



TRADITIONAL FOOD KNOWLEDGE: NEW WINE INTO OLD WINESKINS?

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TRADITIONAL FOOD KNOWLEDGE: NEW WINE INTO OLD WINESKINS?

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Table of Contents

- 04 Editorial: Traditional Food Knowledge: New Wine Into Old Wineskins?**
Andrea Pieroni, Michele Filippo Fontefrancesco and Ina Vandebroek
- 06 Traditional Products and New Developments in the Restaurant Sector in East Africa. The Case Study of Nakuru County, Kenya**
Dauro M. Zocchi and Michele F. Fontefrancesco
- 23 Reviving Traditional Food Knowledge Through Food Festivals. The Case of the Pink Asparagus Festival in Mezzago, Italy**
Michele F. Fontefrancesco and Dauro M. Zocchi
- 33 “The Old Foods Are the New Foods!”: Erosion and Revitalization of Indigenous Food Systems in Northwestern North America**
Leigh Joseph and Nancy J. Turner
- 53 The Persistence of Flavor: Past and Present Use of Wild Food Plants in Sierra Norte de Madrid, Spain**
Laura Aceituno-Mata, Javier Tardío and Manuel Pardo-de-Santayana
- 70 The Importance of Animal and Marine Fat in the Faroese Cuisine: The Past, Present, and Future of Local Food Knowledge in an Island Society**
Ingvar Svanberg
- 88 Root Tonics and Resilience: Building Strength, Health, and Heritage in Jamaica**
Ina Vandebroek, David Picking, Jessica Tretina, Jason West, Michael Grizzle, Denton Sweil, Ucal Green and Devon Lindsay
- 107 Foods of Oppression**
Lisa L. Price, Gisella S. Cruz-Garcia and Nemer E. Narchi
- 114 An Offering of Grain: The Agricultural and Spiritual Cycle of a Food System in the Kailash Sacred Landscape, Darchula, Far Western Nepal**
Francesca Castagnetti, Jagdish Bhatta and Alexander Greene
- 135 Indian Diaspora Gastronomy: On the Changing Use of Herbs and Spices Among Southern California’s Indian Immigrant Women**
Elois Joseph and Robert Voeks
- 156 Wild Food Harvest, Food Security, and Biodiversity Conservation in Jamaica: A Case Study of the Millbank Farming Region**
Donovan Campbell, Alex A. Moulton, David Barker, Tashana Malcolm, Lance Scott, Adrian Spence, Jhannel Tomlinson and Tiffany Wallace



Editorial: Traditional Food Knowledge: New Wine Into Old Wineskins?

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Editorial on the Research Topic

Traditional Food Knowledge: New Wine Into Old Wineskins?

The call for this Research Topic focused on Traditional Food Knowledge (TFK) and its potential for revitalization. Although over the past two decades studies of Traditional Knowledge have greatly increased according to the peer-reviewed literature, these have remained largely focused on ecological, botanical, and medical folk knowledge, while dedicating much less attention to knowledge about animals, foods or rituals. Moreover, while such studies have described mainly the use of biological organisms or systems and their ways of processing, they only have sparingly addressed their associated sociocultural values. Also, in the domain of TFK, field studies have unevenly looked at the processes through which TFK can be implemented in local, community-based programs (see articles published over the past decade in *Journal of Ethnic Foods*; *Journal of Ethnobiology and Ethnomedicine*; *Journal of Ethnobiology*; *Economic Botany*; *Food, Culture & Society*). The current Research Topic offered scholars an opportunity to fill this gap, by exploring new strategies for local production based on the actualization of TFK, promoting locally-owned sustainable tourism and gastronomy with traditional products, and fostering collaborative inclusive platforms of producers, chefs, food activists, local institutions, consumers, and communities. Moreover, this Special Issue intended to invite scholars to look beyond an often-romanticized vision of TFK and to explore the ambiguities of its valorization, i.e., the conundrum generated by commoditization of local knowledge.

Four contributions in this Research Topic bring to the forefront the issue of knowledge erosion, its causes, and the potential for revitalization of TFK. Price et al. investigated the trajectories of food oppression experienced by Indigenous peoples in a contemporary context that have led to the marginalization of their traditional foodways, leading to their overall disempowerment. This discussion is furthered by Joseph and Turner who looked at the processes of erosion and revitalization of TFK among Indigenous peoples in Northwestern North America. While these authors pointed out the impact of Western colonization as a main factor in the loss of TFK, they framed the reappropriation of foods and food practices within an ongoing process of empowerment undertaken by Indigenous communities and supported by academic, governmental, and other allies. Moving the focus to the Sierra Norte de Madrid in Spain, Aceituno-Mata et al. considered the loss in the use of wild food plants and highlighted new trends of leisure and food consumption in Spanish society that are boosting the revival of this practice. Finally, Joseph and Voeks investigated changes in TFK among Indian immigrant women in Southern California, exploring the role of migration as the context for adaptation and transformation of TFK.

Three articles in this Research Topic expand the discussion by considering the link between TFK, environmental conservation, and community resilience. Campbell et al. looked at the

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Millbank region in Jamaica and showed the role of wild food harvesting as a crucial resource for communities to mitigate food insecurity and maintain the well-being of rural households. Similarly, Castagnetti et al., who undertook a study in Darchula in Far Western Nepal, looked at the interconnection between the community's farming and religious year circle and showed the importance of understanding religious practices to design and implement sustainable development policies for food sovereignty. Moreover, in the wake of growing recognition of Faroese Cuisine, Svanberg explored the role of animal fat in the traditional foodways of the islands. Facing the disappearance of TFK, he suggests that the future of Faroese cuisine lies in the maintenance and continuation of local knowledge about traditional ways to extract different types of animal fat and process it into locally made dishes.

Three other articles in this Research Topic consider the relationship between the revival of TFK and the socio-economic forces that (can) promote it. In this respect, Vandebroek et al. analyzed the continued sociocultural relevance of root tonics and their potential for sustainable development for the benefit of local artisanal producers. The value of these drinks as biocultural heritage is rooted in the country's deep cultural history since Transatlantic slavery and also shows their capacity to embody the cultural values of contemporary Jamaican society. Similarly, Zocchi and Fontefrancesco explored the sociocultural causes of the revival of traditional products in the restaurant sector in Nakuru County, Kenya. They suggest that the recent revival of these products is associated with the economic and logistic factors of the sector and, above all, because these foods respond to the cultural needs of contemporary Kenyan society in terms of food safety. Finally, Fontefrancesco and Zocchi described the decline and revival of asparagus production in Mezzago, Italy, triggered by the

organization of a local food festival, which shows the slippery divide between commodification of TFK and its revitalization through tourism.

Imagining the future of TFK studies, we propose that increasing attention to the actual (realized) or potential (envisioned) impacts of knowledge transformation highlighted in this Research Topic (erosion, revitalization, resilience, reappropriation, empowerment, and rural development) will help to expand the focus of studies in this field of ethnobiology. However, in order to build bridges, researchers and local communities should remain engaged in a long-term dialogue to address issues such as commodification and decolonization and co-create projects together. Ideally, these projects should not only be designed to satisfy intellectual curiosity, but also focus in non-fragmentary ways on the multidimensional values of TFK as an immaterial cultural good with spiritual agency that has been co-opted as a policy tool for improving food and nutrition security and public health.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Traditional Products and New Developments in the Restaurant Sector in East Africa. The Case Study of Nakuru County, Kenya

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Over the last 20 years, we have witnessed worldwide a renewed interest in local food products and traditional cuisine. Addressing this demand, the catering industry has played a pivotal role in reviving local food heritage and traditions. While several studies have explored the evolution of this trend in Europe, little attention has been given to this phenomenon in contemporary Africa. To partially fill this gap in the literature, we conducted an ethnographic study to investigate the role of the catering sector in recovering and promoting food and gastronomic heritage in Nakuru County, an emerging Kenyan agricultural and tourist hub. Specifically, we aimed at understanding the main drivers behind the offering and demand for traditional ingredients and recipes. Fieldwork was conducted through the analysis of 41 restaurants and hotels, and data collection was completed through semi-structured interviews with 51 professionals, including owners, food and beverage managers, and chefs. We reported 33 recipes and ingredients tied to Kenyan culinary traditions. Some differences in the role of Kenyan cuisine emerged, with the differentiation mostly linked to the customer profiles. In particular, attention toward traditional foods was more accentuated in restaurants aimed at middle- and high-income Kenyan customers and for specific products namely African leafy vegetables and indigenous chicken, locally known as *kuku kienyeji*. Concurrently, we discovered that the inclusion of these products on the restaurant menus implied an incipient localization of the food supply chains based on self-production or direct commercial relationships with small-scale producers. The research highlighted how the relaunch of traditional food and cuisine develops from a demand for healthy and natural products rather than a search for cultural authenticity. Based on the specificities of the local market, this fosters the creation of alternative supply strategies to cope with the poor quality of ingredients, price fluctuations, and discontinuity of the supply. In this sense, the research suggests also considering tangible factors linked to the technological and logistical conditions of the trade and safety of food to understand the drivers behind the rediscovery of local and traditional foods.

Keywords: traditional food, Kenya, restaurant sector, ethnic cuisine, rural development

INTRODUCTION

Since the blooming of the so-called “Green Revolution” post World War II, the quest for agricultural productivity (Patel, 2013) has led to the loss of food biocultural diversity as well as to an overall standardization of the world foodscape (Bégin, 2016), driven by the industrialization of food production (Clapp, 2012). In reaction to this change, a new understanding started to take shape in the late 1980’s, aimed at rescuing and promoting traditional and local varieties as well as at preserving food and gastronomic heritage. While the first signs of this inclination emerged in the wine industry in the late 60’s, when European legislation about origin certification was designed and enforced (Addor and Grazioli, 2002), it was only in the 1980’s that a new attention to local food products started to spread. Specifically, in the Global North, customers changed their attitudes toward food, giving more attention to the quality of products, their methods of production, their origin as well as to their characteristics linked to regional identity and sensory qualities (Ilbery et al., 2005; Tregear et al., 2007). At the same time, interest in these products was characterized by an ethical and environmental footprint (Murdoch et al., 2000), a new awareness that appears to challenge the hegemony of commercial, mass-produced food (Guptill et al., 2016) fostering new forms of production and consumption as a way to build more democratized, socially just and environmentally sustainable food systems (Allen, 2010; Sage, 2011). This phenomenon has in turn fostered the revival of food heritage; the set of material and immaterial elements of food cultures (e.g., agricultural products, ingredients, dishes, techniques, recipes, and food traditions) that are considered a shared legacy or a common good in a given geographical and sociocultural context (Bessière, 1998).

Consumers are interested in the origin and production methods of food. However, local places of consumption are essential for conveying products and their associated values to final consumers. In this sense, the catering sector has played a pivotal role in building bridges between urban customers and rural producers from peripheral areas (Timothy and Ron, 2013; Rinaldi, 2017). In fact, several restaurants in Europe and North America have contributed to the rediscovery of neglected food and recipes (Pereira et al., 2019), to the promotion of local gastronomic heritage (Miele and Murdoch, 2002) as well as to the reinvigoration of the economic and cultural resources of specific regions (Broadway, 2015). As far as Western countries are concerned, a further dimension of the revival of traditional foods entails a re-territorialization strategy through the creation of stronger networks among the restaurants and a whole set of local food-related actors (Ilbery and Maye, 2005; Lane, 2011). The growing demand for traditional and local products has fostered the purchase of artisanal and seasonal produce directly from local and regional suppliers (Martinez et al., 2010) and more recently the development of projects aimed at the self-production of such products in restaurant gardens and farms (De Chabert-Rios and Deale, 2018).

Restaurateurs have begun to purchase local and traditional food products, as they consider them fresher, of better quality, and with a unique taste (Starr et al., 2003; Sharma et al.,

2014). They see in this strategy new marketing opportunities as well as a mean to differentiate their business from other competitors, thus creating a competitive advantage (Namkung and Jang, 2017). However, the choice has been also motivated by the desire to support local economies (Frash et al., 2015), to provide an ethical and environmental footprint to the restaurant (Curtis and Cowee, 2009) and to offer customers an authentic experience based on ingredients and recipes related to the food and gastronomic heritage of specific areas (Kocaman, 2018; Home et al., 2020). Despite these premises, several studies have highlighted how logistical and time constraints (e.g., extra time to find local suppliers, producer’s ability to deliver on a regular schedule), low-quality consistency of the products, and an increase in supply costs may represent limits to the use of local traditional products and their purchase through alternative supply channels (Starr et al., 2003; Inwood et al., 2009; Sims, 2010; Roy et al., 2016).

While the global trajectory of this phenomenon has been discussed, the motivations and dynamics behind the revival of traditional food in the Global South need further exploration by expanding the debate from South America (Ginani et al., 2020) and Asia (Montefrio et al., 2020; Ozturk and Akoglu, 2020) in order to explore further in depth the emerging trajectories developing in contemporary Africa.

Even though previous studies conducted in Africa have highlighted the role restaurants can play in creating high-value market opportunities for smallholder producers (Mwema and Crewett, 2019) as well as in promoting and marketing the local food and traditional cuisine (Du Rand et al., 2003; Mnguni and Giampiccoli, 2019), little attention has been paid to the role that actors in the catering sector currently play in the revival and promotion of these resources.

Adopting a case study approach (Yin, 2017), the research addresses this topic by questioning the role of traditional foods and cuisine in the catering sector of Nakuru County, an emerging Kenyan agricultural and tourist hub, and investigates the main drivers behind their offering and demand. In seeking to better understand the adoption and diffusion of such products, we pay particular attention to the motivations that shape the decision of restaurateurs to include traditional foods and recipes in the culinary offering as well as to the perceived benefits and implications of this choice. To this end, we carried out a campaign of interviews with chefs, managers, and owners of a selected sample that included different restaurant typologies in terms of the type of menu offering, business structure, and potential target customers. Our study focused on documenting the traditional dishes and products offered in the selected restaurants, understanding the major trends in the industry regarding the attitudes of the different stakeholders toward traditional foods, and on exploring the organization of the supply chain for locally sourced traditional ingredients.

The specific objectives were to:

- define the role of traditional cuisine in the regional restaurant and catering sector.
- analyze the drivers that support the demand and supply of traditional dishes and ingredients.

- understand the organization of the restaurant supply chains for selected traditional ingredients.
- compare the main differences in the role of traditional food according to the type of restaurants and the public they address.

If in the current debate the rediscovery of tradition and the local is often read as a response to globalization (Belasco, 2008; Bessiere and Tibere, 2013; Kim and Iwashita, 2016), here we propose to look at the phenomenon via the adoption of an ethnographic lens (Marcus, 1998) and to explore the contingent problems of the foodscape as well as the material and immaterial elements that shape the use of local and traditional foods in the regional catering sector.

The article opens with an overview of the Kenyan agri-food sector, focusing on the recent trends linked to the rediscovery of traditional food and cuisine. After introducing the main socio-economic characteristics of the foodscape of Nakuru County, the article presents the findings of the fieldwork, showing the diversity of traditional products that compose gastronomic offerings of the regional catering industry and pointing out the motivations restaurateurs assign to their purchase and offerings. We therefore analyze two representative product categories of the foodscape and traditional gastronomy of Nakuru County, namely African leafy vegetables and indigenous chickens. Through the case studies, we argue that the return to local and traditional food is mostly linked to quality, safety, and traceability issues as well as to the emergence of more health-conscious eating habits, especially among Kenyan high- and middle-income customers.

BACKGROUND

Kenya is one of the 10 largest countries and national economies in Africa and the main one of the East African Community (World Bank, 2020). It has seen fast and steady demographic growth since 2000, reaching 49.5 M people in 2016 (United Nations Department of Economic Social Affairs Population Division, 2017). The national economy still relies heavily on agriculture, though the nation is facing fast urbanization, with an annual growth of 5% among the urban population and with 33% of the total population living in urban centers (United Nations Department of Economic Social Affairs Population Division, 2017). The change in the national economy and the fast-growing urbanization have considerably shaped the agri-food sectors with an increasing industrialization and a focus on the production of cash crops for the global market, such as tea, coffee, tropical fruits, and horticultural products (Dolan, 2007).

In the face of this phenomenon, the origins of which lie in the colonial history of Kenya, there has been a progressive reduction in national agrobiodiversity (Maundu et al., 1999). The situation that emerged during the twentieth century has therefore shaped the dietary regimes and culinary practices of the living ethnic and indigenous groups that traditionally inhabited the Kenyan territory (Maundu and Imbumi, 2003). In this context, two main changes have arisen: on the one hand, there has been a standardization of the diet of the Kenyan population, driven by the adoption of staple foods (e.g., maize, wheat, rice,

potatoes, cabbage, and kale) and dishes (e.g., cornmeal *ugali*, *chapatti* bread) that have become the common denominators of the national population's diet (Raschke and Cheema, 2008); on the other hand, gastronomic contaminations have developed as a result of British domination and increased participation in global trade, with the introduction of exotic ingredients (Owuor and Olaimer-Anyara, 2007) and cooking techniques (Cusack, 2000) as well as with the internal migrations from rural areas to the main urban centers of the nation, which have led to a diversification of the urban foodscape (Mwangi, 2002).

While the fast urbanization of the Kenyan population has gone hand in hand with an increase in the consumption of international and processed foods (Maiyoh and Tuei, 2019), in recent decades there has been a growing demand for traditional products linked to the traditional food cultures of specific ethnic groups, such as camel milk and *mursik* (fermented milk), by the new middle classes that have migrated to urban areas (Musinga et al., 2008; Nduko et al., 2017).

It is possible to read within this framework the revival of specific vegetable species, including the so-called African leafy vegetables (hereinafter ALV), among Kenyan customers (Shackleton et al., 2009). While these vegetables have traditionally played a central role in the diet of several Kenyan ethnic groups, their consumption declined dramatically from pre-colonial times until the end of the twentieth century (Maundu, 1997). Nevertheless, since the second half of the 1990's, partially as a result of campaigns and projects promoted by the Kenyan government, through the Ministries of Health and Agriculture, along with international organizations and NGOs (Ngugi et al., 2007; Gotor and Irungu, 2010), such products gained momentum and gradually shifted their status from "food for the poor" to premium products demanded by urban middle classes (Meldrum and Padulosi, 2017; Aworh, 2018). The increase in the consumption of ALV has also been linked to a renewed interest in the nutritional properties of these products and increasing consumer awareness about their health benefits (Gido et al., 2017; Neugart et al., 2017). In the urban areas, greater availability of ALV in supermarkets and shops has fostered the consumption of these vegetables (Abukutsa-Onyango et al., 2007).

A similar pattern marked the rescue of indigenous chicken breeds in Kenya, commonly known as *kuku kienyeji*. They are local poultry ecotypes of the species *Gallus domesticus* L., traditionally reared for meat production by small and medium producers in extensive systems and with limited use of external inputs (e.g., antibiotics, feed), relying instead on indigenous technical knowledge (Kingori et al., 2010). While the productivity of indigenous poultry is lower than exotic breeds, they are hardy, adapt well to the rural environments, survive on low inputs and adapt to fluctuations in available feed resources (Upton, 2000). For these reasons, the rearing of indigenous chicken is considered a poverty alleviation and food security strategy, especially in rural households. At the same time a growing market for the product has emerged in the last decades in both rural and urban areas driven by consumers' preference for the characteristic leanness and flavor of indigenous chicken meat as well as the presumed organic nature of the product (Bett et al., 2012).

Looking at the Ho.Re.Ca sector (Hotellerie, Restaurant, Catering), changes in lifestyle and growing attention to health have contributed to shaping the industry, especially in urban areas. In major cities, there has been an emerging demand for healthier and natural products and the revival of indigenous foods (Adeka et al., 2009; Gakobo and Jere, 2016). While in the past the consumption of these products was limited to the domestic sphere and restaurants located in rural areas, nowadays several restaurants in urban settings offer dishes tied to the traditional food cultures of the new urban middle classes (Mwema and Crewett, 2019). It is therefore common nowadays to find in restaurants and hotels plant-based dishes made with ALV such as *Solanum americanum* L., *Cleome gynandra* L., *Amaranthus* sp., *Vigna unguiculata* (L.) Walp., and *Brassica carinata* A. Braun (Cernansky, 2015; Mwema and Crewett, 2019). Similarly, indigenous chickens have become commonly available ingredients in restaurants and hotels that serve convenience food both in urban and rural areas (Oloo et al., 2017).

It is within this socio-economic framework that the catering industry of Nakuru County should be understood.

MATERIALS AND METHODS

Study Area

Nakuru County, situated in the Rift Valley, covers an area of 7,235.3 km² and is located between longitudes 35° 28' and 35° 36' and latitudes 0° 12' and 1° 10' South, lying about 2100 m above sea level. Nakuru borders eight other districts, namely Kericho and Bomet to the west, Koibatek and Laikipia to the north, Nyandarua to the east, Narok to the southwest and Kajiado and Kiambu to the south (Kenya National Bureau of Statistics, 2010).

Nakuru is the fourth largest city in Kenya, hosting over 500,000 inhabitants with an economy heavily based on manufacturing and the service sector. The surrounding area, though, is known for its agriculture and is characterized by a wide network of small farms with an estimated average area per household of <1 hectare (Foeken, 2006). Farmers integrate cash crop production (e.g., potatoes, maize, and tomatoes) with the cultivation of traditional leafy vegetables such as *Amaranthus* sp., *Basella alba* L., *Cleome gynandra*, *Solanum americanum*, and *Vigna unguiculata*, mostly for the local market (Maundu, 1997; Maundu et al., 1999). Moreover, they usually supplement their income with livestock (shoats and cattle) and poultry rearing, especially indigenous chicken ecotypes (Kyule et al., 2014).

Nakuru is a cosmopolitan region with an ethnoscape dominated by Kikuyu and Maasai communities originating from the region along with other ethnic groups (i.e., Kalenjin, Luhya, Luo, and Kamba). The multicultural milieu is the result of the internal migrations that moved people from all across Kenya to look for employment in the service industry of Nakuru town as well as in the agricultural sector, especially in the flower farms around Lake Naivasha (Sassi and Zucchini, 2018).

The growing urbanization and the multi-ethnic dimension of Nakuru County, along with the rise of the tourism industry, have promoted in the past decades a significant transformation of the agricultural and gastronomic sectors in the area. In this context, there has been an increasing demand for traditional foods from the new urban

middle classes, especially for traditional leafy vegetables (Knaepen, 2018). Little attention, however, has been paid so far to the impact of this phenomenon on the regional catering sector.

Fieldwork Activities and Sample Design

Building on previous studies carried out in Nakuru County (Barstow and Zocchi, 2018; Fontefrancesco et al., 2020), this research aimed to explore the drivers behind the offering of and demand for traditional products, paying particular attention to the dynamics of the regional catering and hospitality sectors.

Fieldwork research was conducted between August 2019 and January 2020 in Nakuru County as part of the broader research project “*Sistemi Alimentari per lo Sviluppo Sostenibili*” funded by the Italian Ministry of Education, University, and Research. It analyzed ethnographically 41 restaurants and hotels located in the city of Nakuru and tourist areas near Lake Elementaita and Lake Naivasha (Figure 1).

Restaurants were selected through a mix of convenience and purposive sampling to be representative of the regional catering sector according to the type of menu offerings, the location of the restaurant, and the potential target customers.

The selection of the restaurants entailed three main stages:

- I A general mapping of restaurants and hotels in the three key locations, analysis of the culinary offering, and definition of the potential target audience, when possible, through the analysis of the restaurants' web pages.
- II Classification of restaurants according to the type of offering and potential target clientele. Based on the findings of the first stage of the preliminary research, we defined three classification categories as follows: (1) restaurants that serve Kenyan cuisine mostly to local low-income customers; (2) restaurants that serve Kenyan and international cuisine mostly to middle- and high-income national customers, and (3) restaurants that serve Kenyan and international cuisine mostly to national tourists and international customers.
- III A preliminary visit to the restaurants and/or the organization of interviews with the owner, manager, or chef. This activity was carried out in the periods prior to the fieldwork activities in collaboration with Slow Food Kenya.

To this end, we carried out a preliminary mapping with Slow Food Kenya using a combination of tools and data repositories. Restaurants were selected by means of an Internet search supplemented by local knowledge. On the one hand, we conducted online research using Google maps and web platforms specialized in the booking and review of catering and hospitality activities including TripAdvisor, Booking.com and EatOut. On the other hand, we conducted exploratory fieldwork to map restaurants aimed at a local clientele, which did not have web pages. This operation was done with the help of local assistant researchers with extensive knowledge of the regional gastronomic sector. Based on the information collected through the two mapping methods, we completed a list of 75 restaurants. Through the analysis of the web pages and the information gathered during the exploratory fieldwork, we were able to define in general terms the culinary offerings of the restaurants, understand the presence and relevance of traditional Kenyan dishes, and identify



potential customer (low-income, middle-/high-income), culinary offering with respect to the presence of Kenyan dishes (most of the food served is based on Kenyan cuisine, about half of the menu is based on Kenyan cuisine, just a few dishes from Kenyan

cuisine). Subsequently, we contacted the restaurants to explain the aims of the research and to organize the interview. Of the 75 restaurants, 41 agreed to take part in the research. The research was limited with respect to the views of the participants who agreed to participate in the study within the scope of sampling and the time they spared for the study.

Data Collection

Data collection was done through face-to-face structured and unstructured interviews with 51 professionals, including six restaurant owners (four women and two men), 29 food and beverage managers (12 women and 17 men), and 16 chefs (four women and 12 men). All of the informants were key decision makers in designing the menu and/or in sourcing food for each restaurant.

The interviews investigated the presence of traditional foods and dishes in the restaurants' culinary offerings and the dynamics driving the offering of and demand for such products. We paid great attention to the motivations behind the inclusion of traditional foods on the menus, the selection of supply chains for local traditional ingredients, and the perceived benefits linked to these choices. During the interviews, we asked informants to present the main characteristics of the restaurant (e.g., type of cuisine, customers' profile, etc.), to list the most important traditional dishes offered on the menu, and to describe the ingredients and cooking methods used for their preparation. In addition, we explored the main reasons why informants included traditional dishes in the restaurant's culinary offerings. Subsequently, we investigated the organization of the supply chain for locally sourced traditional ingredients, paying particular attention to the places and means of supply, the criteria to choose specific supply channels, and the relative advantages the informants attached to this choice. Eventually, we asked the informants to discuss the major trends in the industry regarding the attitudes of the different stakeholders toward traditional foods and cuisine.

The research also included visits to the kitchens and dining rooms to examine the ways of preparing, presenting, and communicating traditional dishes. Moreover, copies of the written menus were obtained when available and pictures of the dishes were taken with the permission of the interviewees. Interviews were conducted in English by the researchers and in Swahili by the research assistant fluent in Swahili and English; they lasted ~45 min. each. Prior to each interview, informed consent was obtained, as recommended by the code of ethics of the American Anthropological Association, and the study was approved by the Ethics Committee of the University of Gastronomic Sciences (AAA., 1998). Interviewees were informed in advance about the rationale, aims, methods, and expected outputs of the project.

The Characteristics of the Sample: Customers, Location, Culinary Offerings, and Services

Tables 1, 2 summarize the main characteristics of the surveyed restaurants.

Of the 41 restaurants included in the sample, 23 facilities were located in urban areas, most of them in Nakuru town, and 18 restaurants in tourist districts, especially near Lake Elementeita, Naivasha, and around Nakuru National Park. Nineteen restaurants were independent and 22 were part of hotels and lodges. Concerning the type of cuisine, 16 restaurants offered mainly Kenyan dishes, and 25 restaurants also included international recipes on their menus (e.g., Italian, Indian, and Chinese). The majority of the restaurants surveyed ($n = 29$) restaurants offered breakfast, lunch and dinner services. Moreover, about 75% of the sample integrated à la carte menus with buffets and private catering, mainly for weddings and seminars.

Based on the preliminary analysis and the interviews, it has been possible to categorize the restaurants according to the type of offerings and the public they target. The sample includes 12 restaurants that served Kenyan cuisine mostly to local low-income customers, 12 restaurants that served Kenyan and international cuisine mostly to middle- and high-income national customers, and 17 restaurants that served Kenyan and international cuisine mostly to national and international tourists.

Data Analysis

The study was largely based on a qualitative analysis of the interviews conducted with professionals in the regional catering industry. The interviews and the filed notes were transcribed, entered into NVivo qualitative data analysis version 12.5.0 (QSR International, 2019), and codes, concepts, and nodes were generated during the analysis.

For data analysis, a descriptive analysis method was used. On the one hand, we selected and organized the data for the 51 interviews and menus in an Excel database. Afterwards, we carried out an analysis to estimate the diversity and frequency of the traditional dishes and ingredients reported during the interviews. For the definition of "traditional food" and "traditional dishes," we took into account the perception of the informants. The frequency was instead calculated based on the number of mentions by the interviewees and cross-checked, when possible, with the menus and the webpages of the restaurants. On the other hand, data were analyzed using a quality content analysis (Elo et al., 2014), with the aim of exploring the motivations interviewees attached to the inclusion of traditional food and recipes in the offerings of the restaurants as well as of identifying the main drivers and consequences behind the revival of traditional cuisine. To this end, the interview transcripts were systematically coded and triangulated with the filed notes, the menus, and the other collected during the fieldwork. Themes and subthemes were identified relating to the role of traditional foods in the selected restaurants, the attributes restaurateurs attached to them, as well as the criteria underpinning the choice of the procurement systems for locally sourced traditional ingredients.

TABLE 1 | Characteristic of the sample.

Location	Nakuru	Naivasha + Elementeita		
	31	10		
Type of restaurant	Urban areas	Tourist districts		
	23	18		
Culinary offering	Independent	Lodge/Hotel		
	19	22		
Types of food service	Kenyan cuisine	Kenyan and international cuisine		
	16	25		
Customer target (major part)	A la Carte	A la Carte + Buffet	A la Carte + Catering	A la Carte + Buffet + Catering
	9	9	4	19
Customer target (major part)	Breakfast + Lunch		Lunch + Dinner	Breakfast + Lunch + Dinner
	4		8	29
Customer target (major part)	Local		National	International
	12		12	17

TABLE 2 | Classification of the sample according to the type of offer and the target clientele.

Type of restaurant	Number
Local, low-income customers / Kenyan cuisine	12
Middle and high-income national customers / Kenyan and international cuisine	12
National tourists and international customers / Kenyan and international cuisine	17

RESULTS

The Diversity of Traditional Dishes and Ingredients in the Regional Restaurants

During the interviews and restaurant visits, 33 recipes and ingredients that informants defined as traditional (i.e., representative of the Kenyan culinary traditions) were reported. Table 3 summarizes the most representative dishes documented during the interviews and gives their names (in English and/or in the local language), category, a brief description, the main ingredients used for their preparation, the cooking techniques, the frequency of citation according to the number of mentions by the interviewees and its relevance in percentage.

Respondents defined the “traditionality” of the dishes mostly based on the type of ingredients and the cooking techniques used for their preparation. In this sense, as shown through the analysis, informants associated products such as leafy vegetables (number of mentions = 120) and white meat (number of mentions = 29) and cooking methods such as boiling and/or stewing (number of mentions = 149) with traditional Kenyan cuisine. Moreover, the analysis highlighted that about 65% of the dishes mentioned by the respondents were vegetarian, whose ingredients include tubers, cereal flours, and leafy vegetables.

As reported in Table 3, starchy foods such as *ugali* (cornmeal), *chapati* (flat bread), and tubers (e.g., *nduma* (*Colocasia esculenta* (L.) Schott), *ngwaci* (*Ipomoea batatas* (L.) Lam.) were the most common items in the culinary offerings of the restaurants. Similarly, ALV, especially *managu* (*Solanum americanum*, $n = 34$), *terere* (*Amaranthus* sp., $n = 22$), *kunde* (*Vigna unguiculata*, $n = 24$), *saget* (*Cleome gynandra*, $n = 12$), *kahurura* (*Cucurbita* sp. $n = 4$), and *ndrema* (*Basella alba*, $n = 4$), played a central role in the culinary offerings both from a quantitative point of view and in terms of diversity of species offered by each restaurant on their menus. Overall, eight different species of ALV have been documented during the fieldwork, and about 80% of the surveyed restaurants included at least one of them in their culinary offerings. While these vegetables are mostly boiled or sautéed and served as side dishes, they are also some of the ingredients representative of local dishes such as *mukimo*, a mixture of mashed potatoes, green maize, and leafy vegetables such as *Cucurbita* sp. and *Urtica massaica* Mildbr. leaves. On the other hand, restaurants offered a more limited range of meat dishes, with the most frequently mentioned being *kuku kienieji* (boiled or stewed), tilapia (deep-fried or stewed with vegetables), and *nyama choma* (grilled mutton and goat meat), the latter usually prepared on request.

The Role and Diversity of Traditional Kenyan Dishes in the Culinary Offerings: Exploring the Motivations of the Restaurateurs

Despite all the restaurants in the sample offering some dishes considered “traditional” by the interviewees, some differences in the role of Kenyan cuisine emerged, with the differentiation mostly linked to the customer profiles and the location of the restaurant.

The restaurants located in touristic areas presented a more diversified culinary offering, including recipes from international and Western cuisine. In this context, the offering of traditional

TABLE 3 | List of the most representative Kenyan traditional dishes and ingredients documented during the fieldwork.

Name of the dish / product	Product category	Brief description	Main ingredients	Cooking techniques	Frequency of citation	%
Brown chapati	Starchy food	Flat bread	Millet (<i>Eleusine coracana</i> (L.) Gaertn.) flour	Baked	7	17%
Brown ugali	Starchy food	Millet polenta	Millet (<i>Eleusine coracana</i> (L.) Gaertn.) flour	Boiled / Stewed	15	37%
Camel broth	Starter	-	Camel meat and bones	Boiled	2	5%
Chapati	Starchy food	Flat bread	Wheat flour	Baked	35	85%
Githeri	Side dish	Mixed of maize and legumes	Maize, legumes	Boiled	14	34%
Kahurura (Pumpkin)	Side dish	Leafy vegetable	<i>Cucurbita</i> sp. leaves	Boiled / Sautéed	4	10%
Kuku kienieji	Main meal	Indigenous chicken	Whole or chopped chicken	Boiled / Fried / Stewed	29	71%
Kunde (Cowpea)	Side dish	Leafy vegetable	<i>Vigna unguiculata</i> (L.) Walp. leaves	Boiled / Sautéed	24	59%
Managu (African nightshade)	Side dish	Leafy vegetable	<i>Solanum americanum</i> L. leaves	Boiled / Sautéed	34	83%
Mandaazi	Sweet	Sweet fried bread	Wheat flour	Fried	10	24%
Matoke	Side dish	Banana stew	Plantain	Stewed	8	20%
Matumbo	Main meal	Grilled offals	Goat and sheep intestines	Grilled	6	15%
Minji (Pea)	Main meal / Side dish	Legume	<i>Pisum sativum</i> L. seeds	Boiled / Stewed	11	27%
Mitoo (Slender leaf)	Side dish	Leafy vegetable	<i>Crotalaria brevidens</i> Benth. leaves	Boiled / Sautéed	2	5%
Mukimo	Side dish	Mashed potato, maize and greens	Potato, green maize, leafy vegetables (e.g. <i>Cucurbita</i> sp. or <i>Urtica massaica</i> Mildbr. powder)	Boiled	18	44%
Mursik	Drink	Fermented milk	Cow milk	Fermented	8	20%
Mutura	Main meal	Spicy blood sausage	Goat and sheep intestines, blood, spices	Grilled	2	5%
Ndengu (Mung bean)	Main meal / Side dish	Legume	<i>Vigna radiata</i> (L.) R.Wilczek seeds	Boiled / Stewed	6	15%
Nderema (Malabar spinach)	Side dish	Leafy vegetable	<i>Basella alba</i> L. leaves	Boiled / Sautéed	4	10%
Nduma (Taro)	Starter	Tuber	<i>Colocasia esculenta</i> (L.) Schott roots	Boiled	13	32%
Ngwaci (Sweet potato)	Starter	Tuber	<i>Ipomoea batatas</i> (L.) Lam. roots	Boiled	10	24%
Njahe (Lab lab bean)	Main meal / Side dish	Legume	<i>Lablab purpureus</i> (L.) Sweet seeds	Boiled / Stewed	7	17%
Nyama choma	Main meal	Grilled meat	Goat and mutton meat	Grilled	16	39%
Omena	Main meal	Soup of sun-dried fish	Dried silver cyprinid fish	Fried / Stewed	3	7%
Oxtail soup	Starter	Soup	Oxtail, vegetables	Boiled	4	10%
Pilau rice	Main meal / Side dish	Spiced rice	Rice, spices, beef	Boiled / Stewed	12	29%
Saget (Spider plant)	Side dish	Leafy vegetable	<i>Cleome gynandra</i> L. leaves	Boiled / Sautéed	12	29%
Samosa	Starter	Fried pastry	Wheat dough, meat and/or vegetables	Fried	13	32%
Terere (Amaranthus)	Side dish	Leafy vegetable	<i>Amaranthus</i> sp. leaves	Boiled / Sautéed	22	54%
Tilapia	Main meal	Fish	Whole fish	Boiled / Fried / Stewed	25	61%
Tumbukiza (Mutton stew)	Main meal	Mutton stew	Mutton, vegetables	Stewed	5	12%
Ugali	Starchy	Cornmeal	Wheat flour	Boiled	36	88%
Uji	Drink	Fermented porridge	Mixed flour (e.g. wheat, millet, sorghum)	Fermented	6	15%

For each dish/product we report the English and/or local name, the category, a brief description, the main ingredients used for its preparation, the cooking techniques, and the frequency of citation according to the number of mentions during the interviews.

Kenyan dishes covered a marginal portion of the whole offering, being mostly limited to buffets and to a small number of items such as starchy foods (e.g., *ugali*, *chapati*) and leafy vegetables, especially *managu* (*Solanum americanum*) and *terere* (*Amaranthus* sp.). This trend was even more evident in cases when the restaurant was part of hotel and lodge facilities that target mostly international customers. Interviewees justified the choice of having a broader menu rather than focusing on a specific culinary offering as an essential strategy to meet the demands of the widest possible spectrum of customers.

As stated during an interview with a restaurant manager of a starred hotel near the shores of Lake Elementeita,

“In recent years, the number of foreign customers and domestic guests from Nairobi has increased. If we want to be competitive on the market, we must have a rich and varied offering to satisfy the needs of our guests. In our menu, we have a selection of local and international cuisines, such as Italian, Indian, and Chinese. We cannot include a broad variety for each type of cuisine. Nevertheless, we try to meet the needs of our guests by offering dishes that are not on the menu in the buffet. We have a few Kenyan dishes on our menu, though we offer them on the buffet or during special events. More and more national and international customers are asking for traditional dishes. However, there is still a great portion of our guests who want to eat international dishes during their stay.”

Differently, in the restaurants targeting mainly national Kenyan customers (i.e., urban middle- and high-income patrons and tourists), traditional Kenyan cuisine represented the main pillar of the culinary offerings in terms of the diversity of the dishes, the ingredients used for their preparation, as well as in the ways of presenting and communicating them on the menus. The majority of restaurants of this kind had on their menus whole sections dedicated to traditional Kenyan cuisine, including starters (e.g., taro and sweet potato), main dishes (e.g., indigenous chicken, tilapia), starchy foods (e.g., *mukimo*, *githeri*, brown *chapati*, brown *ugali*), and side vegetables made with *managu* (*Solanum americanum*), *terere* (*Amaranthus* sp.), *kunde* (*Vigna unguiculata*), *saget* (*Cleome gynandra*), *kahurura* (*Cucurbita* sp.), and *ndrema* (*Basella alba*), all of them ALV. The diversity of the Kenyan dishes further increased as restaurateurs offered on request some products that were not on the menu, such as *mursik* (traditional fermented milk) and *nyama choma* (grilled goat and sheep meat), especially for seminars and other private events.

As highlighted during the analysis of the restaurant menus, a few restaurants (about 10% of the sample) further highlighted the centrality of the Kenyan cuisine on their menus by including information on the history of the dishes, their connection to the culinary traditions of specific regions and ethnic groups, and the origin of the ingredients used for their preparation. This communication strategy was limited to a restricted group of restaurants located in Nakuru town whose main targets are national and international high-income customers. As reported in the following examples, it entailed mainly the presentation of animal-based dishes.

- *Kuku kienyeji*: the road runner chicken is aptly known as *ingokho*. Back in the days in Western Kenya, the *Ingokho* was served on special occasions and the *chimondo* (gizzards) was reserved for the special guests. Traditionally cooked in a stew to delight the palate.
- *Tumbukiza* literally means *submerge*. It is a dish originating from the rich culture of Central Kenya. It is the art of mixing and cooking everything together in one pot.

Moreover, the research highlighted that the name of the dishes and/or their descriptions comprised adjectives such as “traditional” and “natural” as a way to clearly communicate the cooking techniques, their ingredients and their production methods. The triangulation of the data further stressed the relationship between the terms “traditional” ($n = 14$) and “natural” ($n = 11$) and the culinary preparations that have indigenous chicken meat and ALV as main ingredients.

As reported during the interviews, the informants frequently associated traditional and natural foods to specific production systems that rely on the minimal use of external inputs and technologies. The majority of the interviewees defined indigenous products and traditional dishes as opposed to exotic species and industrial, junk food. According to their knowledge and to what they have learned from media communication, such products are associated with the spread of disease such as cancer since they are often cultivated with a great quantities pesticides, as in the case of exotic leafy vegetables like kale, or reared with the use of antibiotics and hormones in the case of broiler chickens. As one food and beverage manager who worked for several years in Nairobi explained,

“Due to the increasing spread of health-related diseases, many Kenyan urban customers have gradually changed their eating habits by reintroducing in their diet healthy and natural foods, often those foods their parents used to produce and cook.”

Our informants often linked the growing interest in traditional foods and the increasing attention toward Kenyan cuisine in the Nakuru catering sector as a consequence of the socio-economic and demographic changes that have marked the region over the last decade. Following the economic boom in the region, an increasing number of Kenyan customers, especially from Nairobi, have been visiting the region both for leisure and business reasons.

As stated by the food and beverage manager of a lodge near Nakuru town,

“We are experiencing a significant increase in Kenyan customers. They are businessmen and tourists belonging to the middle class of Nairobi. During their stay, they want to eat traditional dishes prepared with natural ingredients. In recent years these clients have been paying more attention to their diet. For instance, they prefer to eat traditional vegetables and white meat instead of red meat and fried potatoes. This is something that has spread recently as a consequence of some food scandals. People are paying more attention now to what they eat, as they are more concerned with diseases such as cancer and obesity. If we want

to keep these customers, we need to assure them that the food we cook is nutritious and safe for their health.”

Similarly, the head chef of an independent restaurant located in the urban center of Nakuru highlighted this trend, pointing out the changes in the eating habits of the customers:

“If until recently our customers ordered broiler chicken, cabbage and *sukuma wiki*, they are now asking for traditional products such as *kuku kienyeji*, *managu*, *terere*, and *kunde*, cooked with a limited amount of fat and without the addition of spices (i.e., flavor enhancers). They want simple dishes made with traditional products and cooked as their mothers did at home. They perceive these dishes as healthier and safer. For instance, people prefer *kuku kienyeji* rather than broilers, as its meat is tastier. Customers are aware that farmers raise the animals and open-air feed them with natural products. Broilers, instead, eat only grains and are treated with antibiotics.”

The excerpts from the interviews show how the revival of traditional cuisine is mostly linked to the search for natural and traditional products by the urban middle and high-income classes as a way to improve their health and well-being. To meet this growing demand, restaurateurs offer traditional ingredients, such as ALV and indigenous chickens that their customers perceive as safer, fresher, and more nutritious. Moreover, about 30% of the informants justified the choice of offering indigenous chicken meat to meet the taste preferences of the national customers who prefer the sensory qualities and texture of this meat to those of commercial broiler chickens (i.e., improved poultry breeds reared in intensive systems).

Although the restaurant addressing local low-income customers also based their culinary offerings on traditional Kenyan cuisine, the diversity of dishes and ingredients was lower compared to the other restaurant categories. During the interviews, the restaurateurs highlighted an interesting factor behind the choice of dishes to include in their culinary offerings; the ethnic profile of the customers was the main driver behind the design of the menus. Following the migratory flows from rural areas to Nakuru town, demand for products linked to ethnic gastronomic traditions of migrants emerged, thus fostering the rise of a new niche in the catering industry. As pointed out by different owners and chefs, many of their customers are economic migrants, especially men, who order dishes they cannot eat any more at home due to the limited time available, the difficulties in finding the ingredients, and the lack of knowledge on how to cook them.

In this context, therefore, one can explain the rise of restaurants specializing in fish-based dishes, such as *omena* (small dried fish) and tilapia, millet *ugali*, and leafy vegetables such as *mitoo* (*Crotalaria brevidens*), linked to the gastronomic culture of the Luo and Luhya people, and *mursik*, a fermented drink made from milk and tied to the food culture of Kalenjin.

This circumstance is well-exemplified by what the Luo women who own a restaurant in the city center of Nakuru have witnessed,

“I moved to Nakuru from Kisumu over 20 years ago. I initially ran a small kiosk where I sold fish coming from my hometown.

Over time I realized that several of my customers, most of them Luo, were looking for a place where they could eat traditional dishes such as *omena* soup and millet *ugali*. So I decided to start a restaurant business and offer my customers traditional Luo dishes, the ones I learned from my mother. Now, I am running the business with my daughter. We have an affordable menu with a few dishes, most of them based on fresh and dried fish. We also offer traditional leafy vegetables such as *mitoo* and *mlenda*. We also provide a delivery service to the offices and workers in the neighborhood.”

The Relationship Between “Traditional” and “Local”: an Analysis of Restaurant Supply Choices for ALV and *Kuku Kienyeji*

The inclusion of traditional products in the culinary offerings partially shapes the organization of the food procurement system and the criteria underlying the choice of specific market channels. Several restaurateurs agreed that the growing demand for traditional foods often entails a reorganization of the food supply chain to guarantee customers safer and fresher ingredients.

While wholesale and retail markets are still the main supply channel, about 65% of the surveyed restaurants have recently integrated their food procurement systems by using alternative channels, such as purchasing products directly from local producers ($n = 22$) and self-production for the supply of those products ($n = 31$), with this practice being more common among restaurants targeting middle- and high-income Kenyan customers and national tourists (Figure 2).

In this context, two products are particularly helpful in understanding the consequences of the rising demand for traditional foods on the organization of restaurant activity and the food procurement system: ALV and *kuku kienyeji*. As we observed during the fieldwork, these products are among the most used ingredients in the majority of the surveyed restaurants, unlike other products such as camel-based and fish-based dishes (e.g., *omena* soup), whose offering is still restricted to a small segment of the regional catering industry (i.e., the restaurants target local clientele).

Regarding the supply of indigenous chickens, 40% of restaurateurs stated that they purchased this product directly from local producers. From a quantitative point of view, this practices was more common in restaurants that serve middle and high-income national customers ($n = 8$) and national and international tourists ($n = 5$). A small number of restaurants ($n = 6$) reared their own chicken due to the spatial and temporal constraints connected to this activity.

The restaurateurs recognized the overall economic benefits (i.e., price stability and bargaining power) of these practices as well as the role they play in guaranteeing the consistency of supply both from a quantitative and qualitative perspective.

As the owner of a restaurant in Nakuru renowned for offering indigenous chicken told us,

“When I started my business, I used to purchase most of the chickens from markets in town, but I had several issues with vendors. They often failed in supplying the produce, the price varied considerably from one day to another, and the quality of the

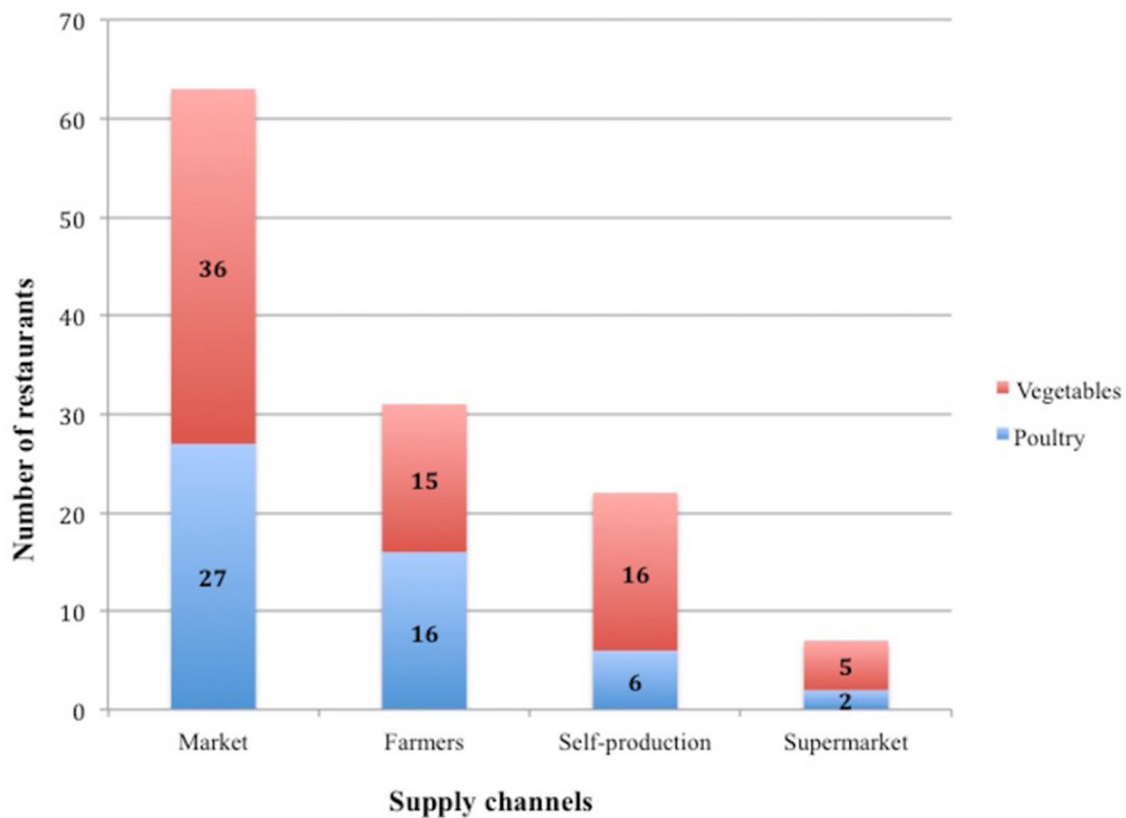


FIGURE 2 | Procurement methods classified according to product category and supply channel.

meat was very poor. I therefore decided to go directly to producers in the area. Now, I buy a stock of chickens from local breeders in the County and I keep them on a farm near the restaurant. I slaughter the chickens at the municipal slaughterhouse according to the number of orders I receive at the restaurant. In this way, I can offer my customers a high-quality product that is tastier, safer, and at a fixed price, even when demand is very high.”

If dealing directly with the producers allows the costs of the supply to be reduced, given the shortening of the value chain, most of the interviewees stressed the importance of knowing the places and methods of production as a fundamental element in the relationship with end customers who are increasingly concerned about their health and who pay more attention to the quality, safety, and origin of the food they eat. According to most informants, the reduction in the intermediary steps in the supply chain was perceived as a suitable strategy to have better control over the traceability of the product, more reliable information on the production methods, and in so doing, to offer customers a high-quality and safe meal.

As far as the supply of ALV is concerned, the decision is to reduce intermediary steps by buying directly from local producers or, more frequently, by self-production with both of these practices being more commonly adopted by

restaurants that serve middle- and high-income national customers and national and international tourists (**Figure 3**). Differently from what observed for indigenous chicken supply, self-production was more common than direct purchase from local producers. While the majority of the informants agreed on the economic benefits of this practice, they also pointed out several barriers, including reliability of the suppliers, quality consistency of the products, and logistical issues since on most of the occasions someone from the restaurant staff has to pick up products from the farmers’ place.

Although in a limited number of restaurants surveyed was able to cover more than 40% of the total supply, this channel covered an important economic function for restaurateurs, it also contributed to an improvement in the quality standard of the culinary offering (i.e., fresher products), and it guaranteed better the traceability of the products, food safety and overall quality of the dishes offered at the restaurant.

As reported by a manager of a tourist lodge located near Lake Nakuru,

“Market vendors can hardly guarantee the traceability of the products they sell. I cannot offer products that I do not know where they come from and how they were cultivated. If a customer

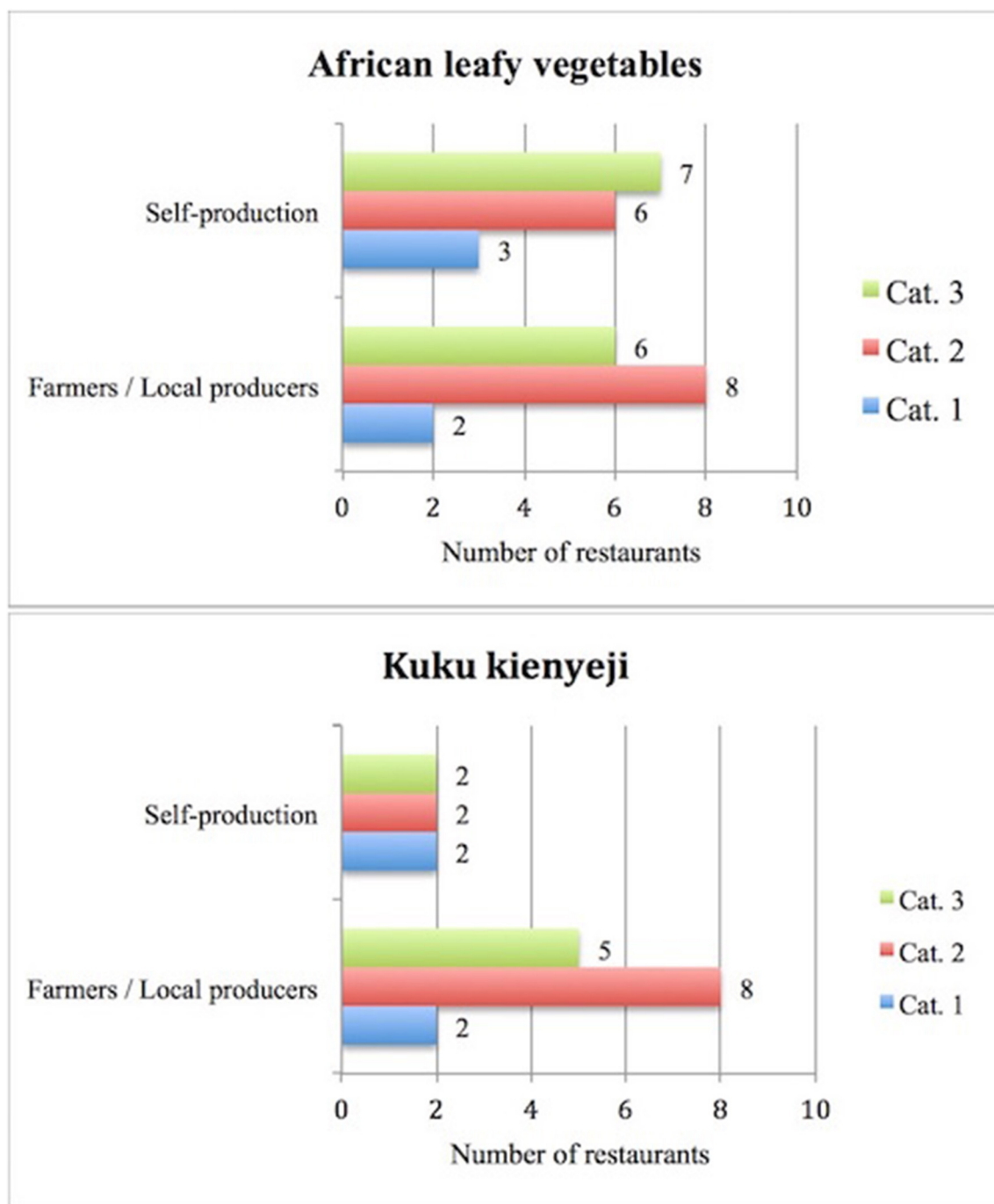


FIGURE 3 | Alternative supply channels for ALV and *kuku kienyeji* according to the restaurant categories.

found out that I sold him/her products grown with chemicals, the image of my restaurant would suffer from it. For this reason, two years ago we started our garden. We have a small piece of land of about 2 acres. We are planning to expand the project and to achieve self-sufficiency at least for *managu* and *terere*.”

At the same time, self-production, mostly of *managu*, *terere*, and *kunde*, played a crucial role in guaranteeing the consistency of the produce, as it allows some of the main problems connected to the supply of ALV to be overcome, such as the lack of refrigeration systems, the high perishability of these

ingredients, and the fluctuation in prices, especially during the dry season.

Overall, the analysis showed that freshness of the ingredients, traceability and price were the main benefits perceived by the restaurateurs who produce directly a portion of the vegetables in restaurant gardens.

While restaurateurs that run catering business that serve local clientele reported an interest in purchasing products directly from producers and/or producing a portion of these ingredients in restaurant gardens and farms, they highlighted the economic, temporal and logistical constraints connected to this opportunity and, therefore, the necessity to rely on the market (retail and wholesale). In particular, informants stated that the choice to buy from local markets was motivated by the need to access fresher ingredients and cope with the logistical and technical barriers such as the lack of adequate preservation systems and places to store the ingredients. This strategy, however, makes the restaurateurs more exposed to the price fluctuations of products in the local food market.

DISCUSSION

The Role of Traditional Products in the Catering Sector

As already shown in other areas of Kenya (Gakobo and Jere, 2016; Mwema and Crewett, 2019), our study highlights that the rediscovery of traditional foods is an incipient trait of the foodscape of Nakuru County. This trend is, in turn, reflected in the catering industry and offers interesting perspectives on the role of restaurants in the promotion of Kenyan food and gastronomic heritage.

Even though in restaurants aimed at an international clientele Kenyan cuisine, still holds a marginal position and the consumption of ethnic products, such as *omena* and *mursik*, is limited to a small portion of local patrons, the research has shown a growing and diversified offering of local products and traditional foods in facilities aimed at middle- and high-income Kenyan customers and tourists. Restaurateurs justify this as being a result of the development of national tourism from urban areas and the attention these customers pay to diet and health.

Overall, it has been possible to identify the socio-economic changes that have occurred in recent decades as one of the main reasons for the introduction of traditional products and recipes in regional restaurants. On the one hand, as already highlighted by Mwangi (2002) in his study on street food restaurants in Nairobi, the emergence of a supply for traditional food is linked to the increasing migrations from urban areas of the County and the consequent development of demand for product tied to the food cultures of specific ethnic groups. On the other hand, our informants justify the rising demand for traditional food as a consequence of the increasing presence of national customers from urban areas, such as Nairobi, who visit the region both for leisure and business purposes. Our findings are in line with the works conducted in France by Bessiere and Tibere (2013) and the study of Du Rand et al. (2003) in South Africa that highlight the connection between the rise of tourism

and the incipient promotion of local and traditional elements of the food and agricultural heritage; however, some differences emerged in the specific drivers behind this phenomenon in the study area.

The Drivers of the Traditional Food Revival

The research highlighted that the revival of local and traditional ingredients, especially ALV and indigenous chickens, has been driven by heterogeneous and interconnected drivers that entail both the nutritional and sensorial properties of the products as well as elements connected to the economic and logistical specificities of the restaurant business.

In the case of ALV, the interviewees highlighted the awareness of customers concerning the nutritional benefits of this indigenous species compared to exotic vegetables such as spinach and kale, as an important element in the shaping of the culinary offerings of the catering industry. Specifically, they pointed to increasing attention to health and diet on the part of the urban population, especially from middle- and high-income customers, as one of the main drivers behind their diffusion. Changes in the lifestyle and greater attention to health among the middle and high-income urban dwellers have been documented as some of the main reasons behind the consumption of ALV at the domestic level (Ngugi et al., 2007; Gido et al., 2017). These changes, in turn, can be linked to specific campaigns carried out by the government and international organization. For instance, Biodiversity International in collaboration with the Ministry of Health, the Ministry of Agriculture and KARI (Kenya Agricultural Research Institute) carried out a campaign aimed at preserving the biodiversity of ALV, its production, and consumption through the creation of commercial chains between rural-urban areas and the development of awareness campaigns to promote the nutritional benefits of these vegetables. As already assessed (Gotor and Irungu, 2010), these activities along with the broader changes in lifestyle have shaped the dietary habits of middle- and high-income customers, especially in cities such as Nairobi. Our study highlights that these changes are also shaping the eating behaviors of the urban population outside the domestic sphere. Similarly, as already noted by Bett et al. (2012), the preference for *kuku kienyeji* is tied to the perceived healthiness of this product as well as to its organoleptic qualities. Overall, this attitude reflects a growing concern about non-communicable food diseases, in particular, cancer (Maiyoh and Tuei, 2019), linked to the consumption of processed products and the use of chemicals and antibiotics in agriculture and chicken rearing.

The connection between the rise in the consumption of traditional foods and changes in the food habits toward healthier and safer diets marked the first stage of development of the revival of local and traditional food in other geographical contexts such as in North America (Ilbery et al., 2005; Inwood et al., 2009) and Europe (Murdoch et al., 2000). This trend seems to guide the rediscovery of indigenous and traditional food in the Nakuru region too. In this context “traditional” is equated with “healthy.”

The Specificities of the Traditional Food Revival

The rediscovery of ALV and indigenous chicken implies, in turn, an incipient localization of the food supply chains. While the market is still the main channel for the purchase of raw materials for local restaurants, thus discounting the limits of poor traceability, food safety, and price fluctuations, restaurateurs have begun to respond to customers' needs by developing alternative production chains based on self-production or direct commercial relationships with local small-scale producers.

In the case of ALV, these strategies give greater control to the restaurateurs with respect to the traceability of the products, as the restaurateur can periodically check the quantity and quality of the production. Moreover, considering the perishability of the leafy vegetables, restaurateurs justify the choice both as a solution to offering fresher products, compared to those found on the market, and in economic terms to coping with price fluctuations and uncertain availability of these products on the market. Similarly, for the production of *kuku kienyeji*, the disintermediation of the market through self-production or commercial agreements directly with producers offers greater control over the product and production methods, thereby guaranteeing traceability and safety. The results are consistent with study findings in the hospitality and tourism setting (Starr et al., 2003; Sharma et al., 2014; Ozturk and Akoglu, 2020) that point to the quality and freshness of traditional, artisanal, and local products as key drivers behind the localization of the food supply chain. However, our findings differ in regards to the economic and logistical constraints that for several scholars inhibit the development of alternative supply systems, including direct commercial relationships with local producers. In their study Inwood et al. (2009) pointed out that convenience and ease of access represents a limit to the development of direct marketing relationships between restaurants and farmers. Starr et al. (2003), in their analysis of the restaurant sector in Colorado, found that, despite the interest in purchasing locally grown foods, logistics, reliability, and consistency of the supply were raised by the restaurateurs as the main barriers. Similarly, Murphy and Smith (2009) observed that coordination with different local farmers might increase delivery times and result in higher costs for the restaurant. Contrary to what has been assumed in these studies and other works that addressed this topic (Sharma et al., 2009; Roy et al., 2016), our findings demonstrated that these strategies do not bring about an overall increase in costs, but they reduce the exposure of restaurants to price fluctuations of the market; thus, they have a positive impact on the restaurant business. This trend represents one of the central elements of the emergent gastronomic phenomenon.

In previous studies, the localization of the supply chain has been associated with an attempt to promote more sustainable and inclusive gastronomic practices by creating alliances with local producers and connecting the restaurants with other local stakeholders (Martinez et al., 2010; Lane, 2011), improving the food procurement system through environmentally responsible procurement practices (Curtis and Cowee, 2009) and enhancing the local food heritage and its associated biodiversity (Fusté-Forné, 2019). Our study highlights

that the ethical and environmental elements, as well as the willingness to boost the local economy, still play a marginal role in this phenomenon since attention to freshness, traceability and quality consistency prevails.

In the context of high market fragmentation (Fontefrancesco et al., 2020) and difficult traceability of food supplies (Chemeltorit et al., 2018), traditional foods and their purchase through alternative supply chains are therefore a potential answer to the search for healthy, fresh, and safe products.

In the face of the potential of this phenomenon, several economic, logistical, and spatial barriers inhibit the possibility of small and medium restaurants implementing these alternative procurement systems. Specifically, while self-production brings economic benefits for a precise segment of the restaurant sector, it can only partially help in boosting the local economy and creating networks among different stakeholders of the local food system. Due to this situation, a great portion of the regional restaurants would be still exposed to price fluctuations of products in the local food market. In order to explore possible solutions to cope with this issue, further studies should investigate the point of view of actors located at different levels of the supply chain to identify their motivations and to figure out alternative ways to foster the creation of commercial and social networks between the restaurateurs and other actors of the local foodscape. In particular, the implementation of short supply chains would imply an analysis of the logistical, spatial, and legal barriers related to the development of these activities.

CONCLUSIONS

The research highlights how the revival of traditional products does not follow a search for cultural authenticity (Umbach and Humphrey, 2017). It suggests reading the phenomenon via an exploration of the link between the gastronomic offering and the specificity of the local agri-food market. The research has therefore highlighted how this relaunch develops from a demand for healthy and natural foods rather than cultural appropriation, and that, based on the specificities of the local market, this fosters the creation of alternative supply strategies to cope with the poor quality of ingredients, price fluctuations, and discontinuity of the supply.

In this sense, the research suggests not overestimating, outside the Global North, the importance of intangible factors such as post-modern disorientation, the influence of global gourmand trends, or consumers' ethical drivers in the revival of local and traditional production. Rather, the research points to other tangible factors linked to the technological and logistical conditions of the trade and safety of food served in order to understand why local and traditional foods are rediscovered and popularized.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Prior to each interview, informed consent was obtained, as recommended by the code of ethics of the American Anthropological Association, and the study was approved by the Ethics Committee of the University of Gastronomic Sciences.

AUTHOR CONTRIBUTIONS

DZ: conceptualization, data curation, formal analysis, investigation, methodology, resources, validation, visualization, and writing—original draft. MF: conceptualization, investigation, methodology, validation, visualization, writing—review, and editing. All authors read and approved the final manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Reviving Traditional Food Knowledge Through Food Festivals. The Case of the Pink Asparagus Festival in Mezzago, Italy

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The article investigates the link between food festivals and traditional food knowledge and explores the role played by tourist events in disseminating local agricultural and gastronomic knowledge. This article presents the ethnographic case of the Pink Asparagus Festival in Mezzago in Italy, analyzing how the festival supported the continuation of crop production and its associated traditional knowledge in the village. In the face of a decline of asparagus production, the article highlights the role of the festival in fostering a revival of local food knowledge, which is also able to embrace modernization, at the same time maintaining a strong sense of the past and Mezzago's legacy. Thus, the article suggests that festivals are not just events aimed at commodifying local knowledge, but can be important tools to refresh and maintain local expertise, which is vital and pressing in the context of modern society, and strengthen and expand the relationship between members of the community, thus converting the festival into an endeavor to foster sociocultural sustainability.

Keywords: pink asparagus, ethnography, food festivals, local development, food knowledge, rural development

INTRODUCTION

A growing attention to the themes of food and its origin, quality, sustainability, and safety marked the beginning of the twenty-first century (Albala, 2013). In an attempt to cope in an age of risk (Beck et al., 2000) and individual and collective uncertainty (Bauman, 2007), consumers have moved from mass-production toward innovative and different products that range from healthy foods to geographically typical foods; and from “free-from” foods to environmentally and socially sustainable foods (Corvo, 2015). In particular, the new demand for food is no longer fuelled by the fear of hunger or the experience of insecurity (Cocchiara, 1980; Camporesi, 1981; Artoni, 1999; Grimaldi, 2012), but by a search for leisure, as well as security (Belasco, 2008; Blackshaw, 2010). In this context, these new appetites to explore food have boosted the rise of culinary tourism (Kivela and Crotts, 2006; Wolf, 2006; Mkono, 2011; Hall and Gossling, 2013), making the sector one of the key areas of contemporary tourism (Hall and Sharples, 2008; Getz and Robinson, 2014; Garibaldi, 2018; Dixit, 2019; Guigoni, 2019). Food festivals have become the fulcrum of this new form of tourism (Dixit, 2019).

Food festivals are public events aimed at celebrating specific food products. They come with straightforward names that identify the event, the products that are promoted, the year of the festival, and the place where it is celebrated (e.g., Taste of Springfield Festival 2019, Byblos en Blanc et Rosé 2019, Sagra del Canestrel di Montanaro 2019). With the clarity of their names, festivals

promote a specific place by emphasizing their gastronomic particularity. They are hallmark events, “of limited duration, developed primarily to enhance the awareness, appeal, and profitability of a tourism destination in the short and/or long term” (Ritchie, 1984). The touristic competitiveness of a hallmark event derives from its ability to create interest and attract attention through its uniqueness and timely significance (Hall, 1989). Food festivals achieve this by promoting a specific experience that draws from a bundle of selected foods and landscapes, both elements ostensibly unique to the event. In so doing, they are able to address both the tourists’ desire for a unique culinary experience and their search for new, exotic, and beautiful locations to be explored at the moment of their maximum splendor (Bessière, 2013; Bessiere and Tibere, 2013; Timothy and Ron, 2013; Brulotte and Di Giovine, 2016; Laing et al., 2019). Their success as tourist events raises questions concerning how festivals can construct a local gastronomic identity, and what possible role the festivals have in revitalizing local gastronomic knowledge and production practices. In particular it poses questions concerning sociocultural sustainability of these events because it is often pointed out that the festivals lead to a commodification of local knowledge (Çela et al., 2007; Sabanpan-Yu, 2007; Blichfeldt and Halkier, 2014; Wu et al., 2014; Meretse et al., 2016). As highlighted by Comaroff and Comaroff (2009), facing the success of these events, and the economic profit generated by use of local folklore and landscape peculiarities as economic asset for the festivals, communities risk being entrapped in a vicious circle of “re-ethnization,” in which local actors invent, enact and embody folkloristic elements in order to appeal the taste of the public in support of the economic success. This process involves also gastronomy and the invention of traditional cuisine (Wilk, 1999). This wide-spread phenomenon sparked a heated debate about authenticity and heritage tourism, reviewed by Theodossopoulos (2013). In the field of tourism and hospitality, this debate has opened relevant questions on how find sociocultural sustainable strategies in order to articulate a gastronomic offer able to promote local heritage and products without triggering phenomena of heritage commodification (Forné, 2015), stepping away from paradigms of frugal sustainability (Peveri, 2019) and seizing the opportunities of local, economic development that tourism promises.

This article responds to these interrogatives by exploring the case-study (Yin, 2018) of the “Sagra dell’Asparago,” the Pink Asparagus Festival in Mezzago in Italy, and its contribution to the revival of the production and food knowledge of pink asparagus in the area. In so doing, the article reveals the transformation of the role of asparagus in the region, and analyses the festival and strategies linked to the promotion of local asparagus. It highlights that the festival has fostered the creation of stronger social ties between the old member of the community and new entrants (e.g., migrants, national and international stakeholders such as small scale producers from other villages, scholars, chefs, asparagus producers from abroad) that have taken part both to the asparagus production and the organization of the fair. From this perspective, the festival represents a strategic tool for promoting a more socially and culturally sustainable and

inclusive environment. Concurrently, the festival has helped local producers to expand the market of the pink asparagus and increase the commercial value of this product, thus contributing to a virtuous process of local development.

MATERIALS AND METHODS

Study Area

The ethnographic research was conducted in Mezzago (MB) (45°37′47″64 N 09°26′45″24 E), between January and July 2019 to explore the reality of asparagus cultivation in the Brianza area.

Mezzago is a town of about 4,500 inhabitants, located in the district of Vimercate, Milan. Since the Middle Ages, its agricultural development has been steady, especially its horticultural and cereal production. The municipality has developed since the nineteenth century, thanks to the diffusion of sericulture (Cento Bull and Corner, 1993; Ghezzi, 2007) which quickly became the main occupation for about 10% of the population, mostly women and minors (Agostini, 2015). During the twentieth century, the population continued to grow despite the lack of industrial development in other neighboring municipalities.

In the first half of the twentieth century, Mezzago was a community of farmers whose livelihoods combined agricultural activities (mostly cereal and horticulture) with the employment in the nearby factories of Monza, Milan, and Bergamo. Therefore, by the first decades of the twentieth century a daily commute between these places was already established. After the end of the Second World War, Mezzago retained this demographic characteristic and remained a predominantly residential and agricultural community (de la Pierre, 2011). The Pink Asparagus Festival, which celebrated its 59th anniversary in 2019—the last for the time being due to its suspension in 2020 as a result of the COVID-19 pandemic—has become a particularly important part of life in Mezzago and at the national level (Agostini, 2015).

Methods

The research encompassed historical analysis and observation of the festive events, as well as 28 in-depth interviews and two focus groups that involved 12 organizers of the event and 15 asparagus producers. Participant observation was carried out on the days in the weekends of May and June 2019, when the festivals were held, conducting short, semi-structured interviews with the volunteers and participants. Participant observation included an analysis of the activities of the festival as well as of asparagus production by the Asparagus Production Cooperative of Mezzago. During the observation, material documentation such as flyers and leaflets was collected.

Interviews with volunteers, local administrators, and producers of asparagus were conducted using the life story methodology (Rosenthal, 2018) to explore the history of the festival and cultivation of asparagus in Mezzago. The interviews focused on the relationship that links the interviewees to the festival, the motivations and expectations that underpin the participation and organization of the festival as well as the involvement of the interviewees in the pink asparagus production. The narrations have revealed not only the origins

of and motivations for these contemporary lay rites but also the emotions and meanings that define the human, gastronomic and natural landscape of the community. We also explored the reasons for linking the celebration with this agricultural practice, the specificities related to the organization of the festival, the production, and marketing of asparagus.

Interviews were conducted in Italian by the researchers and lasted ~1 h each. Prior to each interview, informed consent was obtained and interviewees were informed in advance about the rationale, aims, methods, and expected outputs of the project.

Alongside this work, historiographical research was carried out in order to reconstruct the oral history (Abrams, 2010) of local agriculture and festivals. The data thus collected forms the basis of the present ethnography of the festival.

The study was largely based on an ethnographic analysis (Ellen, 1984) of the materials gathered during the observation of the Pink Asparagus Festival, and historical and bibliographical materials collected during the research. The analysis has combined life-history method (Goodson, 2001) and participant observation into a historical anthropological approach (Schmitt, 2008) aimed at presenting the dynamics of the festival and reconstructing the cultural biography (Kopytoff, 1986) of the pink asparagus in Mezzago.

RESULTS

Asparagus in the Italian Foodscape

The term asparagus encompasses over a hundred species belonging to the Liliaceae family, with *Asparagus officinalis* L. being one of the most important edible species. *A. officinalis* is an herbaceous perennial plant which has a hypogeal part (rhizome and roots), commonly called “crowns,” from which the young edible shoots of the plant, called “spears,” originate.

The asparagus crop consists of two main types: green (and green-purple) and white. Botanically, both types are a single species. The color of the shoots varies according to the cultivation methods. When the crop grows in the open field, the shoots have a green color tending to purple. If the crops are grown under the soil in the absence of light (i.e., forced cultivation), spears appear white as the plant cannot synthesize the chlorophyll (Aliotta et al., 2004).

Asparagus grows optimally on sandy soils with good drainage. After the germination of the seeds, the plants are grown for 1 year, transplanted to the open field and left for another year to develop a strong root crown. From the third year of cultivation, the spears can be harvested for up to 10 to 12 years. In Europe, harvesting usually takes place in spring (late April until mid-June), although earlier harvesting is becoming successful through greenhouses (Falavigna and Palumbo, 2001).

Native to the fertile half-moon of Mesopotamia, asparagus spread westward through Asia Minor and Egypt, and eventually arrived in the Mediterranean region (Aliotta et al., 2004). As mentioned by Pliny the Elder in his *Naturalis Historia* (79 BC), Romans knew asparagus and used it for both medicinal and culinary purposes. With the expansion of the Roman Empire, asparagus was introduced in the conquered territories, especially in Spain and Germany. However, with the decline of the Empire,

the cultivation and consumption of asparagus slowed down. During the medieval period, asparagus was cultivated in feudal gardens or monasteries and used exclusively as an ornamental and medicinal plant (Falavigna and Palumbo, 2001). The cultivation of asparagus for human consumption spread from the fifteenth century as a result of new cultivation techniques for the production of white asparagus, invented by the German botanist Hieronymus Bock, which made it possible to partially overcome the problem of late frosts. Given this technical innovation, in the following centuries, asparagus production expanded to the central-northern part of Europe (i.e., The Netherlands, France, and Belgium) and, later on, to North America (Falavigna and Palumbo, 2001).

While in the past asparagus was a luxury food item, in recent decades it has become more widely grown and consumed. At the global level, there are currently 60 countries with temperate and tropical climates where asparagus is grown (Knoema, 2018). Due to the globalization of its production, asparagus is now available throughout the year. China and Peru are the main producers accounting for around 90% of the world supply. In Europe, Germany, Spain, and to a lesser extent, Italy are the countries with the highest level of production (Future Market Insights, 2017).

In Italy, the production of asparagus has been developing since the fifteenth century, starting from the northern regions and then spreading to the rest of the country. With regards to quantity, the green asparagus is the most widespread, though there are some differences according to regions. White asparagus is concentrated almost exclusively in the north east, violet asparagus on the Tyrrhenian coast, while green asparagus can be found throughout the country, especially in the southern part of Italy (Falavigna and Palumbo, 2001). According to the Italian National Institute of Statistics (ISTAT, 2013), asparagus production covers an area of 5,950 ha with an annual production of 371,302 quintals. Puglia, in particular the province of Foggia, Campania, Tuscany, Lazio, and Emilia Romagna are the main producers of green asparagus in the open field. White asparagus is still grown mostly in the northern regions, especially in the lower Po Valley, where the climate, the loose soil, and the proximity to coastal areas favor its cultivation.

From a production point of view, asparagus cultivation is mainly carried out on a small and medium scale by non-specialized farms. Since the harvesting season takes place in spring, when few other crops are ready to harvest, growing asparagus allows farmers to integrate their income as this crop has a higher market value compared to other horticultural products (Falavigna, 2007). However, in the last decades, due to the reduction in the number of agricultural workers and an increase in the demand for asparagus, intensive production has emerged, based on the modernization and mechanization of production techniques and the introduction of more productive cultivars (Falavigna, 2000). The phenomenon has been more marked in the southern part of Italy, where the early entry into spring production and the long growing season enable higher and longer yields.

Besides the growing industrialization of production (especially for green asparagus), its cultivation still has an artisanal dimension and a strong link with regional and

rural foodscapes (Morganti and Nardo, 2009). Given the embeddedness of this crop in the food and agricultural heritage of Italy, and its potential role as a tool for local development, several local cultivars have been recognized as PDO (protected designation of origin) or PGI (protected geographical indication). The most important and well-known of these are the white asparagus of Bassano (PDO), the white asparagus of Cimadolmo (PGI), the green asparagus of Altedo, the asparagus of Badoere and the asparagus of Cimaldone. Similarly, other cultivars have been documented and included in the PAT catalog (*prodotti agroalimentari tradizionali italiani*), a project promoted by the Ministry of Agricultural, Food, and Forestry Policies (MIPAAF), and intended to preserve the food and agricultural heritage of Italy. In addition, the safeguarding and promotion of asparagus and its associated traditions have been at the center of some projects undertaken by the Slow Food movement, specifically the Ark of Taste and Presidia projects; the one involving the pink asparagus of Mezzago is among the most developed (Slow Food, 2012).

The Pink Asparagus Festival

There are about 70 festivals in Italy dedicated to asparagus (Bianco, 2009). One of the most representative is that of Mezzago. In 2019, the 59th Pink Asparagus Festival in Mezzago was celebrated from April 27th to May 24th. The festival, organized by a local grass-roots organization, called the Mezzago Pro Loco, took place at the Architi Palace, one of the oldest buildings in the municipality (nowadays, it is owned by the Mezzago Coop and is intended to function as a multi-purpose center equipped for catering). The diary of events during the festival includes public meetings, workshops, concerts, dances, small markets, and exhibitions. Annual regular features include the MEZVAGO, the official closing event of the festival. In addition, the 2019 programme included meetings in support of agricultural, environmental, and nature conservation activities, such as the MezzAgro initiative, a collaboration between the Municipal Administration, the North East Agricultural Park (www.parcoagricolonord.it), and Ciboprossimo (<https://ciboprossimo.net>) which is currently in its second year (in 2019 it concentrated on the theme “seed exchange, plants, and surroundings” and was intended to bring the festival closer to social and environmental issues). As the organizers pointed out during the interviews and focus group, villagers from Mezzago and the neighboring municipalities of the Brianza area represent the main visitors of the Pink Asparagus Festival, though people from the other provinces of the Lombardy region.

The fundamental focal point of the festival, however, was the restaurant that catered for about 500 people per meal thanks to a large professional kitchen, which has been set up over the years by the Coop and the Pro Loco in the large spaces of the hall and the arcade, and above all, with the help of a large group of volunteers. The president of the Pro Loco, Alessio Colnago, said:

A hundred volunteers, coming from Mezzago and from the neighboring countries, made the success of the event possible ... they cooked and served in the dining room and strived for the success of the events. Thanks to their commitment, it was possible

to grow the event and serve over 6,000 people in the restaurant during the holiday month, which confirmed the festival as one of the most attended gastronomic events in the Brianza area.

The restaurant has a professional kitchen equipped with professional furniture. Recently the Pro Loco has also provided for the purchase of specific asparagus processing tools, such as a special machine for trimming and peeling the spears. Previously, volunteers carried out this operation manually.

The gastronomy of the festival is mainly inspired by Lombard and Milanese traditions and focuses on pink asparagus as a distinctive element of such dishes as risotto with Mezzago pink asparagus, Mezzago pink asparagus with eggs, and beef in oil with Mezzago pink asparagus. The downloadable menu from the site of the Pro Loco (www.prolocomezzago.it) demonstrates the range of dishes available.

The menu centers on pink asparagus used in traditional recipes (e.g., as an ingredient for risotto, or boiled and accompanied by eggs) or in innovative dishes resulting from research into the gastronomy of Lombard (e.g., with lasagna or as an ingredient in desserts) conducted by the Pro Loco volunteers in collaboration with catering experts such as a chef from a Michelin-starred restaurant near Milan. The innovations that characterize these courses often result from a creative process, which starts with the volunteers, and then expands outside the boundaries of the mid-town community to involve various participants from the regional and national gastronomic sector.

Given the centrality of pink asparagus, the food and wine are drawn from the local food specialties and the broader Lombard territory: raw vegetable ingredients, meat, and pastry products are purchased locally; fresh pastas are produced by an artisan pasta factory in the neighboring municipality of Usmate; and the cheeses (including the ancient Stracchino of the Orobianche Valleys and the Salva Cremasco) come, respectively, from small dairies located in the provinces of Bergamo and Crema. Drinks too, thanks to the voluntary collaboration of experts in the wine sector, are intended to promote the products of the territory.

To quote one of the Mezzago volunteers:

We are proud of our menu, because it tells our story. Research, discussions, attempts, failures, and many satisfactions come with each recipe. Overall, we are certain that this menu can best highlight the product of Mezzago, our asparagus.

The different ways of presenting the asparagus showcase this local product, which is regulated and protected by a municipal denomination (De.Co., formerly DCC Mezzago 11/2004). Moreover, the product has been registered in the Slow Food Ark of Taste (<https://www.fondazioneSlowFood.com/it/arca-del-gusto-slow-food/asparago-di-mezzago/>) as *Asparagus officinalis*, locally grown and characterized by a white shoot and a pinkish apex, whose production is concentrated between April and May. It is cultivated in Mezzago and in the neighboring municipalities (Bellusco) by the partners of the APC Mezzago and seven other agricultural enterprises subscribing to the production discipline (formerly DGC Mezzago 35/2019).

The festival is not only a showcase of local production, but also the main commercial outlet of pink asparagus. This product is sold preferentially by the APC and by other producers at the festival, where about 60% of the total harvested crop is consumed; the remainder is marketed at regional level in retail outlets (e.g., Esselunga, Coop, Gigante, and Eataly) and in markets (e.g., Slow Food Earth Markets and Coldiretti's Mercato Campagna Amica) in Lombardy, particularly in Milan and Monza, in its characteristic pink and black packaging (Figure 1). The pre-eminence of the festival as an outlet for local production is deeply connected to the history of Mezzago and is rooted in post-unification history, especially in its more recent past.

The History of Pink Asparagus in Mezzago

The origins of asparagus cultivation and the specific reasons for its introduction in Mezzago are uncertain. However the inhabitants tend to link its appearance to the history of "Muschen":

Giovanni Brambilla, whom everyone called "Muschen," was from Mezzago and, at the beginning of the twentieth century, announced his departure to America: nobody knew if he would return. He returned and brought with him the roots of a strange pink asparagus, which immediately adapted to the soil of the area, so much so that it became its symbol in a few years. Thus, according to this legend, the pink asparagus of Mezzago was born (Malvasi, 2012).

Perhaps this is only a legend. However, it introduces the specific reality of a rural Lombard village in the early twentieth century that was coming to terms with growing emigration toward urban centers and abroad, and attempting to diversify its production at a time when sericulture was in decline (Cento Bull and Corner, 1993). Until then, the production of asparagus represented, alongside mulberry and silkworms, a possible source of income for the small farmers of Mezzago. From the interviews, we learned that farming families had a few rows of asparagus, usually grown in association with vegetables from the Liliaceae family, such as garlic, shallots, and onions. In this context, the asparagus was produced almost exclusively for sale; it was not an ingredient of the local gastronomic tradition, and was rarely consumed by farmers.

In the years after WWI period, asparagus cultivation was deeply integrated into the fabric of local agriculture. In a municipality of about 2,000 inhabitants, there were around 400 producers growing a total of ~4,000 kg (on average 10 kg per producer) per day during the collection period (Agostini, 2015). Each family grew its own asparagus in small plots along with other horticultural products. The success of the crop was connected to the early harvest period of the asparagus, between April and May, which was earlier than other horticultural and cereal crops, and it thus provided families with a much-needed source of income after the winter.

At the beginning of the twentieth century, Mezzago people specialized in the production of white asparagus by adopting artisanal agricultural practices similar to the current ones: in January, the soil is prepared and vegetation from the previous



FIGURE 1 | Photo of the packaging used by APC (photo from: <https://www.asparagorosa.it/index.php/asparago-rosa>).

year is cleared; in February, the soil is plowed and fertilized; in March, when the first shoots begin to appear the soil is tugged in and mounds of about 30 cm are prepared to prevent photosynthesis in the shoots; from April to May the asparagus is harvested daily; between June and July the soil mounds are leveled, the plants rest, and new seeds are produced. Differently from the rest of Italy, where producers grow asparagus that have completely green or white shoots, the asparagus cultivated in Mezzago have a characteristic pink apex. The color of the tip is due to exposure to sunlight for a limited time (a few hours) from dawn to harvesting, which takes place daily in the early morning. This characteristic is also due to local soil and climate conditions, i.e., clayey soil with a particular concentration of minerals such as iron.

Given the widespread use of the crop in the area, in 1959, the Municipality of Mezzago created the festival. Antonio Colombo, mayor of Mezzago from 2004 to 2014, recalled that:

The festival at the time had nothing to do with its present version. It used to be a competition between asparagus producers who were awarded a prize for the largest asparagus, the most beautiful bunch, the greatest production, and so on. Surely, that tells us how much asparagus production was felt by the community, but the history of the festival as we see it today was born later and in a different context.

The current festival, which was intended to be a celebration of food and focussed on the asparagus, was initiated in 1982, when Mezzago farming families were abandoning small-scale horticulture, cattle, and pig farming and turning to full-time employment in local industries. The transformation of the festival was promoted by the ARCI club of Mezzago together with other local volunteers (de la Pierre, 2011), “making the festival an important opportunity for participation and involvement of the community of Mezzago” as Colombo says. Over the course of a few years, the festival expanded and since 1989, with the birth of the Pro Loco, its organization has become one of the main responsibilities of the new association.

Right from its early years, the “new” festival presented a gastronomy focussed on the asparagus but encountered increasing difficulties in finding local products. “Mezzago had changed and fewer and fewer people had the soil for asparagus production” as Giovanni Vitali, president of APC, recalls. “By the end of the eighties, finding asparagus for the festival had become virtually impossible. We started buying them in Veneto ... until we went back into production with the APC.”

The APC was founded in 2000 following specific circumstances that brought public attention to the municipality, the territory, and the actual state of asparagus production in Mezzago. In the late nineties, a local newspaper published an interview with a citizen who declared: “There is no such a thing as the Mezzago Asparagus Festival; asparagus is no longer produced in Mezzago.” Vittorio Pozzati, currently president of Coop Mezzago and Mayor of Mezzago from 1996 to 2004 explained what happened next: “it was a cold shower, but it was a great opportunity to re-launch the cultivation by combining new opportunities with the need to preserve the territory of the municipality from further overbuilding.” The municipal administration in those years had been engaged in soil protection and the enhancement of the agricultural and environmental heritage of the municipality (de la Pierre, 2011). The Municipality's activities to promote asparagus culture began in 1998 (after the first failed attempt in 1983). It created a collaboration with the Experimental Institute for Horticulture of Montanaso Lombardo. In 2000, in addition to providing technical support, the Municipality (in association with the Lombardy Region) purchased 70,000 roots; 60,000 for the members of newly formed APC and 10,000 for other small local farmers intending to revive cultivation.

As Antonio Colombo recalls, the beginning of the collaboration with the institute of Montanaso Lombardo also coincided with a substantial modification of the system and the agricultural practices linked to the production of asparagus. Following the advice of the institute, various innovations concerning the cultivation of the asparagus were introduced: the width of the asparagus production area was widened from 120 cm to 2 meters; the number of asparagus rows was reduced from three to two; and the soil and the heaps were prepared with a tractor. Black plastic sheets were also introduced to protect the vegetables from sunlight and to prevent the tips of the asparagus from turning green. In following years, experience gained thanks to the collaboration with a community of cultivators from the German city of Reilingen encouraged the introduction of

further technological innovations related to the production, collection, and cleaning operations. According to Colombo and other members of the APC, the old generations of Mezzago cultivators at first seemed skeptical about the innovations, which had been introduced.

In addition to the reticence of the older growers, “the real initial obstacle,” explains Vitali, “was to find owners who wanted to rent the land for us.” Asparagus cultivation lasts for 10 to 12 years. “In a historical period of rapid urbanization, everyone saw the ownership of agricultural land as bank checks to be held because in the following years that would have become building land of much higher value. Finding someone who was available to rent a field for 10 years was not simple” concludes Pozzati. The APC began its activity with 3 hectares of land and gradually expanded to the current 6 hectares, with a production capacity per cultivated hectare of about 4,000 kg of annual harvest. In the current year, the Cooperative members have harvested exactly 25,291 kg of pink asparagus. Actual production began in 2003 and in 2004, and the product was subject to one of the first De.Co. Right from the start the product was primarily intended for the festival and packaged with its characteristic brand.

In the mid-2000s, the Mezzago Festival returned to being the Festival of the Mezzago Pink Asparagus, grown by local producers through an economic collaboration involving the Pro Loco, the APC, and other asparagus cultivators. As a matter of fact, the Pro Loco is committed to purchase the quantity of asparagus required for the festival from the APC which, on the one hand, prefers to sell to the Pro Loco and, on the other, guarantees a fixed purchase price thus completing a supply chain agreement based on assuring the sale of the product and the security of the price.

Therefore, through the festival this economic system generates a clear and positive benefit to the local economy and creates a synergy between producers and the world of volunteering. The success of the festival is linked to the Pro Loco's ability to aggregate and activate a large part of the local population. The Pro Loco's president, Alessio Colnago, underlines the essential part volunteers play:

This year we had over 90 volunteers in the kitchen and serving at the tables. Others helped us with the events. We have volunteers of all ages and from every political and religious background. Whoever wants to help is welcome and we are happy to have them on board. The success of the festival is in the ability to network with all the positive people in the area, creating a festival that involves the whole community.

The synergies and initiatives promoted by the Pro Loco during the festival also extend to other companies operating in the local agri-food business. In addition to local producers and artisans involved in the supply of materials, and associations operating in the environmental field, the event also involves small businesses and projects in the social, cultural, and educational field operating in Mezzago and its surroundings. One example is the start-up “MicroOrtaggi” (www.microortaggi.it), a small agricultural company, and the educational farm “Passo Trotto Galoppo” (<http://sbaraglio.blogspot.com>).

Giorgio Monti, mayor of Mezzago from 2014 to 2019, explains:

The festival works because all the actors of the territory collaborate. It is a platform that brings together the Municipality and civil institutions, the population of Mezzago through voluntary associations and the parish, and companies and producers through the APC and the Co-op. It is through this collaboration we recreated a profound bond between the community and its rural history and landscape. The Festival is pivotal in this work.

DISCUSSION

The Festival and a Revival Through Reconstitution

The pink asparagus of Mezzago is a renowned product nowadays, known across the country and sold in different outlets across Northern Italy. Its name is strictly linked with the community where it is produced; and a strong narrative concerning its past—and the link with the history of Mezzago—is spun around it. Its success is a recent phenomenon and is linked with a revival of its production that is intertwined with the history of the “Festa”; these events are so bound together that one could conclude that there would have been no pink asparagus if the people in Mezzago had stopped the celebration once the cultivation disappeared from the local countryside. The festival is indeed the one element that signifies an uninterrupted cultural continuity in the history of the asparagus of Mezzago, and it contributed to a partial renovation and actualization of this production and its associated traditional knowledge.

First of all, whether the pink asparagus is native to Mezzago is not a matter of genes. Already at the beginning of the twentieth century, when asparagus was consistently cultivated in Mezzago, the crop was not based on a local cultivar and the distinct color was not the result of a genetic selection, but relied on the particular techniques used for its production (Aliotta et al., 2004). Thus, the revival of the Pink asparagus after its marginalization and disappearance is not analogous to places where the reintroduction of a specific cultivar or breed is crucial for triggering and sustaining the process. In Cortereggio, for example, a small village on the outskirts of Turin (which is internationally known today for its white bean production), until the 1950s people were used to cultivating a local cultivar of *Phaseolus vulgaris* named *Piattella Canevasa*. After the Second World War its cultivation declined, and the white beans disappeared from the fields and gardens. Their cultivation was reintroduced only in the 1980s, by planting a sample of the lost cultivar taken from the University of Turin Gymnosperms Bank. Starting with this first sample, local cultivation expanded and has become the most characteristic and remunerative crop for the farmers of Cortereggio (Fassino, 2015).

The recovery of the pink asparagus of Mezzago has neither been linked to the reintroduction and/or the protection of traditional techniques, as happened for the revival of other threatened foods such as the Colonnata Lardo in Tuscany (Leitch, 2003) and the Serpa cheese in the Alentejo region of

Portugal (West and Dominigos, 2012). In these cases, local producers in collaboration with national and international actors (e.g., Slow Food) conducted activities aimed at recovering the traditional knowledge connected, respectively, to the processing of pork meat and the production of dry-aged sheep' milk cheese. Through activist campaigns and the development of product specifications, producers overcame the risks of losing the traditional techniques and the associated knowledge due to the introduction of new food safety regulations, as in the case of the Colonnata Lardo, and to changes in the preferences of local customers who shifted from aged cheese to younger, softer cheeses, as happened in the case of Serpa cheese. In the latter instance, while the project managed to guarantee continuity with the preservation of traditional food knowledge, it faced difficulties in achieving commercial viability—customers were no longer used to the taste of dry-aged cheese produced using traditional techniques. In turn, this risked the transformation of knowledge and practices linked to traditional foods into “museum production” rather than “new rural livelihoods” (Bowen and De Master, 2011).

Conversely, in the case of Mezzago, the revival is linked with a reactivation of local knowledge that does not rely exclusively on the rescue of local cultivars or landraces, or on the recovery of specific techniques and practices from the past. The protest of the farmer about the “allochthony” of asparagus used for the festival in the 90s is revealing. In Mezzago, the marginalization of the cultivation caused the disappearance of practices and the rarefaction of agricultural knowledge. Facing such a situation, the revival of cultivation promoted by the local stakeholders and farmers led to a reshaping of local knowledge by revamping the residual knowledge with new elements coming from research organizations, such as the Experimental Institute for Horticulture of Montanaso Lombardo, and the experience of farmers from other areas, in Italy and abroad, such as the asparagus cultivators of Reilingen. Overall, therefore, the revival is linked to the reconstitution of local knowledge. In this process, the festival played a role in embedding this new knowledge in the community.

The Pink Asparagus Festival illustrates the possibility of fostering new actions concerning the recovery of rural heritage that passes through the transformation of the landscape and actualization of local, traditional knowledge. Such process, as the case of Mezzago demonstrates, is not limited to an antiquarian effort (Momigliano, 1950) aimed at identifying objects of the past and keeping them immaculate. It opens agricultural and gastronomic products to modernization exploring new ways of presenting local products and preparations to the public. In so doing, it opens up local gastronomic heritage to innovation and contribution from new members of the community, who then become co-makers of the local tradition. It is a process that entails local and non-local actors, as Monti suggests. During the field research a strong link emerged between innovation, the spirit of cohesion, and social inclusion that distinguishes the mid-town community. Considering this connection, it is possible to explain the organizers' ability to introduce innovations both in the production and in the context of the festival, and the success deriving from these changes. This dynamic can be

observed in the creation of the current gastronomic offer and in the choice of the ingredients used in the festival menu, in the agricultural innovations that come from the collaboration with the Experimental Institute for Horticulture of Montanaso Lombardo and with the asparagus cultivators of Reilingen, in the promotion of the initiatives set up by young people from the area who work in the agri-food, social and educational sectors, as well as in the involvement of seasonal workers, both Italians and foreigners, in the cooperative during the harvesting season.

These examples highlight the social dimension of the festival and the different actors that make up this social event and the way in which they interact. **Figure 2** illustrates this relationship. The festival involves the entire community and its stakeholders: the public administration, the community, and people from other communities all working together. It is the positive and mutual collaboration among these actors that supports the event and makes it successful and able to strengthen the prestige and cultural relevance of pink asparagus within and outside the community (Fontefrancesco and Zocchi, 2019). At the same time this inclusivity makes the entire community participate in the narration the festival tells: which is a story of local identity that hinges on the pink asparagus. While the festival motivates the organizers and the members of the community at large to rethink their territory and to search for value in the community's history and geography, it also suggests that local uniqueness lies in the asparagus and the knowledge and practices that keep it alive. In so doing, the festival celebrates and legitimizes the present produce made by the APC and the other farmers participating in the De.Co. Thus, it legitimizes the knowledge and practices that underpin the production, which is an expression of reconstituted local knowledge. In this way, the festival makes the renewed knowledge of asparagus part of the community, emphasizing aspects of continuity with the past that it expresses and implicitly endorsing constant innovation, both of the agricultural and the gastronomic aspects of asparagus production. As a matter of fact, the festival strengthens the prestige of the product and its cultural relevance, expands the market, and creates an opportunity for dialogue, confrontation and new knowledge among the inhabitants of the community and the countryside. In this sense, the festival can be read as a folkloric institution capable of strengthening both the economic capital of the community and the social and cultural capital.

The relevance of the Mezzago case can be read in the mutuality of the social actors involved and their ability to support all the fundamental aspects of a community's capital, undoubtedly the result of a fragile equilibrium that made the festival an effective tool for local development.

CONCLUSIONS

Food festivals are a fundamental part of the modern foodscape, and their success is deeply related to the growth of gastronomic tourism. Many festivals promote local products and their history. In this respect, this article interrogates the relationship between food festivals and local, traditional knowledge as well as the role of such events in transforming this heritage into an asset than



can help local communities in promoting the territory and local products. The ethnographic study of the Pink Asparagus Festival of Mezzago suggests a particular role.

The organization of the festival responded to the need for municipal administrations, local associations, and producers to make their territory and products known to a wider public. In doing so, the festival drew from local agricultural specificities to meet the demand of the public (Aime and Papotti, 2012). This attention, however, did not couple with the fabrication of new, traditional products, and ethno-commodities (Comaroff and Comaroff, 2009) able to satisfy the public, but rather it fostered wide research that aimed to reinforce a fading practice. In so doing, the process engendered a reconstitution of local knowledge through the insertion of new competences.

The case of the Mezzago festival is useful to define the role that a gastronomic festival can have for a territory. The case study suggests that a festival can be an important and positive accelerator of local dynamics of social and economic development. It highlights the necessary elements of such positive development, such as the collaboration between public institutions, civil society and local producers on the basis of principles of mutuality that strengthen the economic, social and cultural capital of the community.

In this sense, it stands as a warning against the easy conclusion that, in an age of great interest for local kitchen and traditional foods, a good gastronomic offer or a local specialty is enough to trigger positive development processes. Which brings the discussion to a deeper reflection on the importance of the full involvement of the various actors of the territory within a shared project of territorial design. Precisely, in this perspective, the case opens up further reflections, suggesting a non-top-down participation model, but rather a horizontal one of leadership distributed among the various actors who are able to support and

stimulate each other. Therefore, it highlights the importance of subsidiarity between public and private, and between market and non-market, which is often forgotten in the public debate.

In conclusion, the pink asparagus and food knowledge the festival promotes are new wine in a renewed wineskin, and are able to support the community, endowing it with new perspectives of sociocultural sustainable and inclusive development.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author/s.

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ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

MFF supervised the research team and conducted fieldwork research in Mezzago, completed the first draft of the entire article, read, and approved the final manuscript. DMZ conducted fieldwork research in Mezzago, integrated and completed the draft of the article, read, and approved the final manuscript.

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“The Old Foods Are the New Foods!”: Erosion and Revitalization of Indigenous Food Systems in Northwestern North America

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The global “nutrition transition” has had an immense impact on Indigenous Peoples of Northwestern North America. From an original diet comprised of mostly local plant and animal foods, including salmon, game, diverse plants, seaweed and other marine foods, many Indigenous people are now eating mostly imported, refined marketed foods that are generally less healthy, and many are at risk of diet-related diseases such as type 2 diabetes. Nevertheless, Indigenous people have always valued their ancestral foods, and over the last few decades there have been many initiatives throughout the region to restore and revitalize these original foods, and to re-learn Indigenous methods of processing and harvesting them. In this paper we describe the original Indigenous food systems in the study region, and the methods used to sustain and promote the ancestral food species and habitats. We then discuss the impacts of colonization, and describe recent and ongoing Resilience and Resurgence in relation to ancestral foods and food practices, including firsthand experiences with renewing food traditions. These initiatives are often connected with language revitalization and cultural resurgence programs. Led by Indigenous communities, they are undertaken with support of academic, government, and other partners. In all, they have resulted in stronger, more vibrant cultures and generally healthier communities.

Keywords: indigenous peoples’ health, nutrition, indigenous peoples, health, ethnoecology, cultural resurgence

INTRODUCTION

The diets of Indigenous Peoples of northwestern North America—the region on which this paper focuses—have traditionally been diverse and nutritious, including a range of plant and animal foods. Most of these can be, and have been, obtained locally, with some accessed through trade from other locales. The concept of Indigenous Internationalism introduced by Anishinaabe scholar Simpson (2017) speaks to the ancestral economic and trade relationships between Indigenous communities. We will revisit this concept later in the paper. Since far fewer foods are available in the winter months people originally had to rely on foods as they became available over the course of the year or find ways to store them for later use. Methods for processing the foods—cooking, dehydrating, and otherwise preparing them for storage—have been a key component of overall food knowledge. In general, women have been responsible for harvesting most of the plant foods and shellfish, and men have been the hunters and fishers, although there are no strict rules guiding division of labor based on gender. Anyone—men, women, two spirit and gender diverse

people—could, and can, undertake these food-based activities, including food processing. Children were, and still are to some extent, trained in food harvesting and processing from an early age, and often obtained their own food over the course of the day.

Significant research has been undertaken on Indigenous food systems of the region, including nutrient analyses of both raw and processed foods (cf. Kuhnlein and Turner, 1991; Turner, 2006, 2010, 2014; Kuhnlein et al., 2009; Turner et al., 2009; Kuhnlein and Humphries, 2017). These food systems have been in place over countless generations, in some cases for millennia, and have supported relatively dense populations, especially along the Northwest Coast of North America (Suttles, 1990). Complex social and ceremonial systems were developed over time, helping to assure equitable distribution of food, as well as sustaining and enhancing the food species and their habitats (Ksan, People of, 1980; Atleo, 2004; Deur and Turner, 2005; Turner et al., 2013b; Joseph, 2020). Potlatches are an example of a ceremonial complex in which the serving and distribution of nutritious, culturally valued food has always been a central element (Brown and Brown, 2009). Ownership or proprietorship of key food resource species and harvesting places by individuals, families, and clans is another way in which food species have been monitored and harvesting overseen (Turner et al., 2005, 2013b).

The arrival of Europeans in the region, beginning in the late 1700s, initiated significant changes in the lifeways of First Nations, including the introduction of new foods. The newcomers benefitted widely from the Indigenous Peoples' foods, at first for sustenance and then, in some cases such as the fisheries, for commercial production (MacLachlan, 1998; Lutz, 2008; Turner and von Aderkas, 2012; Turner, 2020a). For Indigenous Peoples, some of the new foods were quickly adopted and enfolded into their existing food systems and lifeways, enhancing their food security (Nabhan, 2006; Turner et al., 2011b). Other foods, such as refined sugar, were more problematic in terms of people's health. In any case, soon colonial forces instigated a systematic dismantling of Indigenous Peoples' food systems through banning access to important cultivation and harvesting landscapes, imposing restrictions on fishing practices and on landscape burning to maintain particular habitats, privatizing land, and, ultimately, through food-related abuses carried out through residential schools and Indian hospitals (Turner and Turner, 2008). These actions were similar to those experienced by Indigenous Peoples worldwide as their homelands were taken over by colonial forces. The new wage economy impacted Indigenous seasonal harvesting rounds and resulted in loss of learning opportunities for children and youth (Thomas et al., 2016). The decline in harvesting and use of Indigenous foods, both regionally and worldwide (Kuhnlein et al., 2009), has been generally detrimental to people's health and has also resulted in significant cultural losses (Turner et al., 2008a). The targeting and appropriation of Indigenous foods created what Simpson (2017) calls an "imposed poverty" where culturally important foods exist but they are either not accessible to Indigenous Peoples, or they are being commercially exploited, raising their monetary value to the point where Indigenous people are unable to afford their own ancestral foods.

In this paper we describe the cultural and nutritional importance of Indigenous Peoples' ancestral foods in northwestern North America, and the ways in which people have maintained and enhanced their foods—their traditional land and resource management systems. We describe some of the impacts on these traditional foods, their uses over the past century and a half, and how the loss of the foods has adversely affected people's health and well-being. We then focus the remainder of our paper on ways in which these ancestral Indigenous foods are being renewed and restored as part of an overall movement in cultural and political revitalization and resurgence.

RESEARCH AREA, SOURCES, AND METHODS

The general region covered in this paper extends from central Alaska to the Columbia River along the coast, and inland to the Rocky Mountain region. The First Peoples of the region speak ~50 different languages or major dialects, and each group has its own distinctive cultural attributes including Indigenous food systems. Three general cultural regions are recognized within the overall area: Northwest Coast, Interior Plateau, and Subarctic (Helm and Sturtevant, 1982; Suttles, 1990; Walker, 1998; Turner, 2014).

Most of Northwestern North America is forested, mainly with conifers. Along the coast on the windward side is temperate rainforest, dominated by western hemlock¹, Sitka spruce and western redcedar, whereas the leeward side, such as on southeastern Vancouver Island, Puget Sound, and the associated islands, is dominated by coastal Douglas-fir, with Garry oak and arbutus in the drier sites, in some places interspersed with fire-maintained prairies. At higher elevations are subalpine forests with mountain hemlock, yellow cedar and subalpine fir, and above the treeline are alpine ecosystems. In the southern Interior, the driest valley bottoms are grasslands, with ponderosa pine forests surrounding and above these are forests dominated by Interior Douglas-fir. With increased elevation are subalpine forests with Engelmann spruce, subalpine fir, and lodgepole pine. Eastwards toward the Rockies is another area of higher rainfall—the interior wet belt—with western hemlock and western redcedar as dominant trees at lower and middle elevations and Engelmann spruce and subalpine fir higher up. The northern Interior is largely forested with sub-boreal and boreal pine and spruce forests, interspersed with willow, birch, and aspen. Throughout the Interior, at higher elevations above the treeline is alpine tundra vegetation (British Columbia Ministry of Forests, 1999; Turner, 2014). All of these vegetation zones produce diverse food species that have been accessed by Indigenous Peoples of the region over centuries and millennia.

The information included here is drawn from interviews with Indigenous knowledge holders, from personal and participatory observation of both authors, and from literature sources, including our own publications (especially Turner's, dating back over decades; e.g., Kuhnlein and Turner, 1991; Deur

¹Appendix 1 lists the scientific names of plant and animal species mentioned in this paper.

and Turner, 2005; Turner and Turner, 2007, 2008; Turner, 2010, 2014, 2020a; Turner et al., 2011a,b, 2012, 2013a,b; also Joseph, 2012, 2020). The methods we have used in our research are standard for ethnobiology and ethnobotany (cf. Nolan and Turner, 2011): interdisciplinary approaches, both qualitative (e.g., ethnological interviews, participant observation) and quantitative (e.g., nutrient analysis, experimental replication of traditional management), following ethical standards and with respect for our collaborators' intellectual property. The first author, Styawat (Leigh Joseph) is Indigenous, a member of the *Skwxwú7mesh* (Squamish) First Nation, and in parts of this paper, the wording reflects her voice, in the singular, as an Indigenous woman.

INDIGENOUS FOOD SYSTEMS OF NORTHWESTERN NORTH AMERICA

Across our research area, about 300 different animal food species (terrestrial and marine mammals, birds, eggs, fish, and shellfish) and 150 different plant food species [root vegetables, greens (including teas and flavorings), fruits, seeds and nuts, inner bark of trees, some seaweeds and mushrooms, and one lichen], have been identified as having been consumed in some form by Indigenous Peoples (Kuhnlein and Turner, 1991; Kuhnlein and Humphries, 2017). Many of these species are little used today, but all have been documented ethnographically, and virtually all were recalled by Indigenous Elders within the past half century or so as having been harvested and consumed by them or their family members in their younger years. Notably, in recent decades there has been a renewed interest and resurgence in the harvesting, preparation and use of many of these foods—a trend that is occurring among Indigenous Peoples worldwide (Kuhnlein et al., 2009, 2013). The phrase in the title, "*The old foods are the new foods!*" is quoted from Nuxalk Elder Dr. Margaret Siwallace, participant in the Nuxalk Food and Nutrition Program (Nuxalk Nation, 1984; Turner et al., 2009, 2013), exclaiming, with some pleasure at the resurgence of community interest in bringing back some of the original Nuxalk foods that had been largely forgotten.

Seasonal Availability

Most of these Indigenous foods are only available or at their prime at certain times of the year, and are restricted to particular locales, being accessed originally during seasonal travels, or "seasonal rounds." Families and communities in the past moved with the seasons from one harvesting place to another, staying for periods of time to harvest and process their food, and generally returning to their permanent villages in the winter months to live in large measure on processed and stored food. Although permanent villages are generally located at lower elevations, along the coast or on the shorelines of rivers and lakes, people also travel to and spend time in upland areas, including high-elevation sites at and above the treeline, for hunting, berry picking, and spiritual purposes (Reimer, 2003; Turner et al., 2011a). People have also accessed certain foods through trade from neighboring or even more distant groups. For example, the Gitga'ata Ts'msyen of Hartley Bay have traded their dried red laver seaweed for

oulachens (a small, oily species of smelt) and oulachen grease from both the Haisla at Kitamaat and the Nisga'a of the Nass Valley (Turner and Clifton, 2006). Many other foods, from smoked clams, to dried salmon, to soapberries and Saskatoon berries, to camas bulbs have been widely exchanged between, for example, the coast and the Interior regions. To some extent, these practices of the past continue to the present day, and gifts of food from one nation to another are standard when people from different regions meet.

Knowledge and Skills Connected to Cultural Foods

Both in the study region and more broadly, the diversity of Indigenous foods has both cultural and nutritional significance. The harvesting, preparation, serving, and consuming of these foods has in many ways shaped, and been shaped by, First People's social institutions, worldviews, languages, customs, and ceremonies. In terms of nutrition, people's original diets were generally well-balanced, with healthy amounts of protein, carbohydrates, fats, essential vitamins, and minerals and dietary fiber (Kuhnlein and Turner, 1991; Kuhnlein and Humphries, 2017). Fish, shellfish and game, including marine and land mammals and waterfowl, contribute fats and protein, while plants are significant sources of calories and dietary fiber in Indigenous diets. Hunn (1981) estimated that plant foods comprised as much as 70 per cent of the calories consumed by peoples of the southern Interior Plateau. This would have probably been somewhat less on the coast, where oulachen grease and other fats have contributed significant amounts of calories, and even less on the northern coast and Interior, where fewer root vegetables were available, and where fish oil and animal fats would have comprised the majority of caloric intake. Both plant and animal foods contribute key vitamin and mineral nutrients. Knowledge of what foods to seek in times of shortage or emergency has also been an important aspect of Indigenous food systems (Minnis, 2021).

Cultural Protocols and Sustainable Harvest Practices

Indigenous Peoples' relationships with culturally important foods include the skills of identifying, cultivating, harvesting, and processing each food item. A central teaching in many Indigenous communities in the region—and elsewhere across North America—is to only take what you need and ensure that you utilize the foods you gather so as not to disrespect that plant or animal relatives that give their lives for our sustenance (Atleo, 2004; Turner, 2005; Turner and Berkes, 2006; Kimmerer, 2013; Geniusz, 2015; Turner and Mathews, 2020). Many of the tools and technologies developed to harvest plant and animal foods had, and have, respect, responsibility and reciprocity built into them. For example, digging sticks, usually carved from Pacific yew, were designed to be narrow and accurate so that when digging nutritious root foods, the individual roots could be selected and pried out without disturbing other plants in the vicinity (**Figure 1**). These could be left for subsequent years of harvesting. Generally speaking, baskets were designed with the



FIGURE 1 | Yew wood digging stick at site of estuarine root gardens, Kingcome Inlet, British Columbia.



FIGURE 2 | Bog cranberries (top), with Pacific crabapples and a few wild rose hips.

food they would hold in mind. Baskets for harvesting root foods have a looser weave, with stouter weaving elements of split roots and branches, so that water can be washed over the harvested roots to clean them of dirt and debris. Berry baskets are more tightly woven, on the coast often of cedarbark or, in the Interior, birchbark or tightly coiled and stitched cedar roots, so as to contain the berries, whatever their size or juiciness. Many baskets are beautifully decorated through variations in weave, or overlay with different colored materials, showing high regard for the foods they are designed to hold.

Processing the foods by dehydrating and/or cooking, as well as storing them and serving them, were, and are, all undertaken with deep respect and appreciation for the foods themselves. Along with the digging sticks and baskets, other implements and containers associated with food harvesting, processing and storage are equally well-designed, with utility, durability, and artistry combined: bows of yew, fishing nets and line of durable stinging nettle or hemp-dogbane fiber, dipnets and hoops of Douglas-fir poles, eelgrass twisting implements of dense western hemlock poles, and bentwood boxes of kerfed and steamed boards of western red-cedar. These last were used both for steaming food (using red-hot rocks dropped into water in the box with clams, root vegetables, or other food) and for food storage (Turner, 2006, 2010, 2014).

Processing and Storing Foods

There are, and continue to be, many ways to process culturally important foods, often involving dehydration, before or after cooking. Juicy, sweet berries such as salal, blueberries and huckleberries, currants, strawberries, thimbleberries and blackberries, amongst many others, can be mashed and dried into cakes, either in the sun, or smoked and dried over a smoldering fire on berry drying racks. Tarter fruits such as Pacific crabapples, bog cranberries and highbush cranberries (**Figure 2**) can be cooked lightly then preserved in water in airtight bentwood

boxes, becoming softer and sweeter over time, to be consumed as needed throughout the winter. Root foods such as bulbs of camas, tigerlily, yellow glacier lily, chocolate lily, and northern riceroor, after cooking, in the past were generally dried, pounded, and made into cakes or preserved loosely in bentwood boxes. Edible seaweed is also dried and, originally, would be stored in bentwood boxes for winter use, although more recently dried seaweed has been stored in jars or ziplock bags (Turner and Clifton, 2006; Turner, 2010, 2014).

Pit-cooking has been, and still is, an important method of preparing large quantities of foods, especially the "root" vegetables such as camas, nodding onions, balsamroots, yellow glacier lily bulbs, silverweed roots, and springbank clover rhizomes. Black tree lichen, as well as the inner bark of some trees, as well as clams and other seafood, and game have also been traditionally pit-cooked (Kuhnlein and Turner, 1991). The fuels used in smoking, cooking and drying the various foods, the skunk-cabbage leaves used as a surface for drying berries, and the salal, sword fern, fireweed, timbergrass, wild strawberry, and other plants used to flavor and protect the food in cooking pits, have all been part of the overall food system.

Indigenous Knowledge and Expertise in Managing Cultural Food Systems

Understanding the level of knowledge and labor that went into cultivating, harvesting, processing, and storing culturally important foods in the past can help develop a current day awareness for how food was equated to wealth historically, not only in the study region, but worldwide. To be rich in healthy, culturally-important foods and to have enough of these nutritious riches to share within your community and neighboring communities was a true representation of what it meant to be wealthy. Gitga'at matriarch Helen Clifton has always said, "We're rich! We're rich in our food!" (pers. comm. to NT 2002; Ommer et al., 2006; Turner and Turner, 2007).

People's activities around harvesting and processing their food have been major occasions for cultural learning as well as healthy land-based exercise (Beckwith et al., 2017; Joseph, 2020). The ceremonies and narratives that surround the harvesting and serving of Indigenous foods, and the care and respect that are key in all aspects of their use, are major elements of peoples' cultures and relationships. Language is also a critically important component of food systems, with names and vocabulary not only for the species themselves and the foods they provide but also for the implements and processes required in harvesting, preparing and serving them. The stories and ceremonies of each nation are other examples of how language is intertwined with food; it is no coincidence that language revitalization and interest in renewal of food systems go hand in hand (Turner et al., 2008b; Kimmerer, 2013; Mills et al., 2017; Simpson, 2017).

INDIGENOUS MANAGEMENT OF FOOD PRODUCTION SYSTEMS

The Healing Power of Cultural Food Practices

Culturally-rooted plant practices have the power to heal relationships with the land. The depth of connection to place, to ancestors and to mindful presence is amplified when we, as Indigenous Peoples (SLJ) across North America and beyond, partake in millennia-old practices of plant cultivation and stewardship (Kimmerer, 2013; Geniusz, 2015; Simpson, 2017). When we practice our ancestral relationships with our plant relatives we heal and strengthen ourselves. We are in a time of Indigenous cultural-political resurgence in Canada (Coulthard, 2014; Manuel, 2017; Talaga, 2018). Increasingly, Indigenous people are finding renewed strength, pride, and grounding through cultural practice and re-establishing our connections to the land. Included in this resurgence are the relationships between people and plants.

When we take plant foods and medicines into our bodies they strengthen us, prevent illness and connect us to place in a meaningful way. The act of harvesting plant foods and medicines involves in-depth knowledge: identifying the plants, understanding their lifecycles, knowing when and where to harvest particular species, recognizing phenological indicators, developing sustainable management and harvesting practices guided by cultural worldview and practical lived knowledge accumulated over generations (Kimmerer, 2013; Turner, 2014; Geniusz, 2015; Simpson, 2017).

Early Misconceptions of Indigenous Food Systems

Until recently, there has been a common misconception that there was little or no active cultivation of plants by First Peoples in Canada prior to European contact (Deur and Turner, 2005; Deur et al., 2013; Turner et al., 2013b). This misunderstanding was one factor at the heart of the European justification of taking land from the First Peoples and distributing it to European settlers who would make "proper use" of the land by turning to more familiar agricultural practices (Theodoratus, 1989; Suttles, 1990; Lutz, 2020). What European settlers did not see was that

complex interactions and systems of knowledge between First Peoples and the land not only existed but were fundamental to the people's identity.

Early anthropologists assumed that the matter of food procurement for First Peoples in Northwestern North America was one of ease and abundance. The perception was that the coastal First Peoples sustained themselves primarily on an endless supply of seafood and that there was no efficient use of land resources taking place (Deur and Turner, 2005). For Interior Peoples, hunting and use of anadromous salmon and other fish were assumed to be the predominant foods. Armed with the tools for clearing land, and introducing European agricultural practices, the early settlers overlooked the numerous food systems and technologies already in place to manage Indigenous plant and animal foods. The examples of management by First Peoples are many and include but are not limited to: camas meadows, estuarine root gardens, Pacific crabapple orchards, berry gardens, montane root meadows and productive berry patches, clam gardens, and fishing technologies, including fish weirs and reefnet fishing, which allowed careful selection of fish to be caught and those to continue to their spawning grounds (Turner, 1999; Peacock and Turner, 2000; Deur and Turner, 2005; Turner et al., 2013b; Claxton, 2015; Deur et al., 2015; Mathews and Turner, 2017). Each of these examples has its own complex set of protocols, technologies, and management practices.

Managing Culturally Important Ecosystems

Among the key habitats for Indigenous root vegetable production were the highly productive tidal estuarine ecosystems, historically used by coastal First Nations to cultivate a number of key food species in managed garden sites (Turner and Kuhnlein, 1983; Deur and Turner, 2005; Lloyd, 2010). There are special names for these tidal root gardens in many coastal languages and complex systems of ownership of the garden plots (Deur et al., 2013; Turner et al., 2013b). The most common Indigenous root vegetables grown in these gardens, including *lhásem* (the Squamish name for northern riceroot) (Figure 3), Pacific silverweed and springbank clover, among others, provided important carbohydrates and other essential nutrients and were a valued component of an Indigenous diet high in protein (Kuhnlein et al., 1982; Kuhnlein and Turner, 1991; Turner and Peacock, 2005; Turner, 2010).

Indigenous cultivation practices for edible roots include such localized treatments as tilling, weeding, fertilizing, selective harvesting, and re-planting propagules, but they also include larger-scale alterations of the natural environment to increase the productivity of certain preferred species (Deur, 2002, 2005; Deur and Turner, 2005; Turner and Peacock, 2005; Deur et al., 2013; Turner et al., 2013b). These include building up areas of the estuary to increase surface area for the estuarine root gardens, removing rocks, and fertilizing the soil to enhance the soil quality for maximum production and ease of harvesting. The areas selected for these estuarine root gardens were situated within a specialized zone of the estuary, above the high marsh and into the transitional salt-tolerant meadow—areas that are high enough that they are not frequently inundated with salt water, but low enough to receive water from occasional flooding. The fall flood



FIGURE 3 | Styawat with *lhásem* (northern riceroot).

season also tends to coincide with the dieback of much of the vegetation, which means that when the flooding takes place there is a higher concentration of organic material deposited into these higher regions of the estuary. The detritus supplies nutrients and leads to a nutrient rich environment over time (Deur, 2005).

The roots grown in these estuarine gardens are a good example of foods that were once highly appreciated; they were harvested in large quantities, overseen by individual chiefs and owners, stored for winter, served at feasts, transplanted to new sites, and traded (Turner et al., 1983, 2013b; Deur et al., 2013). For example, *lhásem* (riceroot) bulbs were eaten and valued by almost all Northwest Coast peoples. Prime patches of *lhásem* were carefully monitored. The bulbs, rich in sugar and starch (Turner and Kuhnlein, 1983), were harvested, usually when the plants are dormant, in fall or early spring. Typically dug by women, they generally grow quite shallowly in the soil, as illustrated by the Massett Haida name, *stla q'üst'aa*, that translates roughly to "round thing you dig out with your finger" (Turner and Kuhnlein, 1983; Turner, 2021). In Squamish, *lhásem* was a highly regarded food plant and was harvested along the Squamish River, just north of Vancouver (Joseph, 2012). Every coastal language had a name for this plant (Turner, 2014). The bulbs were often steamed and served with *oulachen* (ooligan) "grease" (Bouchard and Turner, 1976; Kuhnlein and Turner, 1991). In some areas, elders recall hearing about these bulbs from their parents and grandparents, but have never themselves tasted them. Others, like Eagle Chief Ernie Hill Jr. of the Gitga'at Nation at Hartley Bay, harvested and enjoyed them over their whole life (Turner and Thompson, 2006). But Chief Hill was the exception. For most coastal First Nations, the recent generations have lost touch with this food, among many other ancestral foods.

IMPACTS ON INDIGENOUS FOOD SYSTEMS

As noted in the previous section, Indigenous landscapes in the study area and across the continent reflect long-standing,

deeply respectful, and reciprocal relationships involving intensive plant care and ecosystem management (Anderson, 2005; Trosper, 2009; Kimmerer, 2013; Turner et al., 2013b; Turner, 2014; Simpson, 2017). We need look no further than tended camas meadows, productive estuarine root gardens, managed crabapple orchards, ancestral seaweed harvesting and drying places, wapato gardens, and more, in order to understand just how intensively plant foods and medicines were cultivated (Turner, 1999, 2014; Peacock and Turner, 2000; Turner et al., 2000, 2013b; Garibaldi and Turner, 2004; Deur et al., 2013). Animal foods were equally carefully managed and enhanced. "Clam gardens," now widely recognized along the Northwest Coast (Recalma-Clutesi, 2005; Groesbeck et al., 2014; Deur et al., 2015; Lepofsky et al., 2015), are just one example of ancient management systems for animal foods. Fish weirs and reefnets were technologies that allowed constant monitoring and careful selection of salmon (Claxton and Elliott, 1994; Xanias White, 2006; Claxton, 2015; Thornton et al., 2015; Mathews and Turner, 2017). Harvesting herring spawn on kelp or hemlock boughs (Thornton, 2015), capturing *oulachen* (Moody, 2008), as well as hunting of seal, deer, elk, and mountain goat—all were undertaken with great care and attention to sustaining the populations of these valued species. Yet, Indigenous People throughout their homelands were not only not recognized for their careful stewardship of their food and other resources, but instead, their reliance on these resources was actively targeted as a strategy of colonialism and significantly downplayed in colonial narratives. People were in many ways blocked from accessing and using these very resources that their ancestors had cared for over generations (Thomas, 2015).

Systemic Racism

Systemic racism is the framework and foundation from which the myriad traumatic experiences and events that have impacted and continue to affect negatively the lives of Indigenous Peoples in Canada, including within the study area. The impacts of systemic racism span across access to healthcare, education, lack of access to basic human needs, higher risk of being a victim of violence, higher probability of incarceration, high levels of poverty and more. Failing to recognize the importance of Indigenous food for people's health and wellbeing, or the role of Indigenous Peoples in caring for and enhancing their food resources, is just one component of the racist attitudes that have predominated (Corntassel and Bryce, 2012; Coulthard and Simpson, 2016; Simpson, 2017).

Dispossession of Land

The very foundation of colonialism was to separate Indigenous People, often forcibly and violently, from the land and its resources in order to gain uninhibited access for use by settler populations. The intentional separation of Indigenous bodies from the land served the purpose of disenfranchising people and removing them from their source of power, strength, health, and wellbeing (Harris, 2001; Turner et al., 2013a; Coulthard, 2014; Simpson, 2017; Estes, 2019). The concept of *terra nullius* and the doctrine of discovery contributed directly to the relentless and frequently violent dispossession of land from Indigenous peoples. These factors, amongst others, continue to lead to

the misappropriation of land and resources and pose ongoing barriers to the process of Indigenous Peoples' reconnection to their lands and waters.

The reserve system imposed on Indigenous Peoples by the Colonial government alienated them from many of their foods and food harvesting areas and Indian agents were put in place to monitor when and if people were allowed to leave to harvest (Fisher, 1992; Duff, 1997; Harris, 2001; Deur and Turner, 2005; Deur et al., 2013; Turner et al., 2013a; Joseph, 2020; Turner, 2020a). Furthermore, the pressures for people to follow the "civilized" practices of agriculture and ranching were unrelenting (British Columbia Government of, 1875). Similarly, Indigenous People's access to forested areas under provincially-controlled Tree Farm License management, and to many areas of their Indigenous territories that have been designated as parks, has been curtailed or banned.

Arthur Manuel, a community leader and activist from the Neskonlith (Secwepemc) First Nation, describes the impacts of loss of access to land in his family's experience:

It began with dispossession: our lands were stolen out from underneath us. The next step was to ensure that we are made entirely dependent on the interlopers so they can control every aspect of our lives and ensure we are not able to rise up to seize back our lands. To do this, they strip us of our ability to provide for ourselves. This was done by trying to cut us off from access to our land. My father [George Manuel, OC, chief of the National Indian Brotherhood], in his book *The Fourth World*, wrote how this was achieved in the BC Interior by literally fencing us off from our lands. Suddenly, our hunting grounds, our fishing spots, our berry patches and other gathering places were cut off by fences and then enforced by a maze of regulations, while our timber was carted away and our lands stripped of our minerals. This had never even been envisioned by our people. Even when we allowed the newcomers to set up settlements on our land, it was unthinkable that suddenly our lands would be closed to us" (cited from McFarlane and Schabus, 2017, p. 19).

Michi Saagiig Nishnaabeg writer and activist Simpson (2017, p. 5) has written about similar experiences of her people in Ontario, whose fisheries, forests, wild-rice beds, sugar maples, managed prairies, and burial grounds have all been "stolen, clear-cut, subdivided and sold to settlers from Europe and later cottagers from Toronto." Across the country and around the world, Indigenous Peoples have suffered similar encroachments on their homelands.

Residential Schools

One of the greatest drivers of changing diets for Indigenous Peoples in the colonial era and up into the latter part of the twentieth century was the imposition of residential schools, in which children were taken from their families and forced to attend institutions where their Indigenous food was generally not only unavailable but was disparaged by school officials as primitive and uncivilized. At the same time as they were discouraged from eating their Indigenous food and often forced to eat sub-standard meals, the children's opportunities to learn about Indigenous food harvesting and preparation were also curtailed (Thomas, 2001; Atleo, 2011; Paradies, 2016; Geddes,

2017; Maracle, 2017; Simpson, 2017; Talaga, 2018; Elliott, 2019). These institutions were built on a foundation of the dehumanization and devaluation of Indigenous lives. The impact of generations of children being stolen from their families and communities, and facing atrocities that no child should ever face, resonated through generations. Starvation, malnutrition and terrible food quality as part of the residential school experience led to dysfunctional relationships with food among other impacts (Paradies, 2016; Joseph, 2020).

Predominance of the Wage Economy

With the coming of the European newcomers and the new opportunities presented by the wage economy, there was a general pronounced shift away from use of traditional food by Indigenous Peoples. As people transitioned into paying jobs, there was less time or opportunity for harvesting food out on the lands and waters, and in any case, as already noted, large tracts of people's territories were taken over by the newcomers, and Indigenous People were often forcibly excluded (Fisher, 1992; Lutz, 2008; Turner and Turner, 2008; Turner, 2020a). By the time today's Elders were growing up, many of their ancestral foods were only memories. For the children of recent decades, a number of these foods were completely unknown to them, at least until recently.

Banning of Cultural Food Ceremonies and Practices

In 1885, Potlatches were officially banned by the Canadian government for many decades, not to be reinstated legally until 1951 (Turner, 2014, 2020a). As noted previously, Potlatches, complex institutions of ceremonial, economic, and political importance, have always been associated with feasting and gifting of Indigenous food to guests, who are witnesses to important events, and to those being honored (Bracken, 1997; Brown and Brown, 2009; Trosper, 2009).

Outlawing Indigenous Stewardship and Tending Practices for Food Species and Habitats

Like the foods themselves, Indigenous management systems for food species and habitats—and, as noted above, the accompanying ceremonies and narratives that provide the foundation for these systems—were suppressed and in many cases eliminated by the imposed Colonial and Provincial and Federal government laws and practices. Fires to maintain prairie and subalpine meadow landscapes were banned outright, as was the harvesting of inner bark of trees, and the use of fish traps and weirs, including the reefnets of the Straits Salish peoples, that had been management tools for centuries, in some cases for thousands of years (Claxton and Elliott, 1994; Turner, 1999; Xanius White, 2006; Dilbone et al., 2013; Claxton, 2015; Mathews and Turner, 2017). Ironically, many of the foods, like salmon, oulachen, herring, rockfish and abalone, that had been sustainably used and managed by generations of Indigenous stewards, were, under the newcomers' watch and policies, drastically reduced, sometimes to the point where conservation

measures imposed meant that Indigenous people were no longer allowed to harvest these foods at all (cf. Fisheries and Oceans Canada, 2011, on northern abalone), and children have had no opportunity to even taste them.

Integration of New Foods and Impacts on Ancestral Foods

Some of the new foods that were brought in by Europeans, including potatoes (originally from South America), carrots, turnips, rhubarb, apples, pears, currants, and other fruits, not to mention molasses, sugar, coffee, tea, rice, beans were, indeed, tasty and were easily adopted into Indigenous diets and lifeways. Nevertheless, these foods have tended to replace many of the original root vegetables, greens, and berries that were the mainstay of the original diets (Kuhnlein et al., 2009, 2013; Turner, 2014, 2020b).

Contamination and Industry

Industrial development and urbanization have rendered many former harvesting sites too contaminated for safe use of the food. Logged over areas, including potential berry-picking places, and areas near agricultural production have often been sprayed with herbicides and pesticides, rendering any harvested food unsafe (Thomas et al., 2016). Runoff from mines and potential contamination from pipelines, highways and railways are all major concerns for Indigenous food harvesters. In other cases, as with the seafood around the major urban areas and industrial sites such as pulp mills, contamination from sewage and other water has made harvesting and use both unsafe and inaccessible. For example, "the best (butter) clam beach on Vancouver Island," according to Chief Charlie Jones of Pacheedaht (pers. comm. to NT 1980), was at the Inner Harbor in Victoria where the Empress Hotel now sits. Today, all around the city, where raw sewage has been discharged into the ocean, harvesting seafood is impossible.

RESILIENCE, RESURGENCE, AND ANCESTRAL FOODS

In so many ways, the actions of governments, industry, and laws and policies imposed by the European newcomers, for their own benefit, have impeded Indigenous Peoples' in accessing and using their foods and practicing their cultures. These actions have been compounded by unintended and unplanned impacts resulting from a plethora of other shocks arising from the newcomers' arrival: invasive species, epidemic diseases, insect pests, impacts on pollinators, deforestation, biodiversity loss, wetland destruction and contamination, and, most recently climate change.

The loss of food and loss of access to food harvesting has led to immense grief and anxiety for those experiencing the loss. A Gitka'a'ata grandmother wrote a book called "*What Do Clams Taste Like?*" about her granddaughter who had never tasted abalone because it had been placed under protection from harvesting, and about the fears that children have regarding the future, and about never being able to taste their Indigenous foods,

but only to hear stories about them (Satterfield et al., 2012). Ancestral foods carry memories and often are deeply connected to identity. Certain flavors, smells and textures can connect directly to memories of time spent on the land with loved ones. Ancestral foods guide connection to places, people, culture, and spirituality (Turner et al., 2005, 2008b; Kimmerer, 2013; Turner, 2014; Geniusz, 2015).

Still, in the face of all of these negative and harmful developments and impacts, Indigenous communities continue to demonstrate resilience and strength. The resurgence of cultural knowledge and practices connected to ancestral foods that is taking place in many Indigenous communities is a testament to this resilience. Reinstating stewardship and management practices in connection to ancestral foods is both a political act and an everyday act of Indigenous resurgence (Cornthassel and Bryce, 2012; Turner, 2020a). Current day Indigenous cultural-political resurgence is a testament to the generations who fought to hold on to pieces of culture, language, identity and integrity in order to offer future generations the opportunity to move toward renewed health, connection to the land and cultural identity, both in the study region and more broadly (Simpson, 2017; Talaga, 2018; Estes, 2019; Browne et al., 2020).

These next sections have particular meaning and importance to Styawat, as an Indigenous woman, and here she presents her personal thoughts and experiences relating to Indigenous resilience and resurgence, providing an example of how these are reflected in an ancestral food: *spánanex*, edible camas.

Reconnecting to Indigenous Food Systems Is a Political Act: Styawat's Firsthand Experiences of Resilience and Resurgence

Renewing the knowledge and pride to be able to harvest culturally important foods is an act of resilience and resistance to a dominant system that has historically devalued the health and wellbeing of Indigenous Peoples.

Simpson (2017, p. 48) writes, from an Indigenous Canadian perspective, that radical resurgence "requires a deeply critical reading of settler colonialism and Indigenous response to the current relationship between Indigenous Peoples and the state." The very act of harvesting a plant food or medicine is in opposition to the dominant colonial system that set out to eradicate Indigenous knowledge and related practices (Regan, 2010; Manuel, 2017; Simpson, 2017; Talaga, 2018; Armstrong and McAlvay, 2019).

Harvesting is a political act. Ceremony is intertwined with harvesting and ceremony draws on Indigenous law, spirituality, cultural understanding, language, relationality and reciprocity (Wilson, 2008; Battiste, 2013; Geniusz, 2015; Thomas and Qwul'sih'yahmaht, 2015; Reo, 2019). Cultural protocols, like speaking to our plant relatives, leaving an offering of thanks when harvesting and listening to teachings in the form of dreams and visions, are embedded within Indigenous ways of knowing (Kimmerer, 2013; Geniusz, 2015). Practicing relational accountability, along with what I term ancestral reciprocity, by introducing oneself, asking permission, giving thanks and practicing sustainable plant stewardship, harvesting

and replanting are all ways to respect our plant relatives. These practices, along with the understanding that we are in relationship with plant relatives, lead to the responsibility we have to uphold respectful and reciprocal relationships with plants, this ethical framework constitutes what can be termed *consent-based harvesting* (Elliot, 2019; Joseph, 2020).

The beauty of Indigenous connection to the land through ancestral foods, worldwide, is that it is rooted in cultural context, story, specific locality and time spent with loved ones (Turner and Turner, 2008; Kimmerer, 2013; Geniusz, 2015; Mills et al., 2017; Simpson, 2017). The process of reconnecting to ancestral foods is one of reconnecting with self and with kin. This creates a powerful opportunity for healing and strengthening. Cultivating and harvesting ancestral foods brings a presence of mind, body and spirit and a direct connection to place. The act of harvesting connects the individual to the plant or animal they are harvesting; it connects them to the land on which they stand and to the ancestors who harvested in that same place for millennia. Harvesting offers a path to mindfulness and healing. Each Indigenous community has their own language and cultural practices but there are commonalities across practices of being in relationship with plant and animal relatives that often include: being in a good state of mind and heart before harvesting foods, basketry materials or working with medicines; introducing yourself to the land on which you travel and to the plants or animals you are harvesting; and considering the ancestors who are ever-present on the land. In Squamish tradition, for example, it is respectful to explain in your introduction where your family line comes from, who your parents and grandparents were/are, and that you are presenting yourself in a good way so as to show respect for those who have walked these lands before you.

I believe a deep layer of Indigenous Plant Knowledge and Practice is the innate memory living within the spirit and body that recalls the act of going out on the land to cultivate, harvest, transplant, burn, gather as family and nourish oneself. I term this *ancestral memory*. I've felt this as I've harvested and as I've developed my own relationships with Indigenous plants. Developing a feeling of ease on the land takes time and experience. The belief in the presence of ancestors on the land can help facilitate the feeling of ease, belonging and of being at home in natural spaces.

As previously mentioned, the resurgence of Indigenous food systems is not a stand-alone effort or event. Reconnecting to our ancestral foods is directly linked to language, ceremony, identity, health, and more. Intertwined in the process of reconnecting with these foods there is healing, relearning, and unlearning involved.

- **Healing:** The vast majority of Indigenous people in Canada are, in some way, navigating intergenerational trauma and the ongoing impacts on their identity, health and well-being (Joseph, (forthcoming), 2020; Woolford et al., 2014; Armstrong and McAlvay, 2019). The experience will vary from person to person but the process of healing is a shared one throughout Indigenous communities in Canada and other colonized countries globally (Griffiths et al., 2016; Browne et al., 2020).

- **Relearning:** Many Indigenous peoples in Canada and beyond are relearning ancestral knowledge and land-based practices. The process of relearning and reconnecting is necessary due to the impacts of colonization listed in previous sections. As Haudenosaunee scholar Susan Hill (2008, p. 25) writes in the anthology of Indigenist thinkers, *Lighting the Eighth Fire: The Liberation, Resurgence and Protection of Indigenous Nations*, "A people dependant on their land understand the need to treat the land with great respect and conservation." This statement outlines the necessity of connecting to the land in order to build relationships with plant and animal relatives, or what many would call "resources" in a western paradigm. Therefore, relearning ancestral knowledge is intimately tied to reconnecting to the land.
- **Unlearning:** Many Indigenous Peoples in the study region and beyond experience and live with internalized shame and trauma that affects their quality of life. The impacts of this internalized shame are compounded by the ongoing discrimination and marginalization of Indigenous Peoples in health, education, legal, and justice systems. These factors, combined, influence Indigenous Peoples' life-expectancy, frequency and severity of addictions, suicide, child apprehension, police brutality, incarceration, and more. As Indigenous People heal themselves at an individual and community level there is a significant unlearning process taking place, meaning that people are unlearning internalized shame. The process of unlearning is part of decolonizing oneself and developing a critical awareness for the ongoing external impacts of colonization in order to assert an Indigenized path toward healing.
- **Sharing Indigenous Perspectives and Context in Research:** As Indigenous Peoples worldwide continue to heal and foster and define their own resilience and strength there is an increased presence of Indigenous professionals and experts stepping into leadership roles across many aspects of society from research, teaching, business, law, medicine, and more [see IPAC (Indigenous Professional Association of Canada), 2020]. Given the impacts of the colonial origins of Canada on Indigenous Peoples and knowledge systems, in the context of research, it is critical for Indigenous scholars to present their own research and work in their words and from their perspectives in order to broaden the frameworks and context for research that contributes to cultural knowledge renewal. It is even more critical given the long history of misrepresentation, misuse of information and appropriation of knowledge that exists within the history of Western research with Indigenous peoples.

Grounded Normativity

"Grounded normativity," a concept introduced by Dene scholar and activist Glen Coulthard (2014, p. 13), is defined as "the modalities of Indigenous land-connected practices and longstanding experiential knowledge that inform and structure our ethical engagements with the world and our relationships with human and non-human others over time." Leanne Simpson describes this same concept as "the ethical frameworks generated

by place-based practices and associated knowledges as it applies to Indigenous Worldview" (Simpson, 2017, p. 22). This concept is central in the context of the resurgence of Indigenous food systems, as it establishes a basis for understanding the interconnected nature of restoring ancestral foods knowledge, systems, and practices with Indigenous conceptualizations of health. It is also important as it offers an indigenized framework for understanding the interconnections between cultural food systems, land access, Indigenous law and knowledge renewal. We will revisit this concept later in the paper.

Spánanex/Camas/Teaching Resilience

Plants teach us about adaptability, resilience, and reciprocal interrelationships. We can learn from the physical characteristics, adaptations, and responses to Indigenous management that plants exhibit and subsequently draw parallel teachings for how to approach health from within Indigenous worldviews (Geniusz, 2015). In this section I illustrate the teachings related to Indigenous conceptualizations of health along with guidance for healing in the face of adversity, through the example of one key food plant (**Figure 4**): edible blue camas (*Camassia* spp.), *spánanex* ("span-an-oo"), in my own S?wxwú7mesh language, whose bulbs have been a highly valued root food for Indigenous Peoples in regions of western North America. Camas was intensively cultivated and managed for thousands of years before European contact.

Spánanexw is classified in the Asparagaceae family (formerly in Liliaceae). The two common species with edible bulbs in the genus *Camassia* in western North America are *C. quamash* (common blue camas) and *C. leichtlinii* (great blue camas). *Spánanexw* bulbs were, and are, an important source of carbohydrates that filled a specific dietary niche for Indigenous peoples in a diet otherwise very rich in protein, fiber, fat, and oils (Beckwith, 2004; Cornthassel and Bryce, 2012). The bulb itself is very adaptable. It changes its shape in the first years of its life, morphing from an ovoid shaped or teardrop shaped bulb into a thin pencil-shape, as the bulb grows downwards and pushes itself deeper into the soil profile, so that the oldest bulbs, at their edible stage, can be 10 cm or more deep (Proctor, 2013; Cheryl Bryce, pers. comm. to Joseph, 2020). The Indigenous management of *spánanexw* involved developing a reciprocal relationship with the plant based on an understanding of what encourages it to thrive and what its thresholds for shade, fire, harvesting, and competition with other plant species are (Beckwith, 2004; Proctor, 2013). Ancestral management included clearing and periodically burning over the *spánanexw* meadows, which were actually maintained through this practice. Without regular burning, the surrounding conifer forests will encroach and eventually shade out the camas and other prairie species. Burning not only maintains open meadows by removing tree seedlings, brush, and dense grasses, but it also promotes productivity through providing ready nutrients to the camas (Proctor, 2013; Cheryl Bryce, pers. comm. to Joseph, 2020). Other related practices included weeding, tilling, selectively harvesting, separating and transplanting the bulbs. The timing of harvesting is important as well; the bulbs are usually dug in early summer after the seed capsules have ripened, so that the seeds are

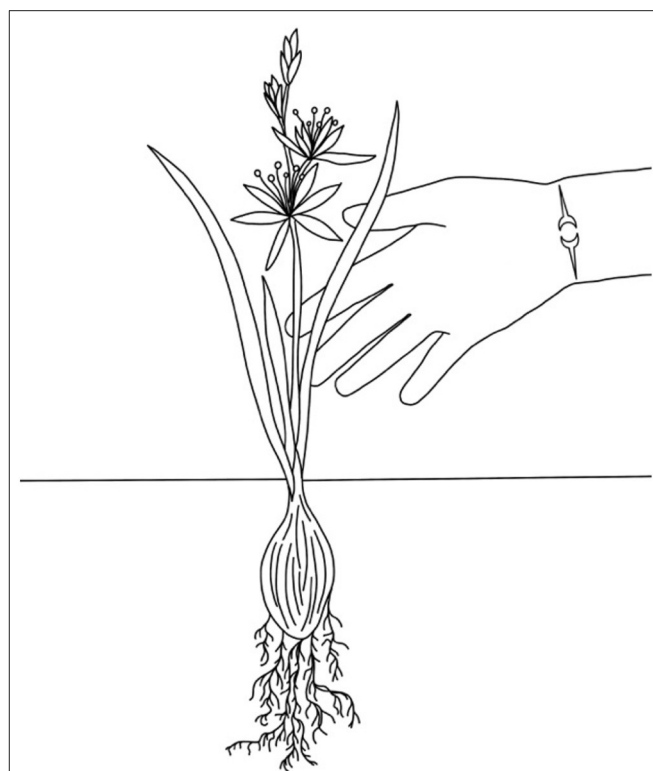


FIGURE 4 | *Spánanexw* (*Camassia* sp.), depicting the below ground bulb that was and is a culturally important food, intensively cultivated in open meadow ecosystems. The bloom above ground is purple-blue in color. (Artist Ocean Hyland from Tsleil waututh and Squamish Nations).

distributed in the dug-up soil as the bulbs are selected (Turner and Kuhnlein, 1983; Beckwith, 2004; Anderson, 2005; Deur, 2005; Beckwith et al., 2017).

Through tending our plant relatives such as camas, people developed the lived experiences, year after year, of working with these plants, and over time, a cultural relationship based on respect and reciprocity developed. Season after season, generation after generation, women and other community members, children and elders, would have sat with these plants, talked with them, cared for them, prepared them for harvest. The selective harvesting of bulbs, in combination with reseeding and replanting the smaller ones, and burning when the season turned cooler and wetter, made *spánanexw*'s path to growth easier and the ground where it grows more fertile. One can imagine the work and care taken to burn the grounds and till the soil, and the joy that must have been felt at the return of the deep purple-blue blooms that covered vast areas of garden, grocery store, ancestral grounds—some describe the original camas meadows as resembling a deep blue lake: a landscape based on longstanding reciprocal relationships between *spánanexw* and her family, her kin, her caretakers.

Spánanexw teaches us about adaptability, resourcing oneself to meet adversity and uncertainty, in order to facilitate growth, fostering the ability to mobilize and move toward what it is

you need for your own survival. *Spánanexw* teaches us about resilience, and how to build a relationship with fire. In some situations fire might be considered destructive, yet one only need bear witness to the regenerative powers of fire in the spring after the late summer, fall or winter burning had taken place to see the beauty of such a relationship. *Spánanexw* teaches us about reciprocity. It flourishes in relationship with ancestral management practices. Burning, tilling, weeding, and replanting led to thriving meadows that provided significant nutrition and enjoyment to the people who relied on this food historically. Current-day restoration efforts focusing on *spánanexw* offer a connection to Indigenous People's health and a contribution to cultural political resurgence through reinstating Indigenous plant management and harvesting practices on the land (Corntassel and Bryce, 2012).

A key element of the story of camas is how the knowledge of its use, and the actual bulbs themselves, were spread from nation to nation, along with the names for the bulbs and the processes for tending and preparing the bulbs. The Sʷwxwú7mesh name *spánanexw* is related to names in other Salishan languages (e.g., Shishálh/Sechelt, Noxws'áq/Nooksack, Hul'q'umi'num/Halkomelem) and is related to the word for "bury or buried"). There is evidence that the bulbs were brought from one locale to another to be replanted (Turner and Efrat, 1982), and that the pit-cooking process used to cook camas bulbs spread from south to north and from central Oregon and Washington to the Northwest Coast (Turner, 2014). The processed bulbs themselves were important as trade goods; for example, Gunther (1945) noted that, except for choice varieties of dried salmon, there was no food item more widely traded by Washington peoples than camas.

Given the long-standing exchange and sharing of camas and its associated knowledge, it is not surprising that one particular act of resurgence and revitalization of Indigenous food was when Lekwungen plant expert Cheryl Bryce visited Squamish recently. She brought with her dozens of camas bulbs that she had dug in her own territory in the Victoria region, along with bulbs donated by friends at Saanich Native Plants and Habitat Trust, and we held the first camas pitcook in lived memory in our territory. It was a powerful example of what Leanne Simpson calls "Indigenous Internationalism."

Indigenous Internationalism

Styawat's account of *spánanexw*, its associated names and traditional knowledge, how knowledge about it has been shared across generations, Indigenous nations, and geographic space, and how it has once more become recognized as a culturally and nutritionally important food for Coast Salish and other Indigenous Peoples, is just one of many instances of knowledge sharing. Styawat learned a great deal about root garden restoration, applicable to her homeland in Squamish, from visiting another community, a Kwakwaka'wakw village at Kingcome Inlet to the north. With other students and youth from the Tsawataineuk community there, she learned firsthand from Kwaxsistalla Clan Chief Adam Dick and other elders of the community about their childhood experiences of cultivating their tidal marsh root gardens, called *tʷkillakw*, at the Kingcome



FIGURE 5 | Styawat learning about Indigenous plants with girls from Gwayi Village, Kingcome Inlet.

River estuary, and how the roots were pitcooked and served at communal feasts. These included springbank clover rhizomes (*tʷxsús*), silverweed roots (*dlɛxsém*), and northern riceroot bulbs (*xukwʷm*), all edible roots known to and used by past generations of Sʷwxwú7mesh people, but which had not been harvested in recent decades, so were little known except to the eldest members of the community. Through Indigenous Internationalism, Leigh, with her own research, was able to bring them back into people's experience, so that, once again, the Sʷwxwú7mesh people were able to taste their ancestral root vegetables and reconnect to their own history of estuarine root gardens (Lloyd, 2010; Joseph, 2012; Deur et al., 2013) (**Figure 5**).

Indigenous Internationalism asserts a new path forward for Indigenous Peoples that is grounded in ancestral economies, trade and connections between communities. The path this offers is not dictated by outside colonial structures or rules. The act of Indigenous researchers, knowledge holders and community advocates turning to other Indigenous communities for support, trade, and knowledge exchange is a form of activism and a declaration of nationhood and sovereignty. Indigenous Internationalism aligns Indigenous People from various communities who share goals of knowledge recovery, access to land and cultural resurgence. Styawat has experienced this directly in connection to her research and academic teaching. Each time she plans to teach a course or carry out a research related activity on other Indigenous territories she is careful to make connections with community leaders and knowledge holders to support her proposed teaching and work.

For example, for the past 4 years Styawat has been teaching a course on Indigenous Land-Based Knowledge through the University of Victoria on Lekwungen territory. Each time she plans this course she contacts other Indigenous people working within both WSÁNEC and Lekwungen communities to participate in the teaching and knowledge sharing. Beangka Elliot, Ashlee Cooper and Tiffany Joseph from WSÁNEC territory and Cheryl Bryce and Joan Morris (Sellemah) from Lekwungen territory all come together to inform how the course will run. One of the main priorities of the course is to contribute to hands-on and on-the-land knowledge resurgence in the local Indigenous communities. This has looked different each year depending on what the community priorities have been. Each year the course opening has been held by Joan Morris to set the tone and intentions of the coursework and ground them in Indigenous ways of knowing. In addition, there is an introductory lecture on the colonial impacts on Indigenous land-based and plant-based knowledge with local context, examples and stories shared. During the first year of the course the group of University students planted front yard gardens in the Lekwungen community. Another year the class supported a camas pitcook in the WSÁNEC village site of SNIDCEL.

Each year the class partakes in ethnoecological restoration activities, including planting out native plants, removing invasive species, planting in community gardens and redistributing culturally important plants within local Indigenous communities. These activities not only follow teachings of respect and reciprocity but they offer the students and the community members an opportunity to meet in a shared place of learning about culturally important species and landscapes, and foster a deep experiential opportunity for cross-cultural understanding. These experiences would not be possible without the enactment of Indigenous Internationalism between Styawat, Beangka, Ashlee, Tiffany, Joan, and Cheryl. It is from these respectful and evolving relationships that the opportunity for meaningful collaboration between an academic class and local Indigenous communities is made possible.

In every community there are individuals who have retained key knowledge, experiences and memories relating to their original foods and other culturally valuable species. These people have been invaluable to all Indigenous nations because today, in a time of resurgence of Indigenous food systems and intensified interest in grounded normativity, they have become the teachers and mentors for so many. The role of Kwaxsistalla, Clan Chief Adam Dick, for example, in bringing his experiences, teachings and wisdom back to his own community as well as sharing them with so many others (Deur and Turner, 2005), was an immense stimulus for cultural resurgence, and his legacy has continued on after his passing (see <https://www.kwaxsistalla.org/>). Today, despite the colonial pre-emption of Indigenous homelands, the displacement of people and erosion of their ancestral languages and food systems, Indigenous Internationalism has allowed cultural revitalization and a resumption of intergenerational knowledge transmission, carrying this precious knowledge and practice forward for future generations.

DISCUSSION

Table 1 summarizes some of the key attributes of Indigenous Peoples' Food Systems presented in this paper, along with negative factors that have impacted, and continue to impact people's access to and use of Indigenous foods, as well as positive factors contributing to the revitalization of Indigenous Food Systems. We have focused on human-caused impacts and factors influencing Indigenous food use, rather than on geographical or physical factors. We did include climate change, since this is an anthropogenic threat that needs to be addressed.

The resurgence and revitalization of Indigenous Peoples' food systems is ongoing. Here we have provided just a few examples of foods and management systems that had almost been lost due to the unrelenting pressures of colonization, land takeovers, habitat destruction, commercial over harvesting, suppression of traditional management, loss of opportunities for passing on associated knowledge, and numerous other stressors imposed by the dominant newcomers. Today, at a time when governments and the population at large are searching for means of reconciliation (Truth Reconciliation Commission of Canada, 2015), one of the most obvious pathways to reconcile the losses that have been endured by Indigenous Peoples is to support their own initiatives for reinstating their ancestral foodways (Turner et al., 2008a; Kuhnlein et al., 2009, 2013). There are many issues to be addressed. For example, perhaps, given the contemporary context of wild harvesting, and the potential for placing undue pressures on wild food populations in environments that are diminishing and losing biodiversity, culturally important native species might be grown in gardens. Ethnobotanical gardens, featuring living plants of cultural importance that can be easily identified by people of all ages are another type of initiative that have had successful and effective outcomes (Turner and Wilson, 2006).

Governance of harvesting areas has always been carefully undertaken by individual Indigenous nations, and they should be invited to play a key role in decision-making around commercial food harvesting within their ancestral territories. Indigenous Peoples should be supported in efforts to restore our plant and animal relatives back into our communities and landscapes; this would be a powerful step toward cultural resurgence and healing. Supporting language revitalization—including the specialized vocabulary of food species and food harvesting and preparation, is a way of rebuilding place-based relationships, much important information is embedded in the names of plants, animals, places, and food use (Turner, 2014).

Culturally Managed Ecosystems

Ancestral food harvesting places and cultural landscapes, such as clam gardens, fish weirs, tidal marsh root gardens, wapato patches, berry gardens, and orchard gardens (Garibaldi, 2003; Turner et al., 2013b; Claxton, 2015; Armstrong, 2017), are currently being studied and restored, in ways that allow people to relearn about them as they go (Augustine and Dearden, 2014). Although they are based on ancient technologies, these initiatives also embrace contemporary methods and techniques from western science, archaeology,

TABLE 1 | Indigenous peoples' food systems in Northwestern North America: attributes, threats and enhancements (United Nations, 1992, 2007; Anderson, 2005; Menzies, 2006; Nabhan, 2006; Watts and Watts, 2007; Brown et al., 2009; Kuhnlein et al., 2009, 2013; Krohn and Segrest, 2010; Cornthassel and Bryce, 2012; Joseph, 2012, 2020; Deur et al., 2013; Proctor, 2013; Turner et al., 2013b; Augustine and Dearden, 2014; Mackenzie, 2014; Turner, 2014, 2020a; Claxton, 2015; Beckwith et al., 2017; Lutz, 2020; Minnis, 2021).

Indigenous food system attributes and values	Some negative factors impacting indigenous food systems	Some factors contributing to revitalization of indigenous food systems
Need for productive terrestrial, aquatic and marine ecosystems and habitats, with natural processes intact Healthy, nutritious Indigenous food and dietary diversity; access to food harvesting areas	Dispossession of Indigenous Peoples' homelands; commercial overharvesting; pollution; habitat loss; invasive species impacts; ongoing climate change Loss of access to Indigenous food because of land dispossession, residential schools, urbanization, industrial encroachment and pollution; lifestyle changes and wage economy	Reconnecting to ancestral lands and waters; controls on commercial harvesting; ethnoecological restoration; wetlands protection; reducing/reversing climate change Indigenous Internationalism; trading for nutritious culturally valuable food; renewed access to land; banning pesticides; recipe books; planting Indigenous food species in communities; reclaiming and recentering Indigenous wellness practices
Medicinal values of Indigenous foods: nutraceuticals Cultural values of Indigenous Food: Respect and Reciprocity	Health impacts of unhealthy processed, marketed food: lifestyle and diet related illness such as type-2 diabetes Banning of cultural food ceremonies and practices (e.g., potlatch); systemic racism; loss of cultural landscapes and food systems	Working with Indigenous herbalists and healthcare workers; education on health values of Indigenous food Promoting Indigenous Foods celebrations (e.g., First Foods ceremonies) and other community initiatives; education on respect, kincentricity and the importance of all species; applying Indigenous values in land use; reinstating ceremony, stories, songs, respect
Traditional Management Practices: tending, caring for species, and habitats	Outlawing Indigenous stewardship, cultivation, and tending practices for food species and habitats (e.g., banning landscape burning, fish traps, harvesting bark); excluding people from their lands	Ethnoecological land and knowledge restoration projects (e.g., rebuilding clam gardens, fish weirs, reinstating experimental burning); increased access and ability to work on lands; supporting Indigenous Conserved and Protected Areas
Impacts of environmental change	Urbanization, pollution, deforestation, invasive species, loss of food species, pollinators; climate change and associated impacts; loss of resilience	Ecocultural restoration practices; planting culturally valued trees and food species; reducing fossil fuel use; maintaining wetlands and peatlands; education; adaptation to some new species
Food-related learning and education	Residential Schools (removing children from opportunities to enjoy their Indigenous food and to learn about looking after the land—also experiencing terrible nutrition, developing dysfunctional relationships with food); participation in wage economy; removal of people from land base	Re-introducing experiential and intergenerational learning about Indigenous food and experiencing Indigenous food, harvesting, processing, and associated equipment; calendars, recipe books, food festivals, harvesting camps, participation in food harvesting and tending by people of all ages; reconnecting youth and elders; reclaiming access to Indigenous lands
Trade and Exchange; sharing knowledge, goods and practices	Suppression of Indigenous trade in food; Challenges accessing healthy market foods (privatization, development, cost)	Incorporating new foods such as orchard fruits; adaptation, resilience over years and over generations; restoring Indigenous plants and renewing knowledge
Food in Indigenous languages, stories, discourse	Pervasive Indigenous language suppression in residential schools and in general	Widespread language revitalization programs, including dictionaries, websites, with food- and species-related vocabulary
Governance and policy relating to Indigenous Foods	Widespread suppression of access to and use of Indigenous food through the Reserve system, Indian Act, and systemic racism	Reconnecting to Indigenous food systems is a political act; reinstating Rights for Indigenous Peoples (through <i>UN Declaration on the Rights of Indigenous Peoples</i> , <i>Convention on Biological Diversity</i> and other International laws to which Canada is signatory)
Monitoring, oversight, control over harvesting	Reduced ability of leaders and knowledge holders to control harvesting and ensure conservation of food species over time	Recognizing the importance of knowledgeable leadership; instating community-based conservation strategies
Sharing with wildlife as relatives: kincentricity	Increasing pressures on wildlife; loss of biodiversity due to habitat loss and industrial encroachment	Ecocultural restoration; enhancing wildlife habitat and opportunities to access food
Insect pollinators	Loss of biodiversity and use of harsh pesticides and chemicals	Indigenous communities collaborating with native plant nurseries to replant pollinator species back onto the land and in gardens

engineering and genetics. For example, wildlife cameras can assist in the understanding of migration patterns of ungulates and other animals, and drones can help determine

the extent of particular habitats by providing aerial views. Educational and research programs embrace videos, data recorders, identification apps, and other recent technologies,

which in turn can inform habitat and species restoration in culturally appropriate ways. As Secwepemc elder Dr. Mary Thomas used to say, "There is strength in the Old and the New together!"

Community-Based Conservation Strategies

Community-based conservation strategies go hand-in-hand with food use. Broad scale Initiatives such as the Coastal Guardian Watchmen, and Indigenous Guardians Program reflect the Indigenous worldview that connects the well-being of other species with human well-being, and the responsibility to care for the habitats of these species in a spirit of reciprocity and gratitude. This perspective—and the requirements of planning, governance and monitoring that it reflects—is a critically important element of Indigenous food systems (Brown and Brown, 2009). There are opportunities for the reinstatement of Indigenous economies and trade networks as well. Indigenous Peoples are renewing cultural knowledge and expertise and, in addition to the sacred work of knowledge renewal and healing, this can lead to empowering local communities toward sustainable development of their local resources, exploring new strategies for local production based on the actualization of Indigenous Knowledge and strengthening Indigenous economic resilience, offering opportunities for economic reconciliation. Whether it's tending the seaweed and eelgrass beds, caring for berry patches or crabapple stands, or looking after the herring spawning places, the production of food is grounded in these conservation activities. There are also collaborative co-management projects based in parks and conserved areas across the region. Indigenous Conserved Areas are also becoming more common and more widely recognized as helping to alleviate biodiversity loss and support Indigenous livelihoods and food security worldwide; a number of these are in the study region (Turner, 2020a).

Commercial harvesting of Indigenous food can have disastrous impacts on its sustainability and availability to Indigenous People; this is what happened when industrial scale harvesting of northern abalone was instated on the Pacific coast, and this has happened worldwide with other locally important foods (Berkes et al., 2006; Turner et al., 2013b). Commercial logging and commercial fishing have also severely impacted Indigenous peoples' abilities to access and use their local resources sustainably. However, occasionally new developments have actually helped to reinstate and reinforce ancestral knowledge and ways, as in the relatively recent establishment of a market for pine mushrooms, or American matsutake in some places. In the Nass Valley, the Nisga'a, with their newly instated modern treaty, were able to oversee and participate in the pine mushroom harvest, and this had the effect of encouraging younger people to get out on their lands, to seek advice from the elders about different areas of the valley, and to become familiar with their ancestral landmarks, plants, animals, and land-based foods, and to learn the time-honored protocols for living out on the land (Menzies, 2006).

Ethnoecological Land and Knowledge Restoration Projects

Many different projects have been developed by Indigenous Peoples and their allies to assist in resurgence of Indigenous knowledge and practices and in the recognition of Indigenous land rights (Turner, 2020a,b). Work in reclaiming, restoring and revitalizing habitats and species of cultural importance has been termed "ecocultural restoration," or "ethnoecological restoration" (Gomes, 2012; Thomas, 2015), and such projects are taking place in numerous locales, not only across Canada but in many parts of the world, from Australia to Scotland. Indigenous knowledge keepers confirm that, in these endeavors of resurgence, gratitude, and reciprocity, as expressed in ceremony, is key to their success (Kimmerer, 2013; Courchene, 2019).

Community projects aimed at bringing Indigenous foodways back into the forefront are underway in many different places. Among the first of these was the Nuxalk Food and Nutrition Program, which began in Bella Coola in the early 1980s. Initiated as a joint project between the Nuxalk Nation and ethnobotanist Harriet Kuhnlein, the project had many facets, including documenting ancestral food systems and dietary change across several generations, determining the availability of traditional foods, assessing changes in health in community members, nutrient analysis of some of the key Nuxalk foods, and promoting healthy Indigenous foods as well as healthy diets in general (Lepofsky et al., 1985; Turner et al., 2009, 2013b). The Tsawout Seafood festival, which occurred every year for a number of years running in the Tsawout community of East Saanich, with pitcooking demonstrations, a reinstatement of the First Salmon ceremony, and general celebration of Indigenous food (Devereaux and Kittredge, 2008; Krohn and Segrest, 2010; Mackenzie, 2014), to the famous huckleberry feasts celebrated by the Confederated Tribes of Warm Springs, Oregon, in which traditional teachings and remembrances are shared (Warm Springs Museum at, 2019).

The Potlatch and related ceremonies have also been critically important in this time of resurgence of Indigenous food systems. Not only do Potlatches serve as incentives and opportunities for preparing and consuming the highly valued foods, but they provide the ceremonial foundation for the recognition, appreciation, tending, harvesting, and sharing of this food, both during the events themselves and as gifts, such as jarred salmon, berry preserves, and dried seaweed to be taken home for later enjoyment (Wilson and Turner, 2004; Brown and Brown, 2009; Turner et al., 2013b).

Squamish Indigenous Foods Celebration and Other Community Initiatives

In recent years Styawat and some of her relatives from the Squamish Nation have started an annual Indigenous Foods Celebration with a central focus on plant foods and medicines. This is a one-day, hands-on, experiential event to learn about culturally important plants through harvesting, processing and creating a food or medicine with them. There is an Indigenous foods lunch that has included pit-cooked camas bulbs, seafood



FIGURE 6 | Indigenous harvester drawn by artist Ocean Hyland from the Tseilwaututh and Squamish Nations. This illustration celebrates the beauty of harvesting and depicts the harvester with a Coast Salish woven blanket and harvesting basket.

soup featuring *lhásem* (northern riceroot) bulblets, dandelion fritters, stinging nettle pesto and spanakopita, salmon, elk, moose, deer, and more. This celebration captures a community-based interest and drive to reconnect to plants and other Indigenous foods in the context of health and wellbeing (**Figure 6**). The celebratory air of the day is empowering and exciting for community members and it is an enjoyable way to gather together and co-create Squamish approaches and definitions of wellness.

Other initiatives to promote and support Indigenous foods include the creation of recipe books and field guides to edible plants and animals (e.g., Hebda et al., 1996; Turner and Thompson, 2006; Watts and Watts, 2007; Krohn and Segrest, 2010; Haida Nation Council of, 2020), as well as developing websites, workshops and courses, both online and in person, that support Indigenous communities in renewing their knowledge and practices connected to plants. As Styawat notes, "These events bring together the renewal of relationships with plants and place. They also renew our relationships with our health as Indigenous Peoples."

Economic Reconciliation

Another aspect of reclaiming and celebrating food traditions is economic reconciliation (<https://reconciliationcanada.ca/programs-initiatives/economic-reconciliation/>). As people reconnect with their plant and animal relatives, there are parallel processes of reconnection to language, health, land-based

knowledge, Indigenous law and culturally rooted economies. The concept of economic reconciliation is one that speaks to the process of a community defining their own holistic model and approach to economic development within the cultural context of the community. For example, Styawat has an Indigenous plant-based skincare business, Skwálwen Botanicals (<https://skwalwen.com/>), that is grounded in her cultural relationships with plants. "Skwálwen" is a Squamish word and concept. The term doesn't translate directly to English but it connotes connecting the mind, body and spirit and situates these interlinkages through a Squamish lens. The business is grounded within what Styawat identifies as cultural pillars, including respect, responsibility and reciprocity, or "giving back." In integrating cultural relationships with plants into a business setting it is imperative to be deeply respectful of the embodied cultural knowledge and to carefully choose what is shared with a wider audience within the cultural context.

Increasingly there are more Indigenous-owned businesses that span the areas of sustainable tourism, outdoor guiding, and recreation. There are also gastronomy-based businesses that focus on fostering collaborative inclusive platforms that include Indigenous producers, chefs, food activists, local institutions, consumers, and communities (c.f. Sherman and Thompson, 2018). These are paths toward creating positive change within Indigenous communities and leading to increased representation of Indigenous People across different areas of society.

CONCLUSION

For the health and well-being of Indigenous Peoples in the study area and throughout the world, the ability to access healthy Indigenous food is not only a recognized right, it is essential to their lives. As Kwakwaka'wakw cultural expert Kim Recalma-Clutesi (pers. comm. to NT, 2002) stated, "It's very hard to practice the culture accurately and properly without proper food... we are not going to survive as a People if we do not have access [to traditional foods]. Our bodies have not adapted yet to this new food... the culture and the food are linked hand in hand."

We are living through a time of Indigenous knowledge renewal, cultural and political resurgence and the reassertion of Indigenous laws and land rights (cf. Turner, 2020a,b). It is the belief of the authors that the motivations for these processes, in the context of culturally important foods and medicines, are grounded in ancestral ties to the land and are deeply connected to cultural and spiritual practices that serve to strengthen ongoing relationships with place and, in turn, with identity. In addition to this, it is a priority for Indigenous communities to consider how their actions today will impact the future of their families and communities. In other words, there is an ancestral continuity across generations, an understanding that the actions and decisions we make in the present are informed by the actions and experiences of our ancestors, and will, in turn, impact our the actions and experiences of those who come after us.

Indigenous Peoples are resilient and have always been adaptive and innovative. During this time of climate change, resource extraction and, most recently, the global Covid-19 virus

pandemic, Indigenous Peoples are being challenged to turn to their ancestral knowledge and practices in response to changing and difficult times. Indigenous Peoples are not inexperienced with adapting in the face of grave struggles. Still today much of non-Indigenous society would uphold a trauma narrative when considering Indigenous issues in Canada. Trauma is certainly part of the story and shared experiences of Indigenous Peoples in Canada and beyond, but it is not the whole story. It is essential that we challenge this narrative and shift it from one of trauma and deficit to one of resilience and adaptability.

As Indigenous communities work to heal from past impacts of colonization, at the same time as facing current social and environmental challenges, the mobilization of ancestral knowledge takes many forms including activism, innovation, advocacy, research, and more. The stories and examples shared here show the work happening at an Indigenous community-based and grassroots level to bring better health to people and the natural environments they live in and to find new paths forward that are informed by the land-based knowledge and practices that are rooted in ancestral knowledge and food systems.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

Both authors contributed to the development and writing of the paper, with NT taking a lead on the initial outline and framing based on decades of working with Indigenous knowledge holders,

and LJ contributing research, firsthand experiences and accounts and perspectives from her own background as an Indigenous scholar, practitioner, and community member.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX OF SCIENTIFIC NAMES

Appendix 1. Scientific names of plant and animal species mentioned in this paper (listed alphabetically by common name as presented in the paper)

Plants and fungi

Arbutus (*Arbutus menziesii*)
 Aspen (*Populus tremuloides*)
 Balsamroot (*Balsamorhiza sagittata*)
 Birch (*Betula papyrifera*)
 Blackberry, trailing wild (*Rubus ursinus*)
 blueberry varieties (*Vaccinium* spp.)
 Camas, edible blue (*Camassia* spp.: *C. leichtlinii* and *C. quamash*)
 Cedar, western red- (*Thuja plicata*)
 Cedar, yellow (*Cupressus nootkatensis*)
 Chocolate lily (*Fritillaria affinis*)
 Clover, springbank (*Trifolium wormskioldii*)
 Crabapple, Pacific (*Malus fusca*)
 Cranberries, highbush (see highbush cranberries)
 Douglas-fir (*Pseudotsuga menziesii*)
 Fir, subalpine (*Abies lasiocarpa*)
 Eelgrass (*Zostera marina*)
 Fireweed (*Epilobium angustifolium*)
 Glacier lily, yellow (*Erythronium grandiflorum*)
 Hemlock, mountain (*Tsuga mertensiana*)
 Hemlock, western (*Tsuga heterophylla*)
 Hemp-dogbane (*Apocynum cannabinum*)
 Highbush cranberry (*Viburnum edule*)
 Huckleberries (*Vaccinium* spp., especially *V. membranaceum*)
 Red laver seaweed (*Pyropia abbotiae*, *Pyropia* spp.)
 Lichen, black tree (*Bryoria fremontii*)
 Matsutake, American (*Tricholoma magnivelare*)
 Mushroom, pine (*Tricholoma magnivelare*)
 Nettle, stinging (*Urtica dioica*)
 Oak, Garry (*Quercus garryana*)
 Oceanspray (*Holodiscus discolor*)

Onion, nodding (*Allium cernuum*)
 Pine (*Pinus* sp.)
 Pine, ponderosa (*Pinus ponderosa*)
 Redcedar, western (*Thuja plicata*)
 Riceroot, northern (*Fritillaria camschatcensis*)
 Salal (*Gaultheria shallon*)
 Saskatoon berries (*Amelanchier alnifolia*)
 Seaweed (see laver, red)
 Silverweed, Pacific (*Potentilla egedii*)
 Skunk-cabbage (*Lysichiton americanus*)
 Soapberries (*Shepherdia canadensis*)
 Spruce (*Picea* sp.)
 Spruce, Engelmann (*Picea engelmannii*)
 Spruce, Sitka (*Picea sitchensis*)
 Stinging nettle (*Urtica dioica*)
 Strawberry, wild (*Fragaria vesca*, *F. virginiana*)
 Sword fern (*Polystichum munitum*)
 Thimbleberry (*Rubus parviflorus*)
 Tigerlily (*Lilium columbianum*)
 Timbergrass (*Calamagrostis rubescens*)
 Wapato (*Sagittaria latifolia*)
 Willow (*Salix* sp.)
 Yew, Pacific (*Taxus brevifolia*)

Animals

Abalone, northern (*Haliotis kamtschatkana*)
 Clams (*Mercenaria* spp., *Saxidomus* sp., *Tresus* spp., *Clinocardium nuttallii* and other species)
 Clam, butter (*Saxidomus gigantea*)
 Deer (*Odocoileus hemionus*)
 Elk (*Cervus canadensis*)
 Herring, Pacific (*Clupea pallasii*)
 Mountain goat (*Oreamnos americanus*)
 Oulachen (ooligan) (*Thaleichthys pacificus*)
 Rockfish (*Sebastes* spp.)
 Salmon, Pacific (*Oncorhynchus* spp.)
 Salmon, sockeye (*Oncorhynchus nerka*)
 Seals (*Phoca vitulina*)



The Persistence of Flavor: Past and Present Use of Wild Food Plants in Sierra Norte de Madrid, Spain

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Despite the increasing scientific and public interest in wild food plants, their traditional knowledge is undergoing a deep cultural erosion process at a global scale. The paper assesses past and present use of wild food plants in Sierra Norte de Madrid (Spain) in order to understand which are the main drivers of its evolution. We interviewed 132 informants and analyzed the cultural importance and present use of the following: (1) the human food use-category compared with all the other use-subcategories, (2) the food plant species, and (3) the human food use-subcategories (e.g., vegetables, fruits, condiments, or beverages). The useful wild flora included 252 plant species, of which 74 were traditionally used as human food, which is the most culturally important use-category. The most important species were three vegetables consumed cooked (*Scolymus hispanicus*, *Bryonia dioica*, and *Silene vulgaris*), other two greens that were eaten raw (*Rumex papillaris* and *Montia fontana*), a condiment (*Thymus zygis*), and a fruit (*Rubus ulmifolius*). Among food use-categories, vegetables was the category with a higher cultural importance index, but beverages and condiments had the lowest cultural erosion rate. We found several drivers of change in the use of wild food plants, some enhancing the trend of abandonment that affects differently certain uses and species, and others encouraging their maintenance. Factors that may explain the general erosion trend are linked to the abandonment of traditional agricultural practices and shepherding: (1) the decrease in the abundance and quality of wild food plants; (2) wild food plants are no longer necessary for subsistence; (3) the reduction of time spent in the countryside; and (4) the negative connotations of some species that are considered famine food. On the other hand, there are several motivations for gathering and using wild food plants: (1) gathering is seen as a leisure and community building activity; (2) the intense flavor of wild plants, which cannot be substituted by cultivated or commercial ones; (3) positive values associated with some species consumed as everyday food that are now considered delicatessen; and (4) the medicinal role of food, mainly food uses closer to medicine such as beverages and condiments.

Keywords: wild edible plants merge, traditional ecological knowledge, ethnobotany, cultural erosion ratio, cultural importance, traditional gastronomy, trends in wild food consumption

INTRODUCTION

Traditional knowledge about wild plants is still important for ensuring food and nutritional security to many people around the globe, especially for poor and marginalized communities (Kaoma and Shackleton, 2015; Ong and Kim, 2017; Ulian et al., 2020). It is mainly orally transmitted from generation to generation (Mesa, 1996). This body of knowledge is dynamic, since the relationship between human beings and plants is a coevolution process based on a continuous interaction leading to adaptive responses to the environment (Berkas et al., 2000). In traditional societies, this interaction is intimate, since the management of plants is the key for survival in every realm of life: nutrition, medicine, animal care, fuel, handicraft, symbolic uses, etc. But what happens when a society evolves to be less dependent upon the immediate environment? When need is not central in the equation, which traditional uses of plants remain, and which are left behind?

The globalization process is affecting rural societies all over the world, making them more dependent on external inputs and disconnecting them from their local resources, such as wild plants or landraces (Jackson et al., 2007). In many western rural societies, such as some Romanian, Italian, or Spanish territories, this change has happened several decades ago (Rey Benayas et al., 2007; Pascual and Herrero, 2017; Gras et al., 2020; Kalle et al., 2020; Mattalia et al., 2020a,b). In Spain, the crisis of traditional agrarian society started in 1960, associated with the industrialization of agriculture production based on fossil fuels, chemicals, and mechanization (Naredo, 2004). Since then, rural societies all over the country have lost, to a greater or smaller extent, their dependence on the surrounding environment.

The cultural erosion process affecting traditional knowledge on wild edible plants has been detected all around Europe (i.e., Pardo-de-Santayana et al., 2005; Tardío et al., 2006; Łuczaj, 2008; Söukand and Kalle, 2011; Turner et al., 2011; Łuczaj et al., 2012; Łuczaj and Pieroni, 2016). Also at a global level, the Millennium Ecosystem Assessment found a general decline in the gathering and consumption of wild edibles (MEA, 2005). Some reasons underlying traditional knowledge erosion on wild foods in Europe are rural exodus, industrialization of agriculture, and changes in lifestyles and ecosystems (Kalle and Söukand, 2013; Łuczaj et al., 2013b; Abbet et al., 2014; Reyes-García et al., 2015; Pieroni and Söukand, 2017; Blanco-Salas et al., 2019; Acosta-Naranjo et al., 2020).

However, this process is not homogenous, since some traditional uses are completely lost, while others remain, and even new uses become popular due to the influence of mass and social media or the migrant's customs. For instance, in Europe, many children's snacks such as *Trapa natans* L. fruits have been abandoned, while today, Asian migrants look for *Pteridium aquilinum* (L.) Kuhn fiddleheads in European woods (Łuczaj and Pieroni, 2016).

While most European authors have presented qualitative analysis of the cultural erosion and current trends affecting wild food plants, only few have used quantitative methods (e.g., Polo et al., 2009; Reyes-García et al., 2015; Menendez-Baceta et al., 2017). In this paper, we give a wider insight into the cultural erosion process considering the whole ethnobotanical culture

of the region and situating wild food plants within it, merging quantitative and qualitative data of their past and present use.

The main objective of the paper is to evaluate the trends in wild food plants traditionally used in Sierra Norte de Madrid exploring which traditional wild plant uses persist despite cultural erosion and why. We hypothesize that there is a negative correlation between the cultural importance index (CI) and the erosion rate (ER), both for use-categories and wild food plants; i.e., the more culturally important a species or use-category is, the less abandoned its use is.

MATERIALS AND METHODS

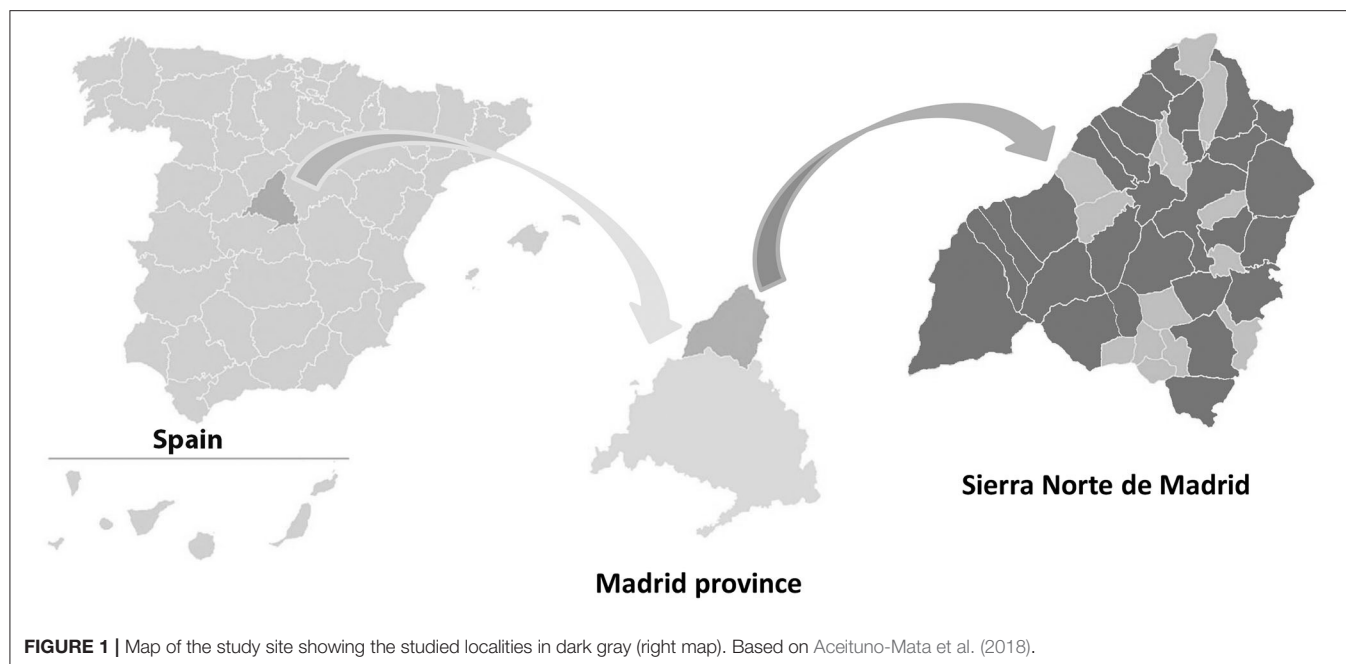
Study Area

The study area is a mountainous region located in Central Spain, in the north of the province of Madrid (Figure 1). Its population is 18,428 inhabitants, living in 41 villages (INE, 2020). The region, with a surface of 1,261 km², includes a granitic mountain range rising up to 2,428 m, and several sedimentary valleys, being the lowest point around 600 m high. Climate in the area is considered continental Mediterranean, with a strong temperature variation between summer (mean maximum temperature 25.8°C) and winter (mean minimum temperature −1°C) and annual rainfall ranging from 600 to 1,000 mm with a dry period in the summer. In the lowest areas, we found holm oak forests [*Quercus ilex* subsp. *ballota* (Desf.) Samp.] and aromatic Mediterranean shrub flora. In the mountainside until 1,600 m high, the forests are mainly composed of *Quercus pyrenaica* Willd., whereas in the meadows and wetlands grow several species used as fodder and as herbal teas.

Local population has maintained a subsistence economy until the mid-twentieth century based on livestock farming, forest resources, and agriculture (Barrios et al., 1992; Aceituno-Mata, 2010). Generally, each family took care of a flock of sheep or goats, herd mainly in the communal lands, one or two cows or oxen for plowing, a donkey for carrying and transport, and pigs and chickens for household consumption. Traditional agriculture made the most of the poor mountain soils of the region, combining irrigated crops in the fields close to rivers and villages, and cereal cultivation in further lands, using the mountainsides for growing rye. The decline of traditional agricultural society in 1960 led to a migration flow to urban areas (Naredo, 2004). Nowadays, the most important economic activities are the service and construction sector. The livestock farmers remaining in the region no longer have sheep or goats but mainly beef cattle. The population remaining in the area maintained part of their traditional practices, such as gathering wild plants, home gardening, or chicken care. However, these traditions are barely transmitted to the younger generations, and nowadays, most of the knowledge and use of wild plants is at risk of disappearing (Aceituno-Mata, 2010).

Field Study

In order to describe and analyze the traditional use of wild plants, we selected a sample of the population that has lived in the area before 1960. This population group have experienced the transformation of traditional agricultural society that occurred in



this period, and hence, their testimony serves to track the changes in the use of wild food plants over the last century.

The method used to select the sample was snowball sampling (Bernard, 1994), contacting in the first place with elderly groups (local associations, adult schools, etc.) and asking them for more references of people to be interviewed about wild plants. To cover all the regional differences of Sierra Norte, fieldwork was carried out in 28 of the 42 villages of the area. Interviews were conducted between 2003 and 2007. The first author has been living in the area since the beginning of the fieldwork.

Several methods were used for data collection: consented semi-structured in-depth interviews, field interviews for collection of plant samples, and participant observation. When starting each interview, the informant was asked for free informed consent, following the ethnobiological code of ethics (International Society of Ethnobiology, 2006). We conducted in-depth interviews about all the use-categories with 64 informants. Afterwards, we interviewed other 68 informants only about wild food plants. In total, 132 informants were interviewed in-depth, with an average age of 68, being 50% of them woman. Sample size was defined by the law of diminishing returns. As the number of interviewed informant increases, the amount of new information obtained per interview drops (Martin, 1995). We considered the research complete when the new data registered were scarce and when it was not necessary to confirm the available data with more informants.

The main method used for data collection was semi-structured interviews. We asked about all the uses of wild plants (e.g., food, medicine, and ornament). Regarding the food uses, we asked for all food categories (e.g., vegetables, fruits, and condiments), the part consumed, the mode of consumption (processing technique and consumption context), the collecting time, and habitat. We considered a use-report (UR) the citation of a plant species by an

informant for a specific use-category. For each UR, we recorded if it was traditional or a new trend and whether the informant still practiced it or not. We asked them for the reasons for abandonment or maintenance of the use, in order to assess the drivers of change in wild food consumption. Interviews were recorded under informant consent, and notes were taken in a field notebook.

The informants were also asked to perform a field interview for collecting plant specimens and for checking the botanical identification of the plants mentioned, going for a walk in the surroundings of the village. A total of 3,500 photographs and 927 herbarium specimens were collected. Botanical plant names follow *Flora Iberica* (Castroviejo, 2019) and *The Plant List* (2013) for the not included taxa. Family names are those accepted in APG IV (Chase et al., 2016).

The dataset, the herbarium, and the media files (recordings and photographs) are kept in the archive of the Food and Medicine Ethnobotany Research Group (Universidad Autónoma de Madrid).

During all the fieldwork, the first author lived in the region, which allowed her to participate in day-to-day activities and understand local culture from inside. Participant observation was a way to look at plants and their uses from the local point of view. During participant observation, casual interviews were also carried out.

Data Analysis

In order to evaluate the trends in wild food plants traditionally used in the area, we analyzed quantitative and qualitative data. We focused on quantitative data for assessing the cultural importance and present use of: (1) the food use-category compared with all the other use-categories (medicine, technology and craft, veterinary, etc.), (2) the human food plants species,

(3) the food use-subcategories (vegetables, fruits, beverages, etc.), and (4) the relation between food and medicine. We focused on qualitative data for exploring the relevance of: (1) gathering and changes in ecosystem management, (2) the food perceptions and motivations for gathering and consumption, and (3) the context and function of food.

The data collected in the interviews were recorded in a MS Access database. The information unit was the UR, as previously defined. The main use-categories were medicine, veterinary, human food, animal food, symbolic uses, technology and craft, fuel and ornamental uses. The food use-subcategories were vegetables, fruits, condiments and preservatives, beverages, and sweets (Tardío et al., 2006). The category vegetables includes the leaves, stems, sprouts, and unripe fruits or seeds, consumed raw directly after gathering, prepared in salads, or cooked. Fruits include the ripe fruits or seeds consumed raw in the field or taken home to process and/or store them (dried, cooked, prepared in jams, etc.). Condiments and preservatives contain all the plant parts used in small amounts to give flavor to food and conserve it. The beverages category is composed of the liqueurs and infusions taken in a food context (social drinks, and digestive teas taken as part of the meal) and not with medicinal purpose, as stated by the informants. Sweets refer to flowers, sap or other plant secretions, bulbs, tubers, or rhizomes consumed as refreshments due to their high carbohydrate content and usually with sweet flavor. Generally, the use of a species for a certain category was only accepted when it was cited at least by two informants, with the exception of the information given by specialists or key informants, who were very reliable and had a comprehensive knowledge about plants (Alexiades, 1996; Scarpa, 2000). When the information could not be clearly associated with a botanical species, it was rejected.

Measuring Cultural Importance

The CI index, formulated by Tardío and Pardo-de-Santayana (2008), was initially used to assess the cultural importance of each species (CI_s) within the corpus of traditional knowledge registered for the study area. This index was defined as the mean number of all the URs mentioned by all the informants (N) for that species in all the use-categories considered (NC) and expressed by the following formula:

$$CI_s = \sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} UR_{ui} / N$$

However, adaptations of this index have also been used to assess the cultural importance of the botanical family or of the use-categories (Pardo-de-Santayana et al., 2007; Tardío and Pardo-de-Santayana, 2008; Aceituno-Mata, 2010; Menendez-Baceta et al., 2014). In the case of use-categories, we fix the variable use-category (u) and sum all the URs of all the species mentioned by the informants for that use-category (UR_{is}), dividing by the number of informants (N). Therefore, the cultural importance of the use-category can be represented by the following formula:

$$CI_u = \sum_{i=i_1}^{i_N} \sum_{s=s_1}^{s_{Ns}} UR_{is} / N$$

It can be defined as the mean number of URs that the informants of an ethnobotanical survey mentioned for a certain use-category.

Measuring Present Use and Cultural Erosion

For studying whether a certain species or category is still used or not, we have separated the URs in present or abandoned. Each UR included the information about whether it was still practiced by the informant or not, which allows showing the proportions of present or abandoned component of the CI and to calculate the ER.

Firstly, as the present URs are a fraction of the total URs, the CI of the species (CI_{total}) can be expressed as the sum of the cultural importance of the abandoned uses (CI_{aband}) and the importance of the present uses (CI_{pres}). The following formula can be applied for both species or food use-subcategories.

$$CI_{total} = CI_{aband} + CI_{pres}$$

This way, a graphical representation of the CI with its two components will show the degree of cultural erosion in each species or use-category. For instance, *Scolymus hispanicus* L., an important species that is still used had a CI_s of 0.29, that is, the sum of CI_{pres} (0.23) and the CI_{aband} (0.06).

Secondly, to better express numerically this loss of traditional knowledge, we have calculated the ER, which is the complementary percentage of the prevalence ratio (PR) defined in our previous works (Aceituno-Mata, 2010; Menendez-Baceta et al., 2014). As the CI, it can be calculated for each species (ER_s) and use-category (ER_u). This index, expressed as a percentage, is the relation between abandoned URs (UR_{aband}) and the total number of URs (UR_{total}), i.e., the sum of the abandoned and present URs, expressed with the following equations:

$$ER_s (\%) = \frac{\sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} UR_{aband_{ui}} * \frac{100}{UR_{total_{ui}}}}{CI_{aband_{ui}}} = CI_{aband_{ui}} * 100 / CI_{total_{ui}}$$

$$ER_u (\%) = \frac{\sum_{s=s_1}^{s_{Ns}} \sum_{i=i_1}^{i_N} UR_{aband_{si}} * \frac{100}{UR_{total_{si}}}}{CI_{aband_{si}}} = CI_{aband_{si}} * 100 / CI_{total_{si}}$$

We considered a UR of a species as present (UR_{pres}) when the informants affirmed that they were still using the species (s) for a certain use-category (u) in the date of the interview. In the case of a use-category (u), we consider the present URs of all the species mentioned for this use-category. Following the same formula as ER_u , the ER was also calculated for the mode of consumption and the food contexts. It should be noted that the present use refers to the period 2003–2007, when the interviews were carried out. This index assesses the trends of ethnobotanical knowledge, as it shows how different plants or use-categories are being or not abandoned. For instance, *S. hispanicus* has a ER_s is 18%, since 31 of the total 38 UR are being still practiced. The ER has to be understood in the context of the number of UR, since a species with few citations may have an ER of 0%, but its use is very rare.

Qualitative Analysis

In order to understand the complexity of the cultural erosion process in wild food plants use, we have analyzed the discourse

of the informants in relation with their explanations about the abandonment or maintenance of wild food plants use. We have grouped the results around two main topics: (1) changes in ecosystem management and patterns of gathering and (2) the context and function of food, from preparation to consumption.

To analyze the changes in the ecosystem management, the habitats of the wild flora in Sierra Norte de Madrid were classified in eight groups: edges (path sides, stone walls, house surroundings, and plot boundaries), rainfed lands (formerly cultivated with dry-land crops and now neglected land), forests, meadows (meadows and pasture lands), home gardens (irrigated crops, maintained at present), wetlands (water spring, stream, and riverbank), shrublands (poor sandy land with shrub formations), and rock outcroppings (rock fissures or rock sides). In the analysis of the context and function of food, the past and present relevance of each food use in the diet was analyzed by following the food groups proposed by Turner and Davis (1993): (1) everyday food, (2) famine food, and (3) snack food.

In the vegetables, the context of consumption and the processing methods are analyzed by means of a Venn diagram, following Tardío (2010), establishing three main groups: (1) consumption raw in the countryside without preparation; (2) consumption raw in salads, so the plants are brought home to be prepared and dressed; and (3) consumption after being cooked.

Caveats

There are three main caveats that should be considered. Firstly, the sample excludes purposefully younger generations, and thus there is a potential bias of underestimation in the cultural erosion ratio. Secondly, the results cannot be generalized to the whole population of the region, since the sample was not randomly selected. As the sample includes the age range that has experienced traditional uses in the past, the cultural erosion is expected to be higher in younger generations. Thirdly, the field study was carried out between 2003 and 2007, and therefore, the erosion ratio is referred to that period, and following the trend, it has probably increased in the last years. Finally, the CI is a proxy for cultural importance; it mainly measures the commonness of use, which is related to cultural reasons but also has relation to multiple other reasons that may influence the use. In this study, we use the index to perform a quantitative analysis, but only the qualitative data capture the complexity of the cultural roles of food plants.

RESULTS

The Cultural Importance Index and Erosion Rate of Human Food Uses Compared With Other Use-Categories

The useful wild flora found in Sierra Norte included 252 species, 74 of which were traditionally used as edible. The wild food plants belong to 58 genera and 25 botanical families. The summarized data about all the use-categories are presented in **Table 1** ($N = 64$) and those about the human food use-subcategories in **Table 2** ($N = 132$). The complete ethnobotanical wild flora catalog is compiled in Aceituno-Mata (2010). All the food

species and the description of their food uses (use-subcategory, part used, mode of consumption, and collection period) are presented as **Supplementary Material**. This table includes also the quantitative data (number of URs, CI, and erosion ratio of each species). **Figure 2** shows the CI of each use-category (CI_u) with its components of present (CI_{pres}) and abandoned (CI_{aband}) URs, also indicating their ER (ER_u).

According to the CI_u (**Figure 2**, **Table 1**), the most important use-category of wild plants was human food ($CI_u = 6.03$), followed by animal food (3.64), technology and craft (3.39), and medicine (3.31). However, according to the CI_{pres} , human food ($CI_{pres} = 3.53$) and medicine (1.74) are currently clearly the most important categories, followed by technology and craft (1.08), ornamental (0.53), and fuel (0.52), with animal food (0.21), toxic (0.06), and veterinary (0.03) being nearly residual categories.

Regarding cultural erosion, the overall ER (ER_s) for all the useful species is 62% considering all the use-categories (**Table 1**). However, in the human food category, the ER (ER_u) decreases to 41% ($N = 64$, **Table 1**), a rate that remains similar in the enlarged sample ($N = 132$) of interviews in relation with human food ($ER_u = 44\%$, **Table 2**). **Figure 2** shows that the cultural erosion process has affected differently each use-category: some traditional uses remain partially alive, whereas others are almost extinct. The highest ERs were found in veterinary ($ER_u = 98\%$) and animal food (94%), whereas the lowest were found in ornamental (33%), human food (41%), and medicine (47%). **Figure 2** also shows that the trends in the ER of the use-categories are not in line with the variation in the CI. For instance, the less abandoned category is ornamental use, one of the use-categories of wild plants with the lowest CI. The correlation between the two variables was calculated to test the initial hypothesis (negative correlation between CI and ER). We found a negative correlation between CI_u and ER_u , although very weak ($r = -0.29$) and not significant ($p = 0.445$). Therefore, the null hypothesis is accepted: the CI of a use-category is not related with which uses prevail and which are abandoned.

Cultural Importance Index and Erosion Rate of Wild Food Species

Figure 3 shows the 25 wild food species with the highest CI_s and the proportion of present and abandoned URs for each species. The most important species ($CI_s \geq 0.2$) were two vegetables consumed cooked (*Scolymus hispanicus*, $CI_s = 0.29$; *Bryonia dioica* Jacq., 0.29; and *Tamus communis* L., 0.20), other two greens that were eaten raw (*Rumex papillaris* Boiss. & Reut., 0.28; and *Montia fontana* L., 0.24), a fruit (*Rubus ulmifolius* Schott, 0.22), and a condiment (*Thymus zygis* L., 0.22).

The use of wild food plants is in force in more than half of the URs, since the total ER of this category (ER_u) is 44% (**Table 2**). However, this ratio varies greatly among the species, which is related to specific characteristics, such as the main food use-category of the plant, the way of processing, and the context of consumption of each species.

The species with the lowest ER are those consumed as beverages and condiments, i.e., *T. zygis* (ER_s 14%) or *Mentha pulegium* (16%). They are followed by vegetables consumed after

TABLE 1 | Summary of the results of the interviews ($N = 64$) about all the use-categories: number of use-reports, number of species, total and present cultural importance index, and erosion rate.

Use-categories	UR	N. species	CI _u	Clpres _u	ER _u
Human food	386	74	6.03	3.53	41%
Animal food	233	92	3.64	0.21	94%
Technology and craft	217	55	3.39	1.08	68%
Medicine	212	55	3.31	1.74	47%
Veterinary	84	34	1.31	0.03	98%
Symbolic	84	45	1.31	0.34	74%
Fuel	82	27	1.28	0.52	59%
Ornamental	51	31	0.80	0.53	33%
Toxic	26	12	0.41	0.06	85%
Overall results for all the useful species	1,375	252	21.48	8.04	62%

TABLE 2 | Summary of the results of the interviews ($N = 132$) about all the food use subcategories: number of use-reports, number of species, total and present cultural importance index, and erosion rate.

Food use subcategories	UR	N. species	CI _u	Clpres _i	ER _u
Vegetables	338	34	2.56	1.35	47%
Fruits	104	18	0.79	0.36	54%
Beverages	77	17	0.58	0.46	21%
Condiments	75	12	0.57	0.42	25%
Sweets	17	8	0.13	0.01	88%
Overall results for all the wild food plants	611	74	4.61	2.60	44%

being cooked, such as the asparagus of *Asparagus acutifolius* L. (ER_s 0%), the midribs of *S. hispanicus* (18%), or the young shoots of *B. dioica* (24%) and *T. communis* (26%). Other vegetables prepared in salads are still consumed as well, but less frequently, such as *M. fontana* (ER_s 34%) and *Rorippa nasturtium-aquaticum* (L.) Hayek (42%). On the contrary, among wild vegetables, the most abandoned are those that were consumed raw as a snack, directly in the field [*Armeria arenaria* (Pers.) Schult., 75%; *Malva sylvestris* L., 88%; or *Vicia lutea* L., 67%].

Figure 4 shows the wild vegetable species grouped according to their mode of processing and consumption and the ER of each group. There is a great variability in the ER among these groups: cooked vegetables have been abandoned only in 20% of the UR (RU_{total} = 135), while the consumption raw in salads was abandoned in 58% of the cases (RU_{total} = 89), and the vegetables eaten raw as a snack were no longer consumed in 70% of the URs (RU_{total} = 99). In Sierra Norte, the species used cooked are not the same as the ones consumed raw, with the exception of *Taraxacum* gr. *officinale*, which is consumed in the three modes considered.

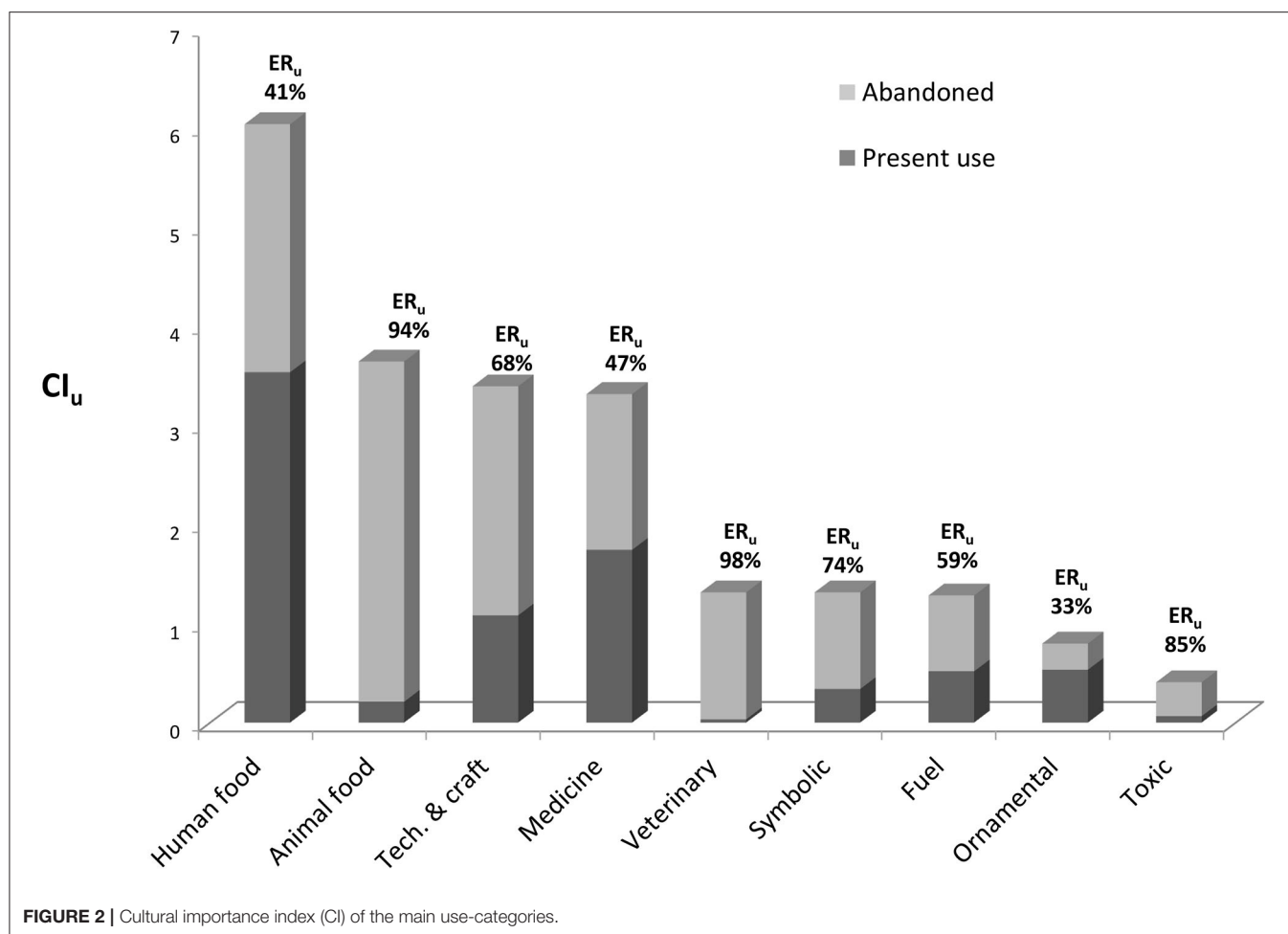
The importance of preparation is not so clear among fruits, since there are opposite present trends among culturally relevant wild fruits, as can be seen in **Figure 3**. For instance, we find the neglected consumption of acorns (*Quercus ilex* subsp. *ballota*), which were consumed both cooked and raw. There are also scarcely used species such as *Crataegus monogyna* Jacq. and *Rosa* sp. pl., in which fruits were eaten raw in the countryside. Finally, there are species in which fruits are still frequently gathered and consumed, such as *R. ulmifolius*, *Rubus caesius* L., and

Prunus spinosa, formerly eaten raw and now generally consumed after preparation.

We also found two new practices related with the preparation of fruits, which were incorporated after the 1970s and became very popular. Firstly, although it was common to eat the fruits of *P. spinosa* raw after the first frosts, to macerate them in alcohol as a liqueur was very rare, and only one informant mentioned to have prepared it in the past. However, in the 1980s, the sloe liqueur called *pacharán* became widespread in restaurants and cafes all around Spain. Thus, the local population of Sierra Norte, who already knew the fruit, started to make it more frequently. At present, in Sierra Norte, the use of raw sloes is extinct, but the gathering to make *pacharán* is very popular, both in middle-age people and in older generations.

The fruits of *Rubus* sp. pl. were also gathered as snacks, and they still are. Nevertheless, their use has become more intense due to the new tradition of elaborating jams, after sugar became cheaper in the 1960s and rural populations could afford to buy it in larger amounts. At present, it is common to find families gathering big amounts of blackberries to bring them home and make jam for all year round.

Despite the general erosion trend, during the economic crisis of 2008, we observed an increase in the cultivation of home gardens and the collection of wild edibles. The construction sector collapsed, and the unemployed population, mainly men, returned to their original subsistence economy, cultivating vegetables in the bare family lands and gathering wild food plants in their spare time to be able to continue providing food for the household. Twelve years later, the mobility restrictions



established due to the coronavirus disease 2019 (COVID-19) have also stimulated the recovery of traditional activities such as gathering of plants and mushrooms in leisure walks, home gardening, or husbandry.

Trends in Wild Food Use-Subcategories

Results show that there are significant differences in the CI_u of the food use-categories (see **Figure 5** and **Table 2**). The most important food use-subcategory is vegetables (CI_u = 2.56), followed by fruits (0.79), beverages (0.58), condiments (0.57), and sweets (0.13). However, the ER_u does not follow this gradient: the subcategories with a lesser erosion are beverages (21%) and condiments (ER = 25%), followed by vegetables (47%) and fruits (54%), while the use of sweets is nearly abandoned (88%).

We tested the hypothesis of a negative correlation between CI_u and ER_u of the food use-categories and found out that the correlation was negative but very low (-0.22) and not significant ($p = 0.716$).

Relation Between Food and Medicine

In order to understand the differential erosion process among use-categories, we explored the relation between human food and

medicine. As shown in **Table 3**, in Sierra Norte de Madrid, there is a high coincidence of wild species used both in human food and medicine. There are 21 species used both as food and as medicine, representing 40% of the medicinal plants and 28% of the food plants. Among these shared species, 15 are used in remedies administered orally, so the active compounds are supplied in the same way as in the food context. The plant part used is the same in 11 species, in all the cases the inflorescences. Comparing the ER_s of the species in **Table 3**, the plants in which inflorescences are administered orally in medicine and are also consumed as condiments or to make beverages have a mean ER_s of 25%, while the other species have a mean ER of 48%.

Changes in Ecosystem Management and Patterns of Gathering

Wild food plants were traditionally gathered in certain habitats more than others. **Figure 6** shows the percentage of UR associated with each habitat, and the **Supplementary Material** describes the habitat where each species is gathered. Edges (34%), forests (19%), and rainfed lands (14%) were the habitats that included most UR.

However, as ecosystem management has changed drastically in the past 60 years, the landscape and its habitats have been

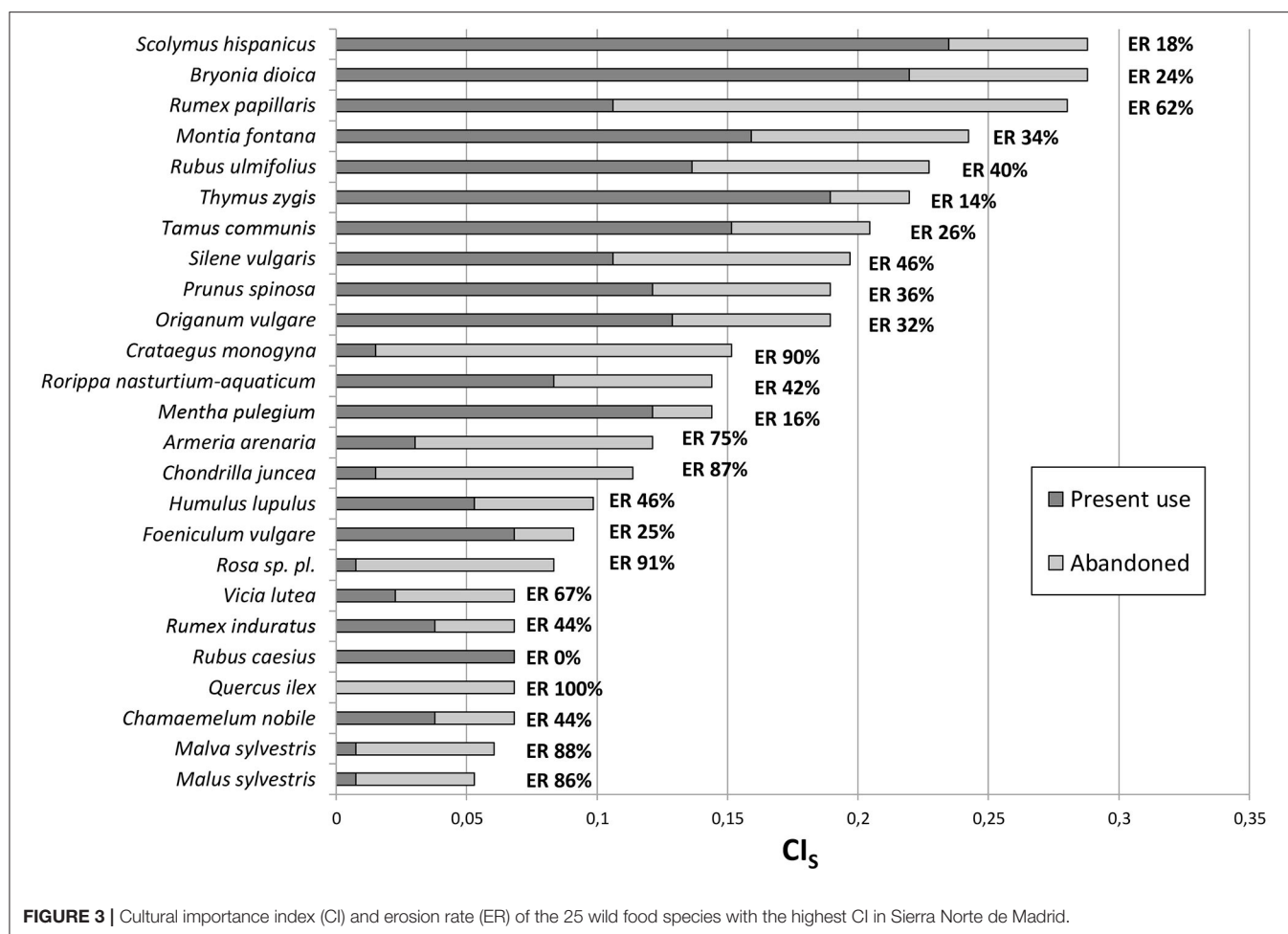


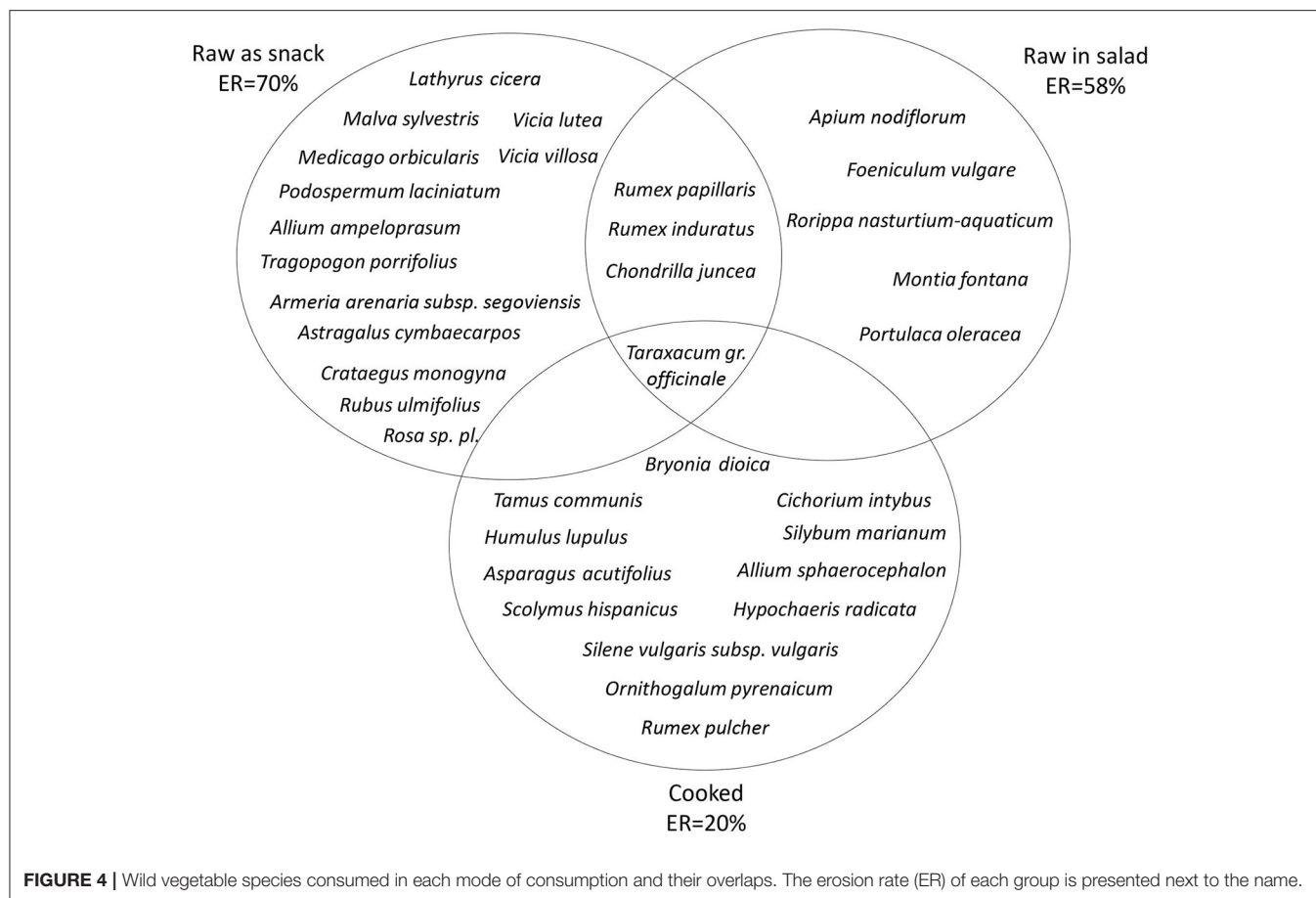
FIGURE 3 | Cultural importance index (CI) and erosion rate (ER) of the 25 wild food species with the highest CI in Sierra Norte de Madrid.

reshaped. The abandonment of most of the agrarian activities and the exodus to the cities have left neglected rainfed land and edges unattended. Home gardens were maintained by the families who stayed in the area, but the plots of the settlers who moved to the cities were abandoned or reduced, because they were left as a leisure weekend activity. Moreover, wet habitats are less abundant and are lost among the thicket, since there are less flocks grazing around and thinning out the shrubs. Besides, the herding activities are less intense, which included cleaning the water springs, fountains, and water basins. On the contrary, shrublands are more abundant, since they have occupied part of the neglected pasturelands and formerly cultivated rainfed land. Furthermore, the forests have increased their area, due to the reduction of cattle grazing but also because pine plantations were carried out in the 1970s to reduce erosion in slopes, thus avoiding the silting of the reservoirs constructed in that period.

Based on the informants' perception, this transformation process has affected the abundance and quality of food plants in each habitat, being rainfed lands the most affected habitat, since cereal cultivation has completely disappeared. All the wild food species that appeared as weeds in the cereal plots, such as *Chondrilla juncea* L., *Cichorium intybus*, *R. papillaris*, *S. hispanicus*, *Silene vulgaris*, or *V. lutea*, have suffered a similar

trend. Since cereals are no longer cultivated in the region, these species are less prevalent, both in the fields and in the dishes. Informants stated that not only the abundance but also the quality of the food plants has been affected by the changes in ecosystem management, leading to a drastic reduction of the use. This trend seems to have affected more acutely some species. For instance, *sonjera* (*C. juncea*), eaten raw in salads, was a very popular wild vegetable in the past and has a very low present use. The informants connected the sharp decrease in the use of the plant with the abandonment of traditional plowing, which led to the disappearance of the habitat and the worsening of its taste and texture. As an elder woman stated: "Now it does not grow so often because the land is not plowed anymore, and when it grows it is not so tender." The traditional plowing created a perfect habitat for the plant and buried the sprouts, which contributed to the whitening of the stems and first leaves and made them more tender and less bitter. Another example is *acedera* (*R. papillaris*), which used to appear as a weed in the wheat crops, and "when it grew in the wheat it was less acid than the ones growing in the meadows now" (67-year-old woman).

Other cultivated areas have also suffered deep changes. Home gardens' total surface has been reduced, and the food plants weeded are mainly left for chickens (e.g., *C. intybus*, *T. officinale*,



and *R. papillaris*). Edges have also suffered from the dominance of shrubs and the reduction of herbaceous plants presence due to management lessening in path sides, plot boundaries, and stone walls. On the contrary, plants gathered in shrublands or rock outcroppings have not suffered deep changes, since the plants growing in these habitats do not undergo grazing and thus are more abundant.

Apart from the landscape changes, the gathering patterns have changed as well due to the socioeconomic transformation. As mentioned above, until the 1970s, many plants were gathered while weeding, but also when going to the fountain for water [*Apium nodiflorum* (L.) Lag., *M. fontana*, and *R. nasturtium-aquaticum*] or collected as refreshments while herding the cattle (*Echium vulgare* L., *Rubus* sp. pl., *Rumex induratus* Boiss. & Reut., and *Vicia* sp. pl.). However, since the abandonment of the agrarian traditional economy in the 1970s, the frequency and patterns of gathering have changed. Nowadays, the agrarian tasks of most people are reduced to taking care of home gardens and chickens, which are considered as a hobby, since most local people do not depend on them for their subsistence.

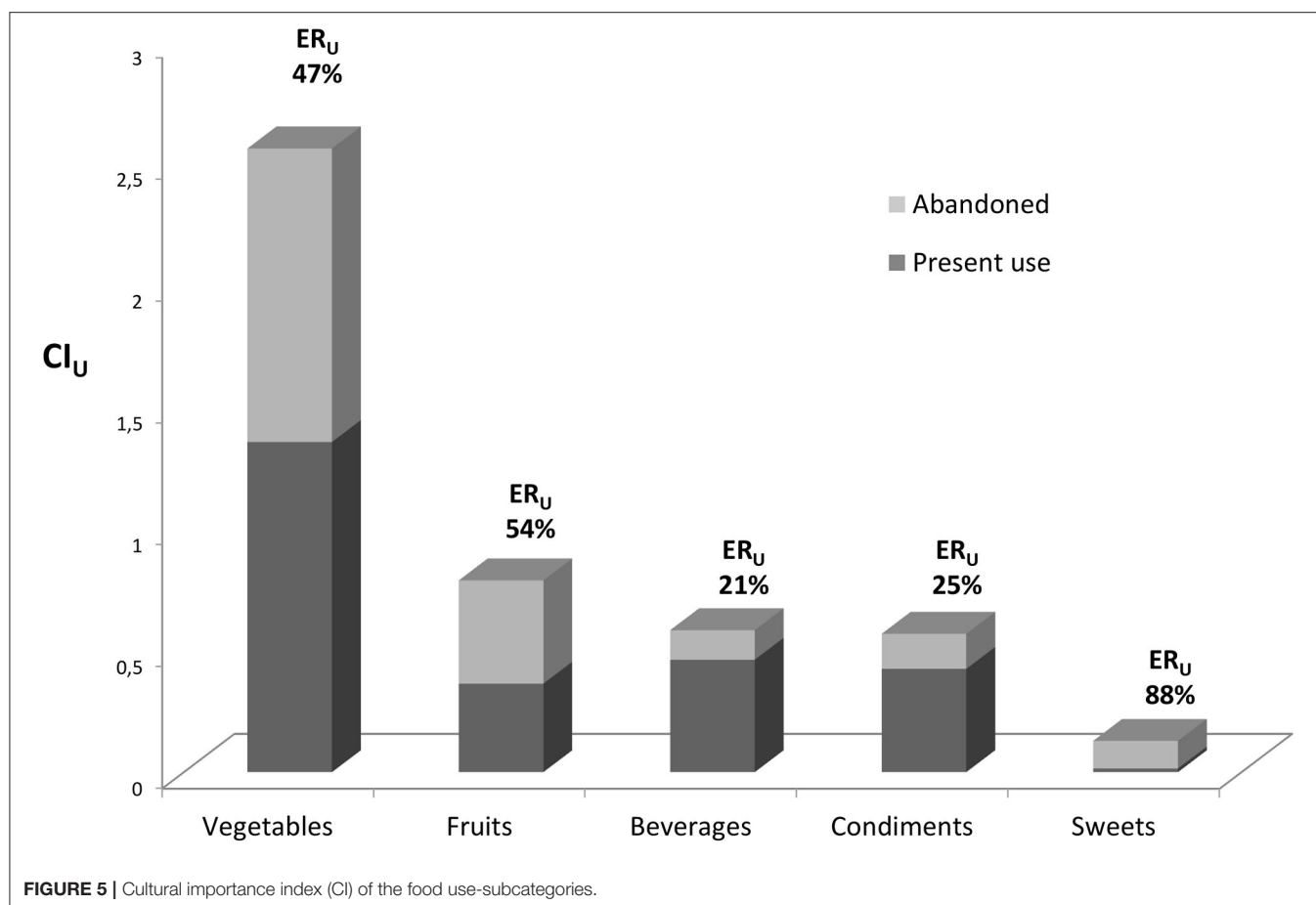
Context and Function of Food: From Preparation to Consumption

Besides analyzing plants by the type of food they represent (vegetables, fruit, etc.), we considered it necessary to understand

their context and function. Therefore, each plant use has been assigned to three food contexts following Turner and Davis (1993): everyday food, famine food, and snack food (see **Supplementary Material**). Calculating the mean ER of each food context, we found that everyday food has an ER of 28%, while snack food rises up to 65% and famine food to 89%. In this section, we present some examples of each food context and function.

Everyday Food

Forty species were used as staple food, including the wild food plants with the highest CI values. They were culturally important in the past and consumed frequently in the periods when they were available. At present, they are still consumed, but only occasionally. Some examples are *S. hispanicus*, *S. vulgaris*, *B. dioica*, *T. communis*, *M. fontana*, or *R. nasturtium-aquaticum*. Wild vegetables included in this group are species with some kind of preparation, being cooked or prepared in salads. As what happens in other Spanish regions, bitter herbs, like *T. communis* or *A. acutifolius*, are generally cooked to improve their taste and texture. However, other species are consumed raw (e.g., *M. fontana* and *R. nasturtium-aquaticum*), because they are so tender and low in fiber that they fall apart if cooked. Condiments and beverages with strong flavors such as *T. zygis* or *Chamaemelum nobile* are also included in this group.



The consumption of the wild vegetables in this group was associated in the past to a seasonal period of scarcity in spring, which was not a famine period but a predictable food shortage because it repeated every year. In Sierra Norte de Madrid, a mountainous region with a marked continental climate, from March to June, the cultivated vegetables were in short supply. In this period, the reserves of stored food were dwindled by the winter. However, from middle of March until the end of May, wild vegetables were abundant, and thus people gathered them to complete the diet.

Famine Food

This group includes 13 species that were commonly used in the past, but their use has been completely abandoned nowadays. They include *Q. ilex* subsp. *ballota* acorns, *Malus sylvestris* (L.) Mill. fruits (wild apples), and some wild vegetables consumed mostly raw (*Portulaca oleracea*, *T. gr. officinale*) or cooked (*Hypochaeris radicata*, *C. intybus*, or *Silybum marianum*). Acorns were widely considered a famine food by informants. In the post-war period (1940s), holm oak trees producing sweet acorns were selectively harvested for human consumption, while the bitter ones were left for pigs. They were consumed raw (after drying or smashing them), boiled, or roasted. There were also some plants used just in occasional circumstances of scarcity, such as the condiments used by the shepherds when they stay in the

mountain with their flock, like *Lavandula pedunculata*, *Allium ampeloprasum*, or *Allium sphaerocephalon*.

Snack Food

Wild snacks include the use of 37 species of vegetables, fruits, and sweets consumed raw just after being collected and between main meals. People used to eat them when they were found in their way, especially in spring, as the immature seeds of some species of the legume family (*Vicia lutea* L., *Vicia villosa* Roth, *Astragalus cymbaearpos* Brot., and *Lathyrus cicera* L.) or the immature fruits of *M. sylvestris*. Some stems were eaten as a snack, selecting the more tender part in the case of *Podospermum laciniatum* (L.) DC or *Tragopogon porrifolius* L. or after being peeled in the case of the sprouts of thorny plants (*Rubus* sp. pl., *Rosa* sp. pl. and *C. monogyna*). Other tender stems were just chewed, such as *A. arenaria* and *Stipa gigantea* Link, extracting the sugars and water present in the stem and not swallowing the indigestible fibers. Moreover, the flowers of certain species were collected and their nectar is sucked, picking them one by one without damaging the plant, such as *Trifolium pratense* L., *Viola odorata* L., *Pedicularis schizocalyx* (Lange) Steininger, or *E. vulgare*. These plant parts that were chewed or sucked usually were left in the lips or mouth for a long time, “in order to have something in the mouth.” In autumn, the mature fruits of *C. monogyna*, *Sorbus torminalis* (L.) Crantz, and *Sorbus aria* (L.) Crantz were consumed as a snack but

TABLE 3 | Species used both in the categories of medicine and human food in Sierra Norte de Madrid.

Scientific name	ERs (%)	Medicinal internal use (oral administration)	Plant part used in medicine	Plant part used as food and use-category [†]
<i>Bryonia dioica</i>	10		Fruits	Tender shoots (VEG)
<i>Chamaemelum nobile</i> *	44	•	Inflorescences	Inflorescences (BEV)
<i>Chiliadenus glutinosus</i> *	20	•	Inflorescences	Inflorescences (BEV)
<i>Cistus ladanifer</i>	50		Leaves	Seeds (FRU)
<i>Foeniculum vulgare</i>	25	•	Seeds	Tender stems and leaves (SEA, VEG), seeds (BEV)
<i>Inula salicina</i> *	100	•	Inflorescences	Inflorescences (BEV)
<i>Jasonia tuberosa</i> *	0	•	Inflorescences	Inflorescences (BEV)
<i>Malva sylvestris</i>	87	•	Flowers and leaves	Unripe fruits (VEG)
<i>Mentha arvensis</i> *	0	•	Inflorescences	Inflorescences (BEV)
<i>Mentha pulegium</i> *	16	•	Inflorescences	Inflorescences (BEV)
<i>Origanum vulgare</i> *	32	•	Inflorescences	Inflorescences (SEA, BEV)
<i>Rosmarinus officinalis</i> *	0	•	Inflorescences	Inflorescences (SEA)
<i>Rubus ulmifolius</i>	40		Leaves	Fruits (FRU) and tender stems (VEG)
<i>Scolymus hispanicus</i>	18	•	Inflorescences	Leaf stalk and midrib (VEG)
<i>Silybum marianum</i>	0	•	Inflorescences	Leaf stalk and midrib (VEG)
<i>Tamus communis</i>	26		Fruits	Young shoots (VEG)
<i>Thymus mastichina</i> *	50	•	Inflorescences	Inflorescences (SEA)
<i>Thymus vulgaris</i> *	0	•	Inflorescences	Inflorescences (SEA, BEV)
<i>Thymus zygis</i> *	14	•	Inflorescences	Inflorescences (SEA, BEV)
<i>Tragopogon porrifolius</i>	100		Latex	Tender inflorescence stem (VEG)
<i>Trifolium pratense</i>	100		Leaves	Flowers (SWE)

In the species marked with an*, the same plant part is used as medicine and food.

[†] Human food use-categories: vegetables (VEG), fruits (FRU), seasonings (SEA), beverages (BEV), and sweets (SWE).

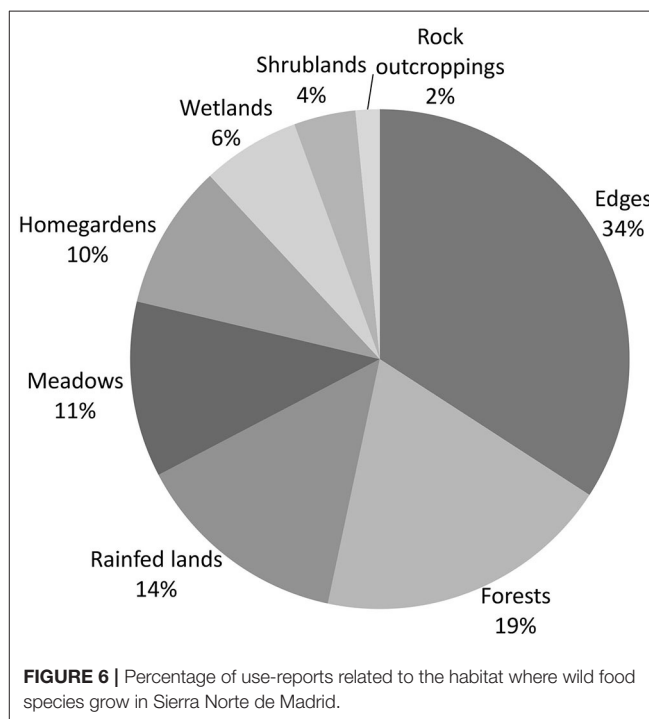
were not gathered in great amounts or not even carried home to store, since *C. monogyna* fruits were not highly valued and *Sorbus* are rare in the region. Another plant parts were also consumed as snack in autumn and winter, such as the “bulbs” (corms) of *Crocus carpetanus* Boiss. & Reut. and *Crocus serotinus* Salisb., or the gum of *Erica arborea* L.

However, there are some vegetables eaten as snacks, which were also consumed at home after elaboration, like the leaves of *R. papillaris* and *Rumex acetosa* L., and thus its use is not completely abandoned. Moreover, some fruits, namely, *Rubus* sp. pl. blackberries and *P. spinosa*, were formerly eaten only as snacks and at present have become very popular due to new trends in food elaboration and consumption.

DISCUSSION

The high ER of plant uses evidences that in the study region there is a clear cultural erosion process. However, this process does not affect evenly all the use-categories and species. Wild plants still have a role in human food, medicine, and ornamental uses, while in other use-categories, they have been substituted at a greater extent by modern commodities.

As shown in *The Cultural Importance Index and Erosion Rate of Human Food Uses Compared With Other Use-Categories*, food plants are the core of the wild vegetal culture of the region, since they were the most important use-category in traditional society, and their use has remained despite the deep socioeconomic changes that occurred. As observed by other



authors, the knowledge about wild edible plants is more likely to be maintained under cultural change than other use-categories, since it is intermingled with the local cuisine, traditional flavors,

and social events (Pieroni et al., 2002b; Ertug, 2003; Nebel et al., 2006).

The study also indicates that the maintenance of certain uses at present is not correlated with the CI, which measures their use in the past. Then, what factors can explain the differences in the cultural erosion process among use-categories and plant species? The culture has changed, and new needs and values drive the collection and use of wild plants. Moreover, the landscape has been reshaped by the socioeconomic changes that occurred in the last decades. The reasons underlying the diet changes are complex, including cumulative effects of cultural, socioeconomic, and environmental factors (Turner and Turner, 2008). Following previous research (Kalle and Söukand, 2013; Łuczaj et al., 2013b; Reyes-García et al., 2015; Pieroni and Söukand, 2017), the informant's perceptions, and our own interpretations, we proposed several drivers of change in the use of wild food plants with opposite effects: some enhance the trend of abandonment in certain uses and species, while others encourage their maintenance.

Decrease in Abundance and Perceived Quality of Wild Food Plants Due to Changes in Ecosystem Management

The abandonment of traditional agrarian practices has affected the abundance and quality of the wild food plants in Sierra Norte de Madrid, as evidenced by the informants' quotations presented in the section Results. The decrease in the abundance of edible weeds due to changes in agriculture and gardening practices has also been documented in other regions of Spain and Europe (Polo et al., 2009; Łuczaj et al., 2012). An example in the study region is *acedera* (*Rumex papillaris*), a species that has shown important changes in its productivity, as an informant stated: "the *acederas* were larger when we grew them in the wheat crops, with a lot of good soil" (69-year-old woman). The expression "we grew" used for a wild plant that appeared spontaneously is noteworthy, reflecting the local view of edible weeds as semi-domesticated plants. As has been argued by many authors, wild food plants may have several stages of domestication along a continuum ranging from entirely wild to semi-domesticated (Harris, 1989; Bye, 1993; Heywood, 1999; Bharucha and Pretty, 2010). Wild food plants in traditional agrarian societies were favored by human activities, since the cultivation created disturbed habitats ideal for their growth, increasing their productivity and improving their quality for human consumption. In traditional agriculture, weeds were not just undesirable invaders but also resources used as food, fodder, or fiber (Turner et al., 2011).

As shown in the case of *sonjera* (*Chondrilla juncea*), several informants expressed their preference for wild food plants gathered in habitats disturbed by human activities, as plowed or fallow lands, because they were more palatable. Nowadays, the semi-domestication process is reversed, and thus, the plants have returned to their sharp flavors and textures. On the contrary, human palates are more domesticated, getting less used to wild flavors. Nowadays, human beings are coevolving less intensively with plants, and therefore, the intermediate positions of semi-domesticated plants and semi-wild palates are moving away.

At present, the quality and availability of wild edibles depend on the encouragement of the synergy between farming and wild biodiversity (Pretty, 2007), i.e., through organic farming practices that tend to increase the biodiversity of weeds (Turner et al., 2011) or the organic cultivation of highly valued wild food species (Molina et al., 2014).

Changes in the Motivations for Gathering and Consumption

In the study region, before 1970 wild food plants were collected as a subsistence activity, since food plants complemented the familiar economy based mainly on local resources. At present, informants told us that they spend less time out in the country than in former times, and wild food plants are collected in leisure walks. This trend was also documented in other regions of Spain (Tardío et al., 2006) and Europe (Łuczaj and Pieroni, 2016), affecting all generations but especially children, who used to help herding, an activity associated with the acquisition and maintenance of traditional ecological knowledge. Regarding motivations, many informants stated that the gathering and consumption of wild food plants was a way of recalling the ancient flavors and maintaining the traditions that bring together the families and the community. Nowadays, the gathering of wild plants is no longer motivated by necessity but by pleasure and identity.

The use of wild plants binds together the community in several ways. In many cases, the collection is a social activity, carried out during the evening walks, when the female relatives or neighbors meet to go across the surroundings of the villages. In other cases, especially when men are the collectors, the gathering is performed alone, but the harvest is usually shared with relatives or friends as part of the gift economy that still rules in rural societies (Acosta-Naranjo et al., 2020). As an informant in his 50's explained: "I like going to collect wild asparagus, even if I do not find any. When I find some, I bring them to my mother, and she prepares them with lard and scrambled eggs, as when I was a kid." Eating wild food plants is closely related with memories, values, and perceptions, as we will discuss in the next section.

The Values and Perceptions of Wild Food Plants

The perceptions of wild food plants are important to determine the maintenance of the use or its abandonment. In this section, we discuss how the appreciation of certain flavors and the values associated with each food context influence the degree of cultural erosion of plant uses, and ultimately contribute to the creation of cultural identity.

The Persistence of Flavor

The unique taste of wild food plants is a key factor for the maintenance of the use, as stated by our informants and pointed by several authors (Pieroni et al., 2002b; Serrasolses et al., 2016). However, the acceptance and appreciation of the flavor of wild plants need a previous education of the palate. Bitterness, a taste very frequent in wild vegetables, is the gustatory response that is first rejected (Harborne, 1993), since this flavor is related with the presence of toxic compounds. However, one can get used to

deriving pleasure for bitter food, especially in early childhood. As stated by Johns (1996), in the weaning process, human beings lose the neophobia characteristic of our eating habits, and for a short period, we are open to all the new flavors offered to us. If in this period children learn to appreciate bitter taste, this gustatory experience is fixed lifelong. The gustatory memory of people that have eaten wild food plants in their childhood made them recall these strong flavors and motivate them to keep them in their diet, even if only present occasionally and in small amounts. Moreover, other authors have argued that the exploratory nature of children may have been a source of introduction of new plants in the diet (Łuczaj and Kujawska, 2012; Łuczaj and Pieroni, 2016). However, some elder informants stated that their grandchildren rejected wild flavors because they had been pampered by being offered only sweets and pasta. When children stop eating wild plants, not only traditional knowledge is lost but also the gustatory memory maintained through generations is impoverished.

Finally, wild plants are part of traditional recipes that, once in the mouth, restore the memory of a completely lost world, such as the Proust madeleine. In the interviews, it was frequent that the informants expressed a longing for the flavors of their childhood. Even if the taste of wild plants is stronger and sometimes bitter than cultivated vegetables, it is preferred and highly valued. A retired shepherd said: “some weeds, their flavor ... you do not know why, but are pleasing to the palate.” A home gardener in his 60's affirmed that for him the *Asparagus acutifolius* omelet is tastier than that made with cultivated *Asparagus* ones. This preference for wild flavors is marked in the case of plants used as condiments and beverages, such as *Thymus zygis* or *Chamaemelum nobile*, still gathered and consumed at present due to their intense flavor, which cannot be easily substituted by cultivated or commercial plants.

Values Associated With the Food Context

Results show that degree of cultural erosion is very different depending on whether a wild food plant has been consumed as everyday food, as a snack, or as famine food.

Everyday foods include the most valued wild food plants, appreciated for their flavor, texture, and nutritional quality. The species in this group have been part of the diet both in times of scarcity and in abundance periods. They include vegetables such as *A. acutifolius* L., *Scolymus hispanicus*, *Montia fontana*, or *Rorippa nasturtium-aquaticum*, nowadays, considered as delicatessen (Reyes-García et al., 2015). Their consumption requires some types of preparation and are cooked in stews, soups, omelets, grilled, or dressed in salads. Most species in this group are still gathered at present, not as everyday food but as an occasional meal, prepared following the traditional recipes.

Famine wild food plants are the less valued, only consumed when there is a necessity, in famine periods due to wars or bad harvests; and their use is mainly abandoned. As in other regions of Spain (Tardío et al., 2006; Menendez-Baceta et al., 2012), acorns are the most emblematic example of this category. They were highly important in the past but are now completely abandoned. In Sierra Norte, in the post-war

period, holm oak trees producing sweet acorns were selectively harvested for human consumption, while the bitter ones were left for pigs. Acorns were the only wild food gathered for trade between villages: the mountain dwellers exchanged sweet acorns for chickpeas with the villages of the plain (one cup of chickpeas for two cups of acorns). They were so valuable in those periods that the villages with more abundance of sweet acorns suffered the visit of neighboring villagers who steal them at night. Famine foods include bitter, rough-texture herbs like *Hypochaeris radicata* L. or *Cichorium intybus* L. that need repeated boiling and eliminating the cooking water to improve their taste or texture to make them palatable (Tardío, 2010).

The use of these plants is associated with poverty, and therefore, there is a negative cultural connotation linked to its food use (Aceituno-Mata, 2010; Łuczaj, 2010; Menendez-Baceta et al., 2012). For some informants, it was a taboo to recognize that they have consumed these wild foods in the past, while others associated them with fodder rather than human food, saying, “this is pig food.” However, these wild foods have been of crucial importance for survival in critical periods (Łuczaj and Pieroni, 2016). According to Johns (1994), the maintenance of the occasional use of famine plants, despite that they are not preferred, allows to preserve a knowledge that could be necessary in times of scarcity. Nowadays, the use of these species is completely abandoned, and the memory of their use is only kept by the older generations.

Finally, snack foods provide small amounts of nutrients, mainly sugar and vitamins, but have had a relevant role as thirst quenchers and refreshments for shepherds and children while herding the sheep's and goats' flocks or looking after the pigs, as also have been documented in other Mediterranean regions (Łuczaj et al., 2013a; Mattalia et al., 2020b). The use of these species is associated with an extinct way of life, when shepherds and children spent long periods of time out in the countryside and ate wild plants to stave off the hunger or just to entertain themselves. As several authors have argued, children (Łuczaj and Kujawska, 2012; Kalle and Söukand, 2013) and shepherds (Mattalia et al., 2020b) have a wild food flora of their own, since the way they interact with nature shares some aspects with the hunter-gatherers, who wander around looking for something to eat for hours. As a female informant in her 70's told us: “when we were children we were always out in the country, with the cows, the sheep, the pigs. The day was too long, and we spent time looking for what we could find around.” At present, these wild snacks are mostly abandoned or only occasionally consumed “to recall former times.”

Ultimately, the maintenance or abandonment of plant uses is related with the construction of cultural identity. Some plant uses are rejected because they are a reminder of the harder experiences associated with the peasant life, such as famine, child labor, or harsh life conditions. On the contrary, other uses are associated with the remembrance of “real” meals, community life, and close contact with nature, and thus, their persistence binds the present society with the positive aspects of its origins.

Medicinal Role of Wild Foods

From the perspective of ecological chemistry, there is a gradient in the way the toxic secondary compounds of plants are managed, from poisons to food (Johns, 1996). Considering this continuum from medicine to food, on the one hand, there are plants administered with therapeutic aims occasionally and in small doses and, on the other hand, plants consumed in great amounts and frequently in a food context. In the middle of the medicine–food continuum, we find condiments and beverages (Johns, 1996), with condiments being closer to medicine since their dosage is low.

In Sierra Norte, the less abandoned food subcategories are beverages and condiments. Therefore, we argue that the intermediate role that these two categories have in the medicine–food continuum has favored the maintenance of their use. The marked cultural appreciation for the intense flavor of the plants used as condiments or beverages, like species belonging to the Lamiaceae and Asteraceae families, may be based on the importance that these plants have for health and nutrition. These flavors were repeatedly associated by informants with “good,” “body cleansing,” or “healthful” properties. Moreover, several testimonies stated that the intensity of flavor (i.e., secondary compounds) in wild food plants cannot be easily substituted by cultivated or commercial plants, which has motivated the maintenance of the gathering and use of wild species. On the other hand, it is easy to supply a household with wild plants for condiments and beverages, since the amount required yearlong is small. However, eating wild vegetables or fruits at a regular basis requires a higher effort in collection and processing.

The food subcategory that follows condiments and beverages with a lower ER is vegetables, which is the most culturally important. The prominence of vegetables among wild food plants agrees with the findings of an ethnobotanical review of traditional wild food plants in Spain (Tardío et al., 2006), where vegetables were the subcategory with the highest number of species and UR. The people of the study region can be considered to have a “herbophilic” culture (Łuczaj, 2008, 2010; Aceituno-Mata, 2010), who highly appreciate wild vegetables and continue consuming them even when there is no shortage of cultivated food. The appreciation for wild greens has also health connotations, since their bitter taste is associated with plants that stimulate appetite, “depurate blood,” or act as liver and stomach tonic, as has been documented in other Mediterranean regions (Ertug, 1998; Pieroni et al., 2002b; Vallès et al., 2017).

The traditional culture in Sierra Norte de Madrid was centered in stockbreeding and subsistence agriculture. As in many other traditional agrarian cultures, there is a long history of consuming wild foods, including game and wild edible plants. As some authors have argued, the maintenance of small doses of wilderness in the agrarian cultures’ diet has had a therapeutic effect, since the content of secondary compounds is higher in wild plants (Etkin, 1996), and they have a prophylactic effect (Johns, 1996), especially necessary in diets based on carbohydrates, meat, and cultivated vegetables. In the Mediterranean area, studies on the nutritional value of wild vegetables found out that these species could contribute significantly with interesting

micronutrients (i.e., minerals, vitamins E and C, carotenoids, and α -linolenic acid) that could improve health. The antioxidant effects of some of these substances could act as preventives of coronary illnesses, hypertension, cancer, and immune system deficiencies (Guil et al., 1997; Bianco et al., 1998; Pieroni et al., 2002a; Zeghichi et al., 2003; Schaffer et al., 2005a,b; Alarcón et al., 2006; Sánchez-Mata et al., 2012; Romojaro et al., 2013; Barros et al., 2016; Sánchez-Mata and Tardío, 2016).

Therefore, the high coincidence of medicinal and human food species and their intermediate role between food and medicine seem to explain that they are maintained to a greater extent.

CONCLUSIONS

In Sierra Norte de Madrid, a general trend of cultural erosion in the use of wild plants has been detected. However, food plants are still valued and consumed among the studied population. Some use-categories are still in force, such as beverages, condiments, and vegetables, while others have almost completely disappeared, such as wild snacks or the use of acorns.

The decline of the traditional agrarian society starting in the 1960s has led to the progressive abandonment of several activities, including the gathering and consumption of wild plants. Linked to this process, we detected several factors influencing the disuse of wild food plants. Firstly, a prominent factor is the reduction of abundance and quality of wild vegetables associated with the abandonment of agrarian tasks. This study shows that, following informant perceptions, there is a marked impact of cultivation practices on the taste and texture of wild vegetables. Such evidence points out the semi-domesticated status of wild food plants growing as weeds, which become less palatable and productive when the agrarian management disappears. Secondly, another factor affecting the loss of cultural significance of wild food plants is the disappearance of the subsistence economy, where wild plants were an important resource to complete the diet in periods of seasonal scarcity. Thirdly, the reduction of the time spent in the countryside because there are less tasks to carry out, had led to a diminution of the chances for gathering. Finally, the negative connotation linked to famine plants has influenced the disappearance of the use of certain species, mainly holm oak acorns.

On the other hand, there are several drivers of the maintenance in the use counteracting the general erosion trend. In the first place, there are still motivations for gathering, despite the socioeconomic changes occurred. Firstly, gathering wild plants is no longer collected as a subsistence activity but rather as a leisure activity that strengthens the bonds with the territory, neighbors, and relatives through the gift economy, which still present in rural societies. Secondly, the intense flavor of wild plants, particularly aromatic plants and bitter wild vegetables, is a strong driver for the maintenance of the use, since cultivated or commercial plants cannot substitute wild flavors. Thirdly, the values associated with the food context are positive in the case of plants used traditionally as everyday meals, which are still consumed occasionally and considered

delicatessen (Reyes-García et al., 2015). Finally, another factor that may explain the maintenance of the use of wild plants is their intermediate role between food and medicine. Specifically, the categories beverages or condiments, situated in the middle of the medicine–food continuum, are the most prevalent at present. The maintenance of the use of wild plants as condiments, beverages, and vegetables represents the nexus between medicine and food, and a living memory of our foraging past.

The maintenance of the use despite the deep socioeconomic changes occurred shows the resilience of this body of knowledge. As long as the knowledge still exists and the plant is available, there is a chance to reverse the cultural erosion trends. This eco-cultural restoration is currently driven by the need of recovering food sovereignty and the desire for healthy and culturally significant foods (Turner and Turner, 2008). In this regard, the persistence of wild flavors in the gustatory memory of the community, including the younger generations, allows wild plants to be reintroduced as everyday food in case of need or interest.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Materials**. Further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation

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and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

The fieldwork was designed by the three authors but was conducted by LA-M, supervised by JT and MP-S. LA-M also analyzed the data and wrote the paper with the help and input of all the authors. All authors read and accepted the final version of the paper.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2020.610238/full#supplementary-material>

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The Importance of Animal and Marine Fat in the Faroese Cuisine: The Past, Present, and Future of Local Food Knowledge in an Island Society

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Since ecological and climatic conditions limit the possibilities for cereal production, the old-established Faroese traditional food system is principally based on the utilization of animal protein and fat. The diet of the islanders has thus been adapted to the specific environmental circumstances of the area. Historically, fat has provided a high energy and nutritious food source for the hard-working sheep farmers and fishermen. Fat procured from both land and marine animals has formed a vital part of the local food culture. Apart from the insubstantial amount of butter produced in the Faroe Islands, tallow from sheep, fish fat and liver from codfishes, and the blubber from the long-finned pilot whale, has been widely utilized within the households. During the last century, Faroese diet has changed due to external factors such as closer integration into the world economy, modernization, and improved household economy. Although butter, cheese and other dairy products as well as margarine and vegetable oil are nowadays readily available in the convenience shops and supermarkets, tallow, and whale blubber continue to be part and parcel of many of the islanders' cuisine. Today, however, such products are not primarily consumed for their energy content. Instead, it can be seen as a contemporary and regional expression of appraisal toward Faroese cuisine. Appreciating and consuming local food has become an important part of expressing Faroese cultural identity. The traditional diet therefore links the islanders with their history. However, the preparation of Faroese food products is highly dependent on traditional knowledge of how to extract different types of animal fat and process it into locally made dishes. Thus, the long-term survival of traditional Faroese gastronomy is contingent on the maintenance and continuation of this knowledge.

Keywords: ethnogastronomy, foodways, heritage food, qualitative research, traditional food knowledge

INTRODUCTION

Marine and terrestrial mammals, seabirds, and fish meet the essential nutritional needs of circumpolar fishermen, herdsman, and hunters. In fact, among these groups, meat and fat play the most important part of daily food intake (Eidlitz, 1969; O'Keefe, 2000). In the same way as other high altitude Northern European societies, the old-established Faroese traditional food system has until recently been based mainly on animal protein and fat, since ecological and climatic conditions have limited the possibilities for cereal production. The diet has thus been adapted to

the specific environmental circumstances of this part of the world (Fjellström, 1982; Joensen, 1982, 1987; Johansson, 1994; Kuhnlein and Chan, 2000).

Fat provides a high energy density and has therefore been nutritious food for Faroese hard-working sheep farmers and fishermen (Olsson, 1958). Along with carbohydrates and proteins, fats are one of the three main so-called macronutrients, which are essential for human survival. In addition to providing energy, fat is essential for the human body in the process of building and repairing cells, as well as in producing hormones and hormone-like substances. The human body also needs fat in order to absorb the fat-soluble vitamins A, D, and E (McElroy and Townsend, 2015) (**Figure 1**).

Although animal and maritime fat has formed an important part of rural diets in subarctic and boreal northern Europe, fat is a seldom-discussed topic in ethnobiological and food-and-culture studies. Within the local Faroese cuisine, animal, and maritime fat formed a vital part of the food culture. Apart from the small amount of butter produced in the Faroe Islands (Claussøn Friis, 1632), tallow from sheep, livers from codfishes,

and the blubber from the long-finned pilot whale, *Globicephala melas*, were widely used within the households. Through various methods, the different fat products could also be preserved and stored for years (Debes, 1673; Panum, 1847; Guðjónsson, 1940; Skyllv-Hansen, 1950; Olsson, 1954) (**Figures 2, 3**).

During the twentieth century, local diet has changed due to external factors such as closer integration into the world economy, modernization, and improved household economy (Joensen, 2015; Sørensen et al., 2018). Although nowadays butter, cheese, and other dairy products, as well as margarine and vegetable oil are readily available in grocery stores and supermarkets, tallow, and whale blubber continue to form part and parcel of many islanders' cuisine (Lauer, 1989). Today however, tallow and blubber are not eaten primarily because of their energy content, but can be seen as appraisal for contemporary Faroese cuisine. Eating Faroese has become an important part in expressing cultural identity (Svanberg, 2015).

Fat can be seen as what ethnobiologists and food-and-culture researchers consider a cultural keystone in the Faroese foodways (Taylor and Anderson, 2020). Local food craft is still important.



FIGURE 1 | Faroese sheep in Gjógv (Photo Osvald Olsen, July 2017).



FIGURE 2 | A meal consisting of fermented cod (*ræstur fiskur*), potatoes and sperðil (made from sheep's rectum filled with tallow). Served as a Christmas meal in Vestmanna in 2018 (Photo Ingvar Svanberg, December 2018).

Nowadays it is considered a question of taste and in-group solidarity to eat locally produced fat products such as fish cakes, fish dumplings, tallow sausage, as spread on sandwich or together with dried or fermented fish, and occasional dried whale meat. Some of these products are now quite expensive, and therefore an increasing number of gastro-tourists arriving to the islands enquire for specific Faroese dishes prepared with locally produced fat. However, as mentioned earlier, the traditional food knowledge is important for the long-term survival of the Faroese cuisine.

The transfer of local or traditional food knowledge within the Faroese society can, following a model by Sydow (1948), be defined as vertical, which means that knowledge about diet and food craft is transferred primarily from individuals belonging to different generations (primarily within the same household). The other kind of food knowledge is transferred horizontally; that is between people of the same age (restaurant kitchen context may serve as an example, as well as TV chefs and cookery books). Nowadays, there are a number of cookery books containing traditional recipes that are widely available (e.g., Dalsgaard,



FIGURE 3 | Boiled whale meat and blubber (Photo Ingvar Svanberg).

2002; Henriksen, 2004; Skaale and Johannesen, 2010). Besides the individual bearers of tradition performing the artisan food craft, the consumers within a household contribute as important correctors, although as passive tradition bearers, as Sydow (1948) calls them. They want the food cooked in a certain way, which the person who cooks has to comply with (for instance seasoning, cooking time, and side dishes). Within established households, there are often conservative structures. The food should taste, as it has always done (“mom’s cooking is the best”). Especially the men who spend months on commercial fishing vessels, want the conditions to be “as it used to be” when returning home. As a

result, they have a strong preference for local, traditional food (Svanberg, 2015).

FRAMEWORK AND RESEARCH AIMS

Several researchers have emphasized the continuity of the Faroese foodways. The main purpose of this chapter is thus to discuss why fat from terrestrial and marine mammals, seabirds, and fish have played such an important role in the Faroese diet ever since the first settlers arrived to the Faroe Islands. For instance, when the food-and-culture researcher Alfa Olsson in the 1950s compared

the western Nordic peasantry diets, she discovered with regard to the Faroe Islands that the dietary habits of the islanders seemed particularly well-preserved there and displayed strong continuity with bygone days (Olsson, 1958).

Her fieldwork in the Faroes took place in 1952 and consisted in observation and interviews about local food habits (Olsson, 1952). Her conclusions were largely correct, since at that time the fishing and farming households of the Faroe Islands were still rather self-sufficient when it came to staple foods such as fresh, fermented, and processed animal products (Håseth et al., 2015). Still in the mid-1990s, I could observe this subsistence pattern in many rural households. Many dishes that she describes are interesting examples of cultural persistence on the islands (Olsson, 1954). *Knetti*, for instance, is a kind of large fish ball containing lumps of lamb's tallow, *grunningshøvd*, are heads of cod fermented in the open air, while *sperðil* is a sheep's rectum filled with tallow or suet (Svabo, 1966; Nyman, 1984; Svanberg, 2015).

These are illustrative examples of ancient heritage food that have survived since the Viking age. Until recently, most people on the islands mastered the craft of producing food from slaughtered animals (including whales) and freshly caught fish (Joensen, 2009, 2015). Even today, especially the elderly generation, has continued consuming a rural diet mainly based on fish and meat products. This segment of the population possess the traditional knowledge of preparing and utilizing meat, fat, and offal, and know how to preserve meat and fish by traditional methods of drying, fermentation, and salting. For them, products such as tallow and whale blubber are also cherished side dishes of importance for them since the flavors correspond to what they have grown accustomed to since childhood. With the exception of potatoes, onions and carrots, vegetables play an insignificant role in their daily diet (Dalgård et al., 2010; Svanberg, 2015).

However, several studies of Faroese food habits and food changes have documented the dichotomization between so-called market foods and traditional foodstuffs. Nowadays, convenience food usually provides a greater proportion of daily consumption (Rasmussen, 1971; Lauer, 1989; Joensen, 2015). In everyday language, many locals make a distinction between *føroyskur matur* "Faroese food" (based on locally available resources) and *útlendskur matur* "foreign food" (e.g., pasta, rice, and other imported foodstuff). Nevertheless, traditional Faroese food still constitutes an important part of local eating habits (Joensen, 2015; Svanberg, 2015).

Within food-and-culture studies, we can distinguish between *diet*, i.e., the food people consume, *subsistence*, i.e., the way in which the provisions are acquired, including the technologies involved in both capture and preparation, and *foodways*, i.e., the entire set of activities, symbolism, and beliefs surrounding the acquisition, preparation, and serving of food (Schulting, 2018). Due to the ecological conditions and geographical situation, the Faroese diet and subsistence were very much the same until the early twentieth century (Joensen, 2015), although there have been some important turning points due to external factors (Teuteberg, 1986).

This chapter attempts to examine the historical and contemporary importance of animal and marine fat in the local Faroese diet, including its production, preparation, and place in the local and national cuisine of the Faroes. The chapter will also discuss such factors as commensality, gastro-tourism, and changes in local attitudes toward fats used as food, since they all are aspects that I have found relevant in this context. Regarding the production and consumption of most of the dishes mentioned in the text, empirical data has been collected from a wide range of historical sources as well as my own observations on Faroese foodways. Therefore, this study can be characterized as a diachronic analysis of the importance of fat in the Faroese diet (cf. Jönsson, 2020).

As an ethnobiologist with an anthropological background, I find it difficult to use the term traditional, as it can be perceived as contradictory to change (Peloquin and Berkes, 2009). Of course, the knowledge of the food is constantly changing, but I accept the concept traditional food knowledge for this chapter. However, we must remember that food culture, as every kind of culture, is something that is alive and constantly changes and it contains an active element. As Swedish ethnologist Jönsson reminds us, food culture does not exist; it is created and re-created (Jönsson, 2020). Local or traditional food knowledge is fundamental for maintaining dietary continuity and food culture. There is an interesting strain of cultural persistence when it comes to local food habits, which includes aspects such as food craft, availability of locally produced natural material, traditions, and taste, but also the concept of Faroese national identity (Svanberg, 2015).

MATERIALS AND METHODS

In this chapter, I have used ethnographic qualitative methods and perspectives from ethnobiology and nutritional anthropology (Anderson, 2014; Pieroni et al., 2016). The data has been gathered through ethnographic fieldwork (including participant observations), as well as from written historical sources.

Environmental and Social Setting

The Faroe Islands consists of 17 populated (out of 18) rocky islands and numerous islets, with a dramatic nature and a rich bird life. The landscape is treeless and mountainous. The climate is subpolar oceanic influenced by the North Atlantic Current. Winters are mild and summers cold. It is windy and rainy (Joensen, 1982; Hannon et al., 2009). The islands are located in the Atlantic Ocean, between Iceland, Norway, and Scotland. The area constitutes 1,399 square kilometers, and the total population is 52,920 inhabitants (December, 2020). About 40 per cent live in the capital, Tórshavn. The majority of the population is ethnic Faroese islanders who as their mother tongue speak the Faroese language (Hagstova Føroya, 2021). However, most of the Faroese people are bilingual and speak and understand Danish as well (Knudsen, 2010).

Present-day Faroese society is a late-modern high-tech welfare state. The Faroe Islands' primary economic activity is commercial fishing. Today the fishing industry covers a wide range of activities spanning both pelagic and demersal fisheries in Faroese

and more distant fishing waters. In addition, there is a large fish processing industry. Besides this, salmon farming on the Faroes is also one of the most profitable aquaculture industries in the world. The recent economic growth has also created new jobs in the service industries for people with university degrees. Earlier the Faroe Islands did not have as much opportunity for well-educated people as it does now. In 2019, the Faroe Islands were the fastest growing country in the Nordic Region. At present, Faroese society is experiencing rapid changes at the same pace as other post-industrial countries. Changes can be attributed to a number of reasons such as globalization, infrastructural initiatives, and economic growth. Undoubtedly, such factors will have an impact on the lifestyle and consumption pattern of the inhabitants. Some of these changes can already be observed. For instance, today formerly important economic activities such as hunting and sheep farming are mainly conducted on a hobby basis (Joensen, 2020; Hagstova Føroya, 2021; Svanberg, in press).

Total life expectancy (both sexes) at birth for Faroe Islands is 82.6 years (Hagstova Føroya, 2021). Still, in contrast to other European countries, the rate of crime is exceptionally small (Svanberg, in press). Culturally, the Faroe Islands comprise a small and relatively homogenous society. Although archaeological research has produced strong archaeological indications of a human colonization of the Faroe Islands between AD 400 – 600 (Church et al., 2013), the current inhabitants are descendants of Viking Norsemen that arrived in the ninth century (Arge, 2014). In 1523, the islands became part of Denmark. The population is mostly Lutheran, belonging to the Faroese Lutheran Church (80%). The remainder belongs to the Open Plymouth Brethren and various charismatic movements. Compared to other Nordic countries, it is a rather conservative Christian nation (Larsson and Svanberg, 2009).

Fieldwork

Since the mid-1990s, I have on a yearly basis collected field data through participant observations (c.f. Svanberg, 2015). The interviews with informants have been unstructured and conducted according to the generative method, which is based on the respondents' own point of view (Adams et al., 2014; Jönsson, 2020). By using these methods, my objective has been to record local knowledge about Faroese diet, subsistence, and foodways. The interviews took place mainly in Vestmanna, Gjógv, and Tórshavn (the capital of the islands), although I have visited most islands and many villages since 1994. Through the observation method, I learned about the activities connected with food as well as local knowledge about the environment of the people in their natural setting (Kawulich, 2005). In addition, as an observer, I was introduced to various activities within the human food chain, from fishing and slaughtering to cooking and consuming. I have experienced most of the dishes mentioned in this text and taken part in the making of them (Svanberg, 2015).

Historical data on diet, subsistence, and foodways were found in sources such as in ethnographic reports, archeological studies, travelogues, and local historic accounts. The historical review is important for our understanding of the past and present use of animal and marine fat in the Faroese foodways (Joensen, 1987).

RESULTS

Traditional Faroese Diet and Subsistence

Food resources have always been collected from the land as well as from the sea. Traditional homemade Faroese food is mainly made from lamb, sea fish, seabirds, and whale meat. Tallow and whale blubber are also part of the local diet, both as ingredients and as side dishes. These provisions have traditionally been acquired through hunting, fishing, and animal husbandry; subsistence activities that still are important on the Faroe Islands. The most important domestic animals providing local food for humans are sheep, geese, ducks, and cattle. There exists local breeds adapted to the climate and ecological conditions. Among these, sheep are the most important species (Joensen, 1982, 2020; Hannon et al., 2009).

Thanks to recent archaeological research, we have some information about the diet in the post-classic era, from the so-called “landnam period” (Norse period), when the Viking ancestors of the contemporary Faroese people settled on the islands, until the Reformation. Until the late nineteenth century, the islands can be described as a peasant society highly dependent on shepherding although hunting was also carried out (Joensen, 1987). The early settlers brought domestic animals such as sheep and pigs, but also horses and cattle (Arge et al., 2009). Fish, seabirds, and marine mammals were important elements of the local diet (Arge, 2014). While pig breeding ceased already in the thirteenth century, keeping sheep has continued to the present day to be of major importance for the islanders (Arge, 2005). A Royal Decree from 1298, known as the Sheep Letter (*Seyðabrævið*), deals with sheep husbandry (Young, 1979). According to this ancient decree, the islanders are allowed to keep 70,000 adult sheep during summer season. Noteworthy is that the figure in question has remained virtually unchanged since 1298. In fact, a greater number would lead to overgrazing with the subsequent risk of soil erosion (Stoklund, 1984). About 40,000 sheep are slaughtered each year. Thus, we may observe that the Faroese local diet and food system has a tradition of more than 1000 years (Joensen, 1979, 1987).

Until the end of the nineteenth century, the Faroe Islands can be described as a rather static, isolated and self-sustained peasant society where meat, fat, and fish were by far the most common food products. An interesting “culinary” institution was the so-called *tálgardi* “tallow bog,” where the farmers stored kneaded tallow obtained from sheep (Olsson, 1952; Joensen, 2015). The presence of these tallow bogs locally serve as a vivid indication of the importance given to fat as an energy source in the Faroes. The longer the tallow was stored in the bog “being so much the better,” wrote Lucas Debes in 1673. Each farm had their own bog where they stored kneaded tallow. It served as a sort of measurement of a specific household's prosperity (Debes, 1673). The small amount of butter produced from cattle was exported to Denmark, while the locals preferred marine fat and tallow for their own consumption (Joensen, 1987).

Since human settlement until the early twentieth century sheep husbandry (for meat, tallow, and wool production) and some barley cultivation, hunting for seabirds, and occasionally marine mammals, such as long-finned pilot whale (*Globicephala*

melas) and gray seal (*Halichoerus grypus*), constituted the main base of the economy. Fishing from the shore was carried primarily with the purpose of supplying food for individual households. Only landowning farmers had one or more boat (Joensen, 1987). Fermented fish (e.g., *ræstur fiskur*), made from Atlantic cod (*Gadus morhua*), saithe (*Pollachius virens*), or haddock (*Melanogrammus aeglefinus*), was used as a storable protein source consumed during periods when weather conditions and seasonal fluctuations may affect food availability negatively (Svanberg, 2015).

In the Faroe Islands, the pilot whales have always played an important nutritional role since they have provided people with meat (*tvøst*) as well as blubber (*spik*) (Debes, 1673; Panum, 1847; Svabo, 1959; Bloch et al., 2003). An English observer wrote in December 1852 from the village Vestmanna that had it not been for the abundance of captured pilot whales, which made up for the shortage of other food, people would have been at jeopardy (Trevelyan, 1853). Still today, although not as important as before, Faroe islanders continue consuming products (meat, blubber) produced from pilot whales (Bloch et al., 2003; Joensen, 2009). According to Faroese law, it is allowed to take other smaller whales. Occasionally, various dolphins are hunted, earlier also gray seal (*Halichoerus grypus*). They also provide edible blubber (Joensen, 1987; Bloch et al., 2003; Bloch and Mikkelsen, 2009).

Regarding seabirds, they breed in large numbers on the steep cliffs. For centuries, guillemots (*Uria aalge*), puffins (*Fratercula arctica*), black guillemot (*Cephus grille*), kittiwakes (*Rissa tridactyla*), Manx shearwater (*Puffinus puffinus*), and other bird species have been exploited as food (both meat and eggs) (Clausson Friis, 1632; Debes, 1673; Svabo, 1959; Svanberg and Ægisson, 2006). In recent years many species have decreased in number and for this reason they are not hunted anymore (Nørrevang, 1986; Svanberg, 2001). However, it should be noted, one species is hunted in great numbers. The bird we are speaking of is the northern fulmar (*Fulmarus glacialis*), eaten oven-baked and very greasy. This species started colonizing the islands in the first half of the nineteenth century and starting in the 1860s it has been hunted ever since. From 1930 to 1938, cases of human chlamydophilosis were reported from the Faroes. After the outbreaks in the 1930s, hunting fulmars for human consumption was prohibited until 1954 (Hermann et al., 2006). Nowadays the islands is home to a huge population of northern fulmar. Only the recently fledged juveniles leaving their nests on the cliffs are captured. About 100,000–150,000 birds are killed each fall, and provide a significant contribution to the households' diet. It is a very greasy food (Wang et al., 2020).

Historically, all animal foodstuffs had to be preserved by means of various methods. Drying and fermentation have always been important. Curing was introduced later (Joensen, 2015). Much of the flavor and taste, typical for the Faroese food, depends on the traditional preservation methods used, especially fermentation and drying of meat (whale meat, mutton, seabirds) and fish, for instance *ræst kjøt* and *ræstur fiskur* (Joensen, 2015; Svanberg, 2015).

Although some barley (*Hordeum vulgare* and *Hordeum distichon*) has been cultivated in the infields, i.e., the more fertile

land area close to the farms, on the Faroes since the Viking age (Arge, 2014), the harvests had always been small (Rasmussen, 1957; Joensen, 1987; Guttessen, 2001). This is also reflected in local food habits. Barley flour was used for baking a primitive kind of bread called *dryllur*, which was prepared in an open peat fire (Joensen, 1987). Usually it was mixed with fat or was put in a soup made of animal stuff. While porridge and bread have been important foods among cereal producing farmers in other parts of northern Europe (Fjellström, 1982; Johansson, 1994), this has not been the case among the Faroe islanders (Joensen, 1987). Instead, the Faroe islanders have prepared dishes of thicker consistency, in which animal fat, liver, and fish roe have played an important role. Blood sausage has also been important in the local diet (Olsson, 1954; Olsson, 1958; Joensen, 2015). The main part of the cultivated land on the Faroes has always been tilled for the production of hay, which has been given to sheep and cattle during the winter season (Nyman, 1958; Svanberg, 1998). Hay is the only crop that remains important today and is used for fodder production (Hannon et al., 2009).

Regarding vegetables in the local diet, traditionally, the root vegetables Faroese turnips (*Brassica napus*) and Norwegian turnips (*Brassica rapa*) have been cultivated. It was not until the mid-nineteenth century that potatoes became widely accepted as food in the Faroes (Svanberg, 1998). The sources inform us that as late as the latter part of the nineteenth century, some elderly people refused to consume potatoes (Joensen, 1987). However, with an increasing population and more people getting access to the outfields for growing potatoes, this crop became popularized. In the first decades of the twentieth century, potatoes became very important in Faroese households and dinner was not considered dinner unless it included potatoes (Guttessen, 2001; Joensen, 2015). Garden angelica (*Angelica archangelica*), was kept in some gardens in olden times, but was regarded as a kind of candy (Svanberg, 1998). In the twentieth century garden culture, promoted by various officials, with culinary rhubarb (*Rheum × hybridum*), and some hardy garden shrubs grown for their berries (*Ribes uva-crispa*, *R. nigrum*, and *R. rubrum*) has developed. Apart from the above examples, vegetables has otherwise played an insignificant role in the islanders' diet (Svanberg and Ægisson, 2012; Sørensen et al., 2018). Seaweeds were in times of need used as food (Panum, 1847; Svabo, 1959; Svanberg, 1998).

Important turning points in the Faroese food habits have been influenced by a number of macro-economic factors such as the implementation of free trade and fishing, industrialization and market economy. The introduction of general merchant stores in the larger villages at the turn of the twentieth century was yet an important factor. In these stores the rural people could easier than before come across a large range of products such as flour, sugar, margarine, tea, coffee, and some spices (Joensen, 1987). The introduction of the freezer boxes in the 1960s brought about major changes in the subsistence pattern and foodways (Joensen, 2015).

During the twentieth century, the economy of the Faroes gradually changed from shepherding and subsistence coastal fishery to large-scale deep-sea fishery in the North Atlantic. During World War II, the islands were occupied by British troops. The presence of British soldiers did have some cultural

TABLE 1 | Main sources of animal and marine fat.

Scientific name	English name	Used for	Faroese name
Marine mammals			
<i>Globicephala melas</i> (Traill, 1809)	Long-finned pilot whale	Blubber used as food	<i>grindahvalur</i>
<i>Tursiops truncatus</i> (Montagu, 1821)	Atlantic bottlenose dolphin	Blubber used as food	<i>hvessinug</i>
<i>Lagenorhynchus acutus</i> (Gray, 1828)	White-sided dolphin	Blubber used as food	<i>Springare, skjórutur springare</i>
<i>Lagenorhynchus albirostris</i> (Gray, 1846)	White-beaked dolphin	Blubber used as food	<i>Springare, kjaftthvitur springare</i>
<i>Phocoena phocoena</i> (L., 1758)	Harbor porpoise	Blubber used as grease and food (historical uses)	<i>nísa</i>
<i>Hyperoodon ampellatus</i> (Forster, 1777)	Northern bottlenose whale	Locally used on Suðuroy: an oil is extracted from the blubber and used as external treatment (it is not eaten)	<i>daglingur</i>
<i>Halichoerus grypus</i> (Fabricius, 1791)	Gray seal	Blubber used as food, medicine (historical uses)	<i>Kópur, láturkópur</i>
Terrestrial mammals			
<i>Bos taurus</i> L., 1758	Domestic cattle	Milk for butter, cheese and various dairy products	<i>neyt, kýr</i>
<i>Ovis aries</i> , L., 1758	Faroese sheep	Suet and tallow used as side-dish or as fat in various kind of food, blood used for pancakes and black pudding	<i>seyður</i>
Sea fowl			
<i>Puffinus puffinus</i> (Brünnich, 1764)	Manx shearwater	Edible fat	<i>skrapur</i>
<i>Fulmarus glacialis</i> (L., 1761)	Northern fulmar	Edible fat	<i>havhestur, náti</i>
Fish			
<i>Gadus morhua</i> L., 1758	Atlantic cod	Liver as food and medicine	<i>fiskur, toskur</i>
<i>Pollachius virens</i> (L. 1758)	Saithe, Coalfish	Liver as food	<i>Upsí, seiður</i>
<i>Melanogrammus aeglefinus</i> (L.)	Haddock	Liver as food	<i>hýsa</i>

Joensen (1987, 2015), Bloch et al. (2003), Bloch and Mikkelsen (2009), Svanberg (2015), field notes 1994–2019.

impact on the islanders, e.g., greeting manners and some food habits, such as British-style chocolate and fish-and-chips (Joensen, 2015; Svanberg, 2015).

Artisan Food Craft and Foodways

Today, fishing is the primary economic activity. The Faroe Islands has a large fleet of trawlers and smaller line fishing boats, fish factories and fish farms. Although most fish is caught by these larger fishing vessels, some people, primarily men, continue to fish for pleasure and for their own consumption in locally constructed boats that are well-adapted to the surrounding sea conditions (Svanberg, in press). Fish products such as *knetti* is a Faroese type of homemade dumpling, which is made with minced fish and tallow. *Frikadellur* on the other hand is a kind of fishcake consisting of fileted fish ground that is mixed with flour and tallow, and finally fried (Olsson, 1954; Nyman, 1984). To make *ræstur fiskur*, fermented cod, is still considered important. Fishermen still dry cod on their ships (Svanberg, 2015). Some very ancient dishes have survived locally, but are becoming increasingly rare (Arge, 1995). Sheep liver filled with tallow is fried, while offal can be minced with fish meat and

made into *mørknetti* (Olsson, 1954). In the Faroe Islands, many people still live in villages, while others have a connection with the villages through their relatives. As a result, they enjoy access to slaughtered lamb products. Besides dry and fermented mutton, they have access to tallow and intestines (Joensen, 1979).

Due to factors such as globalization, infrastructural initiatives, and economic growth, Faroese society is experiencing rapid social change at the same pace as other post-industrial countries. In the end, this will most likely lead to a change in the mentality and lifestyle of the inhabitants. We may for example observe that today post-industrialized diets are quite varied among urban and urbanized people in the Faroe Islands. The society has been characterized and dominated by a long history of monoculture, but this is now changing due to increasing globalization (Joensen, 1987, 2020; Svanberg, 2015).

Export of fish and fish products is the dominating industry, providing welfare to the country. Thus, we can see that the modern economy is highly dependent on fishing and fish farming. Although experiencing a setback in 2020 due to the



FIGURE 4 | Meat broth is a product made with fat from fermented mutton (ræst kjöt). It is used for soup, súpan, here served with pieces of ræst kjöt, potatoes, and leeks (Photo: Ingvar Svanberg, December 2018).

Covid-19 pandemic, the tourism sector was booming earlier and contributed to the development of many sectors in the society, including foodways (Hagstova Føroya, 2021).

In the Faroes, the *grindadráp*, the collective drive hunt of pilot whales, is legal, and still important for providing food. There are about 20 towns, villages, or bays across the islands that have the proper conditions and official authorization for beaching whales (Joensen, 2009; Bogadóttir and Olsen, 2017). Ancient customary law regulates the catch. The meat and blubber are distributed free of charge according to an intricate system that involves hunting participants, spectators and for example, elderly people living

in the village where the hunt takes place (Joensen, 2009). Since the meat and blubber from whales is highly contaminated, the population is recommended by the health authorities to abstain from eating it (Weihe and Joensen, 2012). However, many people continue to consume whale meat and blubber.

Although sheep farming, which was the main important economic activity until the second half of the nineteenth century, nowadays plays an insignificant role in the economy, it is still of great cultural and social importance (Joensen, 1979, 2015, 2020; Stoklund, 1998). The industrial fisheries, which started in the 1870s, have also caused changes in the nutritional intake.



FIGURE 5 | Homemade *fiskafrikadellur* “a kind of fishcakes” consisting of fileted fish (cod or haddock). It is ground, then mixed with flour, spices and tallow, and finally fried (Photo Ingvar Svanberg 2019).

Farmed salmon, previously unknown, is nowadays considered an integrated ingredient in the Faroese cuisine (Svanberg, 2015).

Fat in Faroese Cuisine

Traditional foodstuffs and food knowledge play an important role in contemporary Faroese society. Marine and animal fats can be considered the common denominator for the “traditional” Faroese cuisine. Local food artisans, especially women of rural background, are proud of preserving the old ways of preparing Faroese food. Processing raw products and preparing food have always been tasks ascribed to women (Joensen, 1979) (**Table 1**).

The main fat sources in Faroese cuisine is, and has always been marine based (fish liver, whale blubber, earlier also seal blubber) and animal fat. Tallow and suet from sheep have also played an important role in the local food culture. According to Faroese sheep-owners, several parts of slaughtered sheep containing good tallow may be used for various purposes; the greater and lesser omentum (the membrane surrounding visceral organs), kidney tallow, lump of tallow on the belly, tallow in the pelvis, heart tallow and the important tallow located around the left colon (Joensen, 1979).



FIGURE 6 | *Suðuroyarsperðil*—a local kind of *sperðil* (from *Súðuroy*) made from sheep's rectum filled with tallow, pieces of kidney, heart, liver, and meat (Photo Osvald Olsen, December 2019).

Taking care of the tallow is generally considered as “women’s work” and those who possess this wisdom maintain intricate knowledge of the sheep’s anatomy; something, which is, still the case (Joensen, 1979). They know which kind of tallow should be used when preparing various kinds of food. Suet is for example used when making dumplings and fish balls (*knetti, frikadellir*), black pudding (*blóðmørur*), and other historically relevant customary foods. *Salttál*g “salted suet” is an energy rich spread, which is put on bread. *Garnatál*g is an archaic Faroese foodstuff made with tallow from around the left colon (*garnmørur*). Intestinal fat is formed into a large oval lump, which is air-dried and eaten. *Rognadrýlur* is a dish made with dough of barley, boiled roe from cod, and tallow. Nowadays it is eaten with treacle. This is also the case of black pudding, *blóðmørur*, made with sheep blood, flour and tallow, and at least by some eaten with treacle or brown sugar. *Blóðpannukakur* “blood pancakes” made with sheep blood, flour, milk and tallow, are popular among children. *Tálgapannukakur*, pancakes with diced tallow, is another nowadays-rare dish (Joensen, 2015). Many

more dishes are made using either sheep suet or tallow (Skaale and Johannesen, 2010).

When preparing *garnatál*g it is often cut into slices, melted in a pan, and served with *ræstur fiskur* (Svanberg, 2015). *Sperðil* is a traditional dish made with the tallow around the sheep’s rectum, and prepared into a kind of primitive sausage. It can also be used as spread on bread, eaten with fish or as accompaniment to the traditional unleavened bread (*drýlur*) (Joensen, 1987). It was according to an informant also used for greasing the frying pan when making pancakes or waffles, although it is probably rare today. Earlier, it used to be common to fry *sperðil* and eat it for breakfast.

Spik, or blubber obtained from the under hide of the pilot whale, is also an important food item. It is usually salted (dry- or brine-salted) and consumed together with dry fish or whale meat. Blubber can also be eaten as a kind of spread on bread. Blubber has always been an important source of Vitamin D (Sørensen et al., 2018). However, today, given the high concentration of polychlorinated biphenyl (PCB) and mercury in the blubber,



FIGURE 7 | Map of the Faroe Islands (Courtesy Nation Online Project).



FIGURE 8 | Dried fish (cod) sold in a grocery store in Vestmanna (Photo Ingvar Svanberg, July 2019).

many people try to eat less or even abstain from it altogether. Still, many belonging to the older generation and the so-called “macho Faroese men” continue eating blubber (Svanberg, 2015).

Fiskalivur, “fish liver,” from cod, haddock, and saithe, is cooked and eaten with the fish, or popularly used as spread on rye bread, or during earlier times on *drylur*. A very ancient dish is *kamsur*, a kind of dumpling made with fish liver. *Livraknetti* are *knetti* made with fish liver rather than tallow. A similar dish is *kams-* or *livurhøvd*, cod’s head stuffed with fish liver kneaded in flour. *Livurkøka* was another kind of dumpling that was baked on embers and made from kneaded flour and fish liver. Yet another traditional dish

is *livurmagi*, cod belly stuffed with fish liver (Skylv-Hansen, 1950; Olsson, 1954; Nyman, 1984; Joensen, 2015). Vitamin D has always been supplied through fat fish (Sørensen et al., 2018).

Liver from marine mammals as well as liver from seabirds has had an important place in Faroese traditional food. However, nowadays liver from marine mammals (i.e., whales) is not consumed anymore because of the high concentration of PCB and mercury (Joensen, 2009). Still, liver from sheep is an important ingredient in a number of Faroese dishes such as *livurpylsa*, a sausage made with sheep liver and tallow (Olsson, 1954; Joensen, 2015).

Locally made milk products have played a minor role. Sheep were milked during medieval times, but this activity ended sometime in the 1300s (Arge, 2014). The cattle population on the islands has not had the same cultural significance as the sheep, although they were kept for milk production (Thorsteinsson, 1981; Joensen, 2020). They were kept indoors during the winter. The availability of hay for winter fodder has always been a problem. Therefore, they were kept outdoor from April to the end of November. Milking was traditionally a woman's occupation (Joensen, 1987). Due to climatic and ecological reasons, the lactation period is brief. The milk was precious. The rules of conduct for women who milked were strict (Joensen, 2020). Some coagulated dairy products such as *dralvi* (thickened milk), *fleytir* (milk with rennet) and *ystingur* (curdled milk), were locally produced. Cheese was eaten soon after curdling. In the past decades however, they have lost their importance since now, fermented milk products are readily available in the convenience stores. This applies to other dairy products as well. Cream (*rómi*) was usually made into butter, but in rare cases mixed with sugar for desserts. Formerly, a popular dish was a kind of junket called *rómastampur* (Olsson, 1954; Joensen, 2015). An interesting product made of boiled unpasteurized colostrum was a dish known as *ketilostur*, reminding of the Swedish *kalvdans*. I have never seen the Faroese kind, since beestings is a rare produce today, but my informants have eaten the *ketilostur* still in the late 1970s. It was earlier an important gift, especially to households with whom permanent exchange relations were maintained (cf. Joensen, 2020).

Typical Faroese food makes use of gravy and broth in sauce and soup, which is common in the local diet. Meat broth is a fat product, which is made from fermented mutton (Debes, 1673; Olsson, 1954; Joensen, 2015). It is used when preparing soup, *súpan*, served with potatoes, turnips and some grain (nowadays rice, earlier barley). To have plenty of sauce is important in many traditional meat and fish dishes. *Smelt* (melted tallow) and margarine, is commonly used as sauce accompanying many fish dishes (Figure 4).

The results of a health and odontology survey conducted in 1937–1938, indicated that the nutritional status of the otherwise poor Faroese villagers mainly subsisting on a traditional fish and meat (including blubber and tallow) diet was adequate from a health perspective (Guðjónsson, 1940). This is further indicated by the fact that the average birth weight at the time was higher than elsewhere in the Nordic countries (Olsen et al., 1995). Mutton and whale meat is rich in carnitine. Something, which is important in a community with a high frequency of Carnitine Transporter Defect (Haraldsdóttir Jensen and Mikkelsen, 2019).

DISCUSSION

Traditional Foodways and Commensality

There are several factors that affect the contemporary foodways of the Faroe Islands and the interest for keeping the local diet rich in animal and marine fat (Schulting, 2018). There are historical and social reasons for the conservatism in the diet and foodways. This conservatism was reinforced during Second World War, when about 3,000 islanders were forced to stay in Denmark which

was occupied by the Nazi-Germans, and the Faroe Islands were occupied by British troops. When the Faroe islanders in Denmark were allowed to return to their islands in 1945, after 5 years away, traditional local food gained increased popularity as a symbolic and tangible connection to their native homeland and their national identity (Joensen, 1991; Svanberg, 2015). Another factor for maintaining the traditional food is, as mentioned above, the seamen that spend months on commercial fishing vessels, far away from their native islands. Despite the fact that many of them have considerable expendable plenty incomes, they retain traditional values rooted in local village culture. As a result, they have a strong preference for local, traditional food. Homemade food consisting of fermented fish and meat, fish products (e.g., *knetti*, *frikadellur*) as well as fat in the form of whale blubber, sheep suet or tallow (including *garnatál*) are favorites among them (Svanberg, 2015). Furthermore, the Faroese society is highly family-oriented. Thus, strong familism can be said to be a typical cultural trait. One spends much time with the family and many activities are family-oriented. Huge family gatherings are popular. Equally, commensality that is, for example eating at the same table is an important trait in Faroese social activity and connectivity (Kerner and Chou, 2015) (Figure 5).

The most important rites of passage are christening (baptism), a naming ceremony, that takes place in church when the child is only a few weeks old; confirmation in the Lutheran church when the child is in the early teens; as well as wedding and at funerals. Large feasts involving numerous relatives, friends and neighbors usually follow these church based ceremonies. On these occasions large quantities of food is served (nowadays often buffet-style with many Faroese specialties including wind-dried whale meat, slices of whale blubber, dried fermented mutton, wind-dried goose-meat, dried fish, various types of locally made sausages, etc. (Joensen, 2002).

No socially produced life-styles are immutable. Instead, they are due to various macro factors subject to a process of constant change. Factors such as economy, politics, society, and social structure all have a decisive effect on individuals and local human activities, or what could be labeled cultural pattern (Anderson, 2014). Nowadays it is of course easier than before to have individual food preferences. Some younger people, especially women, tend according to my annotations to avoid fat and often remove fatty parts when consuming for instance mutton. Among some individuals, there are even tendencies toward fat-phobia or anti-fat attitude, that is, fear of consuming fat. In the Faroes, this is a new phenomenon associated with one's own body. However, I do not believe that consumption and knowledge about homemade food is decreasing, as it has in Sweden for instance (Jönsson, 2020). Of course, also in the Faroes large segments of the population have reached the conclusion that excessive intake of fat is harmful to human health and as a result, there is less consumption of fat than before.

Traditional food knowledge and use of resources are always changeable. The increasing globalization with easier access to a wide array of foodstuff has been a determinant factor in changing the local diet (Jönsson, 2020). Also in the Faroes, the food culture has become increasingly internationalized. The

taste among urbanized locals is therefore gradually changing and becoming uniform with the European norm (Joensen, 2005). For instance, in recent decades the consumption of vegetables has increased while consumption of fish has declined (Joensen, 2015). Fresh and *ræst* mutton remains very popular, while traditional meat and fat products, such as various types of organ meats, whale blubber, and *sperðil* are decreasing. At the same time, established skills are modified with technical changes, which also makes traditional foods easier to produce. In order to improve the local food crafts, competitions are organized nowadays, to find out for instance, who makes the best *garnatál* (Figure 6).

The Importance of Gastrotourism

Recently tourism has become an important part of the growing economy and now an increasing number of foreign visitors come to the islands during the whole year. A worldwide survey about tourism in 2007 viewed the Faroe Islands as authentic and unspoiled. Many tourists come for bird watching, the beautiful scenery and trekking. Consequently, new hotels have been established and the infrastructure has been improved. Earlier visitors were not mainly attracted to the island for its cuisine and until quite recently so-called food tourism was virtually non-existent. During the past few years I have also noticed that the number of eating facilities have increased in the rural areas. Still in the 1990s and early 2000s, it was difficult to find places to eat outside the largest settlements, but on a visit in 2019, I saw that the situation had changed dramatically. Now there are plenty of coffee shops and small restaurants all over the Faroes, including fast-food eateries (Svanberg, in press) (Figure 7).

However, this has now changed. Nowadays a number of visitors come to the Faroe Islands as so-called gastro-tourists. It can be defined as activities that provide unique and memorable eating and drinking experiences, both near and far, for the visitors (Povey, 2011; Jönsson, 2020). In recent years, the “New Nordic Cuisine” has attracted international recognition (Nordic Councils of Ministers, 2015). This also applies to the Faroe Islands, where gastro-tourism has become increasingly popular. One reason is the exclusive avant-garde restaurant Koks that has made local food its trademark. In 2017, the restaurant was awarded a Michelin star, and in February 2019, it was awarded a second star. Fermented meat and fish may be difficult to vary in different ways, but Koks has succeeded in transforming traditional craft into modern food (Svanberg, 2015, in press).

In this context, it should be noted that several Faroese food crafts people and food creators have been rewarded with various food awards (i.e., the Nordic Food Awards Embla in various categories such as producers, food artisans etc.). An interesting new sort of food experience for tourists is *heimabliðni* (“home hospitality”) where visitors can enjoy dining experiences in people’s homes. Here the tourists are treated with locally produced homemade food while being entertained by their hosts with storytelling (Kortesoja et al., 2018).

At a time when industrially produced food is eliminating sensations of taste and smell, fermented products with a distinctive accent has started attracting food-lovers from all over the world (Svanberg, in press). Local fat is part of these

dishes. As mentioned earlier, wild plants play a minor role in the traditional local cuisine. However, with regard to these products, an increasing interest may be observed during the last years, especially within the restaurant sector (Svanberg and Ægisson, 2012; Joensen, 2015).

Future of the Traditional Food Knowledge

Traditional dishes cannot survive in exclusive and trendy restaurants alone. Making use of animal fat from sheep and pilot whales is still mainly a domestic craft. Still, large quantities of the local food (sheep, seabirds, whale meat, blubber) is produced through informal food provision practices (Bogadóttir, 2020). These subsistence practices are a guarantee for the survival of the traditional food knowledge in the Faroes. A real threat to the traditional food knowledge is the increasing preference among the young to eat less healthy, and from a taste-point of view, more smoothed or even tasteless industrial food. This can be juxtaposed with homemade Faroese food, which is rich in flavor and tastes (Sørensen et al., 2018). *Ræst* is regarded as a very specific Faroese taste (Kortesoja et al., 2018).

However, fresh fish is rarely found in the grocery stores and supermarkets. One can come across frozen fish (and dried), but not fresh. Instead, people get the fresh fish (mostly cod) by fishing themselves. They also get it from relatives or artisanal fishermen. It should be noted that a limited quantity of fresh fish is sold occasionally at a small fish market in the west harbor Vestaravág in the center of the Islands’ capital town Tórshavn but in fact, the “market” consists of nothing more than a couple of concrete blocks onto which the fish are put on display. Similarly, seafowl and whale meat is not commonly available in the store (Figure 8).

Nevertheless, some of the traditional food is also assumed to affect the health situation of the Faroes. It is believed that the high prevalence of Parkinson’s disease in the Faroes stems from consumption of whale meat and blubber (Wermuth et al., 2008).

However, beside these risks, it should be pointed out that most local food is quality food (in contrast to mass-produced convenience, fast or junk food): fish from the surrounding sea, mutton from sheep grazing in the mountains, birds breeding on the cliffs. In addition, it may be that there are certain health benefits involved with eating fermented food.

There is an imminent risk that the next generation will not learn to smell, taste, and touch traditional food anymore. Eating Faroese food is a question of access to healthy and organically produced food. Fermented meat has a high status. It is neither salty nor smoked. Instead, by the process of fermentation it has acquired its own particular taste, which is highly appreciated by both food connoisseurs and most locals. Knowledge is fundamental for maintaining cultural continuity and many locals pride themselves of mastering the Faroese food craft. Recipes for some rare dishes, still made by some families, are nowadays spread through social media. Of course, these days the craftsmanship is subject to rapid change, which can be partly explained by the availability of modern kitchen utensils such as electronic mixers, modern ovens, microwave ovens, etc., which facilitate the work process. Today for example, it has become popular to add new-fangled spices and fresh herbs to the food. Likewise, modern table condiments, such as tomato ketchup,

HP-sauce, mustard, and remoulade, have become an accepted compliment with traditional Faroese food.

Other challenges to traditional local foodways are modern health trends and ideological food orientations like veganism and vegetarianism that renounce the utilization of animal-based ingredients. Nowadays restaurants are serving vegetable dishes and there are vegan take-a-ways in the capital Tórshavn. For obvious reasons such eating habits are rather impractical in the Faroe Islands. Most ingredients have to be imported. The increased volume of vegetables in the contemporary diet, is however not a “threat” toward the traditional foodways (Joensen, 2015). Today many women refrain from eating whale blubber and sometimes avoid visible fat since it is deemed health hazardous (Weihe and Joensen, 2012). However, despite the fact that it is considered unhealthy to consume whale blubber, the older generation, representatives for rural families and what social anthropologist calls “macho Faroese men,” continue eating blubber (Svanberg, 2015).

CONCLUSION

This study has discussed the past, present, and the potential future status of animal and marine fat in the Faroese diet. As we have seen, eating is not only a biological necessity; it also involves cultural, economic, and social activities. Today, especially the elderly generation continues consuming a rural diet based on fish and meat. Many locals are proud that several aspects of their food tradition have been preserved. The islanders themselves produce significant quantities of traditional food items. In particular, the Faroese enjoy the strong flavors of air-dried fermented fish and mutton. In addition, whale blubber and sheep tallow still constitute important parts of the local diet.

Many people on the islands prefer to prepare traditional dishes themselves at home, and the traditional artisan craft knowledge about food is widely spread. Although, industrial modes of preparing local products cannot replace traditional food knowledge some technical advances has made the craft easier and quicker to carry out. However, the possibility that old-fashioned recipes and dishes will survive or not mainly depends on the maintenance of customary food knowledge. Some of the traditional foodstuff as locally produced *ræstur fiskur*, *frikadellur*, *knetti* and *garnatál* can be bought in the grocery stores. Canned salted fish roe is also available in the stores. It is a popular spread on bread. Urban people and professionals can still enjoy the Faroese cuisine based on fish and tallow.

Just as in other parts of Europe, the daily diet has recently gone through profound changes, partly explained by such

external factors as closer integration into the world economy, overall modernization and improved household economy. As a consequence, there is a richer variety in products available on the islands than before. Today, grocery stores scattered across the islands offer a rich variety of foodstuffs, among them many imported. However, especially men persevere in adhering to “genuine” Faroese food. In contrast, young women appear to be more susceptible to new trends, including foodways, and thus to a higher degree embrace modern ingredients and cooking techniques in their everyday life.

However, as long as traditional subsistence with fishing, sheep husbandry, whale hunting and some fowling, continue to constitute important elements in local food production, it is also likely that fat and meat will persist in being an important part of the local diet in the Faroes. The traditional food knowledge inherited from bygone times will continue to be part of Faroese culture and symbols of identity.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Root Tonics and Resilience: Building Strength, Health, and Heritage in Jamaica

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Jamaican root tonics are fermented beverages made with the roots, bark, vines (and dried leaves) of several plant species, many of which are wild-harvested in forest areas of this Caribbean island. These tonics are popular across Jamaica, and also appreciated among the Jamaican diaspora in the United States, Canada, and the United Kingdom. Although plants are the focal point of the ethnobotany of root tonics, interviews with 99 knowledgeable Jamaicans across five parishes of the island, with the goal of documenting their knowledge, perceptions, beliefs, and oral histories, showed that studying these tonics solely from a natural sciences perspective would serve as an injustice to the important sociocultural dimensions and symbolism that surround their use. Jamaican explanations about root tonics are filled with metaphorical expressions about the reciprocity between the qualities of “nature” and the strength of the human body. Furthermore, testimonies about the perceived cultural origins, and reasons for using root tonics, provided valuable insights into the extent of human hardship endured historically during slavery, and the continued struggle experienced by many Jamaicans living a subsistence lifestyle today. On the other hand, the popularity of root tonics is also indicative of the resilience of hard-working Jamaicans, and their quest for bodily and mental strength and health in dealing with socioeconomic and other societal challenges. Half of all study participants considered Rastafari the present-day knowledge holders of Jamaican root tonics. Even though these tonics represent a powerful informal symbol of Jamaican biocultural heritage, they lack official recognition and development for the benefit of local producers and vendors. We therefore used a sustainable development conceptual framework consisting of social, cultural, economic, and ecological pillars, to design a road map for a cottage industry for these artisanal producers. The four steps of this road map (growing production, growing alliances, transitioning into the formal economy, and safeguarding ecological sustainability) provide a starting point for future research and applied projects to promote this biocultural heritage product prepared with Neglected and Underutilized Species (NUS) of plants.

Keywords: ethnobiology, biodiversity, neglected and underutilized species, wildcrafting, Caribbean, Jamaica, intangible cultural heritage, sustainable development

INTRODUCTION

Traditional and indigenous fermented plant mixtures, multi-component alcohol infusions, and bitter tonics, consisting of roots, bark (and other parts) of wildcrafted species, are prepared and drunk as beverages, medicines, or for sociocultural purposes around the world, e.g., kaojiuqian in Shui villages in China (Hong et al., 2015); garrafadas in Brazil (Barros dos Passos et al., 2018); mahuli (country liquor) in India (Kumari et al., 2015); and bita in French Guiana (Tareau et al., 2019). The preparation and use of alcohol-based or fermented plant mixtures made with roots and bark of wild and cultivated species has also been recorded both in Africa and in countries across the Atlantic Ocean with a significant Afro-descendant population, such as in several Caribbean islands and the wider Caribbean region, especially as aphrodisiacs and for treating sexually transmitted infections (Cano and Volpato, 2004; Payne-Jackson and Alleyne, 2004; Vandebroek et al., 2010; van Andel et al., 2012). In Jamaica, artisanal fermented decoctions that include several wild-harvested and forest plants are known as root tonics (Picking and Vandebroek, 2019). These tonics play a dual role as food and medicine, and have been recognized as a product made with Neglected and Underutilized Species of plants (NUS) that shows potential for income-generation, empowerment of local communities, and reaffirmation of their cultural identity (Padulosi et al., 2013).

Jamaican root tonics are commonly produced and consumed at home, or sold locally in the informal economy, and are widely appreciated by Jamaicans as an energizer, aphrodisiac, for blood purification, and for the promotion and maintenance of good health (Sobo, 1993). Although root tonics are inherently a Jamaican product, their impact reaches beyond this Caribbean island, as their commercialization by a handful of producers in Jamaica and overseas has followed the Jamaican diaspora to London, Toronto, and New York City (Dickerson, 2004; Picking and Vandebroek, 2019).

The popularity of root tonics as a symbol of Jamaican biological and cultural heritage (in short “biocultural heritage”) stands in stark contrast to the breadth and depth of their scientific study. So far, one paper has reviewed the plant diversity of root tonics, from a study that used data from labels of listed ingredients on commercial products (Mitchell, 2011). In addition, the same paper contributed to a comparison of plant mixtures used as aphrodisiacs across the Caribbean and Africa (van Andel et al., 2012). Data is also lacking about the history and cultural context of their use, as well as levels of consumption, domestic production, and sales of artisanal root tonics across Jamaica, and how artisanal root tonics differ from commercial products.

The diverse biological, medical, historical, and cultural dimensions of Jamaican root tonics invite several important research questions, including related to the botanical identity of the plant diversity found in recipes, the illnesses treated and purported health boosting properties, their historical origin and present-day cultural importance, and their potential for sustainable heritage development for the benefit of small-scale Jamaican producers.

The term “sustainable development” is widely used with varying definitions based on the context and purpose of use, but was first coined by the World Commission on Environment and Development in 1987. Common pillar structures found in discussions about sustainable development touch on its economic, social, and ecological dimensions. For the purpose of this paper, we are using the term “sustainable heritage development” (Keahey, 2019) and incorporate a fourth pillar, namely cultural sustainability, which seeks to recover and protect cultural identities through a celebration of local and regional histories and the passing down of cultural values to future generations (Farsani et al., 2012). The cultural pillar of sustainability exists in parallel to ecological, social, and economic sustainability, and stresses the relation of heritage to social cohesion and local identity (Soini and Birkeland, 2014).

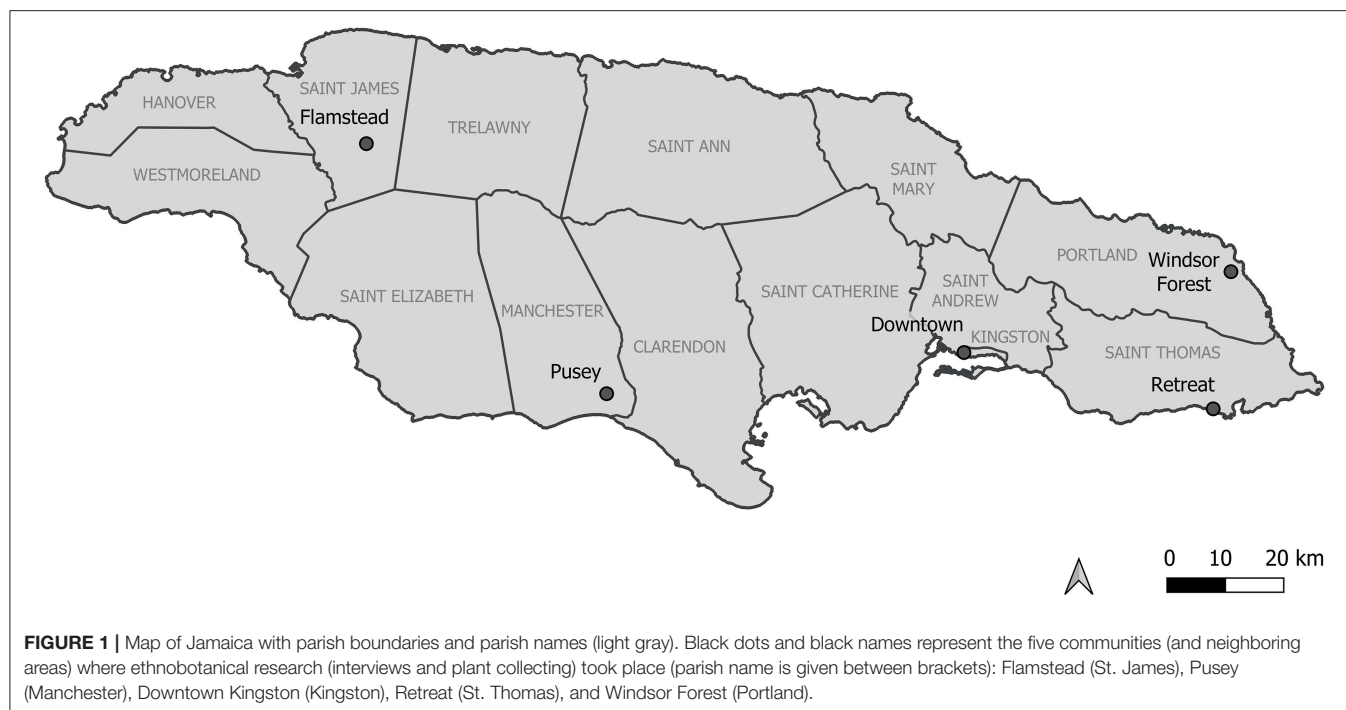
In this paper, we focus on the intangible cultural aspects of Jamaican root tonics, using information from ethnobotany research and oral history testimonies as a lens to explore the potential for development of an equitable Jamaican cottage industry for artisanal root tonic producers. Our primary goal was to conduct ethnobotanical research to increase the scientific knowledge base about root tonics. Our secondary goal was to move beyond research and make this data applicable and relevant to local communities. Specifically, this paper uses a mixed methods approach based on ethnobotany and oral history research, and a contextual analysis of the production market, to understand the “emic” (insider’s or community) perspective of root tonics (Gros-Balthazard et al., 2020), addressing the following questions: (1) What are Jamaican root tonics? (2) Why do Jamaicans drink root tonics? (3) Where did the tradition of making root tonics come from (who developed this tradition)? (4) Who is especially knowledgeable about root tonics (5) What is the profile of an artisanal root tonic producer? and (6) What should a roadmap to a socially just Jamaican root tonics cottage industry look like?

MATERIALS AND METHODS

Ethnobotanical Survey, Interviews, and Participant Observation

Prior to fieldwork, we developed a survey instrument (questionnaire) and a verbal consent form, and obtained permits for fieldwork, including ethics review approval from The University of The West Indies, Mona, and a research permit from the National Environment and Planning Agency (NEPA) in Kingston that specified the terms for collection and distribution of botanical specimens.

At the beginning of fieldwork, we first approached communities across the island through our network of contacts, explained the project and its research objectives, listened to their opinions, and waited for their expression of interest in the study. Upon receiving positive feedback, we planned a visit, stayed in the community for several days to conduct interviews, guided by a local community member, who also facilitated the recruitment process and recommended potential interviewees. To acknowledge the important contribution of these local



collaborators to the success of this project, they are co-authors on this paper.

Before each interview, we explained the goals of the project and asked for the participant's verbal, free and prior-informed consent (FPIC). Written informed consent was obtained for **Figure 2**. We conducted face-to-face interviews in Jamaican Patois, with the interviewer asking survey questions and recording the answers on paper or a laptop. To protect their identity, study participants received a number, nickname, or initials on the questionnaire, unless they explicitly gave their permission to be acknowledged for their participation in the project. For the purpose of this scientific paper, data of all study participants was anonymized. Our questionnaire contained 23 questions that pertained to five sections: (1) Definition and use-patterns of root tonics; (2) free-listing of plant ingredients of root tonics; (3) preparation of root tonics; (4) opinions about root tonics; (5) socio-demographic information of participants.

In total, between February 2018 and May 2019, we interviewed 99 people, 88 men and 11 women, across five parishes (**Figure 1**). The lower number of women reflects the gendered nature of plant collectors and root tonic producers that is skewed toward men. The age of study participants varied from 26 to 88 years, with an average (\pm STDEV) of 59 ± 13 years. Most people (63) were farmers, seven persons were retired; other professions included vendor (7), herbalist (6), mason or construction worker (6), "roots man" who prepares and sells roots (5), while one or two people reported other occupations, such as fisherman, cane cutter, artist, steelworker, higgler, shoemaker, dressmaker, musician, artist, security guard, or taxi driver.

Data Analysis of Ethnobotanical Interviews

Interview answers from all 99 participants were entered and organized in an Excel spreadsheet. Column headings consisted of variables (gender, age, occupation, religion, number of plants reported...) or survey questions, while rows and cells contained individual answers from participants (see **Supplementary File**). The formatted Excel spreadsheet was imported into Atlas.ti, and four central interview questions were coded for qualitative analysis: Q1-Definition (what is a root tonic?), Q2-Motivation (why do Jamaicans drink root tonics?), Q3-Origin (where does this tradition come from?) and Q4-Knowledge keepers (who is especially knowledgeable about root tonics?). After several rounds of careful reading through all interview answers, we identified and assigned 23 codes, based on the recurrence of verbatim terms that were expressed in answers from interviewees to these open-ended questions (**Table 1**). Next, Atlas.ti 8.4 was used to explore relationships between these codes through co-occurrence tables and visual networks.

Creating a Road Map for the Sustainable Development of Root Tonics

Based on the responses from interviews, we developed four central questions to assist in creating a road map for the sustainable development of a cottage industry for root tonics, as follows: (1) What is our definition of sustainable development? (2) What are the steps that a traditional, small-scale root tonic producer can take to develop and scale-up their production in the informal and formal sectors? (3) How can a traditional root tonic be improved upon for sale to the general local population? (4) How feasible is it to suggest a cottage industry; what would



FIGURE 2 | Collecting roots and lianas (called “wiss”) of various wild-harvested plant species to prepare root tonics in St. Thomas parish, at the fringes of the John Crow Mountains, 3 days before the full moon (photo credit IV).

be the ideal socio-economic situation for traditional root tonic producers in Jamaica, and how might this scenario be realized in the future? After developing further sub-questions and grouping these thematically, we determined that the major topics to be researched further were the current industry environment, marketing, traditional knowledge, culture, and health.

We based the definition of sustainable heritage development used in this paper on the results of a review of the literature. To find journal articles, we searched Google scholar and EBSCOhost using the keywords “ethnobotany,” “ethnobiology,” “culture,” “rooibos,” or “traditional knowledge” and “sustainable development,” as well as “cultural sustainability.” Rooibos was used as a search term as an example of a plant species that has specific geographical origins and is used in a beverage with established cultural significance to the people of the region in which it is cultivated.

We then defined the goals of the roadmap and used interview responses, direct (participant) observation of

Jamaican society, its culture and economy, and research into the resources available to informal micro enterprises to identify barriers that artisanal root tonic producers might face. Internet searches were performed to identify the relevant public and private sector authorities and resource-providers in the areas where support is needed, and a review of each of the relevant entities’ websites was conducted to identify what resources, publications, training, and support are being offered to the micro, small and medium enterprise (MSME) sector, particularly for micro enterprises in the agro-processing sector.

The level of production and the sales environment gleaned from the survey results were used to determine the assumed starting point for the root tonic producer to be a home brewer with sales scattered throughout the year, with production being limited to usually a 5-gallon batch of tonic sold over several weeks to mostly people within the producer’s social network. Based on this assumption, we determined what resources would be available, and sought attainable strategies to improve

TABLE 1 | After reading multiple times through the interviews, search query terms were identified based on their recurrence, and subsequently used to conduct additional searches to cover all interviews.

Code (# of quotations)	Search query terms grouped under code
Africa (42)	Africa*
Amerindians (9)	Arawak, Taino, native*
Aphrodisiac (37)	Nature, sperm, sex, impotence, love
Bitters (3)	Bitter*
Black people (12)	Black people
Body (69)	Bones, structure, joints, system, circulation
Build strength (105)	Build, strong*, strength*, power, nourish, fit, gym
Cleanser (33)	Cleanse*, purge, flush, wash, blood
Cure sickness (67)	Health, pain, infection, ailment, cure, disease, ill*, sick*, gas, medic*, stomach*, sickle cell, prostate, heart
Drink (27)	Wine, liquor, draft, drink, ale, product, beer, elixir
Elders (56)	Elder*, older, ancestor*, ancestral, foreparents, forefathers, generations, grandparent*, parent*
Energy (50)	Stamina, energy, energetic, weak*, down, revitalize, lazy
Herbalists (11)	Herbalist*, bush doctor*
Immune system (6)	Immune system
Maroons (31)	Maroon*
Nature (55)	Natural, jungle, earth, hills, soil, forest, woods
Nerves (27)	Relax*, stress, calm, nerves
No one (10)	No one
Plant combination (46)	Bark, leaf, vine*, herb*, wood, plant*, bush, root*
Rasta (63)	Rasta*
Slavery (20)	Slave*, plantation, resistance, surviv*, self-reliance
Spiritual (17)	Creation, God, religion, religious, vision*, spirit*, Lord, bible, Christianity, Revival*
Tradition (36)	Cultur*, history, heritage, roots, ancient

Related verbatim terms (found in answers from participants to open-ended questions during interviews) were grouped together as codes. The total number of interview quotations associated with each code is given in brackets. An asterisk represents a wildcard symbol to broaden the search (e.g., cultur will search for culture and cultural).*

this producer's situation, with steps that can be taken within the informal economy until the producer feels empowered to formalize their root tonic business. The identified barriers were used to create a road map that would seem manageable, and culturally acceptable, to the average producer. Currency conversions to USD in this paper use a conversion rate of \$1 USD to \$148.74 JMD, the rate available on August 12, 2020.

RESULTS

Individual interview answers to a selection of the survey questions and psychosocial data can be found in the **Supplementary File**.

What Are Jamaican Root Tonics (Q1-Definition)?

In their answers to this question, Jamaican participants emphasized a root tonic's strength-building quality as a drink made of a combination of plants that supports and cleanses the body, cures sickness, provides energy, and settles the nerves. **Table 2** shows the recurrent use of these terms by their counts in quotations, as well as their associations with four questions (Q1 to Q4) through the C-coefficient that varies between 0 (no association) and 1 (perfect association) (**Table 2**).

The number of plant species used in root tonics varied between 4 and 55, with an average of 15 ± 8 (STDEV) plants. Persons who prepared root tonics used the roots, bark and whole chopped liana parts of these species, and for some also the leaves, all of which needed to be dried before use. Several producers stated that it was important to work with plant parts that were fully dried, or that otherwise the tonic would spoil. In colloquial language, a root tonic is often referred to as "roots." According to **Table 2**, root tonics are not considered bitters, with only three people mentioning this term, of which one person explicitly clarified that "bitters is not a roots" (MT3, male, age 60). In addition, the difference between a tea and a root tonic was also explained as follows: "[It depends on the] amount of different things you put in it, for a tea [you] just [put a plant like] sarsaparilla, ramoon, chainey root. For a tonic you put more things, 20 different something, bark and roots" (Windsor Forest-1, male, age 62).

The preparation of a root tonic is a time-consuming process that involves the collection, drying, and boiling of various plant ingredients in water, after which the decoction is cooled, strained, and bottled. The whole process from collection to finish can take several weeks, or even months. Most participants reported collecting plants during a specific moon phase, often three days before or three days after the full moon, when the moon is considered strongest (**Figure 2**). Important plant species used in root tonics, notably vines and roots, are wild-harvested in forests and other remote ecosystems that are difficult to reach and require long collection trips on foot. The botanical diversity of root tonics falls outside the scope of this paper and will be addressed elsewhere, but two of the most popular species across the five study areas were lianas of the genus *Smilax*, belonging to the Smilacaceae: Chainey root (*Smilax canellifolia* Mill., illegitimate synonym *Smilax balbisiana* Griseb.), and sarsaparilla (*Smilax ornata* Lem., synonym *Smilax regelii* Killip and C.V.Morton). The plants are usually dried naturally in direct sun or shade, over several days or weeks (**Figure 3**). Each person has their own specific recipe, which we did not record during interviews, out of respect for, and to protect, their intellectual property rights (IPR). The general process for preparing roots involves boiling the plant mixture over several hours, traditionally over firewood, after which the liquid of the "first boil" may be decanted and either finished at this stage, or new water is added, and the whole process repeated (**Figure 4**). Then this liquid is added to the previous, and the preparation is left to cool. Next, it is bottled (**Figure 5**) and put down in a cool place for a month or longer, which is described as "curing."

TABLE 2 | Quotation counts and strength of association (measured as the C-coefficient) between each code and four interview questions (Q1-Definition: What are Jamaican root tonics? Q2-Motivation: Why do Jamaicans drink root tonics? Q3-Origin: Where does this tradition come from? Q4-Knowledge keepers: Who is especially knowledgeable about root tonics?).

Codes	Q1-Definition Gr = 98		Q2-Motivation Gr = 97		Q3-Origin Gr = 92		Q4-Knowledge keepers Gr = 94	
	Count	C-coeff.	Count	C-coeff.	Count	C-coeff.	Count	C-coeff.
Build strength Gr = 105	55	0.37	46	0.29	3	0.02	1	0.01
Plant combination Gr = 46	36	0.33	5	0.04	5	0.04	0	0
Body Gr = 69	38	0.29	28	0.20	3	0.02	0	0
Cure sickness Gr = 67	35	0.27	28	0.21	3	0.02	1	0.01
Energy Gr = 50	29	0.24	20	0.16	0	0	1	0.01
Cleanser Gr = 33	19	0.17	14	0.12	0	0	0	0
Drink Gr = 27	17	0.16	7	0.06	3	0.03	0	0
Nerves Gr = 27	15	0.14	12	0.11	0	0	0	0
Aphrodisiac Gr = 37	12	0.10	24	0.22	0	0	1	0.01
Nature Gr = 55	12	0.09	10	0.07	16	0.12	17	0.13
Immune system Gr = 6	4	0.04	2	0.02	0	0	0	0
Bitters Gr = 3	3	0.03	0	0	0	0	0	0
Elders Gr = 56	1	0.01	4	0.03	30	0.25	21	0.16
Tradition Gr = 36	0	0	8	0.06	21	0.20	7	0.06
Slavery Gr = 20	0	0	3	0.03	17	0.18	0	0
Africa Gr = 42	0	0	2	0.01	39	0.41	1	0.01
Maroons Gr = 31	0	0	1	0.01	17	0.16	13	0.12
Spiritual Gr = 17	0	0	1	0.01	12	0.12	4	0.04
Rasta Gr = 63	0	0	1	0.01	14	0.10	48	0.44
Amerindians Gr = 9	0	0	1	0.01	8	0.10	0	0
Black people Gr = 12	0	0	1	0.01	7	0.10	4	0.04
Herbalists Gr = 11	0	0	1	0.01	5	0.10	5	0.05
No one Gr = 10	0	0	0	0	0	0.10	10	0.11

Gr (groundedness of a code): Number of interview quotations associated with this code; C-coefficient (varies between 0 and 1): Indicates the strength of the relation between two codes (the higher the coefficient, the stronger the association between the codes). Bold numbers are those with a C-coefficient greater than 0.10.

Several persons noted that in the past, the bottles were often buried under the earth to keep them cool and slow down the fermentation process which prevents the glass from bursting. Ingredients that can be added as a preservative to keep a root tonic from spoiling included burned sugar, molasses, honey, wine, or rum. A root tonic can be consumed directly as a shot from the bottle, or as a punch by combination with some of the following ingredients, such as condensed milk (or coconut milk sweetened with honey), Irish moss, rum, Dragon Stout, or Guinness beer.

Jamaicans tend to consume root tonics in a shot glass in the morning and/or evening, especially when they need energy, or to relax the mind. When asked whether men, women, and children all drink root tonics, 84 people (85 percent) answered “everyone,” whereas 11 people said “only adults,” 2 people “mostly men,” one person said it depended on the type of root tonic, and another person did not answer the question. However, 30 people specified that children should only drink a small amount, measured as one or two spoonfuls, or that their root tonic should be diluted with water. Three people added that root tonics should not be consumed by pregnant women.

Why Do Jamaicans Drink Root Tonics (Q2-Motivation)?

It was not until interview participants were asked about reasons for drinking root tonics that their role as an aphrodisiac beverage came to the forefront. Other important functions, such as strengthening, building and cleansing the body and blood, curing sickness, providing energy, and settling the nerves had already been emphasized previously in response to the question “What is a root tonic?” The strength-building capacity of root tonics was associated with working hard (9 answers), as the following quotes illustrate: “It help[s] when we work. It build[s] energy in your body, give[s] you a stronger mindset. Your system feel[s] different, you [don’t] feel pain” (Windsor Forest-1, male, age 62), and “It make[s] you stronger, [when you do] hardcore work, you [don’t] back down, [when you] lift weight, [it is] good for [your] backbone, [it] strengthen[s] your back” (Windsor Forest-5, male, age 61).

We identified at least seven functions of root tonics from the interviews, which complement and/or overlap each other (Table 3). One study participant described the multifunctionality of root tonics as follows: “It has a lot of meaning[s]—a product that can help sickness, like a medicine. It has a lot of



FIGURE 3 | Roots and bark are chopped and dried naturally in the sun (photo credit IV).

different things, substance" (St. Thomas-6, male, 56 years). When Jamaicans mentioned the word "bush" during interviews, they referred to several possible meanings: Any plant, a specific plant species, a specific natural area or forest known to both people who hold the conversation, or any (unspecified) wild natural place.

Where Did the Tradition of Making Root Tonics Come From (Q3-Origin)?

In their answers to this question, study participants emphasized the Africa connection (39 quotations, **Table 2**). They described root tonics as a tradition with deep spiritual and natural connotations passed on by African elders, who endured the brutal hardships of slavery. Several people referred to Creation, God, visions, or a spiritual origin. Someone said: "Older head people, them maybe learn it from the Spirit. Some people recognize it spiritually, the bush become[s] like a spiritual thing, a living soul, them [plants] have their own purpose" (Windsor Forest-7, male, age 66). Another participant stated: "African[s] – our history, they come here, a lot of beating and harassment that we [were]

getting, we just go [in the] woods and find some bush to keep strong" (South Manchester-9, male, age 56). A third person said: "That come from slavery when the white man take away the medicine, and they [the Africans] have to seek their own medicine to stay alive. They try it out and feel nice, and then tell them bredren [friends]" (Windsor Forest-13, male, age 64). Someone else explained: "Slaves, they never got good food from white slave masters so they consumed the roots" (Kingston-9, male, age 62).

Interview answers showed African agency as an act of resistance to slavery instead of passive endurance, with several people associating root tonics with the Maroons who freed themselves from enslavement, and who engaged in sophisticated guerrilla warfare and revolts against the British colonizers to maintain their freedom, while living deep in the Jamaican mountains where they thrived, as the following three quotes illustrate: "The Maroons are the first to release themselves and go into the hills. I always said my ancestors is from that group of people and that is where I get that nature from" (St. Thomas-8, male, age 64). "The Maroons ran away and survived in the forests and they started the tradition [of boiling root tonics]. But their knowledge



FIGURE 4 | Preparation of a root tonic showing boiled plant ingredients after decantation of the liquid. Often, depending on the producer, new water is added for a “second boil.” This process can take several hours to an entire day (photo credit IV).

originated out of Africa. They tapped into the knowledge in order to survive” (St. Thomas-10, male, age 61). “Maybe [it came from] the Maroons – them [are] a rough people, they fight wicked” (Windsor Forest-16, male, age 53). Eight people also referred to Amerindians, postulating that the original inhabitants of the Caribbean islands may have exchanged their knowledge with Africans: “It start[s] from how you learn it, the traditional people, from the Tainos them, the Indians them, they was here first. From Cuba most of them spring from. Because we [Africans] come after the Taino, find out the knowledge, and pass it on the same way” (Maroon Town-9, male, age 67). “It is an African tradition. [The] Arawak (Taino) [are the] medical experts in South America and teach the Africans as a slave. All top herbalists are Indian people (Arawak). After Africans become enslaved, them mix together” (Windsor Forest-8, male, age 45).

Several of these and other answers also highlight the continuing relationship that exists between the use of root tonics and resilience as a people, dynamically finding and employing solutions to respond to, and overcome, adversity and stress, from

the past into the present: “In Jamaica, when people escape[d] from plantation without medication, fi [in order to] build up fi dem [their] body, they test these things [bush, plants] and combine them until they find the good ones. Even today, if you mix two bush and test them, you can tell if this [is] good fi [for] you” (St. Thomas-7, male, age 60). “[Jamaicans drink root tonics because they] can’t afford doctors. Self-reliance, [they] drink [it] and feel much better” (St. Thomas-10, male, age 61). “That thing [root tonics] gi we [gives us] resistance; when you work and you naah [do not] feel energy, you slow, you say yah man [yes man], me boil some roots. Your performance [will be] better” (Windsor Forest-1, male, age 62). “When you come from work and you stress, you can drink [a root tonic]” (South Manchester-1, male, age 65).

Who Is Especially Knowledgeable About Root Tonics (Q4-Knowledge Keepers)?

Half of all study participants (50 people) mentioned Rastafari as persons who are especially knowledgeable about root tonics



FIGURE 5 | The final artisanal product is stored in recycled bottles of rum (or occasionally other types of bottles, such as wine or Campari), often with their original labels (photo credit IV).

(**Supplementary File**), and 43% self-identified as Rastafari when asked about their religion. The following quote links “roots,” a term that represents both the physical roots of plants that grow in the earth and the cultural roots from the ancestors, to Rastafari and other Jamaicans who believe in nature and culture as a way of life: “It [knowledge about root tonics] is coming from the ground (roots, ancestors). Rasta, it come[s] back to the people who are building roots. You don’t have to be a Ras [Rastafari], if you believe in your roots. [It is a] way of life. Ras may be living in the hills, but [they are] eating the right stuff, not using too much fertilizer [chemical pollutants]. They stick to the roots” (St. Thomas-6, male, age 56).

Elders were considered another important group of knowledge holders. Having a strong connection with nature, or living in the hills (17 quotations), which are associated with the lifestyle of the older generations, Maroons, and rural Rastafari,

came to the forefront in answers to this question (**Table 2**). The following quote illustrates this: “Rasta and Maroons, [you] cannot leave out the Maroons, enough things Rasta learn from them. Rasta keep this thing alive, the roots tradition and natural living tradition. Rasta [are] drawn to naturality and Rasta [are] no[t] quick [to] go [to the] doctor” (St. Thomas-7, male, age 60). On the other hand, ten people also replied that not one specific group was especially knowledgeable and said that root tonics are prepared by Jamaicans across Jamaica.

What Is the Profile of an Artisanal Root Tonic Producer?

Almost everyone (97 of 99 people interviewed) drank root tonics, whereas the number of people who reported preparing, collecting plants, and selling root tonics was 87, 84, and 61,

TABLE 3 | Complementary and/or overlapping functions of root tonics, and relevant associated quotations selected from interviews with 99 Jamaicans in five parishes.

Function	Verbatim quotations (name of parish-participant ID #, gender, age)
An enjoyable fermented natural beverage, called wine, beer, draft, or liquor that “tastes good”	<p>“Roots is a tonic from the earth, it make[s] you feel strong, one of the best liquor to me. You have to reap so many things that it becomes a tonic” (South Manchester-9, male, age 56).</p> <p>“All kind[s] of things from the earth. It tastes like wine” (St. Thomas-2, male, age 60).</p> <p>“The older generation bury it [the root tonic] because the dirt is cool and the roots are powerful, [you have to] cool it down to counteract fermentation” (Windsor Forest-18, male, age 52).</p>
Strength-builder, body (and blood) cleanser	<p>“It is a body building tonic for your body. It make[s] you kick it like you [are going to] a gym. [It] build[s] your body, Jamaican man don’t go to the gym, them gym is in the hills and them drink [] roots (South Manchester-8, male, age 60).</p> <p>“The roots are very strong to take them out of the earth. You have to dig and fight it, the chainey root. We feel it, we see it, and we know it is natural. A Jamaican see a roots man selling it and him just can’t pass it, him see the strength and him body call him to it” (St. Thomas-7, male, age 60).</p> <p>“[A] root develop[s] from [the] ground and it [is] strong, me work with that strength. Chainey root, it [is] hard to come out. Same way it work[s] in your system” (Windsor Forest-16, male, age 53).</p> <p>“[It] clean [the] blood, good for pressure, headache, cold. [It] clean you out and build you” (St. Thomas-15, male, age 61).</p>
Medicine (for general health and specific health problems)	<p>“It is a natural medicine for almost all sickness. We can pinpoint the sickness for high blood pressure, diabetes, respiratory condition, blood circulation. A tea is one bush, roots is a combination of bushes, barks. I sell right through the year, some people order, [it] depends on the type of sickness” (St. Thomas-7, male, age 60).</p> <p>“[It is] used as an “all in one” for people who want to be healthy. Tackle several ailments in one bottle, e.g. impotence, back and joint pain, nerves, circulation problems, prostate health – even cancer” (Maroon Town-16, male, age 44).</p>
Energy drink	<p>“Root tonics is like when you pour gas in your car engine” (St. Thomas-4, male, age 56).</p>
Mood enhancer (to settle the nerves, relax, feel good)	<p>“A roots tonic is something to build, put in certain energy, when you feel down or weakness, [when your] nerves [are] not so good, you prepare some roots, like sarsaparilla” (Windsor Forest-13, male, 64).</p>
Prophylactic (that stimulates the immune system, fights off diseases)	<p>“Power. It give[s] you power for the lady, and build[s] your immune system, you get healthy children. When your body [is] strong, sickness [cannot] take you easy” (South Manchester-10, male, 58).</p>
Aphrodisiac that guarantees reproductive success (sex drive, sperm count)	<p>“Cleanser for the blood, aphrodisiac, build nature. Most men lose potency/nature and roots help to build it back” (Kingston-14, male, age 71).</p>

respectively. Six persons who sold root tonics (10%) did not collect the plant ingredients themselves; they were all vendors in the capital, Kingston. However, everyone who sold root tonics also prepared them. Root tonic makers and vendors self-identified predominantly as Rastafari, adhering to a natural lifestyle (40 people), whereas 25 people reported to be Christian, 19 stated no religion, two did not want to answer this question, and one person declared to be Zionist. These producers and vendors were predominantly male (78 of 87 people), middle aged to senior (average age of 58 ± 13 years), and embedded in a social network of family and friends who follow the tradition of “boiling roots.” However, six study participants who sold root tonics were younger than 40, with the youngest being 26 years. Producers learned about root tonics from multiple, complementary and overlapping, sources, including: Elders in the community and other relatives (36 people), parents (32 people), grandparents and great-grandparents (28 people), traditional specialists such as roots men, herbalists, bush doctors, and Maroon mothers (11 people), God, visions, and spirituality (5 people), friends, referred to as “bredren” (5 people), books (5 people), experimentation (4 people), health stores (1 person), the internet (1 person).

The occupation of root tonic producers consisted of farmers who “trot the hills” (in rural areas; 53 of 68 people), market or street vendors (in the capital; 7 of 19 people), and sometimes herbalists or “roots doctors” (11 of 87 producers). They were local producers who operated in the informal sector, without established businesses or products that have been packaged for commercial sale. Root tonics were sold directly from the producer’s home, roadside stalls, small community shops, or more structured market stalls. Occasionally, the artisanal producer will travel to deliver products directly to consumers or to sell their product at festivals, other events, or on the street. The majority of vendors reported selling their product to locals (56 people). Of these, less than half (22 people) also sold to tourists, foreigners, and visitors. Just four persons said they only sold to the latter group.

The Future of Roots: Toward Developing a Road Map for a Root Tonics Cottage Industry

Using the four pillars (economic, ecological, cultural, and social) of sustainable heritage development, we identified the following key considerations and action points in preparing a road map for a root tonics cottage industry, while also pinpointing potential barriers that producers and this cottage industry might face (Figure 6).

Economic Pillar

The main consideration identified under the economic pillar is that traditional root tonic producers need to be able to bring in a reasonable level of income for a fairly-priced product over the long-term. The size of repurposed bottles is generally either 200 ml or more commonly 1 liter. Prices per one-liter bottle range from \$1,500 to 2,000 JMD (\$10.09 USD and \$13.45 USD, respectively) in Kingston and \$1,000 to 1,500 JMD (\$6.72 USD and \$10.09 USD, respectively) in rural areas at the time of research, with \$1,000 JMD (\$6.72 USD) for a one-liter bottle

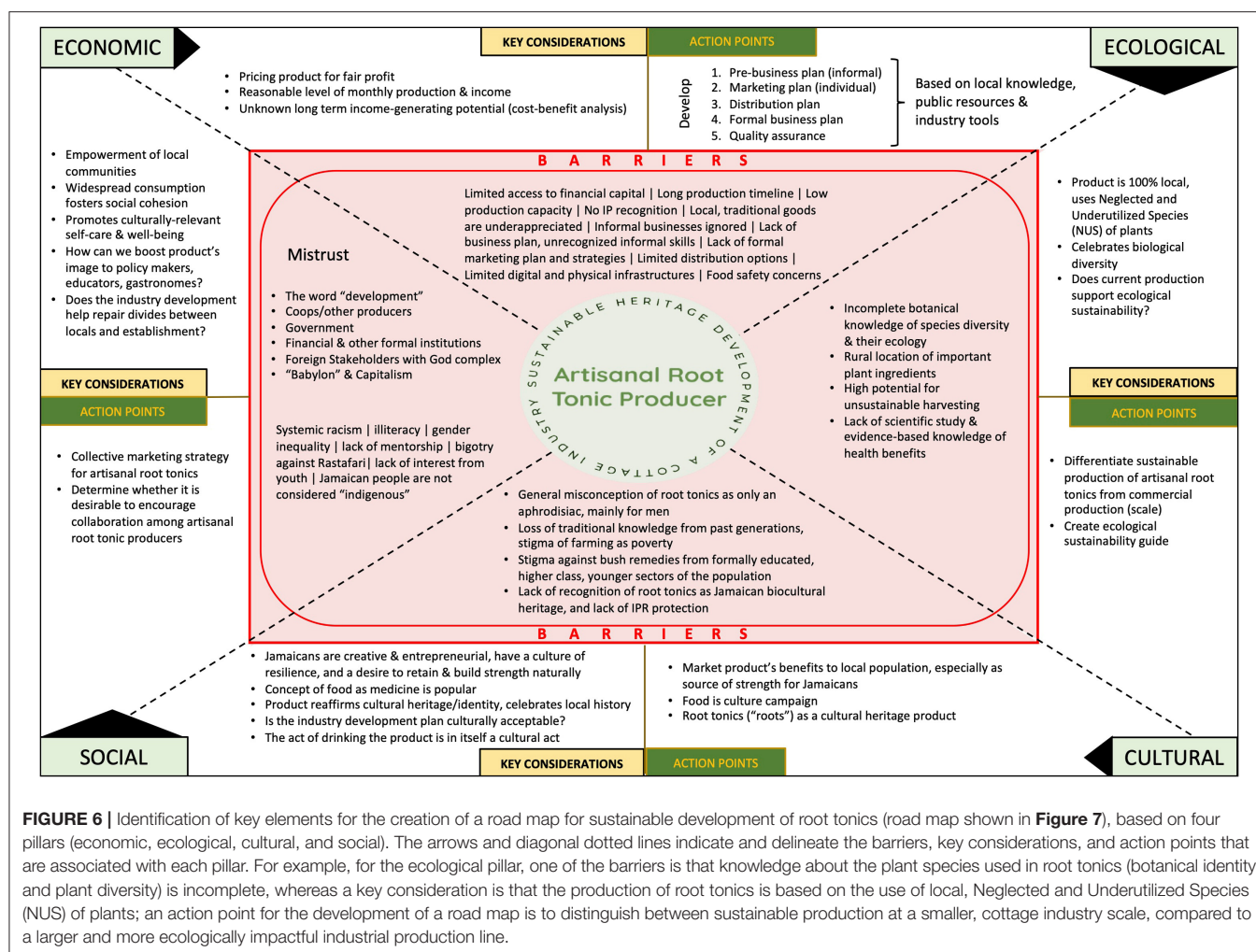


FIGURE 6 | Identification of key elements for the creation of a road map for sustainable development of root tonics (road map shown in **Figure 7**), based on four pillars (economic, ecological, cultural, and social). The arrows and diagonal dotted lines indicate and delineate the barriers, key considerations, and action points that are associated with each pillar. For example, for the ecological pillar, one of the barriers is that knowledge about the plant species used in root tonics (botanical identity and plant diversity) is incomplete, whereas a key consideration is that the production of root tonics is based on the use of local, Neglected and Underutilized Species (NUS) of plants; an action point for the development of a road map is to distinguish between sustainable production at a smaller, cottage industry scale, compared to a larger and more ecologically impactful industrial production line.

being the modal price for those producers who reported pricing. Artisanal producers who commented on batch volume generally indicated that a regular batch was around 5 gallons. Several of the producers interviewed said that they produced batches of root tonics only sporadically throughout the year, or to order for customers, and did not have a steady supply that was ready for sale.

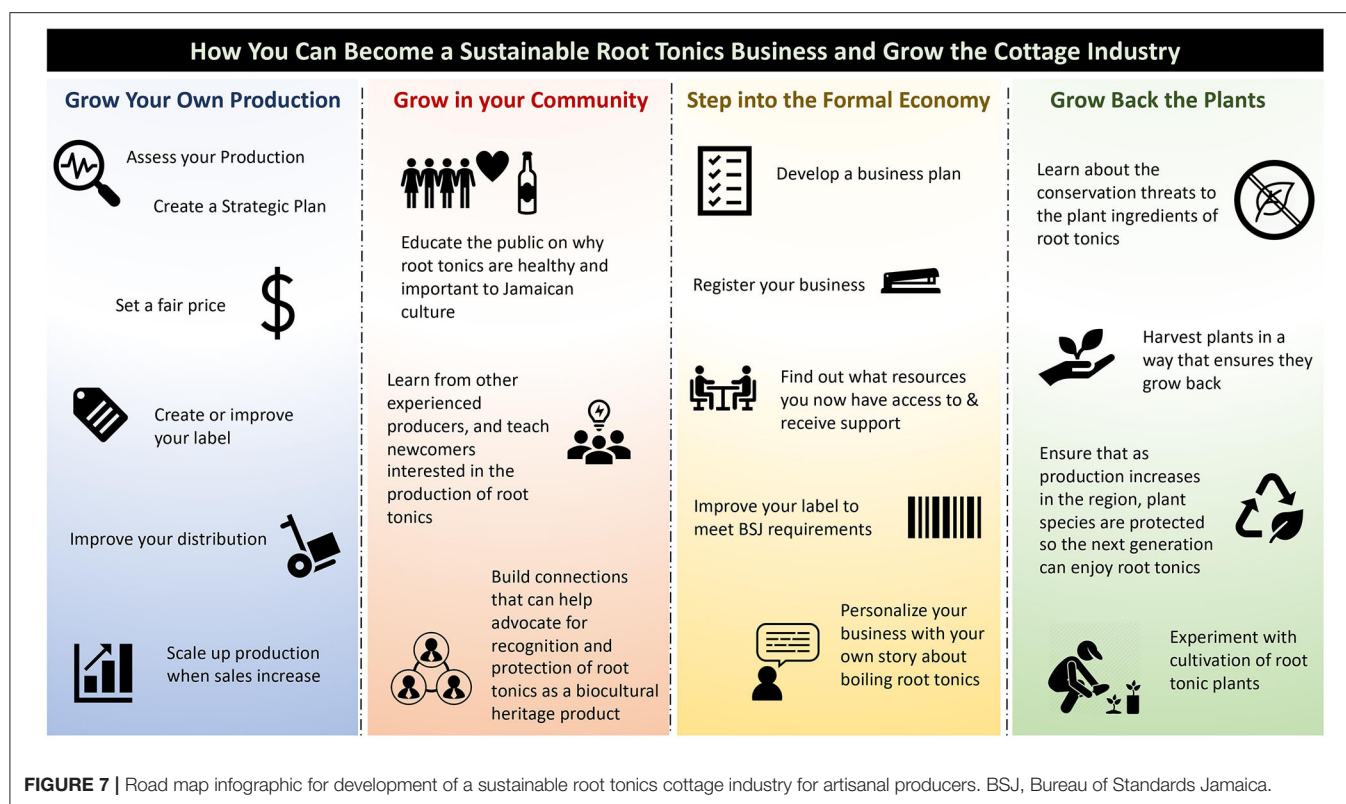
While the goal is to ultimately have a cottage industry that operates in the formal sector, a road map will need to meet producers where they currently are in the informal sector. It will need to help them to use their own local knowledge paired with formalized training via public resources and industry tools that equip producers with what they need to enter the formal sector. There exist several economic barriers to traditional producers developing their own production lines, most significant of which is the lack of, or limited access to, resources such as business training and financial capital for producers operating outside of the formal sector. Other barriers include a low production capacity with a lengthy timeline, lack of IPR recognition, food safety concerns, a general underappreciation for traditional products, limited marketing and distribution options and strategies, and limited infrastructure.

Ecological Pillar

A key consideration here is that root tonics are biodiversity-based products, which depend on the integrity of ecosystems. In order for a road map to help ensure that an increase in production of traditional root tonics will continue to support ecological sustainability, there should be a market differentiation between commercial and artisanal products. Major ecological hurdles that artisanal producers of traditional root tonics face include incomplete botanical knowledge of the plant species used, including about their diversity and ecology; lack of evidence-based knowledge on their health benefits; hard-to-reach locations of the wild plant species used; and a high potential for unsustainable harvesting methods with a significant increase in production.

Cultural Pillar

Given the cultural importance of root tonics, a road map will need to ensure that the cottage industry development is culturally acceptable, both for traditional producers and for consumers. In order for this to be most effective, a deeper understanding of the benefits of root tonics as a cultural heritage product will need to be developed within the local market. Current barriers



to continuing and growing root tonics' acceptance as a cultural product include the general misconception that it is only an aphrodisiac, a loss of traditional knowledge on the beverage's production as compared to past generations, and local stigmas against farming and bush remedies.

Social Pillar

One of the central social considerations in developing a sustainable road map for a root tonics cottage industry is the empowerment of local communities. Currently, there exists a significant divide between locals and the "establishment," and a general mistrust on the part of locals toward each other, government, formal institutions, and capitalistic ideas of development and progress. Systemic social barriers for root tonic producers include racism, classism, and gender inequality. These co-exist with more specific social barriers, such as a lack of mentorship, a lack of interest from the younger generation, and a lack of protection by any social classification such as "indigenous" that might bring with it the right to maintain traditional knowledge and traditional cultural expressions as intellectual property (IP). A road map should consider whether it is desirable to encourage collaboration among producers, and how this should be facilitated. Also, it is necessary to reflect on how an industry marketing strategy might boost the image of traditional root tonics to policy makers, educators, gastronomes, and other key influencers that could help to promote more widespread consumption.

During interviews, multiple artisanal producers commented on competition from other artisanal producers, as well as commercial products that are available nationwide. In Jamaica,

we found at least eight commercial products that are being sold in supermarkets and labeled as roots, root tonics or tonic wine, namely "Baba Roots Herbal Drink," "Put It Een Roots Tonic Wine," "Pure Roots 100% Herbal Tonic," "Pump It Up Roots Tonic Wine," "Mandingo Roots Tonic Wine," "Daniel's Roots Drink," "Power Man Roots Drink" and "Hard Driver Roots Drink." These commercial root tonics are packaged in bottles ranging from 148 ml to 1 liter, with the more common size being single-serving bottles of 148 ml. Single-serving commercial root tonic bottles are generally sold for \$350 JMD (\$2.35 USD) each, a price that is \$1.36 JMD/ml (2.4 times) more expensive than the modal artisanal product with reported pricing in this study. However, none of these beverages are considered as authentic as those of the real "roots man" who sells a cultural product based on tradition. One person alluded to this during interviews, by stating that "*commercial root tonics have lost their purpose [to help] cure sickness out of your body*" (South Manchester-12, male, age 52).

DISCUSSION

Jamaican Root Tonics Have a Deep Socio-Cultural History and Their Use Tells the Story of Survival, Resistance, and Resilience

The preparation and use of complex plant mixtures made with roots and bark in the Caribbean is not restricted to Jamaica, but has been reported in the scientific literature for other islands, for example in the Dominican Republic and Cuba, where they

are popularly known as *botellas* and *galones* (Cano and Volpato, 2004; Vandebroek et al., 2010; van Andel et al., 2012). However, beyond the use of these beverages as aphrodisiacs and medicines, there is little scholarly information about their origin, perceived functions, and meanings. This may be due to a generalized lack of mixed methods approaches that combine ethnobotany with archival and/or oral history research. A study of *pru*, a fermented beverage characteristic to Eastern Cuba known there as “root champagne,” asked questions to *pru* producers, and merchants in herbal medicine, about the drink’s production, consumption, origin and history that were similar to this study (Volpato and Godinez, 2004). However, the authors noted that the literature did not offer conclusive evidence about the drink’s origin or its development over time. Interestingly, one of the plant components in *pru* was *Smilax domingensis* Willd., a species closely related to the two *Smilax* species found in Jamaican root tonics, and Cubans also considered *pru* a blood purifier (Volpato and Godinez, 2004).

The scientific literature, as well as advertisements and consumer views of commercial root tonics, have popularly described them as aphrodisiacs or bitter medicines (van Andel et al., 2012). However, this view may be too limited, since according to our study which was grounded in the informal economy, Jamaican root tonics are fermented beverages without a bitter taste profile that are consumed to sustain, strengthen, and treat the whole body, including the mind. In addition, oral history data associated with these beverages tells a complex story of survival and resistance that is deeply anchored in Jamaica’s socio-cultural past and present. Dating back to the Transatlantic slave trade and gruesome forced labor on Caribbean plantations, Africans turned to nature and herbal medicines to fend off illness and to provide much needed energy, as well as physical and mental strength to survive. Today, according to their oral testimonies, rural Jamaican farmers, facing economic hardship and carrying out demanding manual labor without much help or technological tools (Sander and Vandebroek, 2016), continue to turn to root tonics to cope with hardship.

Importantly, root tonics have complex and layered metaphorical meanings that go beyond the notion of survival. There exist parallel narratives of resilience, and of returning to, believing in, and recognizing one’s cultural roots, referring to the traditions from the past and the African continent. This paper follows the definition of resilience as “the capacity and dynamic process of adaptively overcoming stress and adversity while maintaining normal psychological and physical functioning” (Wu et al., 2013). In the case of root tonics, oral testimonies from Jamaicans described how using root tonics kept older generations alive, strong, and healthy during and after escaping from enslavement. Today, root tonics are still regarded as a product of self-reliance. Furthermore, root tonics are prepared with plant parts, including roots, for a beverage that is “rooted in tradition” (Sobo, 1993), and directly linked to cultural heritage and the ancestors. Since these tonics are considered an “all in one” by people for either obtaining or maintaining an optimal status of well-being, their use is embedded in a holistic framework of health. This framework also considers the human body as an element within the larger natural environment,

characterized by a symbolic transfer of strength from plants to humans. Study participants described some of the plants used in root tonics as particularly resistant and difficult to harvest, and they believed that these plants subsequently transferred their quality of strength to the human body when they were prepared and ingested. In addition, consumption of root tonics also represented a double symbolism of using elements of nature (the earth) to sustain sexual nature and to guarantee human procreation (Sobo, 1993). Unraveling narratives such as these offer a much deeper insight into the cultural importance of plants for people than that offered simply by an ethnobotanical inventory or tallying of plant use-reports.

Who Developed Root Tonics in Jamaica and Who Continues the Tradition?

According to the oral history data presented here, the preparation and consumption of root tonics is primarily an African tradition, which is in agreement with the literature (Volpato and Godinez, 2004; van Andel et al., 2012). In the case of *pru* in Cuba, the authors postulated that the beverage was either “invented and developed locally,” or “a tradition brought to Cuba” in the eighteenth and nineteenth century by Haitians, Jamaicans, and Dominicans, who worked in coffee and sugarcane plantations in Eastern Cuba (Volpato and Godinez, 2004). However, these authors also considered an Amerindian origin of *pru*, based on testimonies from *pru* producers, literature reports that the indigenous population in the Caribbean made fermented drinks of pineapple, and the observation that the name “*bejuco de indio*” [*Gouania lupuloides* (L.) Urb.], a plant component of *pru*, refers to Amerindian people (Volpato and Godinez, 2004). In Jamaica, Higman (2008) described how during slavery (African) sugar workers on plantations were sometimes allowed to drink sugarcane juice or “cane liquor” fermented with *Gouania lupuloides*, which is called “chewstick” (or in earlier texts “chawstick”) there, to produce a “tolerable beer.”

Several participants in our study suggested a shared African-Amerindian origin of Jamaican root tonics, recalling cultural memories that both groups lived together in Jamaica in the past. The island’s original Amerindian inhabitants, and later the Africans, have endured two waves of European colonization, first the Spanish (1509–1660), followed by the British (1655 until independence in 1962) (Picking et al., 2019). During the latter occupation, Anglo-Irish naturalist and physician Hans Sloane (1707–1725) wrote: “*The Indians are not the natives of the island [of Jamaica], they being all destroy’d by the Spaniards, [...] but are usually brought by surprise from the Musquitos [sic] or Florida, or such as were slaves to the Spaniards, and taken from them by the English*”. He specified further that the Mosquitos (also known as the Miskitos) were “*an indian people near the Provinces of Nicaragua, Honduras and Costa Rica*”. However, others have pointed out that British writers who held deep Eurocentric views and hardly ventured beyond the coastal plantations and the edge of mountains were likely simply unaware of the existence of surviving Taino or other Amerindian peoples living in Jamaica’s remote interior mountain areas (Craton, 1982; Fuller and Benn Torres, 2018).

The Amerindian influence on Jamaica's Traditional Knowledge Systems (TKS) has received very little attention thus far (see, for example, Payne-Jackson and Alleyne, 2004), and shared African-Amerindian ancestry has been a standing topic of debate and contention in Jamaica (Fuller and Benn Torres, 2018). On the other hand, one school of thought is that Maroon communities, who settled in the almost inaccessible mountains of the island's interior, where they successfully fought for independence from the British, were in touch or coexisted with surviving Taino Amerindians, who had also fled to these mountains since Spanish occupation (Payne-Jackson and Alleyne, 2004; Fuller and Benn Torres, 2018).

What remains unclear, however, is whether in the past Amerindians prepared root tonic beverages from the *Smilax* species that they collected and sold to European colonizers throughout the larger Caribbean region, including what is now Central and South America. Sloane wrote: "*I was informed that Sarsaparilla is very frequent and cheap up Rio San Pedro in the Bay of Honduras where are several Indian towns. There is brought into Jamaica great quantities of sarsaparilla, by trade with the Bay of Honduras, New Spain and Peru. It grows in all these places on the banks of the rivers, and in moist ground. The Spaniards think it makes the water of those rivers, where it grows wholesome*" (Sloane, 1707–1725). However, there does not seem to exist immediate confirmation that root tonics are an Amerindian tradition; instead these tonics seem to be associated with Afro-descendant communities, as is the case in Cuba, the Dominican Republic, Surinam, and the Guianas. In French Guiana, Afro-Guyanese soak roots and bark in rum or vermouth (Guillaume Odonne, personal communication). Also, in Suriname (and Northwest Guyana), *Smilax* roots are soaked in alcohol in bottled mixtures together with bitter plants, or boiled in water and drunk as a tea (van Andel, 2000; van Andel and Ruysschaert, 2011). Although these bottled mixtures of wood and bark are known as "Black man's medicine," the Amerindian population in Guyana collects the plant ingredients that are used by Afro-Guyanese people (Tinde van Andel, personal communication).

Literature records of Jamaican root tonics are scarce, and archival evidence about them seems non-existent. According to Sloane (1707–1725) "*[The Africans] use very few decoctions of herbs, no distillations, nor infusions, but usually take the herbs in substance*". Thus, either root tonics were not yet prepared in the eighteenth century, or Sloane was not privy to their preparation and use. Sloane did mention several fermented beverages, which he described as "cool drinks" or "diet-drinks," including "China drink" made with the two species of the genus *Smilax* that our study identified as important components of root tonics, the first a plant called China root (nowadays chainey root), *Smilax canellifolia*, and the second being sarsaparilla (*Smilax ornata*). Sloane prescribed these drinks as a regular treatment in his medical practice. He considered the Jamaican China root superior to the one Europeans imported from China, stating: "*This is used for China roots, and yields a much deeper tincture than that of the East-Indies, whence I think it much better for the purposes to which it is employed, than that which is worm eaten coming from China, although [Willem] Piso [a Dutch physician and naturalist] seems to be of another mind*" (Sloane, 1707–1725).

Sloane added that the original China root became known by "Latins" in 1535, who learned it from China merchants, and that the Arabs knew it before the Europeans. Sarsaparilla, on the other hand, was obtained through trade with the Spanish colonies in the Americas, and was described in 1570 by a physician living in Mexico. Europeans thus knew of, and used, these two species since at least the sixteenth century. However, none of our study participants hinted at a possible European contribution to Jamaican root tonics. Charles Leslie, a Barbadian writer, described in 1753 that cool drinks were also consumed by Jamaica's African population, although he did not mention any *Smilax* species: "Their [referring to Africans and Creoles] common drink is water; but they prefer cool drink, a fermented liquor made with chaw-stick, lignumvitae [*Guaiacum officinale* L.], brown sugar, and water" (Higman, 2008).

In present-day Jamaica, study participants considered Rastafari to be the knowledge keepers of root tonics. This is not surprising, given that the Rastafari movement emphasizes "returning to the (cultural) roots." Moreover, Rastafari celebrate "natural livity" (Dickerson, 2004). Root tonics embody a return to nature and natural solutions, since they are made with wild-harvested species collected far away from the potential negative influence of chemical pollutants, which Rastafari consider as one of the main causes of modern diseases (Sobo, 1993).

How Can We Improve the Local Development of Root Tonics as an Income-Generating Product for Subsistence Families?

Based on interviews conducted in five of Jamaica's 14 parishes that represent different geographic areas of the island, our study showed that root tonics are drunk, prepared and sold across Jamaica, and that Jamaicans have detailed knowledge of their ingredients and processing. According to the oral history evidence, production and consumption of traditional root tonics reaffirm Jamaican cultural heritage and identity and celebrate local history. Resilience is an important aspect of Jamaican culture, and the concept of food as medicine is very popular, as is the desire to retain and build strength naturally (Sobo, 1993). The question that remains is how these beverages can be properly promoted as a cultural heritage product to a broader audience, including policy makers and gastronomes, and developed in a sustainable way for the benefit of local communities? Although in our interviews we did not specifically ask producers if they wanted to upgrade their production and sales of root tonics, our study found that the majority of interview participants (62%) were already selling (and preparing) these tonics on their own, without receiving any form of assistance or feedback. The development of a road map for a root tonics cottage industry thus presented itself as a logical applied extension of our ethnobotanical research, in order to provide recommendations to those producers who might be interested in upgrading their production in a sustainable way, at present or in the future. Given that artisanal root tonics reportedly can be enjoyed in moderation for their alleged health benefits by children and youth as well, pursuing a more formal production through a

sustainable cottage industry could be an effective way to ensure that future generations retain access to this traditional knowledge while generating extra income.

The current informality of artisanal production is not unique to root tonics, but is common in Jamaica, where it was estimated in 2006 that the economic activities of the informal sector represented 43 percent of gross domestic product (GDP) (MICAF, 2018). The root tonic producers in this study would most likely be categorized as micro enterprises, which the Jamaican government defines as an enterprise with total annual sales falling under \$15 million JMD (\$100,847 USD) and less than five employees. The MSME sector accounts for 80 percent of jobs within the Jamaican economy and at the time of research was considered to be a priority within the Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF). However, many of the resources made available for MSMEs are only available to those businesses that are formally registered. The MSME & Entrepreneurship Policy of Jamaica incentivizes MSMEs to formalize their businesses in order to receive government and private sector support (MICAF, 2018).

It is important that any road map for a sustainable cottage industry of root tonic producers emphasizes that power and ownership need to remain in the hands of the artisanal producers, given the many barriers these producers face, and the general mistrust between Jamaican people and formal institutions in the public and private sectors (Sobo, 1993). It will be important to provide tools, resources and support to these producers, while acknowledging that the knowledge and expertise belongs fully to them. Based on this premise, the initial road map we developed (Figure 7) should be viewed as a suggested starting point for a cottage industry that has not yet been established, but in which the waypoints, and therefore the map itself, will inevitably change as the industry develops and the socio-economic situation in Jamaica changes over time.

Growing Production

A recent study showed that the impact of soft skills training for entrepreneurs in Jamaica was somewhat positive over only a 3 month term, and only for men (Ubfal et al., 2020). However, the study suggested that business training for small enterprises may be more effective if it is specific to the business, encourages a proactive mindset, has hands-on training, focuses on personal initiative, includes SMART (Specific, Measurable, Attainable, Relevant, Time-based) goal setting training, addresses innovation, efficiency, and resilience, and is followed up by mentorship. Training of this type should be provided by the public sector for businesses operating both formally and informally so that the cost is approachable to entrepreneurs at all levels.

In order to increase production, each producer will need to first complete a cost-benefit analysis, i.e., they will need to assess their current levels of production in terms of revenues and other benefits, direct expenses and other costs, production quantities and timelines. Doing so will allow for a known starting point from which producers can identify goals and track progress. Once this analysis has been completed, a simplified strategic plan that

addresses the strengths, weaknesses, threats, and opportunities of the business with immediately actionable steps can be developed.

It is important that the price of artisanal products reflects the time it took to produce the product, as well as the higher than average number of plant species ingredients used as compared to the industrial products on the market. Comparatively, the mean number of plant ingredients for artisanal products was 15, as compared to 9 for the sample commercial products. Given that the commercial products are currently priced higher than artisanal ones, there is room for artisanal producers to increase their price to some degree.

For artisanal production, glass bottles of varying sizes are repurposed from a prior commercial product, usually alcohol-based, and are filled with the producer's root tonic. The original alcohol's label is either left on the bottle, or removed and not replaced with a new label for the root tonic. Jamaicans tend not to purchase food products unless they are confident of the safety of the food. Consumer confidence in the Jamaican market is something that can be established via purchasing from someone within your social network, and/or purchasing products from established businesses that have clear, detailed product information, including batch code, full list of ingredients, company information, and best by or expiration date.

Since many root tonic producers operate within the informal sector, they do not use the labeling requirements set out by the Bureau of Standards Jamaica (BSJ). As a prerequisite toward expanding their distribution network, producers should strive to create a label for their products that indicates information about the producer, a list of main or common ingredients, how the product should be used, and how to store and consume the product. Producers should also consider their background story: What makes their root tonic special and why do they brew root tonics? Adding a label with these details will increase competitiveness by allowing producers to tell their stories without being physically present at the point of sale, which in turn will allow producers to expand their distribution channels.

Once a producer is ready to enter the formal sector, they will need to ensure that their label is compliant with the requirements indicated by the BSJ. A finished product from a formalized business that abides by food safety regulations can attract a higher price due to the consumer confidence that is gained when they have awareness of product ingredients and that safety protocols are being adhered to.

Distribution in Jamaica is difficult for any producer who lacks access to a vehicle, funding for transportation costs, and/or road infrastructures surrounding their production location. Even for those who do have sufficient access to resources and infrastructure, transport to urban markets from rural regions can be costly and time-consuming, with no guarantee that daily sales will cover costs.

The Jamaican government is encouraging MSMEs, whether they operate in the formal or informal sector, to digitize their business. As such, MICAF is offering a free resource to MSMEs so they can create a website for themselves (Kolau, 2019). MICAF is also encouraging linkages between the tourism and agricultural sectors, and has partnered with the Ministry of Tourism to create a digital Agro-trading platform, called "ALEX," that

connects hundreds of small-scale farmers to consumers (Tourism Enhancement Fund, 2020). However, the ALEX platform is intended for farmers selling fresh produce rather than those working in the agro-processing sector. Platforms such as ALEX would be useful to artisanal root tonic producers, though it should be noted that many Jamaicans have a smartphone but do not subscribe to a data plan, so internet access is not always consistent or economically within reach.

In the short term, root tonic producers can develop their distribution channels by utilizing their community networks to find roadside and market vendors and community shopkeepers who would be willing to sell their root tonics. Products could be transported via handcart, bicycle, or motorcycle as funds allow. As sales increase, production can be scaled up by increasing the number of 5-gallon pots to increase batch size.

Growing Alliances

There is currently a misconception held by the Jamaican public that root tonics are only an aphrodisiac, for men, and there is a general lack of public awareness of the myriad health benefits of the product. Public campaigning is generally effective in Jamaica, since the population is accustomed to seeing multimedia campaigns launched by public and private sector organizations. If artisanal producers in the root tonics cottage industry could band together to create a public education campaign, it could significantly grow their potential market. Since there are limited funds available, social media platforms would be the most cost-effective tool to spread awareness. In order to differentiate the traditionally produced root tonics from industrial ones, the development and use of a visual aid such as a logo or certification mark would be helpful.

Producers can also use cultural and agricultural events to circulate information about traditional root tonics. Annual events such as the Denbigh Agricultural, Industrial and Food Show would allow producers to set up stalls to allow the public to sample, purchase, and learn about their traditional products.

Business cooperatives are not readily accepted in Jamaica, but the Government of Jamaica has identified the need for business clusters to enhance business development, competition, productivity, knowledge-sharing, marketing, and networking (MICAF, 2018). The public and private sectors will need to be creative in order to foster the spirit of collaboration, and an important first step would be to hear directly from current producers about the conditions in which collaboration would work for them, since not everyone will likely be comfortable sharing knowledge about their recipes, or process of harvesting and production. Producers will be better off if they build connections amongst themselves and with key people in the public and private sectors who can assist with advocating for recognition of root tonics as a biocultural heritage product, but this cannot be established without prior dialogue and consensus-building. Having some kind of cooperative between artisanal producers may also make it easier for these producers to achieve recognition for their traditional knowledge of root tonic production as IP. Having this IP recognition and protection would help to increase awareness of root tonics as

a cultural heritage product, encourage interest in production from newcomers, clearly demarcate artisanal and commercial products, and enhance the ability for an artisanal industry to develop in an economically sustainable manner.

Transitioning to the Formal Economy

The Jamaican MICAF has already published an infographic road map consisting of four steps to assist potential small business owners in establishing a formal business (MICAF, 2019). The first step is to develop a business plan and obtain support from the Jamaica Business Development Corporation (JBDC). The next step is to register the business at the Companies Office of Jamaica (COJ). The third step involves receiving assistance from the Jamaica Intellectual Property Office (JIPO), and the fourth and final step is to meet business standards (e.g., for labeling), with help from National Compliance Regulatory Authority (NCRA) and Bureau of Standards Jamaica (BSJ). Once a root tonic business has been formalized, additional resources will become available to the owner for business development and support, depending on various factors, such as the type of enterprise, creditworthiness, scale of operation, and length of time in business. The cost and requirements to access these resources are varied. For example, the Development Bank of Jamaica (DBJ) offers a Voucher for Technical Assistance (VTA) program to assist formalized MSMEs who have not received a voucher within the prior 2 years in closing management gaps by strengthening managerial and administrative abilities with the aim of improving creditworthiness. The DBJ subsidizes 70% of the value of the voucher, and the business owner pays the balance (DBJ, 2020).

Safeguarding Ecological Sustainability

If the cottage industry for traditional root tonics will grow in size, it will be imperative for producers to focus on conservation of plant species and the habitats where these plants grow. If established producers would be willing, they can teach newer producers to harvest in ways that ensure these species grow back, for example by hosting periodic field or “in-the-bush” workshops, taking on apprentices to whom they can transmit traditional knowledge directly over a period of time, and/or by creating reference materials for those getting their root tonic production lines off the ground. Due to the importance that newcomers to the industry understand the need for sustainable harvesting practices, apprenticeship training over a sustained period will likely be most effective in promoting the continued ecological sustainability of the cottage industry.

Currently, the majority of plant species used in traditional root tonic production are wild-harvested. Internationally, the majority of medicinal and aromatic plant species (MAPs) and non-timber forest products (NTFPs) also continue to be wild-harvested. Standards for wildcrafting MAPs and NTFPs are included within a number of existing organic management and certification programs as a means to improve natural resource management and generate higher incomes for communities. The standards for wild collected, rather than cultivated, products are different, focusing on collection activities and the way they are carried out. The aim is to ensure that the collection methods are

sustainable and do not damage the ecosystem and natural yield of the collected products (ITC, 2007).

Examples of organic management and certification programs with provisions for wildcrafted products include the National Organic Program (NOP), overseen by the U.S. (USDA (U.S. Department of Agriculture), 2020) and Ecocert, one of the largest international organic certification organizations (Ecocert, 2013).

Non-organic initiatives also address wild collection practices. The World Health Organization (WHO) published a set of guidelines on good agricultural and collection practices (GACP) for medicinal plants in 2003 (WHO, 2003). This was followed by the establishment of the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) by the Wildlife Trade Monitoring Network (TRAFFIC), World Wildlife Fund (WWF), World Conservation Union (IUCN), and the Species Survival Commission (SSC) (MPSG, 2007). Implementation of the ecological elements of ISSC-MAP were identified as a priority in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (MPSG, 2007).

In 2008 the FairWild Foundation was established to facilitate the global implementation of the ISSC-MAP standard and to ensure that wildcrafted products are produced in a socially and ecologically sound manner (FairWild, 2020).

FairWild certification requires the active participation of stakeholder groups, including local communities, businesses, academic institutions, non-profits, and government institutions. FairWild represents one of the more rigorous of a number of voluntary sustainability standards (VSS), supporting sustainable production and trade, biodiversity conservation, and resilient rural economies. Ultimately FairWild aims to reward communities who wildcraft for functioning as stewards of sensitive ecosystems (Yearsley, 2019). FairWild certification represents, perhaps, the best fit for the Jamaican root tonics industry but would, most likely, require academic grants-private sector funding to offset the inevitable cost barriers to its successful implementation.

In addition to sustainable harvesting, producers, in collaboration with scientists, can experiment with the cultivation of these wild plant species in order to encourage their growth in the producing region. It will also be crucial for producers to engage with scientists to learn more about the conservation threats to the plant ingredients used in root tonics and their natural habitats, in order to better understand the specific ways in which they can promote ecological sustainability. The Caribbean islands represent a global biodiversity hotspot with high priority for conservation, since the region has a high degree of endemic plants and animals (occurring nowhere else in the world) and their habitats face significant environmental threats from anthropogenic activities such as agricultural expansion of high-value commercial crops, wood extraction, mining, and infrastructure development. Jamaica's level of plant endemism (34%) ranks third in the Caribbean islands, after Cuba (53%) and Hispaniola (44%) (Acevedo-Rodríguez and Strong, 2008). Forest cover change has been relatively well-documented in Jamaica, including in protected areas,

and the island experienced net deforestation during 2001–2010 (Newman et al., 2018), although estimates of annual deforestation rates have been highly variable. A comparative regional paper indicated Jamaica as one of two countries with the greatest area of woody vegetation loss (minus 299 km²) between 2001 and 2010 among all countries in the Caribbean (Aide et al., 2013).

Future Research

In order to refine the road map and continue with the development of a cottage industry, additional research can include market surveys of consumer trends, population surveys to better understand the perceived health benefits of root tonics, and laboratory studies to develop an evidence base about these health claims. In addition, further comparative research is needed into current production methods and tools used by traditional producers, as well as the production cost of root tonics, and the potential cost of more efficient tools, better packaging and labeling, transportation, and distribution. Sensory analysis and taste profile comparisons between commercial root tonics and traditional (artisanal) ones will be useful to differentiate better between these two types of products. Finally, marketing campaigns can be designed to explain the evidence-based health benefits and cultural heritage value of traditional root tonics to Jamaicans living on the island and in the diaspora.

CONCLUSIONS

Root tonics are fermented beverages, not bitters, that are consumed, prepared, and sold across Jamaica. The documentation of the oral histories of these tonics shows that there exists a wealth of traditional knowledge related to their use that conceptualizes and situates the functioning and well-being of the human body within the island's natural environment and history. This data contributes much-needed insights into the intricate and layered sociocultural meanings and origin of these beverages, information that has hereto remained undocumented in ethnobotany studies, which often tend to myopically focus on plant diversity and plant uses. Our study has revealed important new perspectives of root tonics beyond their aphrodisiac qualities, as food-medicines that have supported, and continue to support, the holistic health and mind-body equilibrium of Jamaica's Afro-descendant and wider population in the past and present. The strength-building qualities of these root tonics are embedded in a narrative of survival, resistance, and resilience that dates back to the history of Transatlantic slavery. Root tonics are thus rooted in tradition, and knowledge about these beverages has been passed along by African ancestors, Maroons, and others with close access to nature who searched, and continue to search, for plants that could transfer specific therapeutic qualities such as strength to the human body in times of need. Root tonics also embody a double symbolism of using elements of nature (the earth) to sustain sexual nature. The natural lifestyle that is at the core of the consumption of Jamaican root tonics is also at the heart of the Rastafari movement and religion, and it is therefore not surprising that Rastafari, who

celebrate a return to the (cultural) roots of Jamaicans, are seen as the current knowledge holders. Future studies can examine archival ethnobotany records, to trace traditional knowledge about the use of individual plant species in root tonics over time, to learn about the health conditions these species were used for in the past, and to understand which cultural groups knew and used these plants. Untangling this complexity will help to better understand and promote Jamaica's rich biocultural heritage.

Currently, most root tonics are prepared at home and sold in the informal economy. Using the oral history data in our study as a guide, we identified key considerations, barriers, and action points for the development of a sustainable cottage industry for these traditional producers. We then designed a roadmap based on four steps: Growing production, growing alliances, transitioning into the formal economy, and safeguarding ecological sustainability. The main premise of this roadmap is that a cottage industry for Jamaican root tonics should put the concerns and benefits of small-scale, artisanal producers at the center, and recognize and honor their IPR.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The University of The West Indies, Mona. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. Written informed consent was obtained from the relevant individual(s) for the publication of any potentially identifiable images or data included in this article.

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AUTHOR CONTRIBUTIONS

IV designed the project, with input from DP. IV and DP applied for permits, coordinated ethnobotanical fieldwork, and transcribed the interviews. IV, DP, JW, MG, DS, UG, and DL recruited and/or interviewed study participants. JT conducted research into the potential for development of a sustainable Jamaican root tonics cottage industry and created **Figures 6, 7**. IV analyzed the data. IV, JT, and DP wrote the paper and received feedback from co-authors. JT and DP provided editorial assistance to the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2021.640171/full#supplementary-material>

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Foods of Oppression

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The growing recognition of food justice as an element of food studies inquiry has opened a productive vein that allows for analyzing the effects of oppression on traditional foods of Indigenous peoples. We provide a preliminary classification of food oppression by presenting several different types of foods from a number of cultures: (1) replaced and repressed foods; (2) disempowered and misrepresented foods; and (3) foods of oppression of the dispossessed. Our main argument is that these food types represent different faces of oppression and state power that, regardless of the inherent differences, have permeated diets and imaginaries in various spatial scales and, in doing so, have caused deprivation in local communities, despite being accepted in many cases as traditional food items in oppressed cultures. We conducted a systematic literature review in Scopus focusing on the traditional foods of Indigenous people and elements of oppression and revitalization. The results of our review are discussed in light of what we identify as aspects of culinary oppression. We conclude our paper by sketching the plausible first steps for redemptory solutions based on Indigenous food work aimed at reclaiming basic revalorization and revitalization.

Keywords: chefs, colonization, Indigenous, Indigenous people, revitalization, traditional

INTRODUCTION

Burnett and Figley propose the concept of historical oppression that includes the “cumulative, massive, and chronic trauma imposed on a group across generations and within the life course” (Burnette and Figley, 2017:38). They note that historic trauma includes land dispossession, warfare, and forced assimilations. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) was adopted by the General Assembly on 13 September 2007, with 144 countries voting in support, four voting against and 11 abstaining. As of 2020, the four countries that voted against have now voted to support the Declaration (United Nations Department of Economic Social Affairs Indigenous Peoples, 2020). It is not surprising that in 2007 the countries not supporting the UNDRP were Australia, Canada, New Zealand, and the United States- all four being colonial settler countries with disenfranchised Indigenous inhabitants. Settler colonial societies by their very structure were established to have permanent white settlers (United Nations Department of Economic Social Affairs Indigenous Peoples, 2020). These colonial societies engaged in confiscating Indigenous lands and privatizing them as carved up allocations to settlers. While this type of oppression is rooted in colonial history, its effects are ongoing and include continued impoverishment and marginalization, as well as everyday injustices maintained by power dynamics that tend to impose and perpetuate inequality.

Indigenous peoples have often lost vital and rich food territories, been physically relocated to marginal lands, and had their food ways unacknowledged or denigrated (Schoney, 2007; Turner and Turner, 2008). This loss affects multiple aspects of cultural heritage that interface the territorial

and material aspects of food. UNESCO (2003) identifies intangible cultural heritage as including the passing of knowledge from generation to generation, social practices, rituals, and festive events as well as knowledge and practices concerning both nature and the universe and knowledge and skills to produce traditional crafts. All of these elements are aspects of cultural food ways and central to a people's overall culture. Peoples relocated from their homelands have little opportunity to maintain their food knowledge and practices. In the USA, results of land and food impoverishment are to be seen in the on-going barriers to accessing food, health disparities, and endemic poverty (Pindus and Hafford, 2019; Freeman, 2020). Other Indigenous and traditional peoples who remain in proximity to their traditional food environments can experience a decrease in use of traditional foods as a more gradual process (Kuhnlein and Receveur, 1996). Hartwig, Jackson, and Osborne describe the contemporary disenfranchisement of Australian Aboriginal peoples resulting from the historic colonial separation of land and water rights. They state: "Changes in Aboriginal water holdings between 2009 and 2018 are indicative of a new wave of dispossession. Almost one fifth of Aboriginal water holdings by volume were lost over 2009–18" (Hartwig et al., 2020:1). Neo-colonial dispossessions include land grabs in Latin America, Africa, and Asia (Lyons and Westoby, 2014; Ashukem, 2020). While land grabbing has roots in colonialism, the practice is now constructed by state actors and corporations seeking land primarily for profitable agricultural or forestry enterprises, namely for products and food to export (Carmody and Taylor, 2016; Charin and Hidayat, 2019; Nyenyezi Bisoka and Ansoms, 2020).

Oppression affects traditional foods and the knowledge and traditional practices surrounding food, with subsequent impacts on local diets and health from various perspectives including socio-historical contexts of culinary oppression. What people eat is linked to culture, environment, economy, and political power (McMichael, 2012). Select foods currently consumed are historically in intimate alignment to oppression, exploitation, and disenfranchisement of Indigenous and traditional peoples. These foods are often married to hardship but become significantly incorporated into the core diet and viewed as culturally "traditional foods" (Mihesuah, 2016). This use of the foods of oppression shows agency and a creativity that has facilitated survival with varying dietary outcomes (Vantrease, 2013; Batal et al., 2018; Tennant, 2020). In this paper, we examine these food traditions from various perspectives by conducting a systematic literature search using Scopus focused on the traditional foods of Indigenous people. In the next section, the results of our search are discussed in light of what we identify as aspects of culinary oppression.

FOODS OF OPPRESSION, STATE OF THE ART

Scopus Search Methodology

We conducted a two-component systematic literature review using Scopus. The review used both Scopus indexed documents and secondary documents (Scopus, 2020) to include a broader coverage. We recognize that a limitation of this set of publications

is that it might not necessarily capture most community-led efforts taking place. Future in-depth studies could include grey literature and other databases in the search.

All documents referring to traditional food of Indigenous peoples in title, abstract, and keywords, and published to 31 December 2019, were included in our database for further analysis. For that, the Booleans AND, which ensures the presence of both terms, and OR, which allows the presence of either term (or both), were used using the keyword combination ("traditional food*" AND indigenous*) OR "indigenous people* food" OR "indigenous* food" in the search. This yielded 670 publications indexed by Scopus, and 486 secondary documents (search one).

The search for publications that encompassed aspects of oppression was conducted based on the inclusion of terms in title, abstract and keywords related to replaced or repressed foods, disempowered or misrepresented foods, stigmatized foods, foods and status, foods of the dispossessed, and oppression. Regarding revitalization, articles that included aspects of both revitalization and revalorization were included (search two).

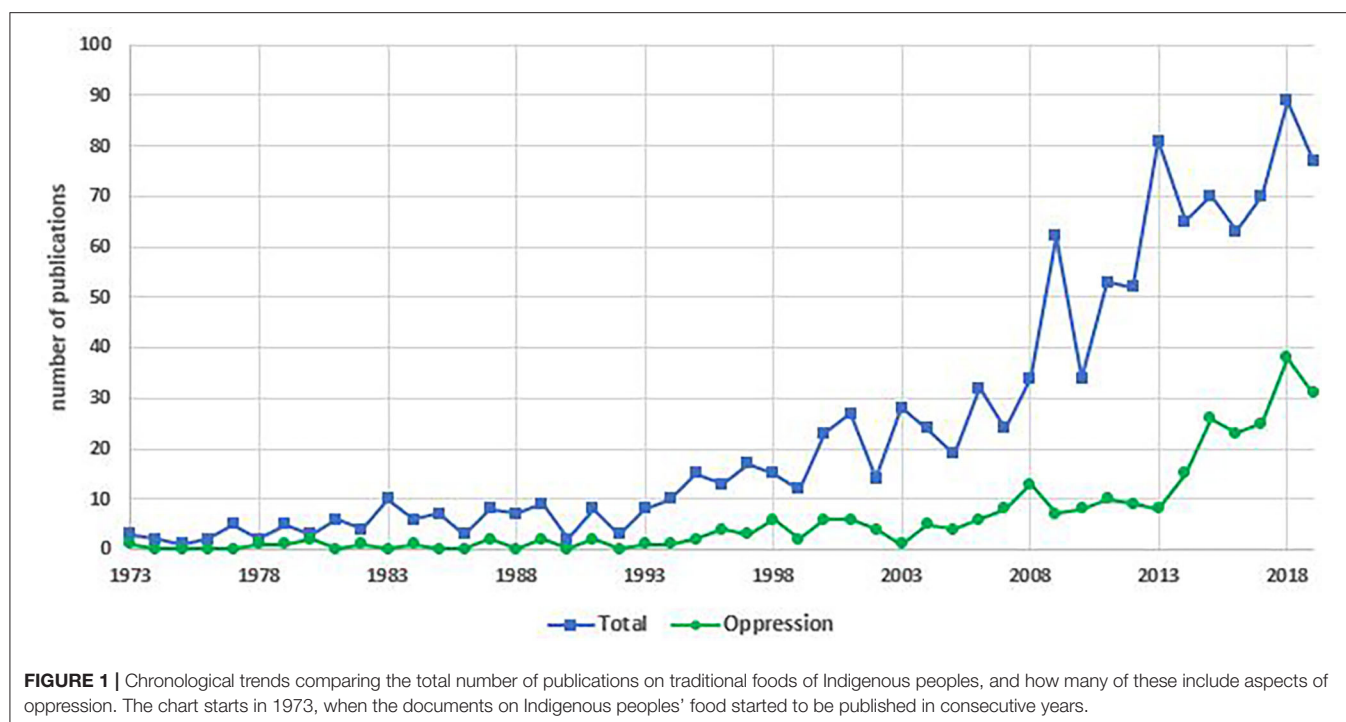
Scopus Search Results

A total of 1,156 publications on traditional foods of Indigenous peoples have been published (search one). The first one dates back to 1915. The number of documents remained below 20 until 2000, when the number of publications started to exponentially increase, reaching a maximum of 89 in 2018 (**Figure 1**). Only 25% of these documents included aspects of oppression (search two), although the first paper on oppression was published in 1973.

The most prominent aspect associated with oppression found in the literature was status (261 publications). The term status, however, fails to fully grasp wider structural and historical issues of oppression for Indigenous populations. Terms related to food replacement, dispossession and oppression were included in few documents (26, 10, and eight publications, respectively); whereas issues of repression, disempowerment, misrepresentation, and stigma were largely absent in the literature (i.e., with one document or none). Only five articles referred to culinary colonialism. These results show that no common front has yet to emerge on foods of oppression for Indigenous peoples.

The revitalization or revalorization of Indigenous foods was mostly overlooked in the literature, with only 29 publications (all except one use the term revitalization). This could be partially explained by the fact that this topic is very recent, with the first document published in 2006. This finding might hypothetically be related to larger contextual factors, i.e., the marginalization of Indigenous voices or low number of Indigenous researchers, which could be a focus of future research. The documents on revitalization did not focus on gastronomy, cuisine or culinary (only one or three documents each). Likewise, there were no publications on revitalization that focused on the role of chefs. Furthermore, only two publications in Scopus are focused on Indigenous chefs. These findings suggest there is no common approach in the literature on the ways Indigenous food can be revitalized or revalorized in the context of oppression.

Traditional knowledge was only partly addressed by the literature. Only 22 percent of the documents addressing oppression include traditional knowledge (**Figure 2A**). The first one dates back to 1993, and only during the last decade did



articles appear annually. Forty-five percent of the papers on revitalization include traditional knowledge, with not more than five documents published per year (**Figure 2B**). These results are surprising, since it has been recognized that oppression is associated with the loss of traditional knowledge, and revitalization is a pathway to regain or reclaim this knowledge.

Only one percent of the publications on traditional foods of Indigenous peoples include food justice. While food sovereignty is a more popular concept, it was only included in nine percent of the documents. Food justice was only included in eight publications addressing oppression, and in six documents on revitalization of Indigenous foods (some also focusing on food sovereignty).

FOODS OF OPPRESSION—AN INITIAL CLASSIFICATION

The incorporation of political topics such as oppression with research on traditional knowledge and Indigenous foods has spanned nearly 50 years. However, the number of papers (averaging 6.2 papers per year) analyzing the convergence of gastronomic and political imaginaries remains relatively low for many topics, including those that are the main focus of our paper and in which oppression, Indigenous peoples, foods, and traditional knowledge intermingle. Imaginaries are those social values, institutions, laws, and symbols which enable common practices, building a sense of legitimacy (Taylor, 2007). Gastronomic imaginaries define what food is and how it should be eaten (see Martinez de Albeni, 2015) while political imaginaries highlight who can or cannot eat it.

We have identified three basic types of foods from a number of cultures that fall into the meta-category of foods of oppression. These types are: (1) replaced and repressed foods (2) disempowered and misrepresented foods, and (3) foods of oppression of the dispossessed.

Replaced and Repressed Foods

To fully understand the meaning of R&R foods it is necessary to link their use to the notions of social apartheid embedded in societal fascism (De Souza Santos, 1998) and in which cities and traditions are classified either as savage or civilized. In territories that have suffered settler colonialisms, as the dominant social groups acquire a growing power over life of the oppressed social groups, the gastronomic practices of the latter are supplanted with colonial foods. This includes introduced substitutes for traditional foods the settler culture deems uncivilized. Numerous examples of R&R foods can be found throughout the colonial history of the Americas, such is the case for the consumption of insects (Katz, 1996), barbecued deer (Vernot, 2018), or native sweets and sweeteners (Wall et al., 2020).

Disempowered and Misrepresented Foods

D&M are those foods that have classist denigration and are now considered (a) inferior in quality and/or nutritional content, (b) filthy, or (c) viewed as food of impoverished people in society regardless of their market value and wide geographic cultivation and yields. *Quelites* are, perhaps the most salient group of D&M foods because of their ample distribution throughout Mesoamerica (Vizcarra, 2000). *Quelite* is a generic name for some 500 plants that can be eaten either raw or cooked (Bye and Linares, 2000). Many of these plants, growing within cornfields

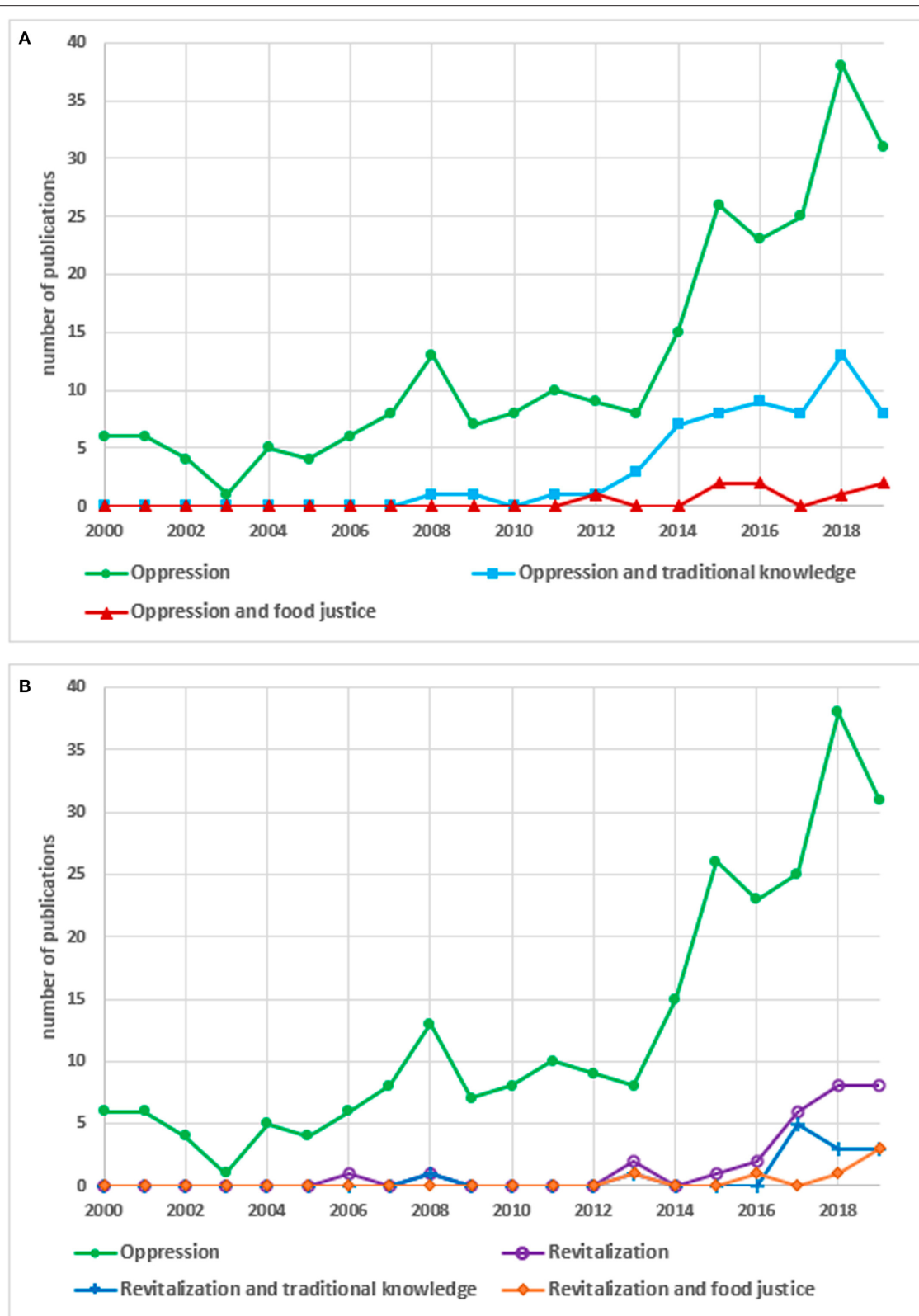


FIGURE 2 | This figure presents a close-up of the chronological trends of publications on Indigenous peoples' food that include aspects of oppression or revitalization, in relation to traditional knowledge and food justice. **(A)** Focuses on publications on oppression, while **(B)** highlights publications on revitalization. The charts start in 2000.

(Linares and Bye, 2017), are considered to be nothing but weeds. *Quelites* are considered food for the poor (Katz, 2009), the colonized, and the slaves (De Shield, 2015) despite their nutritional value (Linares et al., 2019). Therefore, *quelites*, and many other constituents of the Mesoamerican diet (De Walt, 1983) were gradually replaced by processed wheat flour and animal fat (Vizcarra, 2000). The displacement of R&R and D&M foods has severe long-term consequences. For example, prior to the COVID-19 pandemic, Mexico was suffering a public health crisis triggered by diet-related illnesses such as hypertension, diabetes, and obesity (Denham and Gladstone, 2020). Acting as comorbidity factors, these illnesses placed Mexico among the 10 countries with most COVID-19 related deaths (Kánter Coronel, 2020).

Foods of Oppression of the Dispossessed

FOoDs are offered to the oppressed and conquered. Normally their consumption marks a distance between colonized and colonizer. These are food items that push the colonized closer to civilization, but still serve as a low status marker. The insides of cows and other mammals are common, such as *mondongo* (Sarmiento Ramírez, 2008); a kind of stew, usually made with offal (normally the cow stomach), popular especially in the Spanish-speaking Caribbean. Perhaps the more iconic of these FOoDs is bannock also known as frybread in North America (Cyr and Slater, 2016). While considered by many as traditional Indigenous fare, their origin was in government commodity surplus handouts of flour and lard to Indigenous populations displaced and distanced from their food sources (Mihehuah, 2003, 2016, 2020). The term “comod bods” means the effect of eating these foods becomes visible on the body. The term “comod bod” exemplifies the well-known health impact of food aid and lack of traditional foods in the high occurrence of obesity and diabetes (Blevins, 2008; Vantrease, 2013; Mihehuah, 2016; DeBruyn et al., 2020). A study by Chino et al. (2009) illustrate the patterns of contemporary commodity food use showing regional variation and overall association between multigenerational commodity food consumers and contemporary preferences for canned meat, canned vegetables, and fruit and other commodity based foods.

REVITALIZATION AND REVALORIZATION

There are a growing number of prominent Indigenous activist food scholars (Coté, 2016; LaDuke, 2019; Mihehuah, 2003, 2016, 2020). With only two publications in Scopus focused on Indigenous chefs, the growth of Indigenous chefs and their visibility and cultural influence is an area that needs further scholarly attention. Sean Sherman, Oglala Lakota chef and author of *The Sioux Chefs' Indigenous Kitchen* (Sherman and Dooley, 2017), won the 2018 James Beard Award for the Best American Cookbook. Chef Sherman cooks no frybread and does not use dairy, sugar or domestic beef or pork. In recent years, television productions have increasingly featured North American Indigenous chefs. Rich Francis of the Tetlit Gwich'in and Tuscarora Nations is the first Indigenous chef featured on *Top Chef Canada* (Indian Country Today, 2014). Chef Francis is an advocate for protecting Indigenous food practices

in Ontario and challenges government regulations restricting hunting of wild game that have been central to tribal food ways. Francis appeared in the documentary series *Red Chef Revival*, which follows three chefs traveling to Indigenous communities in Canada to profile pre-colonial food systems (Kaur et al., 2019). Additional examples of television productions featuring Indigenous chefs include *Alter-NATIVE: Kitchen* (Luther, 2019) which highlights three Indigenous North American chefs who are creating a new diet of traditionally inspired cuisine, and programming produced by the *Aboriginal Peoples Television Network of Canada*.

Grey and Newman (2018) caution against contemporary culinary colonialism. They argue that there must be a right to hold Indigenous gastronomic capital back from the market. Gastronomic multiculturalism can be a threat to Indigenous food sovereignty. They note that diet under settler colonialism was one of assimilation but caution against the growth of appropriation that can now follow from non-indigenous chefs where “Indigenous cuisines are thus gentrified, reoriented toward the demographic that originally sought their eradication” (Grey and Newman, 2018:719). The visibility of Indigenous chefs and the work they do in and for Indigenous communities on the ground and digitally are important aspects of revalorization and revitalization. They embody acts of resistance as well, acting as political advocates for the Indigenous right to food sources, territory and culture as well as sustainable provisioning (Judkis, 2017; CBC News, 2018; Pereira et al., 2019).

The revitalization or revalorization of traditional foods is triggered by communities themselves, by outsiders, or both. Tribal educational initiatives have been largely successful in raising awareness and sharing knowledge and skills within Indigenous communities surrounding traditional foods that are central to cultural identity and good nutrition. For example, tribal schools and colleges in North America like the Northwest Indian College (2014) offer classes on cooking traditional foods for Indigenous people throughout Washington state as well as Indigenous professional culinary courses that can help fulfill career aspirations of college students. The Native American Food Sovereignty Alliance (NAFSA) (2014) provides an example of the reach of the internet to provide a place to network and share the renewal of indigenous food, culture and resilience. Adult educational programs also prove to be successful on an international level. For example, the Farmer Field Schools on Nutrition and Local Food Plants (Sowing Diversity = Harvesting Security program www.SDHSprogram.org), encourage Indigenous farmers to identify the main bottlenecks that prevent the consumption of local biodiversity and conduct activities to counter them. During cooking demonstrations farmers regain their knowledge of old recipes with the collaboration of the female cooks in the community, or by inviting chefs to experiment and illustrate new ways of cooking traditional foods.

DISCUSSION

We have identified colonialism as a mechanism for eroding local food systems. This has also been noted as a three-stage progression that concludes by misappropriating local foods (Grey

and Patel, 2015). So far, we have clearly established boundaries for three types in which sorts of foods have oppressed native and formerly enslaved peoples.

Currently, many of these food items have resurfaced as important elements of a multicultural and globalized cuisine that seeks to bridge cultures through a banal fashion of cosmopolitanism (see Harvey, 2000) that keeps such foods and cultures as captives of culinary colonialism. To get out of this conundrum, it is important to give back the food to its fully acknowledged legitimate owners as has begun to happen if we look at the growth of Indigenous chefs and activist food scholars. Our Scopus search results, however, indicate that more scholarship on revalorization and revitalization is needed.

Future attention to neoliberal arenas of cosmopolitanism with the growth of interest in Indigenous foods deserve close attention. Warnings already made through historic reflection and contemporary concerns remind us that the politics of food go beyond eating and have to do with connecting power, land

use, and supply chains. While some of the problems associated with all of these realms cannot be immediately solved, we are convinced that by identifying some of the existing types of culinary oppression and state of the art in publications from Scopus this paper offers a foundation from which new analytical points of view can contribute to the overarching debate in food justice and Indigenous culinary freedom.

DATA AVAILABILITY STATEMENT

The original contributions generated for the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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An Offering of Grain: The Agricultural and Spiritual Cycle of a Food System in the Kailash Sacred Landscape, Darchula, Far Western Nepal

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Foodscape are commonly embedded in spiritual landscapes, making the spiritual dimension of local and indigenous food systems an important element of food sovereignty. However, this dimension is often overlooked in food systems research and policy making. Based on ethnobiological fieldwork conducted in the Kailash Sacred Landscape of far western Nepal, we show how religious festivals and rituals reenact the covenant between people and the land through the numinous intercession of Hindu gods and landscape deities. To demonstrate this, we present the local calendar of the agricultural and ritual year based on data collected through household surveys and participation in festivals and agricultural activities. The complex fabric of the local agri-food system is revealed as articulated in the warp and weft of interwoven agricultural and spiritual cycles. These cycles contribute to respectful and sustainable landscape management practices by shaping the relationship people have with the land. In the annual women's festival of Gaura, the fertility and well-being of people and land is affirmed through the offering of locally produced pulses and grains. Furthermore, local gastronomic identity is enriched by the incentive to cultivate heirloom varieties of crops that are prescribed in rituals performed during Gaura and other major festivals. We conclude that spiritual practices should be considered key elements of biocultural diversity, and recommend that they receive more attention in the implementation of sustainable development that aims to embody the principles of food sovereignty.

Keywords: food sovereignty, agri-food system, agro-spiritual calendar, traditional knowledge, biocultural diversity, agricultural ritual, sacred landscape, agro-spiritual cycle

INTRODUCTION

Local and indigenous food systems in rural areas have long been contested spaces where interests are negotiated by different actors with often conflicting agendas. The stakes of research and development involving traditional and local knowledge, including Traditional Food Knowledge, are high. Kimmerer (2012) has vividly expressed a concern about knowledge mining that we, as researchers, are acutely aware of: "knowledge mining or the extraction of useful facts from the body of knowledge, without exploration of the cultural context in which they belong, can do a disservice

to the information as well as to the culture. Just as gold mining degrades a large area of land for the extraction of what is perceived as valuable “ore” and leaves a wasteland in its place, extraction of valuable data from traditional knowledge without consideration of its cultural context can also be damaging.” A general disconnect between top-down development and management, and local and indigenous relations to their lands, tends to “persist in ways that erode even the best attempts at collaborative management and plans for long-term sustainability in our contemporary plural societies,” Felice Wyndham has observed (Wyndham, 2009). Li (2007) has exposed how organizations’ “claim to expertise in optimizing the lives of others is a claim to power.” Co-management has often had the effect of, at best involuntarily, forcing rural and indigenous communities into tacitly accepting assumptions about the nature of the land and the species to be managed, with state institutions failing to understand local values and worldviews (Nadasdy, 2005), and thus imposing the institution-held scientific assumptions rather than engaging in cross-cultural co-construction of knowledge (Apgar et al., 2016).

Food sovereignty has increasingly been adopted by civil society organizations and global social movements as a tool for contestation, reconfiguration and metamorphosis (Pimbert, 2006; Patel, 2007, 2009; Van der Ploeg, 2008, 2010; Rivera-Ferre, 2018). Food sovereignty, as defined in the Declaration of Nyéléni (2007), attests to the right of people to define their own food systems in ways that are empowering, context-dependant and culturally appropriate, prioritizing local and national economies rather than the demands of the corporate trade market. The Declaration was crafted by local and Indigenous communities from all over the world who demanded to place at the heart of food systems policy the very people and communities who produce, distribute and consume food.

Conversely, the top-down scholarly and policy making framework of food security, as suggested by Patel, “is agnostic about the production regime, about the social and economic conditions under which food ends up on the table” (Patel, 2007). Food security oriented policy is rooted in the narrative of food scarcity, and it has occasionally provided a justification to the narrative of *terra nullius* - empty land (Harvey, 2007; White et al., 2012), which has historically legitimized land expropriation and all sorts of abuse on indigenous territories around the world (Coates, 2004). Policy framed uniquely by a concern for food security may tend to prioritize quantity over quality, and to overlook discourses on modes of production and distribution, alongside their impact on local and global social dynamics. The discipline of political ecology is well-suited for agri-food systems research, as it focuses strongly on both social-ecological interactions and political-economic dynamics (Hall, 2015). A political ecology framework invites analysis that attempts to understand “the ways in which food, agriculture, and the environment are understood and valued, and the profound inequalities that underpin the production, transformation, and consumption of food” (Hall, 2015). Quoting Slow Food’s slogan, Nabhan (2014) invites a partnership between ethnobiology and political ecology to predict “how we can better design our food

systems, not only to be resilient in the face of climate change and other “shocks,” but to be “good, clean and fair” as well.”

In an ethnobiological approach to food systems, the entire dimension of social-ecological systems is considered, including ecosystems, place-related history, culture, and importantly, the spiritual aspects comprising local diversity (Pieroni et al., 2016). The Declaration of Nyéléni (2007) acknowledges all of these aspects of social-ecological systems, and embraces a view of nature as including both spiritual and material beings. Yet, very little attention in the declaration is directed toward the spiritual landscapes underlying traditional and indigenous food systems. In the reports of the Food and Agriculture Organization (FAO) and the High Level Panel of Experts for Food Security and Nutrition (HLPE), the spiritual dimension is either not mentioned, or touched upon in rather reductive and generic terms by including it among cultural ecosystem services alongside aesthetic, recreational, inspirational and educational benefits (HLPE, 2017; FAO, 2019; FAO and UNEP, 2020). In Nepal, food sovereignty was recognized as a constitutional right in 2064 (Interim Constitution of Nepal 2063, 2007). The right to food sovereignty in Nepal was further defined in the The Right to Food and Food Sovereignty (2018), where the government also commits to protect traditional and indigenous food. Still, in the act no mention is made of the spiritual dimension of traditional and indigenous food.

While the literature discussing food sovereignty and exploring all elements of local and Indigenous food systems, including spirituality, is broad, few works have demonstrated the importance of the sacred domain in food sovereignty, and the role of spiritual beliefs and practices in protecting and contributing to biocultural diversity in sustainable food systems. Rappaport (1968) was among the first scholars to discuss the role of ritual in the Tsembaga’s food system in New Guinea as regulators of relationships with animals and plants and conservation of certain species. Barrera-Bassols and Toledo (2005) discuss the complex entanglement of beliefs, knowledge and landscape management by presenting aspects of the Yucatec Mayan spiritual landscape and the sacred dimension as a key contributor to their social-ecological resilience. Håland (2009, 2012, 2015) has discussed ritual and agricultural yearly cycles by comparing modern and ancient Greek festivals, and illustrated the importance to farmers of fertility magic to ensure good harvests both in modern and ancient Greece. Salmón (1999) shows how the physical, social and mental health of northern Mexico Rarámuri are closely related to their cycle of ceremony. Felice Wyndham further explored Rarámuri landscape management from a relational perspective by discussing what she calls the *subtle ecologies* of people’s relations and interactions with the landscape. She shows how “the subtle material effects of ritual and exchanges with the spirit world” affect the making and unmaking of landscapes over time (Wyndham, 2009). Wyndham also denounces a persisting disjunction between Western management practices and indigenous relations to landscape, and highlights the importance of investigating people-landscape relationality in Western inquiries into indigenous land management. Part of a growing trend for the recognition of food sovereignty as

a key element in *in-situ* biodiversity conservation, Sarmiento et al. (2019) present case studies from Andean agri-food systems and highlight the role of the spiritual dimension of indigenous foodscapes in the preservation of heirloom varieties with special spiritual status. Haider et al. (2020) discuss the role of traditional practices and rituals in defining alternative development pathways, and focus on the social-ecological implications of an introduced wheat on the food practices of a New Year ritual in two communities in the Pamir Mountains.

Based on ethnobotanical fieldwork conducted in the village of Malikarjun, in the Kailash Sacred Landscape of far western Nepal, this study contributes to these discourses by revealing the complex fabric of a village agri-food system as articulated in the warp and weft of its interwoven agricultural and spiritual cycles.

METHODOLOGY

Field Site Description

Fieldwork centered on the community of Malikarjun, located in Darchula District of far western Nepal. Malikarjun is a small village of around 500 households located <10 km from the Mahakali River, which forms the border with India. Malikarjun falls within the Kailash Sacred Landscape (KSL), which encompasses far western Nepal and the neighboring regions of India and China. The International Center for Intermountain Development (ICIMOD) designated the KSL as a critical transboundary landscape in 2010 due to its rich ecological and cultural diversity and heritage (Oli and Zomer, 2010). At the spiritual heart of this landscape is Mt. Kailash in Tibet, a sacred site for millions of Hindus, Buddhists, Sikhs, Bönpos, and Jains (Zomer and Oli, 2011). The entire region comprises an intricate network of spiritual sites, many connected to the ancient pilgrimage routes that center on Mt. Kailash. Malikarjun, located 165 km south of Mt. Kailash, is the site of its own sacred mountain, which bears the same name as the community.

The community centers on a market and temple, which are located at 1,800 m on a narrow ridge. The community is distributed along the ridge up to 2,100 m, and down to the small streams that run in the valleys on both sides of the ridge. Other than these streams, located well below the community center, the only sources of surface water are a handful of springs along the slopes of the ridge and the lower parts of Malikarjun mountain. The mountain rises above the community to 2,500 m, and its lower slopes are divided into three community forests administered by community forest user groups (CFUGs). Three additional community forests are located in other areas of the community, and the majority of households in Malikarjun are members of one of these CFUGs.

Malikarjun is located along the road that connects the district capital of Darchula with the nearest market center, Gokuleshwar, as well as Baitadi and the distant Terai beyond. During fieldwork in 2018, a short spur road connected this main artery to the Malikarjun market, but was blocked or impassable beyond. By 2020, however, 3–5 roads starting at the market or main community gate had been cleared, extended or built by the regional government further into the community. These roads are putting an increasing number of houses

into direct connection with distant markets, but they have not yet significantly impacted life in the village, as very few households own vehicles that could transport their goods to larger markets. Houses are widely scattered, except for the market and community center, and are usually surrounded by or adjacent to their farming lands. All agricultural land is terraced and nearly all, with the exception of the narrow ridgetop (**Figure 1**), located on steep slopes. Water access is scarce throughout the community, and irrigation is non-existent except for the valley bottoms. The community are primarily subsistence farmers, with most households supplementing their income through out-migration for work in India and elsewhere in Nepal. Most of the business owners of the market shops are locals, and have their own houses and farming lands within the community.

Malikarjun is also the name of the lineage god, who was brought with the people from their original home in India several centuries ago. Malikarjun is seen as an emanation of Shiva (Sanskrit Śiva), who has chosen to dwell in a cave on Malikarjun mountain. The community settled here in response to his choice of this particular location. This temple, the mountain, and the deity who animates both, are the center of an important regional cult. The Malikarjun tradition is inextricably linked to the physical landscape, which in turn is narrated and mapped out in the origin stories contained in many of the local sacred songs. In addition to Malikarjun mountain, many members of the Malikarjun familial pantheon have their own specific sacred sites and temples up to several days travel by foot throughout the surrounding landscape. The most prominent of these within the community are two smaller temples to Latinath, the first son of Malikarjun and an emanation of Ganesh (Sanskrit Ganeśa). Sacred sites also mark the route by which Malikarjun and his people traveled from India. The female lineage is also represented in the landscape in the form of Malikarjun's seven wives, who are associated with specific temples and locations throughout the regional landscape. The principal wives, Baghashree and Shobhashree, live within the community and are connected to a series of sacred springs, whose water is used in the most important rituals performed yearly at the Malikarjun and Latinath temples.

Methods

Fieldwork was carried out between May and June 2018, and again between March and June 2020. In 2018 this comprised a series of visits of 1 week or less, while in 2020 the research team rented a local house and lived in Malikarjun, providing an experience of the conditions of daily life in the community. The primary aim of the 2020 fieldwork was to record the sacred oral epics performed at annual festivals, which are one of the key elements in maintaining the community's ties to the land and their gods. Complications due to the Covid-19 crisis, particularly the impossibility of holding the large gatherings which are necessary for the performance of the songs, resulted in redesigning the project aims. With freed up time and resources, the team decided to focus on collecting data about the local agri-food system and its embeddedness in the spiritual landscape which is evoked in the sacred oral literature.



FIGURE 1 | Wheat and barley growing on terraces in Malikarjun.

Participant observation in agricultural activities and religious ceremonies; audio recording of soundscapes, stories and songs; interviews; and home garden surveys were the primary methods employed to gather data about agricultural practices, gastronomic ethnobotany, and local spiritual traditions. Author B.J. is from the region, and given his knowledge of the local Doteli dialect, acted as interpreter for interviews, translator of audio recordings, and more generally as “cultural broker” for the rest of the team. In 2018, 14 individual interviews and 15 group interviews were conducted, alongside five recording sessions of informal group singing. In 2020, 10 garden surveys, 24 individual and group interviews, and nine recording sessions of traditional songs commonly performed during festivals were conducted.

The practices and timings of the local agri-food system and rituals that will be discussed are synthesized and visually represented in a calendar (**Figure 2**). Calendars can be powerful tools as they allow us to visualize how agro-ecological and ritual cycles intertwine with one another. The calendar presented here encapsulates a preliminary overview of the yearly agro-spiritual cycle of Malikarjun. We took inspiration from Kassam et al. (2018), who have described ecological calendars as context-specific and “embedded in the relationships

of people to their own ecosystem.” Ecological calendars are inspired by historical and contemporary observation of the systems people have developed to guide their planning and decision making in a given environment. Developed over sustained occupancy of ecosystems, these commonly include forecasting methods and other methods for timing livelihood practices and their inextricable spiritual practices (Orlove et al., 2002; Mondragón, 2004; Kassam et al., 2011, 2018; Prober et al., 2011; Rautela and Karki, 2015; Cochran et al., 2016).

The home garden surveys included sketching the gardens (**Figure 3**), recording all species of plants, and a structured interview covering agricultural production, growing seasons and practices, grain varieties, and associated spiritual knowledge. Visual representation of the data facilitated mutual understanding with the participants. Homes were selected for these garden surveys in an attempt to represent the community’s full topographical and elevational range. Further context on the results of these structured surveys was provided by the semistructured techniques used for the 24 interviews, which focused on agricultural knowledge and practices, uses of domesticated and wild plants, and associated stories and descriptions of rituals and ceremonies connected

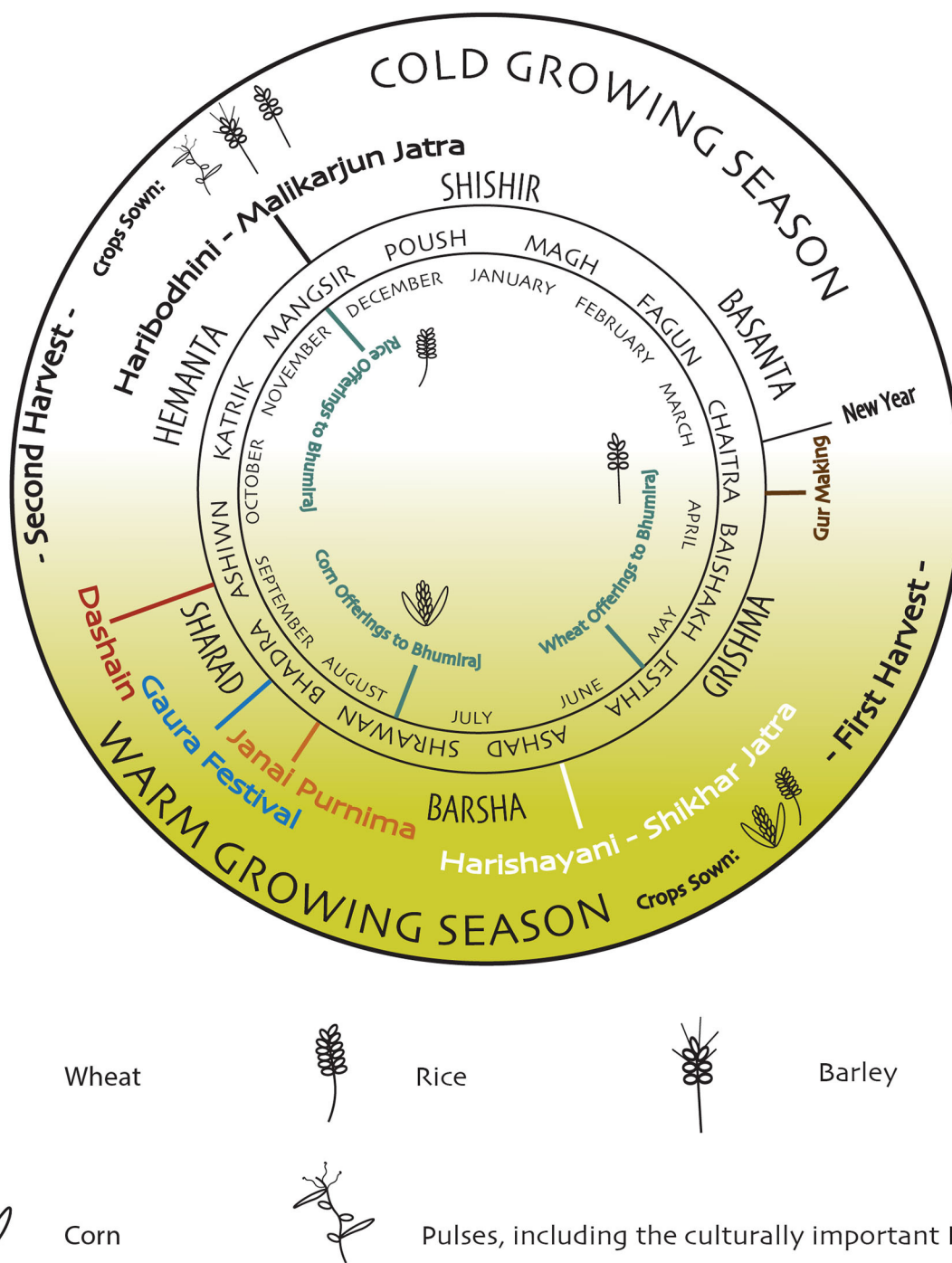


FIGURE 2 | A representation of the ritual and agricultural calendar of Malikarjun, showing Nepali months and seasons alongside Gregorian months. Two agricultural seasons corresponding to the two main sowing and harvest times are visible in white and yellow, respectively. The most important crops are also indicated, namely wheat, corn, rice, barley, and pulses including the culturally important *kalaun* pea. The timing of the harvest offerings to the land deity Bhumi are indicated in the center. Key festivals are marked alongside the Hindu cosmic cycle of Haribodhini and Harishayani.

to sowing and harvesting times, or to specific plants. In 2018 the chairman of the rural municipality connected us to several initial key knowledge holders, and snowball sampling was used to expand the network. The fieldwork in 2020 built on

the relationships previously created to contact additional local knowledge holders.

The Code of Ethics of the International Society of Ethnobiology guided the research, and oral prior and informed

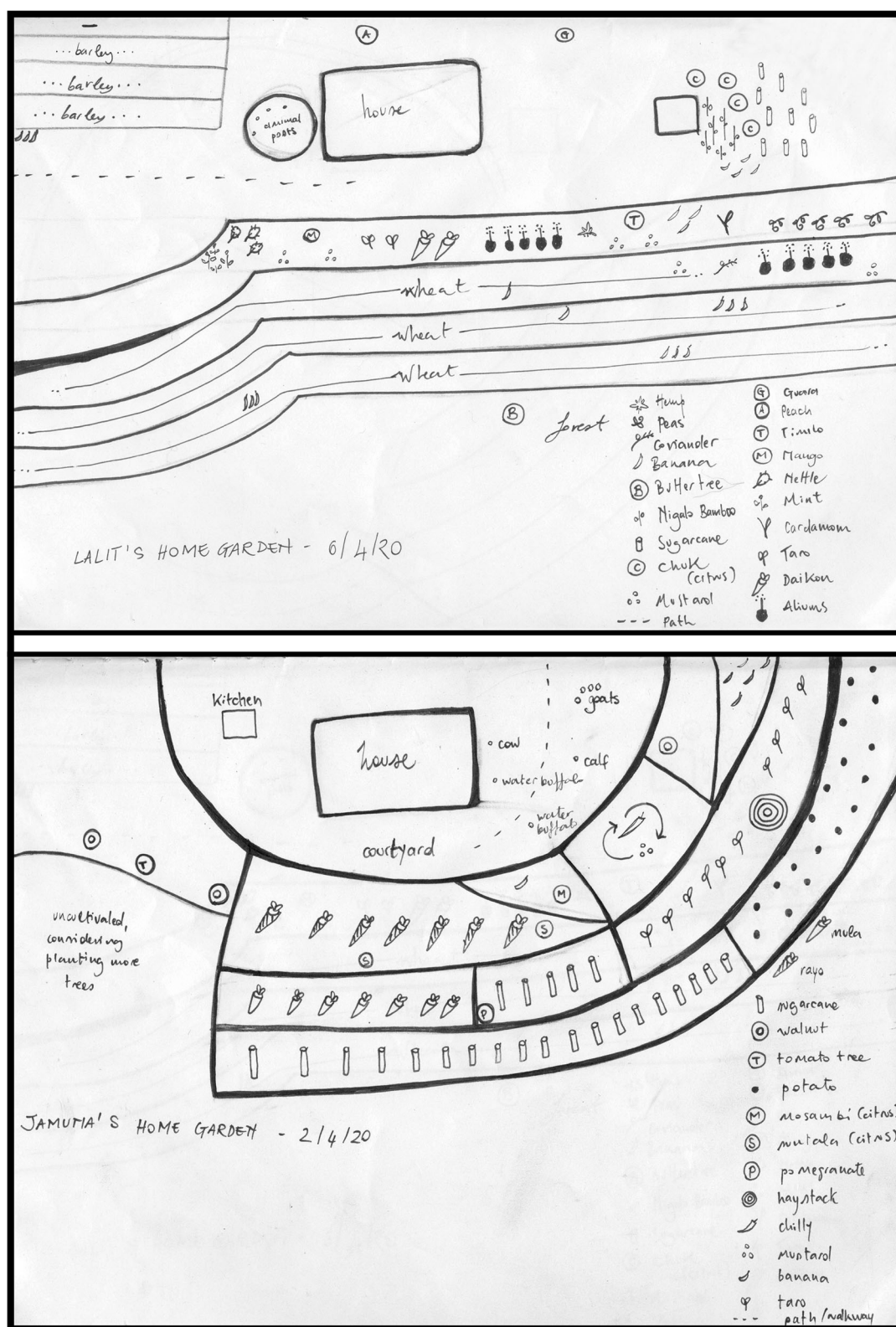


FIGURE 3 | Home garden sketches.

consent was received for all interviews, surveys and audio/visual recordings. Most garden surveys involved a full household with husband and wife as primary respondents, whose average age ranged between 35 and 55. Children of all ages also sometimes participated in the garden surveys, as they are responsible for many important chores in the household, the garden and the fields. Grandparents would sometimes also contribute, so survey responses often benefited from intergenerational input.

Botanical specimens of ethnobotanical plants were collected in the community forests during the first phase of the research in 2018, and in 2020 some further collections of ethnobotanical, home garden and wild plants were made. Donations were made to the community forests committees where plant collection was performed to support their conservation and capacity-building activities. A total of 20 collecting trips were made, which yielded 156 herbarium specimens. Physical descriptions, site descriptions, GPS locations and elevation data were recorded to accompany each specimen. Permits for plant collection were issued by the national Department of Forestry in 2018 and 2020, and the local Department of Forestry office in Darchula facilitated the transportation of specimens to Kathmandu, where they are in the process of being identified and deposited at the National Herbarium & Plant Laboratories (KATH). Plants were identified according to the Linnaean classification system in order to enable future comparative research, however local names were employed in the field because of relevance in the local community.

RESULTS: FOOD SYSTEM OF MALIKARJUN

Agricultural System and Diversity

The agricultural cycle of Malikarjun, which is typical of much of the mid-hills of Nepal (Khatti, 2012), has two growing seasons. In both home gardens and the terraced fields, crops are sown for the summer season in *Baishakh* or *Jestha* (May/June) and harvested in *Ashwin* or *Kartik* (September/October), then again for the winter season in *Kartik* or *Mangsir* (October/November) and harvested in *Chaitra* (March/April) (Figure 2). The main winter crop is wheat, although barley is also grown by every household (Figure 4), as much for its ritual significance as for its contribution to human and animal diets. Wheat and barley are grown separately, but both are intercropped with mustard and *kalaun*, a local pea variety, and more rarely with lentils, chickpeas and linseed. In the summer the main crop is corn, with households also cultivating rice whenever their land allows it (70% of surveyed households).

Corn is intercropped with a wide variety of Cucurbitaceae vegetables and legumes, in particular soybeans, black gram, french bean, rajma bean, and black-eyed peas. Many legumes are also grown on the terraces or edges of fields rather than mixed directly in with the terrace grains. A total of 10 legume species were reported, with at least 70% of households growing *kalaun* pea, soybean, black gram, and black-eyed pea. Rice is intercropped with sesame, and to a lesser extent with black gram and foxtail millet, a common staple crop across far western Nepal

(Kunwar et al., 2012). More than half of the surveyed households grow a little finger millet, which is not intercropped due to its high density of growth. About one third of surveyed households also grow oats, and several grow *wah*, naked barley, described by locals as an old grain declining in use.

Landrace diversity varies significantly among the main staple grains. Wheat has only five reported varieties (Dauti, Bikashi, Jhuse, Chaute, Dhole), with the majority of households growing only Dauti and Bikashi. Barley is often reported to have no or only one variety, although a few households reported that it had two varieties (Jhuse and Thade). Corn has seven varieties grown in the community (Rato, Daule/Seto, Shankarmukha, Bikashi, Nanduk, Mankamana 3), including one for popcorn (Murli), although two basic red and white varieties (Rato and Seto) predominate. Rice has by far the highest diversity, with 16 reported varieties (Nanidhan, Choti, Khele, Basmati, Rate, Bure, Rebele, Naka, Jini, Ara, Kaldhan, Kaljade, Jaule, Bungau, Chamade, Tede), although most households reported growing 3–7 varieties. Many of these appear to be local, perhaps unique to the region. Oats and millet were also reported to have no or only one variety. Peas were recognized as being either typical peas, or *kalaun*, a local variety with particular culinary and spiritual significance to the community (Figure 5).

It appears that landrace diversity is due to several different factors. Rice varieties are usually described as having particular qualities and are used for specific purposes, such as the highly-specialized Kaldahn, a rare variety which is harvested before the grains fully mature, so that it can be crushed, mixed with milk and sugar and eaten fresh. In the case of rice, it appears that the culinary qualities and associated cultural values of different varieties have led to their preservation, which is why they are stored and consumed separately. Heirloom varieties like the *kalaun* pea have their own origin stories, and their use is prescribed in important rituals like the women's festival of Gaura. These biocultural indicators explain both landrace diversity and preference for local cultivars. Wheat varieties, on the other hand, are preserved because of their variability in growing season, yield, response to drought, etc. Aside from those kept for seed, different wheat varieties are mixed together for consumption. In this case, it appears that landrace diversity is being preserved in order to increase the resilience of winter crops against fluctuations in climate and precipitation.

Home gardens contribute to food and household income, producing a variety of vegetables, fruits, and other essential products (Table 1). In fact, drawing a division between “home gardens” and “agricultural fields” is impossible; in lived experience, the location of a particular plant is a question of proximity to the home. The gardens and terraced fields blend seamlessly together, a porous boundary that oscillates throughout the seasons and years. Gautam et al. (2008) have described home gardens as “a land use practice around a homestead where many annual and perennial plant species are planted and maintained by the members of the household.” Home gardens in Nepal have also been described as “a micro-environment composed of a multi-species ..., multistoried and multipurpose garden situated close to the homestead (Gautam et al., 2006)” For the purpose of this study we have defined the home garden as the portion of ground



FIGURE 4 | Barley harvest sorted and left to dry.

devoted to vegetables, trees, legumes, or agricultural plants other than the staple grains described above.

Home gardens are relatively small and generally aimed at fulfilling household needs rather than producing goods for sale, although many households do sell surplus produce or valuable commercial plants like *okhars* (*Juglans regia*) and *timur* (*Zanthoxylum armatum*) from the home garden (Kunwar et al., 2012). A few households have been given the materials to build greenhouses by the USAID project PAHAL, local non-profit Community Rural Development Society (CRDS-Nepal), or other organizations, which allows them to grow tomatoes or other crops for sale. Many households also sell fruit, which is generally produced in excess of family needs. One of the surveyed households has transitioned away from growing grains to focusing exclusively on trees, and has a current orchard of more than 2,000 fruit and nut trees of 27 species.

In complete surveys of 10 home gardens, 91 species of fruits, vegetables and other plants were cultivated (see **Table 1**). Individual households grow 32–59 species of plants, including grains and legumes. The 38 species of vegetables includes a high diversity of Cucurbitaceae (11 spp). More than 80% of surveyed households grow onion, garlic, potato, tomato, daikon radish, mustard greens, cress, ridge gourd, and cucumber. Taro, pumpkin, chili and fenugreek are also commonly cultivated, and a wide variety of other vegetables and spices, depending on taste,

enthusiasm, and garden characteristics. The 23 species of fruit trees include a high diversity of citrus (6 spp), and more than 80% of households grow peach, banana and citron. At least 50% of households also grow tangerine, orange and a local variety of sour pomegranate called *darim*.

Not all cultivated home garden plants fall into the “food” category; some are also grown for seed, nuts, oil, medicine, fiber, or flowers that can be used as offerings in household rituals (*pujas*). We found 18 additional non-tree species, which includes some semi-wild plants at the interface between cultivated and uncultivated, such as mint, cannabis, buckwheat (*Fagopyrum* spp), *Chenopodium*, and *Amaranthus*, as well as planted flowers useful for *puja* (chrysanthemum, hibiscus, *Datura*, crape myrtle, and rose). There were also nine additional tree species, although only walnut was grown by more than 80% of households. The remaining trees include those useful for fodder, a spiritually significant bamboo also used for making a wide variety of baskets, a *Bauhinia* with edible buds, and a number of other useful species with commercial value (butternut, soap nut, cinnamon, and *Zanthoxylum armatum*) (Kunwar and Bussmann, 2009).

The entire agricultural system of Malikarjun, and thus the lives of community members, is intimately linked to their practice of animal husbandry. Every household keeps animals, in numbers roughly equal to but usually slightly exceeding the number of human household members. Domestic animals are cow, water



FIGURE 5 | *Kalaun*, a local pea variety with ritual significance in the community.

buffalo and goat; there are no sheep or yak at this elevation, and <5 horses in the community. The animals are kept at night in the ground story of the home, with the second floor housing the human inhabitants. Bedding plants are added daily to the rooms where animals are kept. The urine and dung mixes with successive layers of bedding and slowly breaks down. Twice a year, during the preparations of the fields for the planting of summer and winter crops, this mixture is shoveled out of the animals' quarters and left for a few days to decompose into fertilizer, which is carried out to the fields and spread on each terrace. This fertilizer, produced on a household scale, is the only input used in Malikarjun, and thus the role that these animals play in the agricultural system is critical.

Agricultural Labor

Agricultural labor is differentially distributed throughout the seasons and between groups in the community. Farming is generally a female domain, and women are the main tenders of the fields during the long periods waiting for the growth and ripening of crops. During the intensive periods of planting and harvest, all available community members are mobilized, with

extended families and neighbors often gathering together into small groups to more efficiently harvest one household's crops at a time. Plowing and tilling is done by men, using bulls and handmade wooden plows, and women and children follow them seeding the rows during planting. Children will often assist with the harvest and planting, but do not work much in the fields at other times.

The home garden is tended by a collaborative and flexible group of adults. Women are often responsible for planting many of the vegetables and culinary plants, while men may plant fruit trees, and an elder man might zealously tend a little patch of tobacco. Animal husbandry, however, is largely a female responsibility. Women spend much of their time gathering fodder (two or three times a day) and bedding (daily or a few times a week), often at great distances from the house, and carrying it back to the animals in the ubiquitous *dhoko*, bamboo carrying baskets. Women also milk the buffalo and cows, and manage most of the process of dairy production, including making buttermilk, ghee, and sometimes a kind of fresh cheese called *galyun*. Children and women are often the ones looking after animals when they are sent to graze in the community forests. Children and teenagers, particularly boys, are sent with the animals to more distant grazing grounds which some families have inherited rights to use. Men and the elderly will look after the home garden or graze the animals depending on age, ability, fitness and interest.

The tradition of making *gur*, an unrefined solid sugar produced from sugarcane juice, encapsulates the communal tradition of shared intergenerational and multispecies agricultural labor. Each household grows a variable amount of sugarcane during the winter season. Once the sugarcane is ready to be harvested, the entire process becomes communal; all genders and generations partake. Groups of multiple households of relatives and neighbors gather together, with women moving from house to house and cutting the cane, while the men assemble a sugarcane press, which is communally owned, on a flat spot kept for this purpose near the participating households. Over a few days or up to a week, the sugarcane yields of all the families are processed, and the final product is distributed between the participating households. Animals initiate the heavy labor of pushing the beam that runs the sugarcane press. However, by late morning it is too hot for the animals to continue, and children and women take over the working of the press, laughing and joking as they work. Small children or elderly women usually feed sugarcane into the press, a task they can attend to while sitting comfortably on the ground, with an eye to the turning beam passing above their heads (**Figure 6**). Men are responsible for building the fires and overseeing the boiling and slow reduction of the juice, in huge cauldrons over many hours. When the *gur* is nearly ready, elder men direct the pouring of the thick sugarcane syrup into a hollowed out tree trunk, and the stirring and forming into balls as the *gur* cools and solidifies.

Consumption Patterns and Important Foods

The household diet is vegetarian and based primarily on a combination of rice and other grains with pulses, vegetables and dairy products. Morning meals usually consist of semolina halva

TABLE 1 | Home garden survey results of crops grown in gardens and terraced land include English names, percentage of households cultivating the plant, a name in the local Doteli dialect, a Nepali name, and the Linnean family and name.

English name	% Cultivating	Local name	Nepali name	Family	Latin name
Grain (8 spp)					
Corn	100	Ghoga	Makai	Poaceae	<i>Zea mays</i> L.
Wheat	90	Gahun	Gahun	Poaceae	<i>Triticum aestivum</i> L.
Barley	90	Jaun	Jaun	Poaceae	<i>Hordeum vulgare</i> L.
Rice	70	Dhan	Dhan	Poaceae	<i>Oryza sativa</i> L.
Finger Millet	60	Kodo	Kodo	Poaceae	<i>Eleusine coracana</i> (L.) Gaertn.
Oats	30	Jwato	Jai	Poaceae	<i>Avena sativa</i> L.
Naked Barley	20	Wah	Uwa	Poaceae	<i>Hordeum distichon</i> L.
Foxtail Millet	10	Kaun	Kaguno	Poaceae	<i>Setaria italica</i> (L.) P.Beauv.
Legumes (10 spp)					
Kalau Pea	80	Kalaun	Kerau	Fabaceae	<i>Pisum sativum</i> L.
Black-eyed Peas	80	Shotta	Gajalu bodi	Fabaceae	<i>Vigna unguiculata</i> (L.) Walp.
Black Gram	80	Mas	Mas	Fabaceae	<i>Vigna mungo</i> (L.) Hepper
Soybean	70	Bhatt	Bhatmas	Fabaceae	<i>Glycine max</i> (L.) Merr.
Lentils	40	Masoor	Masoor	Fabaceae	<i>Lens culinaris</i> Medik.
Kidney Bean	30	Rajma	Ghiu simi/Rajma	Fabaceae	<i>Phaseolus vulgaris</i> L.
Rice Bean	30	Gurans	Jhlangi	Fabaceae	<i>Vigna umbellata</i> (Thunb.) Ohwi and H.Ohashi
Horse Gram	20	Gaut	Gahat	Fabaceae	<i>Macrotyloma uniflorum</i> (Lam.) Verdc.
Peas	10	Matar/kalaun	Kerau	Fabaceae	<i>Pisum sativum</i> L.
Green Gram	10	Mung	Mung	Fabaceae	<i>Vigna radiata</i> (L.) R.Wilczek
Vegetables (38 spp)					
Coriander	100	Dhaniya	Dhaniya	Apiaceae	<i>Coriandrum sativum</i> L.
Mustard	100	Toori	Toori	Brassicaceae	<i>Brassica juncea</i> (L.) Czern.
Onion	90	Piaj	Pyaj	Amaryllidaceae	<i>Allium cepa</i> L.
Potato	90	Aloo	Aloo	Solanaceae	<i>Solanum tuberosum</i> Lindl.
Sugarcane	90	Likhu	Ukhu	Poaceae	<i>Saccharum officinarum</i> L.
Garlic	80	Lasun	Lasun	Amaryllidaceae	<i>Allium sativum</i> L.
Tomato	80	Tamatar	Golbheda	Solanaceae	<i>Solanum lycopersicum</i> L.
Daikon	80	Mula/choto	Mula	Brassicaceae	<i>Raphanus raphanistrum</i> subsp. <i>sativus</i> (L.) Domin
Broadleaf Mustard	80	Rayo	Rayo	Brassicaceae	<i>Brassica juncea</i> (L.) Czern.
Cress	80	Chansoor	Chamsoor	Brassicaceae	<i>Lepidium sativum</i> L.
Ridge Gourd	80	Toriya	Pate ghiraula	Cucurbitaceae	<i>Luffa acutangula</i> (L.) Roxb.
Cucumber	80	Kakara	Kakra	Cucurbitaceae	<i>Cucumis sativus</i> L.
Pumpkin	70	Farsi/Kadu	Farsi	Cucurbitaceae	<i>Cucurbita</i> L. hybrids
Spinach	70	Palungo	Palungo	Amaranthaceae	<i>Spinacia oleracea</i> L.
Taro	70	Pidau	Pidalu	Araceae	<i>Colocasia esculenta</i> (L.) Schott
Chili	60	Khursani	Khorsani	Solanaceae	<i>Capsicum annuum</i> L.
Fenugreek	60	Nethi	Methi	Fabaceae	<i>Trigonella foenum-graecum</i> L.
Bitter gourd	50	Tite karela	Tite karela	Cucurbitaceae	<i>Momordica charantia</i> L.
Bottle gourd/Opo	50	Lauka	Lauka	Cucurbitaceae	<i>Lagenaria siceraria</i> (Molina) Standl.
Ash gourd	50	Kopindo	Kupindo	Cucurbitaceae	<i>Benincasa hispida</i> (Thunb.) Cogn.
Yam	50	Gittha	Tarul	Dioscoreaceae	<i>Dioscorea deltoidea</i> Wall. Ex Griseb.
Chives	40	Sekuwa	Jimbu	Amaryllidaceae	<i>Allium schoenoprasum</i> L.
Eggplant	40	Baigan	Bhanta	Solanaceae	<i>Solanum melongena</i> Wall.
Cabbage	40	Kopi	Banda	Brassicaceae	<i>Brassica oleracea</i> L.
Cauliflower	40	Cauli	Cauli	Brassicaceae	<i>Brassica cretica</i> Lam.
Sesame	40	Til	Til	Pedaliaceae	<i>Sesamum indicum</i> L.
Bell Pepper	30	Simla/sage Khursani	Bhede Khorsani	Solanaceae	<i>Capsicum annuum</i> L.
Carrots	30	Ganjer	Ganjar	Apiaceae	<i>Daucus carota</i> subsp. <i>sativus</i> (Hoffm.) Arcang.

(Continued)

TABLE 1 | Continued

English name	% Cultivating	Local name	Nepali name	Family	Latin name
Sweet bitter gourd	30	Karela	Barela	Cucurbitaceae	<i>Momordica cochinchinensis</i> (Lour.) Spreng.
Okra	20	Bhindi	Ramtoria	Malvaceae	<i>Abelmoschus esculentus</i> (L.) Moench
Snake Gourd	20	Chichindo	Chichindo	Cucurbitaceae	<i>Trichosanthes cucumerina</i> L.
Long bean	20	Simi	Simi	Fabaceae	<i>Vigna unguiculata</i> subsp. <i>sesquipedalis</i> (L.) Verdc.
Broccoli	10	Bracauli	Brocauli	Brassicaceae	<i>Brassica cretica</i> Lam.
Sponge Gourd	10	Ghiraula	Ghiraula	Cucurbitaceae	<i>Luffa cylindrica</i> (L.) M.Roem.
Zucchini	10	Bote kadu	Lamcho farsi	Cucurbitaceae	<i>Cucurbita pepo</i> L.
Chayote	10	Iskus	Iskus	Cucurbitaceae	<i>Sechium edule</i> (Jacq.) Sw.
Green Bean	10	Simi	Simi	Fabaceae	<i>Phaseolus vulgaris</i> L.
Linseed	10	Alsi	Alas	Linaceae	<i>Linum usitatissimum</i> L.
Other (18 spp)					
Cannabis	70	Bhang	Bhang	Cannabaceae	<i>Cannabis sativa</i> L.
Rose	50	Gulab	Gulaf	Rosaceae	<i>Rosa</i> L.
Buckwheat	50	Phapar	Phapar	Polygonaceae	<i>Fagopyrum</i> Mill. spp
Black Cardamom	40	Thulo Alaichi	Alaichi	Zingiberaceae	<i>Amomum subulatum</i> Roxb.
Mint	40	Pudina	Babari	Lamiaceae	<i>Mentha</i> L. spp
Chrysanthemum	40	–	Guldaudi	Asteraceae	<i>Tagetes erecta</i> L.
Tobacco	30	Tamakh	Tambaku	Solanaceae	<i>Nicotiana tabacum</i> L.
Artemisia	30	Kurjo	Titepati	Asteraceae	<i>Artemisia</i> sp
Aloe	30	Ghiu Kumari	Ghiu kumari	Asphodelaceae	<i>Aloe vera</i> (L.) Burm.f.
Crape Myrtle	30	Asare	Asare	Lythraceae	<i>Lagerstroemia indica</i> L.
Datura	20	Bhokarya Ful	Dhaturo*	Solanaceae	<i>Datura suaveolens</i> Willd.
Stinging Nettle	20	Sinno	Sisnu	Urticaceae	<i>Urtica dioica</i> L.
Amaranth	20	Chuwa	Lunde	Amaranthaceae	<i>Amaranthus</i> L. sp
Satuwa	10	Satuwa	Satuwa	Melanthiaceae	<i>Paris polyphylla</i> Sm.
Hibiscus	10	Ghanti Ful	Ghanti ful	Malvaceae	<i>Hibiscus</i> L.
Begonia	10	Chitra Ful	Kagaje ful	Begoniaceae	<i>Begonia</i> L.
Chenopodium	10	Bethe	Bethe	Chenopodiaceae	<i>Chenopodium boscianum</i> Moq.
Perilla	10	Bhangiro	–	Lamiaceae	<i>Perilla frutescens</i> (L.) Britton
Fruit (23 spp)					
Peach	90	Aru	Aru	Rosaceae	<i>Prunus persica</i> (L.) Stokes
Banana	80	Kela	Kera	Musaceae	<i>Musa x paradisiaca</i> L.
Citron	80	Chouk	Amilo	Rutaceae	<i>Citrus medica</i> L.
Orange	60	Mosambi	Mausam/Junar	Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck
Darim	60	Darim	Darim	Lythraceae	<i>Punica granatum</i> L.
Tangerine	50	Suntala	Suntala	Rutaceae	<i>Citrus reticulata</i> Blanco
Plum	40	Pum	Arubakhada	Rosaceae	<i>Prunus</i> L. sp
Mango	40	Aam	Aanp	Anacardiaceae	<i>Mangifera indica</i> L.
Lime	40	Kagati	Kagati	Rutaceae	<i>Citrus limon</i> (L.) Osbeck
Guava	20	Amba/Amrood	Amba	Myrtaceae	<i>Psidium guajava</i> L.
Papaya	20	Papita	Mewa	Caricaceae	<i>Carica papaya</i> L.
Kumquat	20	Matya kakadi	Muntala	Rutaceae	<i>Citrus japonica</i> Thunb.
Pomegranate	20	Anar	Anar	Lythraceae	<i>Punica granatum</i> L.
Grapes	20	Angur	Angur	Vitaceae	<i>Vitis</i> L. sp
Apple	10	Shyou	Shyau	Rosaceae	<i>Malus domestica</i> Borkh.
Persimmon	10	Haluwabad	Haluwabad	Rosaceae	<i>Diospyrus kaki</i> L.f.
Sour Orange	10	Jamir	Jyamir	Rutaceae	<i>Citrus x aurantium</i> L.
Opuntia	10	Siundo	Siundi	Cactaceae	<i>Opuntia ficus-indica</i> (L.) Mill.
Lychee	10	Lychee	Lychee	Sapindaceae	<i>Litchi chinensis</i> Sonn.

(Continued)

TABLE 1 | Continued

English name	% Cultivating	Local name	Nepali name	Family	Latin name
Lapsi	10	Lapsi	Lapsi	Anacardiaceae	<i>Choerospondias axillaris</i> (Roxb.) B.L.Burt and A.W. Hill
Kaphal	10	Kaphal	Kaphal	Myricaceae	<i>Myrica esculenta</i> Buch.-Ham. ex D. Don
Amla	10	Amla	Amala	Phyllanthaceae	<i>Phyllanthus emblica</i> L.
Tree Tomato	10	Rukh tamatar	Tyammatar	Solanaceae	<i>Solanum betaceum</i> Cav.
Other Trees (12 spp)					
Walnut	90	Okhad	Okhar	Juglandaceae	<i>Juglans regia</i> L.
Timilo	70	Timilo	Timilo	Ficaceae	<i>Ficus auriculata</i> Lour.
Bamboo	50	Ninglo	Nigalo	Poaceae	<i>Drepanostachyum falcatum</i> (Nees) Keng f.
Timur	40	Timur	Timur	Rutaceae	<i>Zanthoxylum armatum</i> DC.
Dudhilo	40	Dudhilo	Dudhilo	Ficaceae	<i>Ficus neriifolia</i> Sm.
Belta	30	Belta	Berulo	Ficaceae	<i>Ficus subincisa</i> Buch.-Ham. ex Sm.
Butternut	20	Chiuri	Chiuri	Sapotaceae	<i>Diploknema butyracea</i> (Roxb.) H.J.Lam
Cottontree	20	Kapash	Kapash	Malvaceae	<i>Gossypium arboreum</i> L.
Oak	20	Bnaj	Katus	Fagaceae	<i>Quercus oblongata</i> D.Don
Koiralo	20	Koiral	Koiralo	Fabaceae	<i>Bauhinia variegata</i> L.
Rittha	10	Rittha	Rittha	Sapindaceae	<i>Sapindus mukorossi</i> Gaertn.
Cinnamon	10	Dalchin	Tejpat	Lauraceae	<i>Cinnamomum tamala</i> (Buch.-Ham.)T.Nees and Eberm.



FIGURE 6 | Women feeding sugarcane into a gur press.

or *roti* made of corn or rice flour accompanied by a vegetable dish. The midday and evening meals are derived from the classic Nepali *dahl bhat* meal of rice or *roti*, a dahl of cooked pulses, a vegetable *tarkari* dish, and a dish of cooked greens, *saag*. However, in homes, not all of these elements will usually be present in any given meal. *Achar*, a condiment which is either a fermented pickle or freshly made sauce (mint, sesame, tomato, hempseed, etc.), accompanies most meals. In far western Nepal, rice is usually not consumed after dark, so for the evening meal *roti* of wheat or corn flour usually accompany pulses and/or vegetable dishes.

Cows and water buffalo produce sufficient milk for household dairy needs. Buttermilk is usually prepared once daily in the early morning, and the butter produced as a side product is saved and clarified into ghee. Milk and buttermilk are drunk and used for cooking. Buttermilk is an important element of local cuisine and is often added to vegetables dishes or other regional dishes such as *dukpa*, a buttermilk sauce with dumplings made from the *kalaun* pea. Vegetable dishes and dahls are cooked with either ghee, depending on how much a household is able to produce, or vegetable oil purchased from outside the community. Other kinds of cooking oils are also sometimes produced and used locally, including from mustard seed, linseed, and butter nut (*Diploknema butyracea*). Dishes are seasoned with *masalas* made from a wide variety of spices, many of which are produced in the home gardens, such as garlic, turmeric, coriander, cumin, black cardamom, mustard, etc.

Enough wheat, corn, barley, and vegetables are produced by most families to meet household needs. Whether a household can rely solely on its crops of grains, pulses and vegetables may depend on the amount of land cultivated by the family and the available workforce. The largest component of the diet purchased from outside the home is rice, which can only be produced on a limited amount of land in the community. Many households may also need to purchase dahl to supplement their production, and there is a ready household trade in spices, seeds and grain.

Wild plants do not contribute significantly to the diet, although there are many species which are known and used. Perhaps the most popular is *kaaphal* (*Myrica esculenta*), a common tree in local oak forests, whose fruit is widely gathered and enjoyed in the spring, and sometimes sold to visitors and buses passing along the road to Gokuleshwor. A number of other wild fruits, notably *ainseu* (*Rubus ellipticus*) and *kimuda* (*Berberis asiatica*), are also eaten by children and adults in the fields and forest edges. A few other wild species are sought out and brought back to the home, including the fern *liudo* (*Dryopteris cochleata*), the young greens of *jarko* (*Phytolacca acinosa*), and the buds of *koiralo* (*Bauhinia variegata*). Wild yams, *tarul* (*Dioscorea deltoidea*), are often dug and consumed in the forest, either raw or roasted. The leaves of buckwheat or *phapar* (*Fagopyrum esculentum* and *F. tataricum*), which grow on the edges of terraces and gardens, are commonly gathered and cooked as *saag*.

Meat is generally considered an impure food in Hinduism, so its consumption is fairly limited and it is often excluded from the household kitchen. Nonetheless many people do occasionally eat goat, which is not milked like cows and water buffalo. Goats

are bought and sold and can be another significant source of household income. Goats are also sacrificed and offered to a variety of gods and local deities, often at prescribed locations and during specific festivals and life events (Gray, 1979; Govindrajan, 2015). A variety of special foods and dishes are prepared at temples and during festivals which are not part of typical household cuisine, such as *mohan bhag* (food of god), toasted wheat flour with ghee, coconuts and other condiments. The main meal eaten at festivals consists of *poori*, rice, *tarkari*, *dahl*, etc., while fruits and sweets are offered as *prasada*, or blessings.

Agro-Spiritual Cycle

The agricultural cycle of Malikarjun is embedded within the traditional Hindu Bikram Sambat calendar, which lays out the timing of festivals and prescribes auspicious and inauspicious dates and periods for nearly every kind of life activity. This 12-month lunisolar calendar (**Figure 2**) begins with the month of *Baishakh* (roughly corresponding to mid-April to mid-May), and is divided into six *ritu*, or seasons. The spring season of *Basanta* is characterized by warm temperatures. In the summer season of *Grishma*, rice is sown, which grows throughout the monsoon season of *Barsha*. It is followed by *Sharad*, the festival season, when rice is harvested, and then the winter seasons of *Hemanta* and *Sisir*. Each major event in the agricultural cycle is reflected in this calendar, and at the same time, lived experience in the fields contributes to shaping the calendar's local manifestation by determining the precise timing of certain festivals and events.

The two most important festivals in Malikarjun are local versions of *Haribodhini* and *Harishayani*, which are celebrated throughout the Hindu world. Hari refers to the god Vishnu (Sanskrit *Viṣṇu*), the preserver of the universe, who is understood to undergo an annual cycle that is linked with the seasonal cycle of the earth. During *Harishayani* ("Hari sleeps"), in Shrawan (June/July), Vishnu goes to sleep in the cosmic realm and manifests on earth, bringing with him the fertility that manifests in the monsoon rains and the growth of the summer rice and corn. Then in Poush (November/December), on *Haribodhini* ("Hari wakes"), Vishnu leaves the earth and wakes up once again in the cosmic realm, releasing the earth to undergo winter. The months of *Poush* and *Magh* (roughly December to February), during Hari's absence, are believed to be the least fertile time of the year, and thus not a propitious time for marriage.

In Malikarjun these two festivals are known as Shikhar Jatra (*Harishayani*) and Malikarjun Jatra (*Haribodhini*), and both are celebrated by festivals that draw thousands of people to the community to undertake *jatra*, pilgrimages to the Shikhar (ridge) of the sacred mountain (**Figure 7**), the dwelling place of Malikarjun the deity. Shikhar Jatra is intimately linked with the harvest of the winter crops, in particular barley, which is recognized as the most pure of all the crops grown in Malikarjun. In an outbuilding of the main temple complex, ripe heads of recently-harvested barley are placed on the earthen floor, and milk (another pure substance) is poured over them each day until they sprout. On the 8th day from their sprouting, some of the seedlings are uprooted and offered to Malikarjun at the main temple. On the following day, more seedlings are uprooted and offered to Balichan, a companion deity of Malikarjun. Then

on the 10th day from sprouting, all the remaining seedlings are uprooted and brought to the top of the sacred mountain to offer to Malikarjun (and by extension, Shiva and all the other gods).

The other staple grains, although they are not seen as intrinsically pure like barley, have their own special times of offering. In the month of *Jestha*, just after the spring harvest, heads of new wheat are ground into flour, which is made into *rotis* and offered to Bhimiraj, the “lord of the earth,” who is responsible for caring for the soil. Then in *Shrawan* or *Bhadra*, during the *Janai Purnima* festival when Hindu men renew their *janai*, or sacred thread, whole heads of recently harvested corn are offered. Finally in *Mangsir*, the recently harvested rice is offered. Each family makes their offerings of grain to Bhimiraj at a site they have selected in their terraced fields, often marked with a white *dhaja* or prayer flag, as well as to Malikarjun at one of the main temples. After offering grain to these main deities, people are free to offer at other locations and to any other gods that they may have a local or familial connection to. Not only grains, but all the most important “fruits” of agricultural production are first offered to the gods before being consumed and used by people, including newborn calves, a cow’s first milk, freshly-made *gur*, etc.

The offering of grains and other agricultural products to the gods, in recognition of their critical role in plant growth and health, is not the only way in which the agricultural system of Malikarjun is connected to spiritual practice. Nearly every offering, blessing, or ritual employs agricultural products, in particular pure substances like milk and barley, as well as rice, fruits such as banana, which represent fertility, and various flowers which are grown in the household gardens specifically for this purpose. For example, in mid-*Chaitra* (April), in the midst of the spring harvest, people bless the temples, their houses, storehouses, and even the large chests used for storing grain by applying *tika* to them made of cow dung (another pure substance), with sprigs of newly-harvested barley, *kalaun* pea and mustard stuck into the dung (three plants which are intercropped during the winter growing season). *Tika*, marks made on the forehead with colored pastes, rice and other substances (similar to *bindi*), are applied when people visit temples, perform rituals, welcome guests, practice *puja*, or during any other spiritual practice in Nepal and throughout the Hindu world. As such, the placing of *tika* on buildings and temples associates these structures with the human body and identifies them as carriers of divine energy.

Another clear example of the interweaving of spiritual and agricultural practice is the annual women’s festival of *Gaura*, a local expression of a wider Hindu festival unique to the far western region of Nepal. This festival celebrates Gauri (Sanskrit Gauri), a form of *devi* or the goddess, who embodies motherhood, nourishment and fertility. *Gauri* is strongly associated with a feminine nurturing principle, and this is reflected in the nature of the *Gaura* festival, which culminates in women dancing in a circle, singing and giving blessings so that their families, community and land may continue to thrive, nourish and be nourished “as long as there is snow in the Himalayas, as long as there is water in the seas.” *Gaura* lasts for 4 days of rituals and culminates in a final community-wide

festival. On the 1st day, women bring a special mix of grains and pulses called *biruda* (wheat, *kalaun* pea, horse gram, black gram, and rice bean) to one of the sacred springs associated with Malikarjun’s wives (**Figure 8**), and soak it in the water from the spring. Every household contributes their own *biruda*, which is grown especially for use in *Gaura*. On the 2nd day, the women wash the *biruda* five times in the water from the spring. On the 3rd day, they build and decorate a statue from a wide range of natural and pure substances, including flour made from the *biruda*, flowers, fruits, copper, etc. New *duvdhagas*, the female sacred thread, which is unique to far western Nepal, are hung on the statue to offer and bless them. On the 4th day, the women exchange their old *duvdhagas* for the new ones, taking them from the statue. The statue is then brought to Malikarjun Mandir, where multiple smaller “sister Gauras” meet and offer their statues and *biruda* at the temple. The women then bless their husbands and each member of their family in turn, after which the *biruda* is distributed among all households in the community. The typical blessing used at *Gaura* and other holidays employs many images of flourishing to describe different manifestations of fertility:

A hundred festivals, a hundred celebrations
May you celebrate; *biruda* of Panchami
Jamara of Dashain, beaten rice of Dutya
May you have rice and milk
May you have a comfortable bed to sleep on
May you have a pair of bulls for ploughing
May you have water from the spring to drink
May you marry the daughter of a noble
May you receive the blessings of God
May you hold the favor of the king
May you spread like a lawn of *dubo* grass
May you spread like the banana
May you bend like the uvula
May you blossom as fluff
As long as there is snow in the Himalayas
As long as there is water in the seas
May you live forever!

The three festivals specifically mentioned evoke the festival season of *Sharad* by identifying the *biruda* mix of *Gaura*; the barley from which *jamara* (germinated seeds given by the elders as a blessing with *tika*) is made during the important Dashain festival, and the rice which is beaten and offered during other festivals. All of these crops are either sowed or harvested during the *Sharad* festival period, so that the rituals indicated in the *Gaura* blessing encompass the entire annual agro-spiritual cycle.

Agricultural rituals are not only connected to the major grains and pulses grown in the community. In the household gardens, each woman maintains a *tulsi* (*Ocimum tenuiflorum*) or holy basil shrine (**Figure 9**), which is commonly built facing the east. *Tulsi* is a holy plant in Hinduism with a complex origin story which culminates in a mythic woman committing suicide after Vishnu deceives her into believing that he is her husband (Narayan, 1997). In compensation, she is turned into the *tulsi* plant. Each year on *Haribodhini*, the *tulsi* plant is ritually married to Vishnu in the form of sugarcane. *Tulsi* also plays an important role during human wedding ceremonies and in the annual



FIGURE 7 | One of the last gates before the Shikhar (ridge) of Malikarjun mountain visible beyond.

ancestral rites, in which *tulsi* leaves are used to purify the offering water, and the soil from which it grows is used in the offering shrine. Women make daily offerings at the *tulsi* shrines from the moment the seeds are sown on *Harishayani*. The offerings include incense and *diyo*, or oil offering lamps with cotton wicks made from either commercially available cotton or the cotton

tree, *kapash* (*Gossypium arboreum*), which is sometimes grown in household gardens. *Tulsi* shrines can be understood as the domestic and private expression of the public female ceremonial role in ensuring fertility and prosperity for family, community, and land, which is embodied in the rituals and blessings of *Gaura*.



FIGURE 8 | The Malikarjun Naula, one of the sacred springs where water is gathered by women for use in Gaura.

DISCUSSION

The festival of *Gaura* and the other rituals of the agricultural and spiritual cycle of Malikarjun presented here serve multiple and multifaceted purposes. On the one hand, gods and goddesses are honored and the covenant with the land is reenacted, through celebrating, making offerings and praying for the prosperity of family, community and land. In the specific case of *Gaura*, the five grains and pulses of the *biruda* symbolically represent the food of the entire community, and by purifying and offering them the women symbolically purify and offer all the food of the community. Further, culturally important foods are preserved, and local gastronomic identity is enriched, by the incentive to cultivate heirloom crops that are prescribed for use in rituals, such as the *kalaun* grown for *Gaura* and the barley grown for *Harishayani* and *Dashain*. Simultaneously, the cultivation of landraces has the double benefit of promoting resilience through plant diversity and preserving species adapted to local conditions (Sunderland, 2011; Nabhan, 2014).

The agro-spiritual rituals also have implications for community identity: by participating in *Gaura*, young brides who have recently married into the community (which is patrilocal) receive their *duvdhaga*, the womens' sacred thread, which like the festival itself, is unique to far western Nepal. Traditionally,

women only become officially integrated into the ceremonial life of the community once they have married and received their *duvdhaga* by participating in *Gaura* (men are also not fully integrated into the spiritual community until they have received *janai*). As such, *Gaura* not only celebrates and prays for the fertility and health of the community and land, it also affirms the belonging of individuals within the broader spiritual community, and links that belonging with the role of upholding fertility.

As Haider et al. (2020) suggest while describing the ritual use of the red wheat *Rashtak* in the Pamirs, "It is difficult now to disentangle whether the culture expressed so distinctly through ritual and daily practice exists because of the seed or if the seed exists to serve these cultural practices." This is certainly true in regard to the interpenetration of agriculture and ritual in Malikarjun. However, it is not just the value of these agricultural products to the community that makes them effective in spiritual practice. The cultivation of these products *is itself* perceived as possessing both a material and a spiritual quality, since it depends on the farmers' labor and knowledge *as much as* it relies on the elemental and cosmic forces of rain, sun, and soil fertility, which depend on the numinous intercession of gods, goddesses and landscape deities. Seasonal and spiritual cycles are intertwined and inseparable. Thus, through farming, the farmers of Malikarjun participate in something similar to



FIGURE 9 | A typical *tulsī* shrine in a yard in Malikarjun.

what Kimmerer (2013) calls “ceremonies of practical reverence,” powerfully pragmatic “acts of reverence,” in which manifest and material action has seemingly unmanifest and immaterial effects. When agriculture is understood as a spiritual practice, then the deities who participate in that process are manifest in agricultural products, just as they are also manifest in natural features of the earth like springs, mountains, and caves, as well as in certain specific plants, such as *pīpal* (*Ficus religiosa*) and *tulsī*. In this

way, the offering of crops completes a cycle by recognizing and returning the energy of life (in the form of food) to its spiritual source.

For anyone intending to engage in, and fully grasp, the practices and the needs of the people of Malikarjun, it is of critical importance that the local food system is understood as the result of the combination of material, spiritual and multispecies relations. From a multispecies perspective, traditional grains and



FIGURE 10 | Landslides caused by poorly-implemented road construction in Malikarjun.

pulses like the *kalaun* pea have evolved over time to play a mediation role in which they allow the covenant between the people the deities, and their divine blessing, to become manifest as nutritious food. Hence, traditional and culturally important foods are spiritually embedded in ways that food produced and purchased outside the community is not. Similarly, in traditional Hopi culture, “...corn is the central bond. Its essence, physically, spiritually, and symbolically, pervades their existence. For the people of the mesas corn is sustenance, ceremonial object, prayer offering, symbol, and sentient being unto itself [...] The connection between the people and the corn is pervasive and deeply sacred. In a remarkable symbiosis between the physical and the spiritual, the Hopi people sustain the corn and the corn sustains Hopi culture” (Wall and Masayesva, 2004).

Road development appears to be one of the main threats to the current food system of Malikarjun. Increased consumption of exogenous and mass produced foods due to better road connections may over time create a disconnect between people and their culturally important foods, and ultimately between people and the land. A decline in local biocultural diversity is a plausible outcome of this disconnect, as rituals and practices may lose salience along with meaning (Pretty et al., 2009). This would likely affect *in situ* conservation of genetic crop diversity, given that landraces are an invaluable genetic source

of disease-resistant material and contribute variation associated with various terroir-dependant flavor profiles, in a context of unpredictability brought about by climate change and cultural transition (Pretty et al., 2009; Sunderland, 2011; Nabhan, 2014). From a food security and quantitative point of view, increased connectivity to distant markets may bring more wealth to individual households, which may in turn improve the general living condition of local families. On the other hand, from the perspective of food sovereignty, opening the local food system to a wider market may result in eroded traditional practices and beliefs; loss of local gastronomic identities, and of landrace diversity in favor of more high-yield or commercially valuable cash crops, with an overall negative impact on local biocultural diversity.

Destruction derived from poorly implemented road development affects households’ self-sustenance capacity. In fact, some of the community members lamented lost portions of home-gardens and terraced fields because of poor management of debris from road construction and increased risk of landslides (Figure 10). In the long run, diminished availability of land may cause families to abandon certain crops, hence impacting both plant diversity and diversity in household diet. Another threat to local self-sufficiency is the widespread out-migration in search of work opportunities in the Nepali cities or abroad,

as decreased workforces seriously impacts families' capacity to meet household needs.

CONCLUSION

Situated at the intersection of political ecology and ethnobiology, this study demonstrates why spiritual practices should be considered key elements of biocultural diversity. By presenting both agricultural practices and spiritual beliefs, we show how the local food system is embedded within a broader spiritual landscape. We discuss how the covenant between people and the land is constantly reenacted in the yearly festivals and how these provide an incentive to cultivate specific landraces whose use is prescribed in rituals, as in the case of the Gaura festival, where the fertility and well-being of people and land is affirmed through the offering of locally produced heirloom pulses and grains.

Collection and analysis of stories and songs, as well as the investigation of local rituals, constitute crucial methods to reveal the complexity of the agri-food system of Malikarjun's. Stories and songs powerfully encapsulate and store history; ecological and traditional knowledge; shared values; ethics. *"The songs are sung in the forest, and if people do not go to the forest, they will lose their songs"*, one of the most knowledgeable local singers, Binda, pointed out during a recording session. Binda succinctly expresses a key issue for many rural and indigenous communities: access to traditional food and the continuation of its linked practices are paramount to the preservation of their knowledge, and *vice versa*. For communities stories and songs are the seeds of the world to come: alongside self-determination and access to land the continuation of traditions and identities depend on them. A great deal of knowledge is lost when people are prevented from being in, or relating to, their homelands in their traditional ways, "gathering plants and animals for food and ceremonies and performing the ceremonies that ensured the prosperity of the earth and its life-forms," (Deloria et al., 1999). We therefore recommend that in the implementation of sustainable development that aims to embody the principles of food sovereignty, local and indigenous ways of knowing should be foundational to all interventions, through the tools of consultation and knowledge co-construction through participatory and community-informed holistic approaches, and indigenous and decolonizing methodologies (Smith, 1999; Pimbert, 2006; Wilson, 2008; Kovach, 2010; Chilisa, 2012; Drügge, 2016). In particular, we strongly advocate that spiritual practices should be considered key elements of biocultural diversity and the right to food sovereignty, and we urge that they receive greater attention in the academic and policy-making fora, and in all stages of agricultural development.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants, in accordance with the local legislation and institutional requirements. The participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Fieldwork in 2018 was carried out by AG, with assistance from JB. JB translated collected stories and songs. FC was responsible for visual and audio documentation, and the photos and infographics for the manuscript. All authors conducted fieldwork in 2020 and shared the conceptualization, analysis, and writing of this manuscript.

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Indian Diaspora Gastronomy: On the Changing Use of Herbs and Spices Among Southern California's Indian Immigrant Women

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Southern California has witnessed a burgeoning Indian immigrant population in recent decades. And among the cultural features that most distinguishes Indians is their cuisine. Their use of herbs and spices in food and medicine, in particular, is tightly bound to language, religion, gender, and overall cultural identity. Identifying how Indian immigrants' culinary choices adapt to southern California's varied and often fast-food based gastronomy, particularly impacts on the inter-generational transmission of traditional culinary knowledge, is important in terms of understanding the role of cultural retention and assimilation, as well as culturally-defined notions of food in physical and psychological well-being. We explored these questions by means of interviews with 31 Indian immigrant women in southern California. Participants were selected by means of snowball sampling. Our working hypothesis was that problems with sourcing and cultural assimilation pressures would have eroded the use of traditional herbs and spices. A total of 66 herbs and spices (and associated seasonings) were reported. Of these, the highest frequency of use was recorded for turmeric (100% of respondents) followed by cilantro, cinnamon, clove, cumin, curry leaves, and ginger (all 97%). The highest Species Medicinal Use Values were recorded, in descending order, for turmeric, ginger, fenugreek seeds, clove, cinnamon, curry leaves, and Tulsi. Contrary to expectations, there was no significant association between years resident in the United States and decreasing use of herbs and spices. Indeed, in some cases the confluence of northern and southern Indian immigrant women with a new identity simply as "Indian" resulted in an increase in the knowledge and use of herbs and spices. Spices are nearly all locally sourced, and where specific herbs are not readily accessible, they are cultivated in homegardens or brought directly from India. Many Indian immigrants are relatively prosperous and able to travel frequently to and from India, thus maintaining close cultural ties with their homeland. Indian immigrant women are fully aware of the health benefits associated with the use of traditional herbs and spices, and all participants reported that Indian food is a healthier choice than American cuisine. Knowledge is passed *via* vertical transmission, primarily through mothers and grandmothers to daughters. Overall, there is little concern among female Indian immigrants to southern California that knowledge and use of their traditional herbs and spices are in a state of decline.

Keywords: Indian diaspora, cuisine, gastronomy, herbs and spices, homegardens

INTRODUCTION

The sumptuous flavors, aromas, and colors derived from spices and herbs represent pivotal elements in the march of world history and the development of regional identities. For ancient peoples, spices truly were “fantasy substances” (Morton, 2000). The Chinese were importing various spices from Southeast Asia well before the Common Era, and vast quantities of spices flowed into ancient Egypt and later the Roman Empire from India and unknown points of the mysterious east (Warmington, 1928, p. 182; Dalby, 2000). Throughout the Middle Ages, exotic and astronomically expensive spices represented items of conspicuous consumption for Europeans of wealth and position. To serve highly spiced foods to guests was considered the highest form of snobbery (Freedman, 2008; Voeks, 2018, p. 120). And of course, the European Age of Discovery was fueled by dreams of discovering sea routes to eastern spice lands (Parry, 1955). It is not an overstatement to say that Columbus, de Gama, and Magellan, the three standard-bearers of the Age of Discovery, “were spice seekers before they became Discoverers” (Turner, 2004, p. 36).

But spices were not just pricey organoleptic enhancers. Various lines of evidence suggest that herbs and spices were in the past important elements in neutralizing harmful bacteria in tropical cuisines (Sherman and Billing, 1999). And they have long been perceived to possess miraculous medicinal virtues. The medicinal value of spices has deep historical roots in South Asia, and much of this was transferred to European medical practices by Arab pharmacologists (Gupta, 2012). In ancient Rome, black pepper from India’s Malabar Coast was often referred to as “the Indian remedy,” especially for treating malaria (Warmington, 1928, p. 182). In Medieval Europe, spices were similarly revered for their medicinal attributes, particularly in their ability to harmonize the bodily humors (Freedman, 2008). During the fourteenth century, incense pouches containing pepper, ginger, cinnamon, cloves, turmeric, and other exotic plant products, were used to prevent “bad air,” which Europeans of that era regarded as a cause of the plague (Kuk, 2014). Strongly aromatic herbs have long been associated with rituals by the principal monotheistic religions, principally for purification, good luck, protection from disease and evil eye, and associations with witches and other demons (Dafni et al., 2020). Even today, many spices and herbs serve the dual function of livening up meals and treating medical maladies.

Spices and herbs also serve as cultural markers for the diverse ethnic peoples of the world. Just as foods and dining patterns serve as powerful symbols of cultural identity (Narayan, 1995; Flitsch, 2011), so to do the symphonies of scents, colors, and flavors of local herbs and spices serve to identify to which group individuals belong, and to which ones they do not (Etkin, 2009, p. 66). Some nationalities have become associated with a single spice or herb, such as paprika for Hungarians and peri-peri for Mozambicans. Other peoples are rather evenly identified with two or more spices and herbs, such as ginger and garlic for Koreans, shiso and sansho pepper for Japanese, and ginger and turmeric for Moroccans. Some groups are situated in the culture

hearth of globally significant spices or herbs, such as chilis, vanilla, and Mexican oregano from Mexico, whereas others enjoy native spices that have remained largely endemic, such as wattle seed, lemon myrtle, and mountain pepper from Australia.

Among all the nationalities of the world, perhaps none is as readily identifiable as herb and spice lovers as Indians. Indeed, India’s ancient Malabar Coast, today’s Kerala, is often referred to as “the land of spices.” The use of herbs and spices is an integral component in the preparation of nearly every Indian dish, and it is not unusual to include 20 or more herbs and spices in a single recipe. The items used most commonly in India are black pepper, chili, mustard seed, cumin, turmeric, fenugreek seed, ginger, coriander, asafetida, and curry leaves, as well as spice mixtures that incorporate cloves, cardamom, and cinnamon (Srinivasan, 2010, pp. 66–67). In addition to the intoxicating mix of colors, flavors, and aromas, the presence of herbs and spices in Indian cuisine is keenly understood by Indians to also provide medicinal benefits. Whereas for some contemporary food cultures the concept of food as medicine is relatively novel, for the Indian community it is a long-standing tradition (Kessler et al., 2013; Chandra, 2016). Because the use of these spices and herbs is deeply lodged in India’s various medical beliefs and practices, the retention and inter-generational transference of these culinary traditions among the Indian diaspora is culturally reinforced with religious reverence and belief. For Hindu culture, food is “the fundamental link between men and gods” (Appadurai, 1981, p. 496).

We are living in the age of human migration. There are at present an estimated 272 million international migrants, or some 3.5% of the total global population. Among the myriad sources of immigrants, India continues to have the largest number of migrants (17.5 million) living abroad (United Nations, 2020, p. 19). And whereas immigrants to the United States (US) arrive from varied socio-economic backgrounds, from refugees and low-skilled urban workers to highly skilled professionals and entrepreneurs (Zhou et al., 2008; Zong and Batalova, 2017), most of the Indian immigrants that arrive in the US are skilled laborers, filling the need in the labor market primarily in the fields of engineering and medicine (Rumbaut, 2008; Zong and Batalova, 2017). According to the U.S. Census Bureau, in 2017 a total of 712,532 people in California reported as Asian Indian, representing a growth of over 16% in just 2 years.

This article documents the culinary and medicinal uses of spices and herbs among Indian women residing in southern California. Immigration is underpinned by various cultural assimilating forces, among these being changes in foods and cuisines. Given these influences as well as the sharp distinction between the knowledge and use of spices and herbs between Indian and Anglo-American cuisine, our working hypothesis was that there would be an overall reduction in the usage of traditional herbs and spices over time among Indian women immigrants to southern California, and that this reduction would be most evident in those who had resided in the US longer (see Benson and Helzer, 2017). Based on research concerning the importance of language as an indicator of a

strong and confident cultural identity, we further hypothesized that participants who were more likely to speak English as their dominant language instead of the traditional Indian language with which they were raised were more likely to accept change in their food habits as well, assimilating to a more American or western cuisine (Wallendorf and Reilly, 1983; Montanari, 2006; Rumbaut, 2008; Kang, 2013; Parasecoli, 2014). Finally, we hypothesized that although there would be differences between the types of meals, as well as spices and herbs used to prepare them, based on the North Indian and South Indian cultural identification, the connections and sharing of knowledge that exists within the Indian immigrant community in southern California would blur these distinctions over time.

MATERIALS AND METHODS

Thirty-one Indian female immigrant research participants were selected through the snowball sampling method in Los Angeles and Orange counties during a 5-month period in 2017. The women were all over the age of 18, of Indian descent, and living in southern California. We focused our interviews on Indian women because they are primarily in charge of domestic responsibilities, including food preparation (Appadurai, 1981), even after migration to the North America (Ray, 2004 p. 115; Acharya and Acharya, 2008; Vallianatos and Raine, 2008). Data were obtained by means of personal interviews and a questionnaire with respondents, both of which were approved by the California State University, Fullerton Institutional Review Board. Participants were asked for permission to use the results of their interview through oral consent preceding the personal interview process, and to audio record their interview. At the end of each interview, respondents relayed contact information about other potential participants in the project. The majority of participants were parents of children who were born in the US. Most of their children were under the age of 18; however, some participants had adult children who had children or families of their own.

The questionnaire consisted of demographic and socio-cultural questions, as well as freelisting of herb and spice usage. We inquired about cultivation of traditional herbs at home, as well as about usage and perceived knowledge of the medicinal qualities of herbs and spices (Figure 1). Species Use Value for medicine was calculated with reference to Hoffman and Gallaher (2007). Quantitative data were assessed by means of linear regressions and Student's *t*-tests. A few questions were considered but eventually omitted before the final version. The question of religious lifestyle of the participants upon immigration to the US was considered for the purpose of measuring cultural identity. The ability to comfortably practice the religion of an immigrant's homeland plays a significant role in cultural identity, and Indian medicinal and health beliefs are often rooted in religious beliefs. However, the sensitive nature of a person's religious beliefs raised some ethical concerns, and we therefore omitted reference to religious beliefs, using instead language use as a reasonable proxy of cultural identity and assimilation.

RESULTS

The socio-cultural results and the total number of spices and herbs recorded by the respondents are listed in Table 1. First names of participants who chose to reveal their names are included. Many of the study participants lived in relatively close proximity to one another in southern California, but they originated from various regions of India (Figure 2). Although India is home to many different languages, clothing styles, and cuisines that often vary on a state-by-state basis, a clear north-south distinction exists; most Indians identify as being either North Indian or South Indian. The majority of participants in the study (19) hale from North India, whereas fewer came from South India (12).

The number of years female participants had lived in the US varied from 3 to 50 years. Using number of years living in the US as a proxy for likely degree of cultural assimilation, our first hypothesis, that usage of traditional herbs and spices would decline over time, was not supported by the data. There was no significant linear association ($y = 28.791 - 0.1125x$, $p > 0.05$) between number of years living in the US and the total number of herbs and spices used by respondents in cooking. Women who had lived in the US for several decades were just as likely to use the same number or even more herbs and spices than women who had recently arrived. Sunila, for example, had resided in southern California for fifty years and was able to list 29 herbs and spices that she used on a frequent basis. Archana, on the other hand, who had been in the US for just 3 years, listed only 22 herbs and spices that she regularly used. Overall, number of years of exposure to American culture and cuisine seems not to be leading to an evident erosion of knowledge and use of herbs and spices among Indian immigrants.

Moreover, in response to the question of whether they were using more, less, or the same herbs and spices after arriving in the US, 35% indicated that they were using more, and 39% said about the same. Only 13% of respondents thought that they were using less traditional herbs and spices.

Regarding language continuity, 19 of 31(61%) participants spoke primarily English or a mixture of English and an Indian language at home, whereas 12 of 31 (39%) spoke primarily an Indian language. Indian languages spoken at home included: Dogri (3%), Gujarati (13%), Hindi (16%), Kannada (3%), Kutchi (6%), Malayalam (3%), Marathi (23%), Marwari (3%), Punjabi (10%), Saurashtra (3%), Tamil (19%), and Telugu (6%). Percentages exceed 100% because several participants spoke more than one Indian language at home. The mean number of herb and spice items used by those who spoke either English or English and an Indian language was 26.7; the mean number for those who spoke primarily an Indian language was nearly identical at 26.9. These means were not significantly different ($t = -0.0786$, $p > 0.05$).

Respondents originally listed 78 unique culinary items. Of these, 12 did not constitute proper herbs or spices, but rather seasonings or condiments, such as black salt, ghee, honey, ready-made masalas, and yogurt, and these were culled from the data. The only exceptions were coconut oil, coconut meat, lemon, and sesame oil, all of which are used in cooking as if they were herbs

Demographic Questions:

Participant name, age

Children:

- ☐ Yes
☐ No
☐ Prefer no answer

Details: (age, gender)

How long have you lived in the United States? OR When did you move to the United States?

What language do you speak at home to your spouse/ children? (Most common language spoken – least for multiple answers. “Both” is acceptable)

What part of India are you from?

Open-ended Questions:

- a. Can you please list Indian spices and/or herbs that you use on a daily basis? (prompting acceptable)?
 b. Are you aware of any medicinal or health benefits of any of these spices and/or herbs?

Spice / Herb	Last time used	Know Medicinal purpose	Personally, use medicinally

Did you use more spices and/or herbs when you were growing up versus now?

Is there any particular reason you use, or you don't use these spices and herbs for medicinal use for yourself?

Do you see yourself cooking more, less, or the same amount of Indian food?

On average, how often do you go out to eat food that is not Indian (week basis)?

- a. How important is it that traditional foods get passed down to your children?
 [1] Not important
 [2] Important
 [3] Very important

b. Why?

Are there concerns for the consumption of Indian food in the future for your children/ family? (based on yes/ no response, please elaborate) Why?

Is there anything else that you would like to add to this study?

Are there any Indian individuals or families that you can recommend participating in this study?

FIGURE 1 | Questionnaire administered to 31 Indian immigrant women in Southern California.

and spices, and all of which are perceived to have medicinal properties. The final list includes 66 items—35 spices, 27 herbs, and 4 “others” (**Table 2**). Species usage per culinary item varied from 100% of respondents to a single respondent. The most commonly used item was turmeric, which was used by 100% of respondents, followed by cilantro, cloves, cumin seed, curry leaves, and ginger, which were used by 30 of 31 respondents. All of these species are native to the Old World, and all have been important elements in Indian cuisine since ancient times.

The 31 participants listed between 14 and 35 herbs and spices, with a mean of 26.8. In terms of regional provenance, participants from North India averaged 27.1 herbs and spices, whereas those from South India averaged 26.3. There was no significant difference in herb and spice usage between North and South India respondents ($t = 0.334, p > 0.05$).

The frequency with which herbs and spices are used by individual respondents is also an indicator of the item's importance to the individual and the greater community. Frequency of use was calculated into five categories. A numeric value between two and six was attached to each of the categories to classify the data. The frequency of use for each participant for the items listed in their corresponding interviews are listed in

Table 3. Many of these items were used daily or weekly; however, there were a few items on the list, such as Tulsi and saffron threads, that were primarily listed as “used as needed” indicating that their purpose in Indian households is not specifically related to food. The frequency of use of each of the items is an important dimension of overall importance. Items that are used daily are usually considered more important than items that are used seldom or rarely. Items that are “used as needed” are also important, however, because they are used either specifically for their medicinal properties when the occasion arises, or they are used on special occasions. Items that are rarely used, noted as a numeric value of four or five, are overall less important than items that are rated two, three, or six.

Participants revealed various medicinal and health benefits associated with the spices and herbs they used in cooking. These are organized into 24 categories in **Table 4**. Categories range from preventative measures, to treatments for minor ailments such as coughs and digestion, to claims of preventing or treating more serious health issues such as cancer, diabetes, high blood pressure, and cholesterol. Other uses were oriented to overall well-being, such as cosmetic, weight loss, detoxing, and heating/cooling down the system. Remedies were used for

TABLE 1 | Participant socio-cultural information, including name, age, original homeland, North or South India origin, years living in the US, age at arrival in US, city and county in US, and total number of herbs/spices listed.

ID	Name	Age	Indian Homeland	Region in India	Years in US	Age at arrival	Home in California	Number of spice/herb items listed
1	Participant 1	28	Bangalore	South	14	14	Norwalk, LA	23
2	Participant 2	64	Bangalore	South	14	50	Norwalk, LA	17
3	Sumi	41	Kerala	South	41	0	Fullerton, Or	17
4	Sathi	68	Kerala	South	45	23	Fullerton, Or	29
5	Kiran	53	Punjab	North	30	23	Norwalk, LA	14
6	Sonia	41	Delhi	North	16	25	Cerritos, LA	15
7	Bhavana	40	Mumbai	North	14	26	Cerritos, LA	29
8	Priyanka	41	Gujarat	North	18	23	Cerritos, LA	31
9	Puntia	35	Mumbai	North	7	28	Brea, Or	34
10	Kavitha	41	Mumbai	North	18	23	Cerritos, LA	23
11	Purvi	39	Mumbai	North	15	24	Brea, Or	32
12	Aditi	44	Pune	North	13	31	Cerritos, LA	38
13	Suchitra	34	Mumbai	North	11	23	La Mirada, LA	29
14	Shivangi (Sonia)	40	Delhi	North	4	36	Artesia, LA	24
15	Niru	36	Hyderabad	South	10	26	La Palma, Or	26
16	Mansi	38	Maharashtra	North	10	28	Cerritos, LA	27
17	Chellam	54	Chennai	South	32	22	Cerritos, LA	28
18	Participant 18	27	Bangalore	South	2	25	Cerritos, LA	23
19	Vasuki	38	Chennai	South	14	24	Cerritos, LA	31
20	Kasthuri	39	Chennai	South	5	34	Cerritos, LA	33
21	Nisha	51	Chennai	South	30	21	Torrance, LA	31
22	Arti	48	Hyderabad	North	20	28	Cerritos, LA	30
23	Monika	40	Bangalore	South	18	22	Cerritos, LA	28
24	Mona	37	Punjab	North	19	18	Cerritos, LA	31
25	Preeya	31	Chennai	South	7	24	Cypress, Or	30
26	Vaishali	44	Mumbai	North	39	5	Mission Viejo, Or	16
27	Sunila	73	Maharashtra	North	50	23	Mission Viejo, Or	29
28	Namita	34	Rajasthan	North	10	24	Harbor City, LA	35
29	Pooja	34	Hyderabad	North	8	26	Norwalk, LA	29
30	Esha	32	Rajasthan	North	10	22	Torrance, LA	27
31	Archana	37	Pune	North	3	34	Torrance, LA	22

LA, Los Angeles County; Or, Orange County.

personal and family care, especially in treating influenza, colds, and coughs in children. Medicinal and health benefits for each herb and spice item are listed in **Table 5**.

The Species Use Values (SUV) for medicinal applications and health benefits were calculated using Hoffman and Gallaher (2007, p. 209): $UV_{is} = (\sum UV_{is})/(n_i)$, where U_{is} is the total number of uses mentioned for item s , n_i is the number of respondents (**Table 5**). The highest medicinal SUV was for turmeric (2.109), meaning that on average the 31 respondents perceived turmeric to have over two medicinal properties. Six other herbs and spices contained on average more than one medicinal use per respondent, including cinnamon (1.032), clove (1.065), curry leaves (1.032), fenugreek seeds (1.097), ginger (1.387), and Tulsi (1.032). Although a wide range

of perceived medicinal properties were listed, several species retained relatively consistent values.

Although many of the medicinal benefits were idiosyncratic among the respondents, that is, often only one or a very few respondents associated a particular herb or spice with a particular medicinal or health benefit, some perceived benefits were fairly consistent among respondents. In **Table 6**, 12 herb and spice items with > 25% consistency among respondents are listed. These include three that were perceived useful for more than one purpose, including cinnamon, which was useful for nasal problems, colds and cough, and cholesterol, ginger, which was useful for nasal (and associated issues) and digestive issues, and turmeric, which was considered useful for nasal problems, cosmetic uses, and as an antibiotic.

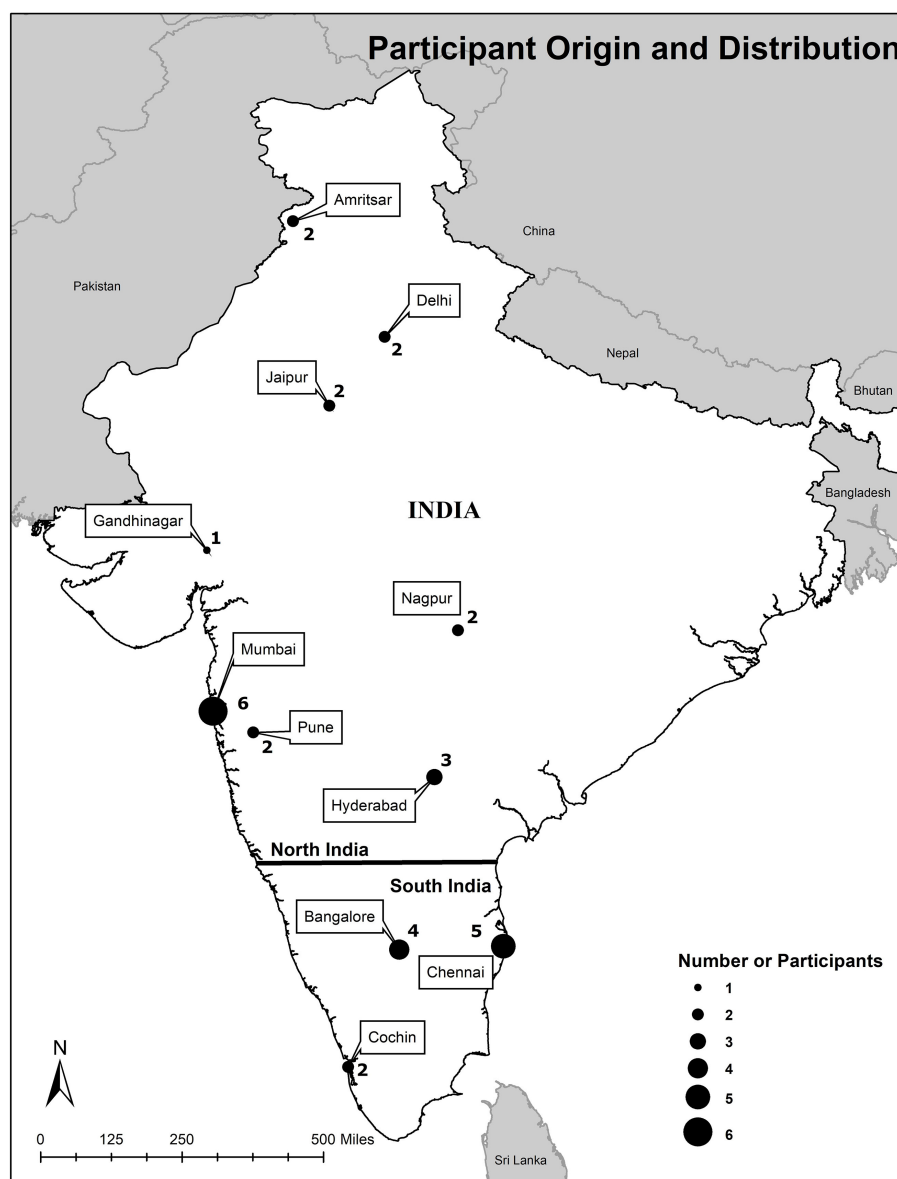


FIGURE 2 | Place of origin in India of 31 research participants.

DISCUSSION

Traditional Herbs and Spices

The relationship between food and people is a complex connection involving both tangible and intangible elements. It is influenced by the availability of ingredients, as well as through the cultural environment into which intangible factors, such as ideas, perceptions, and belonging, play key roles influencing the people-food nexus. From a cultural perspective, food and cuisine are fundamental means through which cultural identity can be expressed and shared. They are central components to the sense of collective belonging (Narayan, 1995), and they are highly visible and olfactory means through which people separate

themselves from others (Narayan, 1995; Fischler, 2011; Flitsch, 2011; Bailey, 2017). Thus, “Man [and woman] eats, so to speak, within a culture, and this culture orders the world in a way specific to itself” (Fischler, 2011, p. 281). Food not only creates a sense of oneness within a community or cultural group, but it also creates a sense of otherness, wherein people identify themselves as different from others based on food and cuisine choices. A person’s culture is the foundation upon which their food and their culinary choices are determined, and each possess cuisines or dishes that are considered traditional and therefore fundamental to a person’s sense of identity.

In the case of international immigrants, there are many obstacles-socio-cultural, economic, and material-that can hinder

TABLE 2 | All listed spice and herb items from 31 southern California Indian immigrant respondents.

	Spice/herb	% of respondent use	C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Ajowan caraway	39	S				x								x	x	x	x		x					x	x	x	x		x	x			
2	Anise seed	10	S												x	x	x																	
3	Asafetida	90	S	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
4	Basil	32	H				x			x	x	x									x				x			x		x		x		
5	Bay leaves	84	S				x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
6	betel leaf	3	H												x																			
7	Black cardamom	19	S							x					x		x										x	x						x
8	Black cumin	10	S							x					x															x				
9	Black nightshade	3	H																				x											
10	Black pepper	94	S	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11	Black stone flower	6	S												x																			x
12	Brahmi powder	3	H											x																				
13	Caraway (Shahi jeera)	13	S				x			x																		x		x				
14	Chili (fresh)	74	S	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x		x		x	x	x	x	x		x		x		
15	Chili powder	74	S	x	x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x	x			x	x		x		x	x	
16	Chili (whole dry)	74	S	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x		
17	Cilantro	97	H	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
18	Cinnamon	94	S	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
19	Cloves	97	S	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
20	Coconut	38	O		x										x			x	x	x	x	x	x	x		x				x		x		
21	Coconut oil	10	O																			x	x									x		
22	Coriander seed/powder	77	S	x		x	x		x	x	x	x	x	x	x			x	x			x	x	x	x	x	x	x		x	x	x	x	x
23	Cumin seed/powder	97	S	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
24	Curry leaves	97	H	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
25	Dill	16	H				x					x								x						x					x			
26	Fennel	58	S				x				x	x			x	x	x			x	x	x	x	x	x	x	x		x	x	x		x	
27	Fenugreek leaves	81	H						x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
28	Fenugreek seeds	77	S	x			x				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
29	Garam masala	32	S					x	x		x					x		x	x		x						x	x				x		
30	Garlic	94	H	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
31	Garlic powder	10	H									x												x								x		
32	Ginger	97	H	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
33	Ginger powder	19	H									x		x	x													x			x	x		
34	Green cardamom	87	S		x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x		x	x	x	x	x

(Continued)

TABLE 2 | Continued

Spice/herb	% of respondent use	C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
35 Karpuravalli (Cuban oregano)	6	H																	x			x											
36 Kokum	29	S							x	x	x		x	x				x												x	x		x
37 Lemon	16	O																		x	x	x	x				x						
38 Lemongrass	10	H							x			x	x																				
39 Licorice root	6	H												x	x																		
40 Mace	13	S												x					x			x	x										
41 Mango powder	16	S					x						x	x																	x	x	
42 Mint	90	H	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
43 Moringa leaves	10	H																	x		x	x											
44 Mustard leaves	6	H			x																										x		
45 Mustard seeds	74	S	x			x		x	x	x	x		x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	
46 Nutmeg	45	S	x						x	x	x		x		x			x			x			x		x	x		x		x	x	
47 Onion	19	H	x	x	x	x		x														x											
48 Onion powder	3	H		x																													
49 Onion seeds	3	H													x																		
50 Oregano	19	H							x	x	x													x		x		x					
51 Paprika	6	S	x							x																							
52 Parsley	6	H																					x			x							
53 Peepramul powder	3	S											x																				
54 Pomegranate seeds	3	S											x																				
55 Poppy seeds	10	S									x			x																x			
56 Rosemary	6	H									x																						
57 Saffron threads	61	S				x			x	x		x	x	x	x	x	x	x			x			x	x	x	x		x	x		x	x
58 Sesame oil	3	O																			x												
59 Sesame seeds	35	S									x	x	x	x	x			x					x	x					x		x	x	
60 Star anise	54	S	x			x				x	x		x	x			x	x	x	x	x	x	x	x	x		x				x		
61 Tamarind	51	S	x						x					x	x	x	x		x	x	x	x	x		x		x			x		x	x
62 Thai Basil	3	H																															
63 Thyme	6	H				x																	x										
64 Tulsi	71	H	x				x		x	x	x	x	x		x	x	x		x		x	x		x	x	x	x		x	x	x	x	x
65 Turmeric	100	S	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
66 White pepper	6	S				x																					x						

Items are categorized S/H/O—Spice, Herb, Other.

and otherwise suppress the preparation or consumption of their traditional foods, or that can facilitate it (Vallianatos and Raine, 2008). At a basic level, they have two options—follow traditional assimilation models and conform to mainstream cultural norms of their adopted home, or create a new cultural niche where they can continue and perpetuate the culture and identity of their homelands. The former is historically the rule rather than the exception among most immigrant groups to the US. According to Gabaccia (2009, p. 225), in spite of the various motivations for preserving traditional ethnic food customs, American immigrants “play with our food” far more often than we preserve the culinary traditions of our ancestors. Many second-generation Sikh immigrants in California’s Central Valley, for example, report a total transition to American fast food and snacks (Benson and Helzer, 2017). Drivers of culinary preservation or re-creation, on the other hand, include the profound culture-bound role of food in Indian culture, as well as the complex gendered role of women in the kitchen (Appadurai, 1981). It is also driven by nostalgia that is “predetermined, indeed overdetermined, in scripting immigrant attachment to the past” (Mannur, 2009, p. 28). Food-based nostalgia can be as much for a cuisine that is unknown and untasted, and for a homeland to which one never wishes to return (Roy, 2002). In the case of Indian immigrants to southern California, gastronomic preservation rather than assimilation has predominated, with notable exceptions. Many have the financial resources and security to live differently than unskilled immigrant laborers and refugees, and these conditions allow Indian immigrants to live within their personal cultural comforts without much opposition or motivation to assimilate. This includes the option of continuing culinary traditions. Many Southern California Indians travel on an annual basis to their homeland, or even more frequently, where their traditional culinary practices are reinforced and, perhaps, new ones introduced.

Availability, access to, and affordability of culinary resources is another factor that either facilitates or hinders the transfer of food and cuisine traditions. Arab immigrants to Canada, for instance, were unable to source fresh parsley, a key ingredient in Arab cuisine. And Indian immigrants were limited by the high cost of imported foods and spices (Vallianatos and Raine, 2008). In most cases, however, this has not posed a challenge for Indian women immigrants to southern California. Indian shops have become a ubiquitous feature of southern California’s urban landscapes. And if an important culinary item is not found in one or another local shop, they have the option of making a short trip to “Little India” in the city of Artesia, where more than 100 shops cater to the needs of the Indian community. As for the rare or specialty items that are not available, these can be purchased in bulk during visits to India.

The participants in this study were eager to share their knowledge about Indian cuisine and the medicinal and health benefits of spices and herbs that are used frequently in Indian cooking. While some were more knowledgeable than others, all employed a wide array of herbs and spices in their cooking, and all were familiar with some of their medicinal and/or health benefits. Participants ranged from 2 to 50 years of

residence in southern California. They listed an average of roughly 27 herb and spice items, with no significant difference between North and South Indian women, and they averaged 10 items used daily among all participants. Because it is not possible to know how many spices were being used in their cooking prior to immigration, there is no way to quantitatively determine whether there has been continuity of herb and spice usage. However, there was no evidence, either in terms of years living in the US and herb/spice usage, or in terms to respondent’s perception, that traditionally used herbs and spices were declining in usage. Indeed, nearly 40% of respondents reported increased knowledge and usage of both. The most commonly known and used herbs and spices used in cooking by Southern California Indian women—*asafetida*, black pepper, chili, cilantro, cloves, coriander, cumin seed, curry leaves, fenugreek, garlic, ginger, mustard seeds, and turmeric—are identical to the most commonly used herbs and spices in India (Srinivasan, 2010). At least in terms of usage of core herbs and spices, migration to southern California appears not to have led to significant culinary abandonment.

Regarding the perceived medicinal and health value of culinary items, the usage frequency list was nearly the same, with the exception of cinnamon and *Tulsi*. Neither are used in cooking on a daily basis by many of our respondents, but both are known and used when needed for their medicinal qualities. Although respondents cited a wide range of medicinal benefits from their culinary herbs and spices, from antibacterial to cancer to weight loss, the most common gastronomic treatments were for respiratory ailments (cough, colds, sore throats) and digestive complaints (stomachache, gas).

The source of the participant’s knowledge was an important component of our findings. Indian immigrant women’s herb and spice knowledge was derived from various of sources, but primarily from their mothers, or mothers-in-law, that is, *via* vertical or horizontal matrilineal transmission, well as through female friends. There was also a strong sense of pride in their medicinal knowledge of spices and herbs, as women who knew more about Indian medicine and the medicinal use of spices and herbs were considered particularly valuable members of the Indian immigrant community.

In terms of perceived health benefits, all 31 participants reported that Indian food was much healthier than alternative local food options, especially for those who followed a vegetarian diet. Vegetarian participants often reported that by preparing Indian food, they not only had more culinary options, but also had the opportunity to eat food that they considered palatable. For example, one participant (Arti) noted “For us it [Indian food] is better because how often can we eat out? If we get fast food, we are limited to cheese quesadillas at Del Taco, and even then, we don’t know how they are prepared—if they actually are vegetarian.” This perspective was true for a large number of the participants, as many followed a strict vegetarian lifestyle. Their vegetarian dietary restrictions enabled them to continue to prepare Indian recipes, perpetuating the use of Indian spices and herbs as part of a daily routine. Thus, as similarly reported for Indian immigrants in the Netherlands (Bailey, 2017), cultural

TABLE 3 | Frequency of Use for Items listed during participant interviews (0 indicates that participants did not list the item during the interview process).

Spice/herb	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ajowan caraway	0	0	0	3	0	0	0	0	0	0	0	3	4	2	6	0	6	0	0	0	0	3	4	3	4	0	4	3	0	0	0
Anise seed	0	0	0	0	0	0	0	0	0	0	0	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asafetida	3	3	3	2	0	0	2	2	2	3	2	2	2	2	2	2	2	2	3	3	2	2	2	3	2	5	2	2	2	0	2
Basil	0	0	0	2	0	0	3	4	5	0	0	0	0	0	0	0	0	4	0	0	0	4	0	3	0	3	0	4	0	3	0
Bay leaves	0	0	0	3	0	0	3	4	4	5	5	5	3	4	3	4	3	4	3	3	3	4	4	3	3	4	3	4	3	4	3
Betel leaf	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black cardamom	0	0	0	0	0	0	4	0	0	0	0	3	0	2	0	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	2
Black cumin	0	0	0	0	0	0	2	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Black nightshade	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Black pepper	2	2	0	2	2	0	2	4	4	4	4	5	3	2	3	4	2	2	3	3	2	2	4	2	3	2	2	3	2	4	2
Black stone flower	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Brahmi powder	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caraway (Shahi jeera)	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0
Chili (fresh)	3	2	3	2	2	0	2	2	2	3	3	2	0	2	2	3	3	0	3	0	2	2	2	2	3	0	2	0	0	3	0
Chili powder	2	3	3	2	2	0	2	2	2	4	2	2	2	0	2	0	2	2	2	2	3	0	0	2	3	0	3	0	2	2	0
Chili (whole dry)	3	4	3	3	4	3	0	4	0	3	2	2	2	2	3	2	3	0	3	3	2	2	2	0	0	0	0	2	2	4	0
Cilantro	4	3	3	3	2	3	3	2	2	3	2	2	3	2	2	2	2	3	3	3	2	2	2	2	3	3	2	2	2	2	0
Cinnamon	3	3	3	3	4	0	3	4	4	5	3	3	4	2	3	5	2	3	3	3	3	2	4	4	3	0	3	4	3	4	2
Cloves	3	3	3	3	5	3	4	4	4	5	2	3	3	5	3	5	3	0	3	3	3	2	4	3	3	3	3	4	2	4	2
Coconut	0	2	0	0	0	0	0	0	0	0	0	3	0	0	3	3	3	2	3	2	3	0	2	0	0	0	5	0	5	0	0
Coconut oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	6	0	0	0
Coriander seed/powder	3	0	3	3	0	3	2	2	2	3	3	2	0	0	0	3	3	0	3	2	3	2	2	2	3	0	2	4	2	2	2
Cumin seed/powder	3	3	3	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2	3	2	2	2	2	0	4	2	2	2	2	2
Curry leaves	3	3	3	2	0	3	3	4	2	3	2	2	2	2	2	3	2	2	2	2	2	3	2	3	3	4	2	2	2	3	2
Dill	0	0	0	3	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0	0	5	0	0	0	0	4	0	0	0
Fennel	0	0	0	3	0	0	0	4	2	0	0	2	3	4	0	0	2	2	3	3	2	2	5	4	0	4	2	3	0	4	0
Fenugreek leaves	0	0	0	0	0	3	2	4	5	4	0	3	4	3	4	4	3	3	3	5	3	5	5	4	4	0	4	4	3	3	3
Fenugreek seeds	4	0	0	2	0	0	0	3	2	4	2	2	3	4	3	4	2	2	3	3	2	2	4	4	4	0	3	3	4	3	3
Garam masala	0	0	0	0	2	3	0	3	0	0	0	0	3	0	3	3	0	3	0	0	0	0	0	2	3	0	0	0	3	0	0
Garlic	2	2	3	2	0	3	3	2	2	4	2	2	3	2	3	2	2	2	3	3	2	2	2	2	3	3	3	4	0	3	2
Garlic powder	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0
Ginger	2	2	3	2	0	3	3	2	2	2	2	2	2	2	3	2	2	2	3	3	2	2	2	2	2	3	2	3	2	2	2
Ginger powder	0	0	0	0	0	0	0	0	4	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2	4	0	0
Green cardamom	0	3	3	3	2	2	3	4	4	4	2	3	3	0	3	5	0	3	2	3	3	2	4	3	3	0	3	3	2	4	2
Karpuravalli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	0

(Continued)

TABLE 3 | Continued

Spice/herb	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Kokum	0	0	0	0	0	0	4	5	3	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	3	5	0	4
Lemon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	2	0	0	0	3	0	0	0	0	0	0
Lemongrass	0	0	0	0	0	0	2	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Licorice root	0	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mace	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4	0	0	3	4	0	0	0	0	0	0	0	0	0	0
Mango powder	0	0	0	0	5	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	0	0
Mint	4	0	0	3	4	2	3	4	2	3	2	4	4	3	3	4	3	2	3	4	3	2	4	3	3	3	4	3	0	3	4
Moringa leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	5	2	0	0	0	0	0	0	0	0	0	0	0
Mustard leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
Mustard seeds	3	0	3	3	0	3	2	2	2	0	2	2	2	3	2	2	0	3	2	0	2	2	2	3	3	3	2	2	0	2	0
Nutmeg	5	0	0	0	0	0	5	4	5	0	5	0	5	0	0	5	0	0	2	0	0	2	0	5	4	0	4	0	5	0	4
Onion	2	3	3	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Onion powder	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onion seeds	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oregano	0	0	0	0	0	0	4	4	5	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0	3	0	0	0	0	0
Paprika	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parsley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0	0	0	0	0	0
Peepramul powder	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomegranate seeds	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poppy seeds	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Rosemary	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Saffron threads	0	0	0	5	0	0	4	5	0	5	5	4	5	5	5	5	0	0	5	0	0	5	5	3	4	0	4	6	0	5	2
Sesame oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Sesame seeds	0	0	0	0	0	0	0	0	4	4	4	3	5	0	0	5	0	0	0	0	3	4	0	0	0	0	3	0	4	5	0
Star anise	3	0	0	3	0	0	0	4	5	0	5	3	0	0	3	5	3	4	3	3	4	4	4	0	4	0	0	0	3	0	0
Tamarind	4	0	0	0	0	0	3	0	0	0	0	4	3	4	3	0	3	2	3	3	3	0	2	0	3	0	0	3	0	3	4
Thai Basil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Thyme	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Tulsi	6	0	0	0	2	0	4	3	2	5	4	0	3	6	6	0	3	0	6	4	0	2	6	5	6	0	6	6	2	3	4
Turmeric	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	4	2	2	2	2	2
White pepper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0

Frequency of use: 0, item not listed in interview; 2, used daily; 3, daily to weekly; 4, weekly to monthly; 5, monthly to yearly; 6, as needed.

TABLE 4 | Medicinal and/or health benefit categories and identification (I.D.) number (corresponding with **Table 5**).

Medicinal or health benefit categories	Number (I.D.)
None	0
Nasal/throat/cold/congestion/cough	1
Digestive/appetite/gas	2
Cholesterol/diabetes/blood pressure	3
Cosmetic (hair, skin, etc.) topical use for scars, burns, etc.	4
Anti-cancer	5
Pregnancy/pre or post-natal/babies/menstrual	6
Heat/cooling effect	7
Sleep	8
Immunity	9
Anti-inflammatory	10
Heard about benefit, but not sure	11
Detox, cleansing/purifying	12
Heart health, blood	13
Antibiotic/antiseptic	14
Overall health	15
Eyesight/vision	16
Energize/depression	17
Mental, cerebral function	18
Bone health/joints/arthritis	19
High mineral or vitamin content ex. iron	20
Toothache/oral problems/breath	21
Body ache	22
Weight loss/metabolism	23
Antioxidants	24

identity is maintained not only with food choices, but also through following dietary restrictions as part of religious beliefs.

Language is also a fundamental factor in cultural identity (Wallendorf and Reilly, 1983; Montanari, 2006; Kang, 2013; Parasecoli, 2014), especially as it relates to communication and understanding, but also as it relates to food and spiritual practices. In India, each region is characterized by a separate language, and it is common to know, speak, and/or understand more than one Indian language. The national language in India is Hindi, which is taught in most schools. The majority of the participants in this study referred to the Indian spices and herbs they used on a regular basis in their language of origin, for example “jeera” for cumin seeds, “elaichi” for green cardamom, or “dhaniya” for coriander seeds or powder. There were instances in which the participants did not know the English name for certain spices and herbs, instead referring to them in Hindi, Tamil, or Kannada. Some of these items were purely medicinal in nature, such as “karpuravalli,” commonly known as Cuban oregano, Mexican mint, Indian borage, or Caribbean oregano; and “meeta laghdi” (literally translates to “sweet stick”) for licorice root. Both these items are used to prepare medicinal concoctions to help fight minor ailments such as coughs, colds, and digestion problems, especially with infants and small children. Some participants referred to spices and herbs

in their Indian name and followed with the English equivalent, such as “jeera” followed by “cumin seed.” This indicated that they knew the English name for some of the items listed, but preferred to call the items in their language of origin. The knowledge of spices and herbs is thus closely linked to the Indian language of their homeland.

Language is a significant dimension of cultural assimilation. In this sample, a majority of participants spoke either English or a mix of English and an Indian language (or more than one), whereas a minority spoke primarily an Indian language at home. Although we hypothesized that traditional herb and spice usage would decline among English speakers, this was not the case. Both groups used nearly identical numbers of herbs and spices in their cooking.

Passing the Torch

Identifying the factors that are involved in the intergenerational passage of knowledge pertaining to Indian cuisine improves our understanding of cultural traditions, cultural erosion, and cultural identity. But the transfer of the culinary torch from one generation to the next means much more than the passing of culture and cultural identity, especially because of the abundant medicinal health benefits of a majority of the spices and herbs used in Indian cooking (Dhandapani et al., 2002; Hemphill and Cobiac, 2006; Muthu et al., 2006; Srinivasan, 2010; Srivastava and Vankar, 2012; Kessler et al., 2013; Murugan et al., 2013; Malav et al., 2015; Siruguri and Bhat, 2015), as well as the linguistic connection created through the transfer of traditional food knowledge and practice. For many of the women in this study, intergenerational cuisine continuity ensured the health of generations to come. And all participants indicated that passing down the knowledge and use of Indian spices and herbs to future generations was of paramount importance.

Participants strongly supported the idea that Indian food was synonymous with a healthy lifestyle. And surprisingly, none were concerned that their children would have difficulty continuing to prepare and consume traditional food. All had confidence that their children would continue to cook and prepare Indian food, and would continue to use Indian spices and herbs on a regular basis, especially their female children. The reasons listed were both related to access and acceptance of Indian food in the region. The diversity of southern California's cultures fosters an environment in which cultural identities can be easily and confidently expressed through the use of traditional language, clothing, religion, and food. Bhavana, for example, when asked to elaborate her highest rating on the level of importance of passing down Indian culinary traditions from one generation to the next, stated “I really feel we are passing down culture because I am the only person who will pass it down to my daughter and son, more my daughter I feel. I think it is very important that they know what language we speak, which region we came from, what our origins are, and what food we eat.” In addition to passing down language and regional origins, Bhavana's statement also underscores the fact that traditional gender roles are still an important consideration, even after immigration to the US.

TABLE 5 | Medicinal and/or health value of spices and herbs listed by participants.

	C	SUV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Ajowan caraway	S	0.355				2								2	2	23	6 2		2					0	2	2	22		0	2				
Anise seed	S	0.065												6 7	0	0																		
Asafetida	S	0.677	2	0	2	2			2	2	2	1	2	2	2	2	2	2	2	0	2	2	2	0	0	0	2	0	0	2	2		6	
Basil	H	0.097				14			0	0	0									0				1		0		0		0		1		
Bay leaves	S	0.097				0			0	0	0	0	0	0	0	23	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
Betel leaf	H	0.097												16 3 6																				
Black cardamom	S	0.129							0					2 14		7 2										0	0							0
Black cumin	S	0.065							2					2															0					
Black nightshade	H	0.032																				21												
Black pepper	S	0.903	2	2		2 7	0		1	1	1	1	1	7	1 6	5 24 2	1	1	1	0	1 2	1 12	0	2	1	1	1	0	0	1	0	1	0	0
Black stone flower	O	0.032												7																			0	
Brahmi powder	H	0.065											4 18																					
Caraway (Shahi jeera)	S	0.032				0			0																		0		2					
Chili (fresh)	S	0.452	2 13	20	0	2 7	16		0	0	0	0	0	7 2		21	0	0	0		0		24 13	1 23	0	21	0		0			0		
Chili powder	S	0.355	2 13	21	0	2 7	0		0	0	0	0	0	14	0		0		0	9	0	0	24 13			0	0		0		1	11		
Chili (whole dry)	S	0.452	2 13 20	20	0	2 7	0	0		0		0	0	7 2	0	21	0	0	0		0	0	24 13	1 23	0				0	1	0			
Cilantro	H	0.581	20	12	0	0	11 12	15	13	0	0	24	0	2	12	20	0	20	12	0	0	0	2	0	0	0	21 12	0	20	0	16	12		
Cinnamon	S	1.032	3	4	0	3	15		0	1	1	3	1 23	2 4	3 23	13 3	0	1	3	1	1	23	13 24	3	1 23	0	3		3 19	3	3	3	1	1
Cloves	S	1.065	21	21	2	0	21	1	1	1	21	21	1	1 2 21 14	21 2	21	21	2 21	21		21	21	2	0	21	21	1 21	21	21	1	0	1	1	
Coconut	V	0.290		4										20 4			7	0	3 21 2	4	0	0	0		0			0		4				

(Continued)

TABLE 5 | Continued

		C	SUV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Coconut oil	O	0.129																				3 4	4								4				
Coriander seed/powder	S	0.387 7	12 7			0	0		0	7	0	0	0	0	7				0	0		7 2	1	0	0	1	2	0		2	0	1	0	7	
Cumin seed/powder	S	0.742	2	2	2	0	0	0	0	0	23	0	2	23	2 7	2	2	1 2	0	2	7	2	0	2	0	1	0		0	2	2	7	0	7	
Curry leaves	H	1.032 3 4	2 3 4	4	0	3		0	4	0	0	20	2 23 4	0	2	2 23	2 4	4	3 12	4	21	4 16 20	2 20	3	4	0	4	0	3	20	4	0	4		
Dill	H	0.032				0						0								0						0				2					
Fennel	S	0.163				3 2					0	2 6 21			2	2	0			21	7	2	2	2	2 21	2	2		2	2	0		0		
Fenugreek leaves	H	0.612							3 23	0	0	11 6	0		0	0	20	2	3	3	0	20	20	2 3	3	0	6	3		3	3	4 6	0	0	
Fenugreek seeds	S	1.097	6			2					2	6	3	20	22 6	6	2 4	2 3	3	0	6	2 7	6	2 3	3	3 6	6	23 2 6 3		3	10	4 6	2	6	
Garam masala	S	0					0	0		0						0		0	0		0					0	0				0				
Garlic	H	1.193 2 1	13 2 1	14	1	24			1 5	7	3	0	13	13	1 13	3	24 13 3	1 2	13	2	1	2	2	2 13	3	0	13	2	0	3	1 9		13	5	
Garlic powder	H	0.097										0												2 13							7				
Ginger	H	1.387 1	2 1	2	1	24			1	7	23	1	1 2	1 2 10	2 1	2	2	2 1	1 2	7 2	1	1	23	2 9 10	1 10	1 12	1	2	2	2	1 9	1	1	1	
Ginger powder	H	0.194										1		2 1	2												0			7	1				
Green cardamom	S	0.323		0	0	0	11	1	0	0	0	0	0	0	2 7	0		0	2		0	0	0	2	0	0	0	0	21		0	2	7	0	7
Karpuravalli	H	0.065																		1			1												
Kokum	S	0.161								7	0	0		7	7				0											0	0		7 1		
Lemon	V	0.226																			9	0	23 12	2 23 9 10			0								

(Continued)

TABLE 5 | Continued

	C	SUV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Lemongrass	H	0.065							1			1	0																				
Licorice root	H	0.098												1	2																		
														1	1																		
Mace	S	0												0					0			0	0										
Mango powder	V	0					0						0	0																0	0		
Mint	H	0.903	7			21	2	7	0	0	0	24	1	2	0	2	2	15	12	7	20	20	2	0	1	0	21	21	0	2		7	2
							21									7	1	14					20				12						
																	7																
Moringa leaves	H	0.161																	3		20	20											
																			20			6											
Mustard leaves	H	0.032																												7			
Mustard seeds	S	0.226	4		0	0		0	0	0	0		19	2	2	21	0	0		0	0		3	0	0	0	0	0	0	2		0	
Nutmeg	S	0.258	0						7	0	0		0		0			4				15		0		0	0		8		8		2
																					5												8
Onion	H	0.097	1	0	0	14		0														0											
						24																											
Onion powder	H	0		0																													
Onion seeds	H	0													0																		
Oregano	H	0							0	0	0													0		0		0					
Paprika	S	0	0							0																							
Parsley	H	0																					0			0							
Peepramul powder	S	0.065											1																				
												2																					
Pomegranate seeds	S	0											0																				
Poppy seeds	S	0.065									6			6																0			
Rosemary	H	0.032									0													24									
Saffron threads	S	0.258			0				0	0		0	6	1	0	5	0	4			0			0	0	0	6		0	18		0	0
												14				24																	
Sesame oil	O	0.032																			6												
Sesame seeds	S	0.226							0	7	0	7	0				20						0	13					20		19	0	
																								3									
Star anise	S	0.097	0		0				0	0		0	7				0	0	0	0	0	0	0	0	0	0		0			0		
													2																				
													6																				
Tamarind	S	0.226	20						0				0	0	20	7	0		0	2	0	23	13		0		0		0		0	2	

(Continued)

TABLE 5 | Continued

	C	SUV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Thai Basil	H	0																					0										
Thyme	H	0			0																		0										
Tulsi	H	1.032	2				1		1	1	1	1	1	1	1	1	1	12	1	1	1	1	1	1	1	13	1	5	1	9	1	0	2
			3				5				15	3						1													4		1
			1																												17	15	
																															16		
Tumeric	S	2.194	4	4	1	15	1	5	18	1	1	14	10	1	1	1	1	1	2	9	15	1	15	10	1	10	12	2	14	10	1	14	4
			10	15		9		14		10			1	10	5	5	24	14	12		5	7	10	24	14	6	14		14	10		2	
			14			6		6		4		4	4	10	10	14	14			4	4	14		4			15		1		1	12	
										22																				4			
White pepper	S	0			0																				0								

Blank cells indicate that the spice or herb was not used by the participant. 0 I.D number indicates that the species was used but that no medicinal or health value was associated with the item by the participant. C = Spice (S), Herb (H), and Other (O). SUV is medicinal Species Use Value.

TABLE 6 | Herbs and spices with >25% consistency of medicinal/health benefits among southern California Indian immigrant women.

Herb/spice	Medicinal/health benefit	% of Respondents
Ajowan caraway	Digestive	26
Asafetida	Digestive	61
Black pepper	Nasal	52
Cinnamon	Nasal	29
	Cholesterol	35
Clove	Tooth	55
Cumin	Digestive	35
Curry leaves	Cosmetic	39
Fennel	Digestive	39
Garlic	Heart	26
Ginger	Nasal	61
	Digestive	42
Tulsi	Nasal	58
Turmeric	Nasal	45
	Cosmetic	26
	Antibiotic	32

Although she was eager to share her knowledge of the use of Indian spices and herbs with both her son and daughter, Bhavana clearly felt it was her duty as a woman to pass it down to her daughter, more so than to her son. This identifies the gendered roles that are prevalent in Indian culture, with the woman's responsibility to maintain and pass on Indian culture, as Acharya and Acharya (2008) identify with the term “bharatiyanari” which encompasses many gendered ideals, including the transfer of culture.

These gender ideals have been much discussed elsewhere. Ray (2004) reported that many Bengali-American women, regardless of education, preferred to stay home to do housework and raise children. “One woman with a medical degree classified herself in the survey as a ‘housewife,’ while another was a physician's assistant; another woman with a Ph.D. stayed home” (Ray, 2004, pp. 115–116). Acharya and Acharya (2008, p. 39) state that Gujarati women are often expected to be “repositories and transmitters of culture.” They are also expected to handle duties that are labeled “Pativrata Dharma (the duty of the wife),” which include responsibilities such as cooking, housework, and childcare. Contrary to the fluid and changing gendered roles in the western world, traditional male and female roles are still very much alive in Indian households. According to the participants in this study, the duty of passing culinary knowledge to the next generation remains a primarily female responsibility.

In at least one case, recollection of superstitions and stories helped perpetuate the use of spices and herbs. Paraphrasing one of the statements made by Kasthuri during an interview, when asked about the health or medicinal benefits of black pepper, she stated “Even if you eat at the house of your enemy, if you put a lot of black pepper in your food, you will survive.” She explained that black pepper is medicinally valuable as a detox, removing toxins, heavy metals, and poisons from the body.

Regional Identity

Participants reported that a portion of their knowledge of the medicinal benefits of spices and herbs was made through friendships they made after arrival in southern California. Indian immigrants in southern California no longer distinguished themselves as being from a particular region in India, but rather identify as being “simply Indian.” This homogenization of cultures has resulted in a blending of regional cooking traditions and the transfer of culinary knowledge across boundaries that are no longer perceived to be relevant. Indian cuisine varies considerably from region to region, in particular, between foods and culinary items that are “North Indian” or “South Indian.” These dishes vary not only in the way they are prepared and taste, but also in the herbs and spices used. South Indian food is rarely prepared or consumed in North Indian households, and vice-versa (Narayan, 1995). Crossing the international boundaries from India to the US allowed participants to cross culinary boundaries that they probably never would have crossed if they still lived in India. Identifying as simply Indian, without regional distinctions, has allowed immigrants to identify as a unified group, separated from “the other” non-Indians (Flitsch, 2011).

An example can be seen by considering the participants’ use of curry leaves. Whereas curry leaves are primarily seen in South Indian cuisine (Joseph and Peter, 1985; Hema et al., 2011; Singh et al., 2014), 96% (30 out of 31) of participants mentioned that they used curry leaves in their cooking. Sixty-one percent of these participants identify themselves as being from North India, where curry leaves are not traditionally used in meal preparation. Many of these participants mentioned that they had begun to use curry leaves after their migration to southern California and learning about the medicinal benefits that curry leaves are thought to contain. Most of their knowledge was derived from association with friends from South India, as well as research on social media and the internet.

Homegardens

Southern California’s Mediterranean climate allows for near year-round cultivation of tropical and subtropical plants. Homegardens, where familiar fruits, vegetables, and herbs can be grown, as well as plants used for medicine and religious purposes, are exceptionally important for immigrant cultures (Helzer, 1994; Ban and Coomes, 2004; Vandebroek and Voeks, 2018). They represent personal space where useful plants that are not available in local markets may be grown, and they often represent botanical symbols of the process of cultural continuity. Many Indian spices and herbs have significance to Indian cultural history and cuisine beyond simple gastronomy. This is especially true of holy basil—Tulsi—whose significance in India extends beyond its use in the pantry and kitchen and into religious practices and symbolism. It is “the most sacred of all Hindu plants” (Simoons, 1998, p. 8), and this special standing is still prevalent within the Indian immigrant community in southern California. Participants indicated that Tulsi was a very important plant in their lives and for Indian culture in general. In India, it is tightly connected with the god Vishnu, and it is in its own right, considered a goddess. In terms of access, all 31 participants

either personally cultivated or knew someone who cultivated Tulsi plants in their homegardens. At least one medicinal use for Tulsi was listed by 22 of the 31 female participants. Tulsi plants usually adorn front entranceways, pathways, or are potted in planters on apartment balconies and porches. The herb’s vital spiritual role was elaborated by Kiran, who noted that she makes a religious food offering with Tulsi every day during her daily prayers. She declared that the goddess Tulsi would not “bhog” (Hindi word for consume or eat) the food offerings if she does not eat some Tulsi first. Every morning, both Kiran and the goddess consume Tulsi leaves before any other food. Another participant, Pooja, recalled that when she was considering removing one of the Tulsi plants that her mother had planted in the yard, her mother responded “If you cut this plant, you will cut my life.” When asked about the significance of Tulsi in her household, Preeya stated that “Tulsi is the mother of all herbs.” The front gateway of Arti, another participant, is adorned with a lush and bountiful Tulsi bush from which she picks off a few leaves and consumes them whenever she passes the plant (**Figure 3A**). She believes that it is good for her overall health. In addition to providing “good oxygen” (Preeya), a majority of respondents reported its use to treat coughs and colds. The presence of a Tulsi plant in a homegarden is a cultural marker that Indian people live in that home.

Other plants that are used in Indian cooking or for medicine and were difficult to source were also found in some of the homegardens. These included karpuravalli, a species of oregano used to treat coughs and colds (**Figure 3B**), as well as curry leaves, which as noted earlier, are a mainstay of South Indian cuisine that have been adopted by almost all North Indian women immigrants to southern California (**Figure 3C**). In addition to livening up their foods, curry leaves are employed to treat a wide array of illnesses. Finally, in those rare cases where a traditional herb or spice cannot be locally sourced, respondents noted that they are able to bring these in on their frequent trips to their homeland. This includes licorice root (meeta laghdi), which is used by a few participants as flavoring and medicine (**Figure 3D**). The inclusion of these plants into homegardens is important because, in addition to their utility for the family, they are shared among their community of Indian friends.

Traditions in Transition?

For female Indian immigrants living in southern California, association within the greater Indian community is pivotal to the presence and perseverance of culinary traditions. Community identity encourages cultural continuity. However, some culinary changes were reported. Although relatively minor, these changes were mostly focused on convenience and increasing the health value of the food consumed. For example, although Indian food is consumed daily, participants reported that they made compromises when it came to work and school, that is, in the public sphere (Vu and Voeks, 2012). This was not because of embarrassment, but rather because of convenience. Children carry peanut-butter and jelly sandwiches and Oreo cookies from home for lunch and snack time because there is not enough time to eat roti (Indian flat bread) and curry at school (see also Vallianatos and Raine, 2008). Parents carry salads to work



FIGURE 3 | Home sources of selected herbs by southern California Indian immigrant women. **(A)** Tulsi in homegarden; **(B)** Karpuravalli in homegarden; **(C)** Curry leaf tree in homegarden; **(D)** Meeta lagdhi (licorice root) brought from India.

because rice and curry is an inconvenient food to heat and consume in the office. The sheer complexity that embodies Indian cuisine makes it a difficult food, not only to prepare, but to transport to work or school. For these reasons, Indian food in many instances is substituted with another alternative that was easier to eat and consume in public places; they are Americans when eating out, and Indians when eating at home.

Another example can be seen with the substitution of ingredients. Most participants indicated that they had modified the ingredients in their cooking to include healthier options, while maintaining the integrity of traditional Indian dishes. For example, many said that they substituted quinoa for rice, and

that they made chapatis and rotis healthier by substituting multi-grain flour for the traditional rice flour during preparation. It is unclear whether these substitutions would have occurred with the participants had they been living in India, especially with increased global connectivity and social media platforms such as Facebook and WhatsApp, which are widely used by the participants to communicate and discover new knowledge about Indian spices and herbs, Indian cooking, and their traditional medicinal use. However, living in southern California, these participants are exposed to a wide array of alternative ingredients making it easy to substitute traditional ingredients with healthier choices, creating a variation of Indian cuisine that converges ingredients in a best-of-both-worlds scenario.

The elaborate process to prepare ingredients that enter into cooking traditional Indian dishes serves as a challenge for busy participants. Therefore, it is often easier for them to use the ready-made masalas (spice blends), that can be purchased at any Indian store and are widely used in India as well. The most popular is garam masala that contains “five or more dried spices, commonly comprised of cardamom, cinnamon, and clove” (Srinivasan, 2010, p. 67), and is used in a variety of Indian recipes. Because these items are readily accessible in southern California, it adds an element of convenience to preparation allowing the participants to prepare traditional Indian meals.

Other changes were the result of personal choice and, in all likelihood, the influence southern California gastronomic culture. One participant, for example, was special in that although she was the most recent immigrant to the US, having emigrated from India only 2 years prior, she exhibited the most change in her consumption of Indian food. She had come to southern California to finish her education at a university and to procure a job. However, in her college experience, she had decided to adopt a vegan lifestyle, which is much different and significantly more “American” than an Indian culinary choice. Many Indians are vegetarian (estimated at about 20%, Natrajan and Jacob, 2018), but even among vegetarians there is considerable consumption of dairy and dairy-based products within Indian cuisine that does not fit into a vegan diet. She did, however, continue to prepare most of her food with Indian spices and herbs, albeit to a lesser extent than would be necessary in traditional Indian recipes. This was done not only to preserve flavors that were desirable or familiar but also because she was aware that Indian spices and herbs added medicinal elements to her vegan dishes. In this case, she had not moved away completely from the use of Indian spices and herbs in cooking, but rather had adopted what she considered to be a healthier alternative to fit her lifestyle needs.

Finally, although the knowledge of traditional spices and herbs is primarily rooted in knowledge that has been passed down from generation to generation, many of the women in this study owed part of their knowledge of their medicinal value to other less conventional sources. Several stated that some of their knowledge of the health dimension of Indian food expanded out of their own personal research using the internet, social media, and through informal conversations with friends within the Indian immigrant community.

There were acknowledged limitations to this study. First, the exclusion of men from the data set may well have led to omissions in understanding the herb and spice transference process and the nuances of gendered roles. In the Netherlands, for example, Indian immigrant men are often forced to learn to cook because they often emigrate alone (Bailey, 2017). Moreover, as noted by several Canadian Indian and Muslim women, men may not take an active role in cooking, but they often help much more in kitchen duties, thus modifying traditional gendered roles (Vallianatos and Raine, 2008). Second, there was an apparent bias toward Hindus in the sample. Although we did not ask participants about their religion, most self-reported being Hindus, with only two noting that they were Christians. A larger sample that included a greater

cross section of underrepresented groups might have changed the results. Finally, the snowball sampling method led us to mostly middle and upper middle class Indian Americans. Although Indian immigrants to the US are more likely to be highly educated, occupy management or otherwise professional positions, and have lower poverty rates than other immigrant groups (Zong and Batalova, 2017), purposeful sampling among less prosperous Indians may have amplified the findings.

CONCLUSIONS

This research explored the importance of spices and herbs to Indian immigrant women in southern California. We investigated their role in traditional Indian cuisine, their medicinal and healing properties, and the intergenerational transfer of traditional knowledge. We found that the use of traditional Indian herbs and spices is thriving among California's Indian diaspora. The most important herbs and spices used in cooking are nearly identical to those used in their homeland. Indian cuisine among female immigrants to southern California is synonymous with functional food—food with perceived medicinal and health values. Many of the herbs and spices used by participants have been shown to possess therapeutic benefits, and all participants expressed their belief that Indian food was a healthier choice than American cuisine. There was no indication, either in terms of years living in the US or the use of English language in the home, that the usage of traditional herbs and spices is declining among Indian immigrants. Indeed, as North and South Indian immigrants self-identify as simply “Indian,” distinctive herbs and spices that were once regional culinary markers are now shared by all members of the greater Indian community.

Culinary continuity is attributed in part to the sizeable Indian presence in southern California. The spices and herbs needed to prepare most Indian dishes are easily accessible from shops located throughout the region. And those that are not readily available are cultivated in homegardens or brought directly from India. Moreover, given the region's large and diverse immigrant population, there is a general acceptance of cultures and the cultural traditions of immigrants. There is no sense of embarrassment among the Indian community regarding their food choices; rather, they are proud of their culinary heritage, and are keenly interested in transferring these traditions to the next generation. Respondents reported that gender is a significant feature of the intergenerational passage of culinary knowledge. And despite ongoing challenges to traditional gendered roles, the Indian immigrant community in southern California adheres in many respects to the traditional role of women in the household. This translates in almost all instances to Indian women passing their knowledge of herbs and spices to their daughters and daughters-in-law. Moreover, the strong community that exists through connections—both physical and technological—through social media outlets and ethnic enclaves, empowers Indian women immigrants in southern California to

have a strong sense of cultural identity that they are passing to the next generation.

DATA AVAILABILITY STATEMENT

The original contributions generated for the study are included in the article/supplementary material; further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by IRB, California State University, Fullerton. Written informed consent for participation was not required for this

study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

EJ contributed 75% of the research and writing. RV contributed 25% of the research and writing. All authors contributed to the article and approved the submitted version.

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Wild Food Harvest, Food Security, and Biodiversity Conservation in Jamaica: A Case Study of the Millbank Farming Region

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Harvesting wild food is an important coping strategy to deal with food insecurity in farming households across the Caribbean. The practice is tightly connected to the region's unique agrarian history, food heritage, traditional cuisine, and local knowledge of wild or semidomesticated plants. In Jamaica, small-scale farmers are the chief stewards of agrobiodiversity, and their food security and well-being are often dependent on wild food harvest. Yet, there is a paucity of empirical research on the relationship between wild food use, food security, and biodiversity conservation. In this paper, we use the knowledge and lived experience of rural farmers in a remote community (Millbank) at the edge of the Blue and John Crow Mountains National Park (BJMNP) to explore the relationship between wild food harvest and food insecurity within the context of protected area management. Specifically, we seek to (1) characterize different patterns of wild food harvest; (2) examine the relationship between food insecurity and wild food harvest, and (3) explore the implications of forest conservation measures for wild food harvest. Detailed interviews were conducted with 43 farmers to capture data on food insecurity, wild food collection, livelihood satisfaction, household characteristics, farming activities, livelihood strategies, and forest resource interaction. The Food Insecurity Experience Scale (FIES) was used to characterize food insecurity, while participatory techniques were used to develop indicators to assess the well-being of farmers. The results show strong evidence of a relationship between wild food harvest and food insecurity ($p < 0.001$). Overall, the findings support the importance of wild foods to the well-being of rural households and provide empirical evidence for its inclusion in food security, poverty, and biodiversity conservation policies.

Keywords: wild food, food security, traditional knowledge, protected area management, farming system, livelihood

INTRODUCTION

Harvesting wild food is well-established as an important coping strategy to deal with food insecurity in rural households (Rao and McGowan, 2002; Hickey et al., 2016; Asprilla-Perea and Diaz-Puente, 2018; Erskine et al., 2019; Aceituno-Mata et al., 2021) and increasingly in urban areas as well (Bunge et al., 2019; Garekai and Shackleton, 2020). According to the FAO (2009), "wild species

and intraspecies biodiversity have key roles in global nutrition security” and often constitute a significant portion of the food basket of poor rural households (Bharucha and Pretty, 2010). The word “wild” is taken to mean that the plants and animals are not dependent on human intervention or management for survival (Heywood, 1999). In this study, we use Harris’ (1989) definition of wild food as “existing along a continuum [or gradient] ranging from the entirely wild to the semi-domesticated, or from no noticeable human intervention to selective harvesting, transplanting and propagation by seed and graft” (Harris, 1989, p. 12). Despite the estimated one billion people worldwide who incorporate wild foods in their diets (Burlingame, 2000), there is a paucity of empirical research on the relationship between wild food use and food security.

Scientific evidence suggests that the use of wild food is context-specific and related to issues of food shortages (Quave and Pieroni, 2013; Redžić and Ferrier, 2014), food heritage and traditional cuisine (John et al., 2010; Guarrera and Savo, 2016), knowledge of nutritional and medicinal value (Alarcón et al., 2015), enjoyment (Schunko et al., 2015) and taste (Serrasolses et al., 2016; Aceituno-Mata et al., 2021), and availability (Kalle et al., 2020). Many wild or semidomesticated plants are neglected and underutilized on the basis of being perceived as “poor man’s food” (Padulosi et al., 2014). While in many cases the use of wild food is an indicator of poverty (Sthapit et al., 2008; Bharucha and Pretty, 2010), this should not be overplayed, as farmers are often conscious of their nutritional benefits and prioritize them over other food items (Kalle et al., 2020). For example, Erskine et al. (2019) found that while there is a clear connection between poverty and wild food harvest, the associated nutritional and cultural value often offset social stigma. In some cases, the exotic nature and health benefits of wild food elevate its commercial value above propagated alternatives. In some areas, wild foods have been found to be of greater significance to food and nutrition security compared to garden food (Ulian et al., 2020).

The food security challenges facing Caribbean islands are well-documented (Fischer et al., 2005; Thomas-Hope, 2017; Ewing-Chow, 2021). The Caribbean is a net importer of food, “a paradise that cannot feed itself” (Ahmed and Afroz, 1996, p. 4). Food insecurity exists when individuals lack adequate “access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (FAO, 2001). Ewing-Chow, 2021 estimates that the food import bill for the region could increase to US\$8–10 billion by the end of 2020. In 2018, food imports across CARICOM countries amounted to US\$4.75 billion—a 44% increase since 2000 (US\$2.08 billion). In Jamaica, approximately 78% of the 220,000 registered farmers cultivate <2 hectares. In 2018, these smallholders contributed \$1.7 billion to Jamaica’s Gross Domestic Product (GDP) (PIOJ, 2018). In that same year, the agriculture sector contributed 7.1% to GDP and supported 16% of the country’s population (PIOJ, 2018). Yet, in 2019, the country’s import bill was over \$900 million (Stanberry, 2020).

Dietary transitions have paralleled epidemiological challenge in low-income countries (Popkin, 1998) and a decline in domestic food production across the Caribbean. While

agriculture’s contribution to GDP has diminished over the years, concerns with the growing rate of Non-Communicable Diseases (NCDs) and environmental change risks provide a strong impetus to support domestic food production as a health security strategy. The rise of chronic NCDs in Small Island Developing States (SIDS) increases sensitivity to shocks and stressors (Hassan et al., 2020). Some authors estimated that NCDs accounted for 30% of deaths after hurricanes Irma and Maria, 2017, Dorian, 2019, (Hassan et al., 2020). In some Small Island Developing States (SIDS), NCDs are a greater threat than sea-level rise (Connell, 2013).

Domestic food production is the pillar of local food heritage, which is central to culture and identity. This domestic food production system developed from provisions grounds that were first cultivated by the Maroons (groups of Africans who escaped slavery and established communities in the hilly interior). Subsequently, in an effort to reduce the costs associated with feeding enslaved people, plantation owners permitted their slaves to cultivate provisions grounds on the periphery of the plantations (Wynter, 1971; Mintz, 1989; DeLoughrey, 2011). The provision grounds food became the staples of the Afro-Jamaican diet and were supplemented by food harvesting and hunting of wild pigs and the Jamaica coney (*Geocapromys brownii*) (Parry, 1955; Barker and Spence, 1988; John et al., 2010). Castellano (2021, p. 25) designates these practices by which the Maroons survived as “guerilla foraging and gleaning.” Parry (1955, p. 19–20) goes so far as to suggest that, “Without the institution of slave provision grounds, without the constant search for crops to stock those grounds, emancipation, in the form which it took in Jamaica, would have been economically and socially very difficult, perhaps impossible.” Beckford (2012) posits that solutions to food security challenges facing the Caribbean should incorporate the (re)discovery of traditional foods for popularization and (re)inclusion in local diets. With reference to Jamaica, the author also observed a pattern of diminishing dietary diversity, alongside erosion of traditional and wild foods from local diets. Strengthening local food production systems would provide multiple economic and health co-benefits—as diseases such as hypertension and diabetes exert considerable pressures on Caribbean economies (Abdulkadri et al., 2009) and well-being.

Previous research on food security in the Caribbean have primarily focused on historical and contemporary institutional constraints on domestic food production (Campbell, 2011; Beckford, 2012; Saint Ville et al., 2017a,b) and agricultural innovation (Lowitt et al., 2015) in local food systems (Gumbs, 1981; Timms, 2006; Beckford and Campbell, 2013). There is a dearth of phenomenological research on food security and well-being among rural households across the region. Scholars from various backgrounds have converged on the idea that a lack of political will to support domestic food systems (Weis, 2004; Timms, 2009) and even marginalization and neglect (Barker, 1993; Borrás et al., 2012) in some countries has resulted in multiple breadbasket failures across the region. There is also agreement on the idea that strengthening the role of marginalized people in rural areas provides multiple economic, health, and livelihood security co-benefits. Through the lens of traditional food systems and rural livelihood, this research focuses on the

relationships between harvesting wild food, food security, and biodiversity conservation.

TRADITIONAL FOOD SYSTEM AND FOOD SECURITY

In Jamaica, small-scale farmers play a key role in the development of nutrition-sensitive agriculture and food systems. The IFPRI (2020) defines a food system as “the sum of actors and interactions along the food value chain—from input supply and production of crops, livestock, fish, and other agricultural commodities to transportation, processing, retailing, wholesaling, and preparation of foods to consumption and disposal. Food systems also include the enabling policy environments and cultural norms around food” (p. 8). Traditional knowledge systems have been central to the evolution of local food systems, are unique and dynamic (Vandebroek et al., 2011) and encapsulates the shared histories and experiences developed and maintained by local people (Beckford and Barker, 2007). Small-scale farmers are the chief stewards of traditional food culture, which is central to local economies, livelihoods, and food security. Since the effectiveness of food system transitions are mediated by local knowledges, understanding these knowledge systems and the practices they inform, is essential for climate change policy, land use governance, and livelihood resilience (Gamble et al., 2010; Popke et al., 2016).

Traditional food forests and kitchen gardens are resilient agricultural systems that are still practiced across Jamaica. Food forests are also referred to as kitchen gardens (Hills, 1988; Brierley, 1991) and provide multiple cultural and social services while supporting a space for farmer experimentation (Beckford and Campbell, 2013). Food forests exhibit spatial and temporal transitions over time that are aligned with societal changes and are recognized as ecologically sound and sustainable farming systems. Food forests can also be conceptualized as spaces for farmer experimentation and a traditional knowledge product of ecological, biocultural heritage, and economic significance (Kalle et al., 2020). It is a classroom for farmer knowledge transfer, a playground for experimentation, and a repository of cultural and spiritual assets. A communal food forest is not just “an adaptive survival strategy among resource-poor farmers” (Thomasson, 1994, p. 4), for example, as a source of food in the immediate aftermath of a hurricane or tropical storm, but they are also important spaces for innovation and social learning among small farmers.

Local crops such as yam (*Dioscorea alata* L.), dasheen (*Colocasia esculenta* L. Schott), and breadfruit [*Artocarpus altilis* (Parkinson) Fosberg] (POWO, 2019) among others are identified as neglected and underutilized (Padulosi et al., 2014) with potential to provide multiple co-benefits to food security and the preservation of food heritage (Picking et al., 2019). In this study, we refer to food heritage in the context of food systems—defined as the “dynamic and complex bodies of know-how, practices and skills that are developed and sustained by peoples/communities with shared histories and experiences”

(Beckford and Barker, 2007, p. 118). There is limited systematic research on the knowledge and use of wild food resources across the Caribbean. The focus has primarily been on the development of food crops for large-scale commercial markets, with limited attention to the development of conservation-based economies in rural areas.

Jamaican food is a rich blend of native and exotic crops introduced primarily by the Taino, African, Asian, and Europeans (Higman, 2008; DeLoughrey, 2011; Picking et al., 2019). In the Millbank farming region, the combined knowledge and practices from African and Amerindian ancestors has resulted in a rich biocultural heritage of local plant use—especially from the Blue and John Crow Mountains (BJCM) (Davis-Morrison and Barker, 1997). These mountains contain a rich array of endemic plants—one of the highest among world's islands for plant endemism (Davis et al., 1997). Bertzky et al. (2013) describe the BJCM National Park as an irreplaceable protected area for biodiversity conservation in the Caribbean. As Millbank's population decreased over time, abandoned food forests and provision grounds at the edge of the BJCM became a communal resource pool, providing a diverse range of ecosystem, cultural, social, and economic services.

The BJCMNP provides a range of different agroecosystem services that are crucial to farmers' well-being in the Millbank community. The community remains heavily reliant on the forest for resources beyond subsistence, such as bamboo for artisanal productions. The dependence on the forest's wild food reflects not merely a dependence for food but a sense of the nutritional value and perceived health benefits of more “natural” food. In some parts of the world, the diversity of wild food collected by households can be twice as much as cultivated crops (Hickey et al., 2016).

Against the background of structural weakness in the agricultural sector emanating from decades of structural inequities, coupled with the ecological novelties associated with climate change, Jamaica provides an ideal case for assessing the role of traditional food systems within the context of food security and biodiversity conservation. There is a paucity of research geared toward understanding food heritage and the sustainability of traditional food production systems in the Caribbean. A study of this nature is deemed desirable because of the increased role domestic food production is likely to play in the economic well-being of Jamaicans in general, and the livelihood security of resource-poor farmers in particular. It is anticipated that by doing this research, a valuable contribution will be made to the discussion on the role of wild and semidomesticated plants in the nation's food security policies and strategies.

METHODS

The research utilized both qualitative and quantitative data collection and analysis techniques. Composite indicators representing food insecurity and livelihood satisfaction were used to organize and explore patterns of wild food use in the study area. Questionnaire survey was the main method used to collect quantitative data, while key informant

interviews facilitated the acquisition of qualitative data. A census approach guided the collection of primary survey data. In-depth interviews were conducted with farmers ($n = 43$) to capture data on food insecurity, wild food collection, livelihood satisfaction, household characteristics, farming activities, livelihood strategies, and forest interaction. To complement the survey and acquire rich qualitative data, key informant interviews were also conducted with leaders of the Farmers Association (Bowden Pen) and senior members of the Millbank community. Complex challenges are best understood through open discourse (Gee and Green, 1998), and the qualitative interviews provided rich time-bound perspectives on the lived experiences of farmers in the Millbank community. The key informant interviews ($n = 11$) also provided farmers with a unique opportunity to discuss ideas, identify critical knowledge gaps, uncertainties, constraints to harvesting wild food, and other livelihood security challenges.

The FAO's Food Insecurity Experience Scale (FIES) was used to characterize food security, and participatory techniques were used to develop indicators to assess livelihood conditions. The FIES was developed under the FAO's Voices of the Hunger project in 2015 (Ballard et al., 2013). The project promoted the adoption of the FIES methodology by national governments as a simple tool that facilitates detailed analysis of food insecurity across different social, economic, institutional, and geographical factors. The FIES is relevant to the region as it is derived from the Latin American and Caribbean Food Security Scale and the US Household Food Security Module. The eight (Yes/No) questions reflect the three domains of food insecurity: changes in food quantity, uncertainty/anxiety, and changes in food quality (FAO, 2019). Based on the number of positive responses, an individual can be placed on a scale from food secure to severe food insecurity.

The FIES provides quantitative estimates of proportions of the population lacking access to nutritious and sufficient food as a result of a lack of money or other resources. The estimates are based on responses to eight questions that reflect conditions that shape access to food. The prevalence of undernourishment and severe food insecurity are the main indicators used to monitor progress toward the eradication of hunger (SDG indicator 2.1.1). The "State of Food Security and Nutrition in the World" reports for 2018 and 2019 incorporated the Food Insecurity Experience Scale (FIES) as a core indicator for monitoring SDG Target 2.1.2: the Prevalence of Moderate or Severe Food Insecurity (FAO, 2019). However, in both reports data were lacking for the Caribbean in all dimensions of the measure. In most cases, the Caribbean region is grouped with Latin America—thereby masking country-specific conditions.

Farmer survey data were combined with emergent themes from key informant interviews to assess key research questions. The aim of combining both methods is to facilitate a more in-depth assessment of the conditions and processes that shape food insecurity and livelihood satisfaction rather than a simple measurement of the concept. The overall design of the study enabled the researchers to gain a unique understanding of the food system challenges facing farm families in the study area.

Study Area

The Rio Grande Valley (RGV) is situated between the Blue and John Crow Mountains National Park, which spans over 41,000 hectares of forested land. The Rio Grande river system is one of the largest on the island. An estimated 25,000 inhabitants occupy the RGV (Statistical Institute of Jamaica, 2011). The watersheds of upper sections of the Rio Grande comprise one of the last remaining undisturbed stretches of tropical broad-leaved montane rainforest in Jamaica. The river separates the contrasting geologies of the two sides of the river which have resulted in a mosaic of complex of soil types. To the west are the steeply rising Cretaceous slopes of the spurs and ridges of the Blue Mountains, while to the east are the slopes of the Palaeocene limestone escarpment of the John Crow Mountains. The mountainous, deeply dissected topography of the upper Rio Grande is dominated by steep slopes, many of which exceed 30 degrees and are prone to erosion and mass wasting. The local environment is prone to multiple hazards including erosion, mass wasting, flooding and landslides from torrential rainfall. The Upper watershed region accounts for 40% of this population with the highest concentration in the Moore Town—considered to be the capital of the Windward Maroons. The Millbank community is situated on the edge of the forests within the buffer zone of the BJCMNP conservation area (Figure 1). The Upper RGV is exposed to hazards such as landslides and flooding that are accentuated by storm events. Livelihood systems in the area are primarily centered on agriculture. The natural and social history of the Blue and John Crow Mountains position the region as an important site for the examination of how global changes are manifest in rural agrarian societies and are mediated by traditional knowledge systems.

ANALYSIS

Profile of Wild Food Collectors

Of the farmers surveyed, 77% indicated that a member of their household harvests food. Similar to some regions in Africa, the most commonly harvested wild foods in the study area include fruits, roots and tubers and animal products (Hickey et al., 2016). Yam (*Dioscorea* spp.) is the most frequently harvested food, followed by banana and plantain, respectively, (*Musa acuminata* Colla and *Musa balbisiana* Colla), fruits, and hunting wild pigs, respectively. Of significance to the Millbank area is the yampie (*Dioscorea trifida* L.f.) crop which, unlike all other species of yam which were introduced into the region from Africa, is native to the Caribbean and Central and South America. Yampie was introduced to Jamaica by the Taino (Rashford, 1991) and was still being harvested by farmers at the time of this study. Our findings reaffirm the importance of yam to local and national food security (Beckford et al., 2011). While farmers mainly collect yam, banana, fruits, and hunt wild pigs from the forest, key informant interviews revealed a much wider range of food collected (Table 1) and ecosystem services provided by the forest (Figure 2). Using the Plants of the World Online database (POWO, 2019), a list of the wild foods (and common use) mentioned by farmers during the interview are presented in

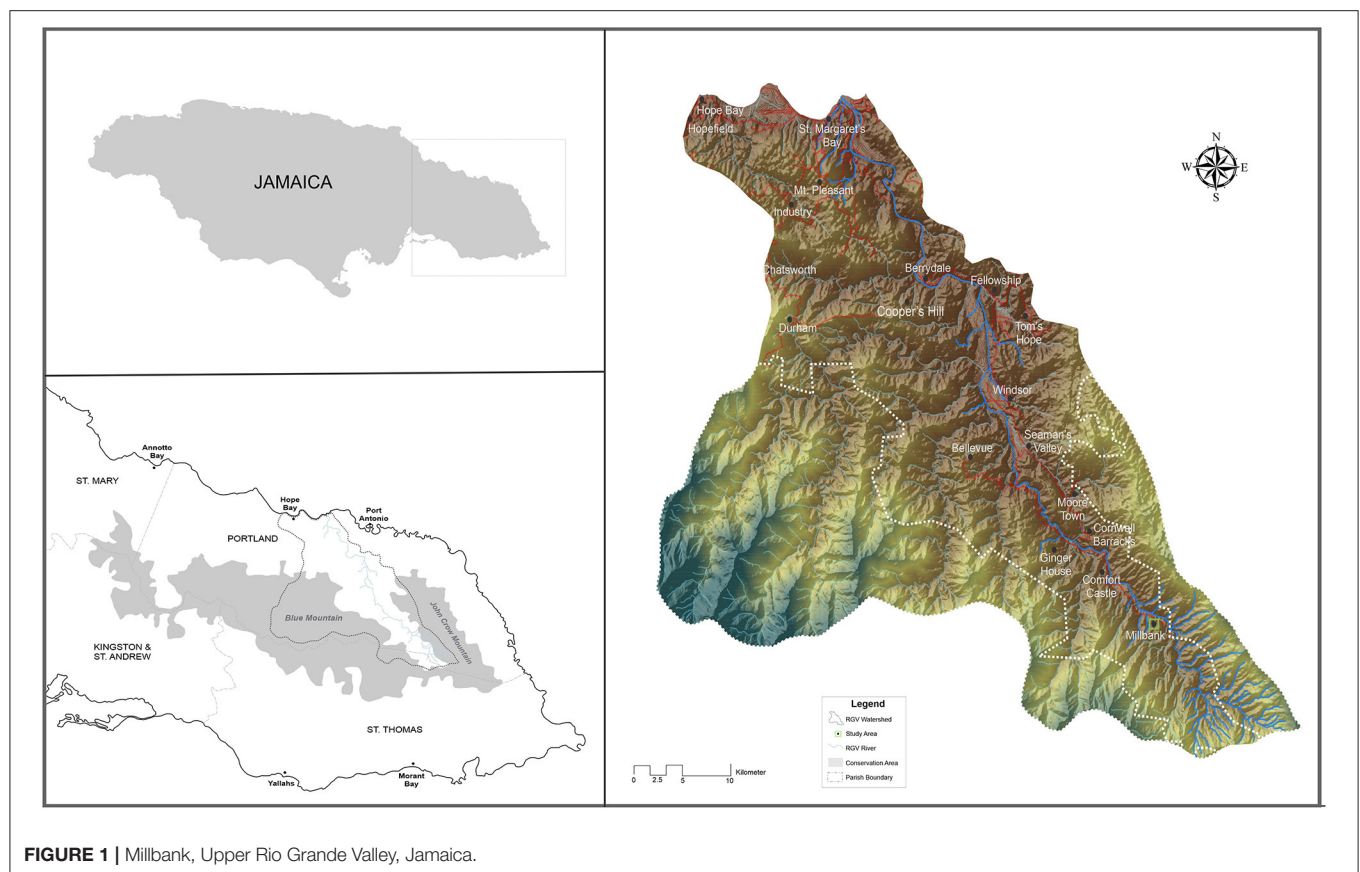


Table 1. These wild food sources most likely are harvested from land which was formerly cultivated but has since been abandoned and reverted to forest land.

Based on the main types of food harvested from the forest (and for analytical convenience), farmers can be described as either *specialized* or *multiple food* collectors. Specialized collectors are farmers who typically harvest one type of food from the forest, while multiple food collectors target more than one food type. Approximately 47% of the sample are multiple food collectors, 30% are specialized, and 23% are non-collectors. The median age of farmers (55 years) is used to separate farmers into younger and older age groups. Younger farmers account for 65 and 60% of the multiple food and non-collector groups, respectively, while older farmer represents 69% in the specialized category. The fact that farmers who collect multiple foods and non-collectors are predominantly younger farmers, and specialized collectors are mostly older farmers implies that age is an important consideration when characterizing use of wild food in the study area. The fact that older farmers are more specialized is unsurprising. One possible explanation is that older farmers might find it more physically challenging to traverse multiple (and distant) areas of the forest and may choose to focus on a specific area and crop.

Farmers reported that a concerning trend in the Millbank community is the declining number of women in the community. These demographic changes are known to impact farmers field

decisions (Ji et al., 2017), and can shape patterns of wild food harvest. Women play a critical role in the preservation and transmission of culture in the RGV. One farmer explained that in the Millbank community, women are the chief custodians of traditional knowledge of medicinal plants, herbs and spices that are used for food and spiritual ceremonies. This is especially true as it relates to the preparation of authentic Jamaican food. As Picking et al., 2019 observed, it is the way foods (and drinks) are “prepared or combined... that distinguish[ies] them as uniquely Jamaican” (p. 104).

Socio-spatial characteristics of wild food harvest are also reflected in the distance traveled by farmers to collect food. On average, most of the farmers (37%) journey more than 3 miles into the forest for food. A slightly lower proportion (33%) indicated that they do not go beyond a mile in the forest for food. Approximately 81% of the specialized collectors operate within 3 miles of the forest, while 50% of the multiple food collector group typically traverse more than 3 miles into the forest (**Table 2**). In terms of the foods harvested, majority (63%) of the older farmers indicated yam, followed by banana and plantain (25%), fruits (8%), and wild pig (4%). Most farmers in the younger cohort also collect yam (42%) followed by banana and plantain (24%), fruits (18%), and wild pig (16%).

According to one of the farmers interviewed, the number of cultivated plots has declined over the years, but the use of the forest has increased—primarily as more farmers access wild food

TABLE 1 | List of wild food and fruits and their common uses.

Name of crop	Family	Species name	Common name	Common use	References
Yam	<i>Dioscoreaceae</i>	<i>Dioscorea alata</i> L.	Renta yam	<ul style="list-style-type: none"> Food yams are used principally for the carbohydrate they provide. 	Muzac-Tucker et al., 1993; POWO, 2019
		<i>Dioscorea alata</i> L.	St. Vincent yam	<ul style="list-style-type: none"> Secondary metabolites such as steroidal saponins, diterpenoids, and alkaloids, which have been exploited for making poisons and pharmaceutical products. 	
Fruits	<i>Myrtaceae</i>	<i>Dioscorea trifida</i> L.f.	Yampie yam		Batista et al., 2017; POWO, 2019
		<i>Syzygium malaccense</i> (L.) Merr. and L.M.Perry	Otaheite Apple	<ul style="list-style-type: none"> Edible portions possess antioxidant capacity. Leaves have anti-inflammatory and antioxidant effect as well as cytotoxic properties. The bark of the plant shows glycemia/cholesterolemia-lowering effects. 	
	<i>Sapotaceae</i>	<i>Manilkara zapota</i> (L.) P.Royen	Naseberry	<ul style="list-style-type: none"> Primarily cultivated for its fruit, timber, and latex. Used for its analgesic, anti-arthritis, anti-pyretic, anti-microbial, antioxidant, anti-tumor, hypoglycaemic, and hypocholesterolemic properties. 	Moura et al., 2019; POWO, 2019
	<i>Anacardiaceae</i>	<i>Mangifera indica</i> L.	Mango	<ul style="list-style-type: none"> The leaves, bark, fruit peel and flesh, roots, and flowers are used as anticancer, anti-inflammatory, antidiabetic, antioxidant, antibacterial, antifungal, anthelmintic, gastro-protective, hepato-protective, immunomodulatory, antiplasmodial, and antihyperlipemic agents. Provides shade, shading trees are increasingly being recognized to benefit biological regulation in tropical agroforestry systems. Useful as dyes, mosquito repellent, dental care, carpentry, and light construction. 	Tscharntke et al., 2011; Ediriweera et al., 2017; POWO, 2019
	<i>Sapindaceae</i>	<i>Blighia sapida</i> K.D.Koenig	Ackee	<ul style="list-style-type: none"> Heartwood of the mature trunks are hard and termite resistant, therefore ideal for furniture and other construction use. The immature fruit are used to make soaps and the pod extract can be used in cosmetics. Extract from flowers used cologne production. Oil extracted from the seed has pesticidal properties and the crushed fruit can be used to poison fish. Ackee has many folk medicinal uses. Repeated small doses of an aqueous seed extract have been used to expel parasites. Ackee pod poultice has been used for skin infections, ringworm, and liver spots. The ripe arils, with sugar and cinnamon, have been given as a febrifuge and as a treatment for dysentery. The bark mixed with pungent spices has been applied as an ointment to relieve pain. The crushed new leaves have been applied to the forehead to relieve severe headache while leaves crushed with salt have been poulticed on ulcers, and ackee leaf tea used as a cold remedy. 	Mitchell et al., 2008; POWO, 2019
	<i>Anacardiaceae</i>	<i>Spondias dulcis</i> Parkinson	June plum	<ul style="list-style-type: none"> Commonly used as a food source. The astringent bark is used as an antidiarrheal. Used in eyesight enhancement and eye infections. Used to cure itchiness, internal ulceration, sore throat and inflammation of skin. Used as an antidote. The polysaccharide identified from the fruits pulp has eliciting activity on peritoneal macrophages. Leaves of the plant has shown antidiabetic activity. 	Islam et al., 2013; POWO, 2019
	<i>Annonaceae</i>	<i>Annona muricata</i> L.	Soursop	<ul style="list-style-type: none"> Widely used in traditional medicine to treat illness such as diarrhea, dysentery and fever, pain, respiratory and skin illness, internal and external parasites, bacterial infections, hypertension, inflammation, diabetes, and cancer. 	Coria-Téllez et al., 2018; POWO, 2019

(Continued)

TABLE 1 | Continued

Name of crop	Family	Species name	Common name	Common use	References
	<i>Annonaceae</i>	<i>Annona squamosa</i> L.	Sweet Sop	<ul style="list-style-type: none"> • Also used for treating respiratory tract, heart, and kidney infections. • Used to treat animal bites and stings. • Used to control obesity. • Used as an insecticidal, antitumor agent, anti-diabetic, antioxidant, anti-lipidemic, anti-inflammatory agent. • Used in the management of diabetes and has antispasmodic activities. • Useful against heart failure, palpitations, and also aids in digestion. • The seeds are reported to have anti-parasitic activities (against lice). • Crushed leaves are applied on ulcers and wounds and a leaf decoction is taken in cases of dysentery. • A decoction of the leaves is imbibed either as an emmenagogue, febrifuge, cold remedy, digestive, or to clarify urine, while both the leaves or bark decoction is given as a tonic and to halt diarrhea. • The leaf decoction is also employed in baths to alleviate rheumatic pain. 	Coria-Téllez et al., 2018; Zahid et al., 2018; POWO, 2019
	<i>Sapindaceae</i>	<i>Melicoccus bijugatus</i> Jacq.	Guinep	<ul style="list-style-type: none"> • Fruit pulp and roasted embryo used as a source of food. • Fruit pulp may have potential toxicological effects when consumed excessively or during periods of growth or high iron requirements. 	Bystrom, 2012; POWO, 2019
	<i>Sapotaceae</i>	<i>Chrysophyllum cainito</i> L.	Star Apple	<ul style="list-style-type: none"> • Possesses strong antioxidant properties either <i>in vitro</i> or <i>in vivo</i>. Extracts from the leaves, stem bark, fruits, peel, pulp, or seed are also used in traditional medicine for curing diabetes and fighting against bacterial, fungal, and viral infections. • Leaf extract alone or in a complex formula exhibits anti-inflammatory responses by reducing hypersensitivity, acts as inflammatory markers, and has antinociceptive effects. • Leaf extract also increases wound healing speed and assists in regulating fat uptake. • Additionally, fruits show anticancer activity against osteosarcoma. 	POWO, 2019; Doan and Le, 2020
Banana	<i>Musaceae</i>	<i>Musa acuminata</i> Colla <i>Musa acuminata</i> Colla <i>Musa acuminata</i> Colla	Robusta Lacatan Gros Michel	<p>All parts of the banana plant have medicinal applications: Medicinal use</p> <ul style="list-style-type: none"> • Flowers used to treat bronchitis and dysentery and on ulcers; cooked flowers are given to diabetics; • The astringent plant sap used in cases of hysteria, epilepsy, leprosy, fevers, hemorrhages, acute dysentery and diarrhea, and it is applied on hemorrhoids, insect and other stings and bites; 	Cheesman, 1948; Kundapura Venkataramana et al., 2015; POWO, 2019
Plantain		<i>Musa balbisiana</i> Colla	Plantain	<ul style="list-style-type: none"> • The roots are administered in digestive disorders, dysentery and other ailments; • Banana seed mucilage is given in cases of diarrhea. • Young leaves are placed as poultices on burns and other skin afflictions; • The astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhea and used for treating malignant ulcers; • Antifungal and antibiotic principles are found in the peel and pulp of fully ripe bananas; • A fungicide in the peel and pulp of green fruits is used as a fungicide in tomato production. 	

(Continued)

TABLE 1 | Continued

Name of crop	Family	Species name	Common name	Common use	References
Dasheen	Araceae	<i>Colocasia esculenta</i> (L.) Schott	Dasheen	<ul style="list-style-type: none"> Used as a possible blood pressure regulator, inhibits gastric secretion and stimulates the smooth muscle of the intestines. Non-medicinal use Banana and plantain fibers are used to weave ropes, mats and other textiles. Tannins present in ripe banana peel act as tanning agents in leather processing. The pseudo-stem is often most valuable economically if it is chopped and left in a field for its organic matter content and numerous other benefits. The pressed juice of the petiole is styptic, and may be used to arrest arterial hemorrhage. It is sometimes used in earache and otorrhoea, and also as stimulant and rubefacient and also in internal hemorrhages. Leaf juice is stimulant, expectorant, astringent, appetizer, and otalgia. The juice expressed from the leaf stalks with salt is used as an absorbent in cases of inflamed glands and buboes. Cooked vegetable contains mucilage and found to be an effective nervine tonic. Decoction of the peel is given as a folk medicine to cure diarrhea. Increases body weight, prevents excessive secretion of sputum in asthmatic individuals. Juice from the corm is used in cases of alopecia. Internally, it acts as a laxative, demulcent, anodyne, galactagogue and is used in cases of piles and congestion of the portal system; also used as an antidote to the stings of wasps and other insects. The corm is used by people of the Munda tribe as a remedy for body ache. 	Prajapati et al., 2011; POWO, 2019
Breadfruit	Moraceae	<i>Artocarpus altilis</i> (Parkinson) Fosberg	Breadfruit	<ul style="list-style-type: none"> A multipurpose species that provides food, medicine, building materials, and feed. Can be subjected to different types of culinary preparations, including; steaming, baking, or frying at the mature stage. Can be transformed into flour or used for making cakes. Its latex and bark are used as traditional medicine to treat sprains, sciatica, and skin diseases. The trunk is used for construction. Its leaves have traditionally been used to treat cirrhosis of the liver, hypertension, and diabetes. The breadfruit has a high percentage of carbohydrates, mostly as starch, and a small amount of protein but of excellent quality. Depending on the cultivar, bread flour contains excellent minerals, such as calcium, iron, potassium, magnesium, phosphorus, and sodium. In addition to carbohydrates, breadfruit is also a rich source of fiber, vitamin C, and flavonoids. While breadfruit is a valuable food resource, its current use is limited by the poor storage properties of its fresh fruits. 	Soifoini et al., 2018; POWO, 2019

^aVoucher specimens were not collected.

(which is defined by residents as food harvested from the forest which they have not specifically planted, but which have resulted from previous cultivation). Frequency of wild food harvest varies across the sample. Approximately 30% of the sample indicated

that they rarely collect wild food from the forest, while 37% indicated that they collect wild food frequently or very frequently. Majority of the specialized collectors indicated that they visit the forest for food frequently (61%). Half of the farmers who

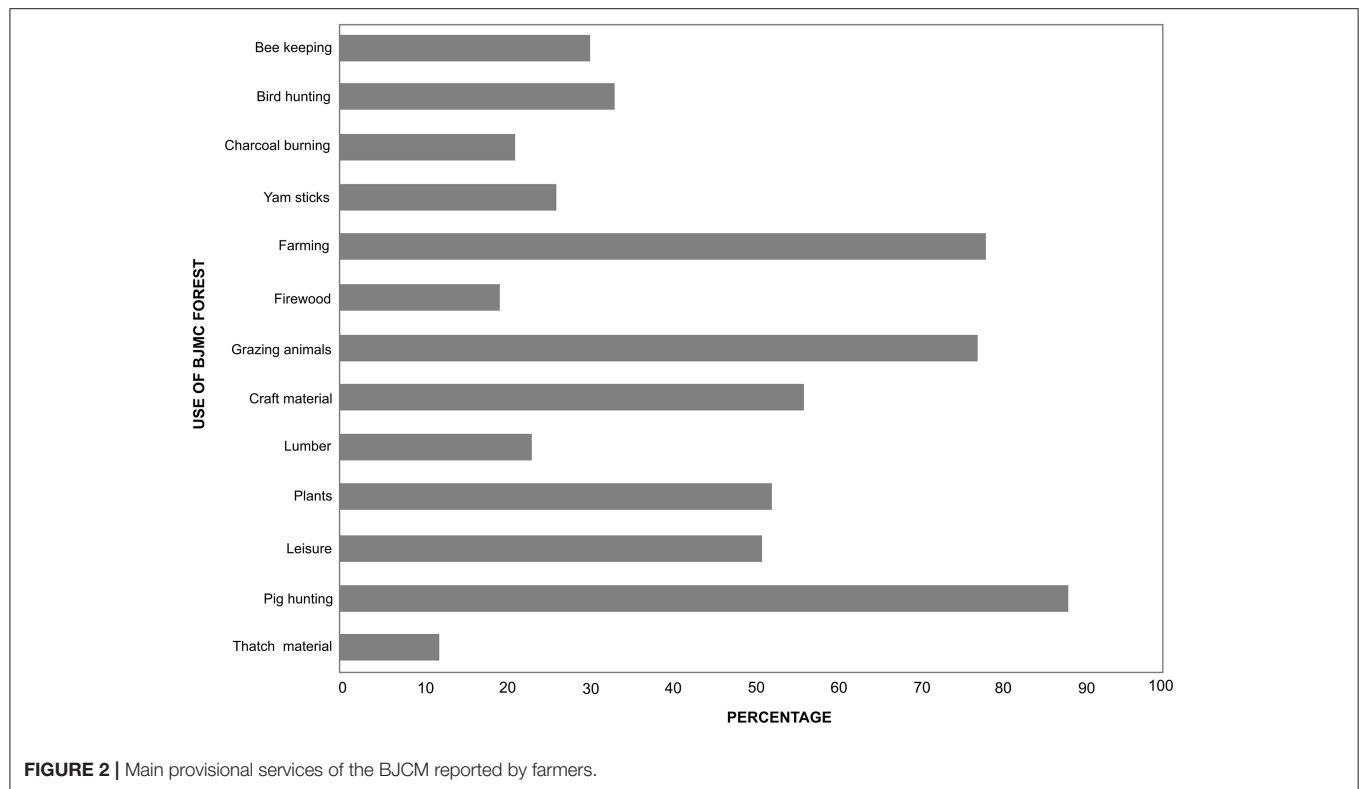


TABLE 2 | Wild food harvest by distance and age.

Wild food harvest	Sample (%)	Distance (miles)			Age (years)	
		<1	1–3	>3	Younger	Older
Yam	94	36	32	32	52	48
Banana/Plantain	46	27	27	46	60	40
Fruits	27	22	33	45	78	22
Wild pig	21	43	14	43	86	14

collect multiple foods indicated that they rarely use the forest. In the Millbank area, farming and wild food harvest are mutually reinforcing activities. Replanting after harvesting wild food is an established rule among farmers, and it is not uncommon for farmers to take advantage of the rich forest soils to cultivate other crops.

In terms of seasonality, 53% of the sample indicated that they typically collect wild food between November and April. A few (10%) farmers also indicated the months of June and July which overlaps with the dry season and mid-summer dry spell, respectively (Curtis and Gamble, 2007). This is understandable since Millbank is one of the wettest areas on the island and traversing the forest during the rainy season could be challenging. Projected impacts of climate change on seasonality could disrupt patterns of wild food collection. Across the Caribbean, additional warming by 0.2–1.0°C, could lead to a predominantly drier region (5–15% less than present-day), and

a greater occurrence of droughts (Taylor et al., 2018) along with associated impacts agricultural production and yield in the region (Gamble et al., 2017; Hoegh-Guldberg et al., 2019). These changes could undermine the climate-sensitive livelihood of wild food collectors and exacerbate food insecurity challenges (Campbell et al., 2010; Gamble et al., 2017; McCubbin et al., 2017).

Most of the respondents (51%) indicated that wild foods account for <50% of their household income. A further 30% of that total stated that wild food contributed to <25% of their household income. Only 6% of the sample depend on wild food for >75% of their household income. Similar results were observed by Hickey et al. (2016) who conducted a global assessment of the economic contribution of wild food to rural livelihoods and found that while majority of the sampled households (77%) were involved in wild food collection, it only contributed 4% (average) of overall household income. Most of the wild food is consumed at the household level (42%).

Eighteen percent of the sample indicated that they harvest wild food for commercial purposes, while the remaining farmers indicated that they use wild food for both commercial and subsistence purposes. Fifty-four percent of the sample indicated that their household income is completely dependent on farming. Of this total, 85% depend on the forest for food. Regardless of specialization, most farmers (70%) indicated that wild food is very important to their survival. Multiple food collectors use a greater proportion of wild food for household consumption compared to specialized collectors. Of the total number of farmers who indicated household consumption as the main purpose for collecting wild food, 79% are multiple food collectors. Conversely, 67% of those who indicated sale as their main purpose are specialized collectors.

Collection of wild foods also cut across educational divides. All four of the farmers with post-secondary level schooling indicated that they collect food from the forest. Most of the farmers indicated that they have been collecting wild food from the forest for more than 15 years. While age did not emerge a good explanatory factor for wild food harvest, there is a slightly higher proportion (80%) of older farmers (defined as above the median age) compared to younger farmers (below the median age) 74%. Similarly, access to land does not seem to be an influential factor to the use of wild foods. Of the farmers who collect wild food, 52% have secure land tenure arrangements (owned, family land, and maroon property) while the others have insecure land tenure arrangements (capture/settled, rent-free, and leased). Only 12% of the sample indicated that they own the land on which they do most of their farming. Most of the farmers (37%) operate on family land (tenure system based on kinship ties), while the others operate on capture/settled (24%), leased (15%), rent-free (9%), and communal/Maroon land (3%). Forty-two percent of the sample indicated that they are cultivating more farmland compared to when they started farming. This could be related to increased land availability and improved marketing conditions.

Food Insecurity and Wild Food Harvest

The results of the FIES show that majority of the sample (47%) is moderately food insecure, 44% is either mildly insecure (25%) or food secure (19%), and 10% is severely food insecure. There is strong evidence of a relationship between wild food and food insecurity ($p < 0.001$). Most of the farmers (60%) who harvest wild food are either moderately (54%) or severely (6%) food insecure. This finding reaffirms the importance of wild foods to the food security of farmers in Millbank, but is incongruent with other observations (Hickey et al., 2016) on the connections between wild food extraction and self-stated food insecurity.

Analysis of the dimensions of the FIES and categories of wild food harvest reveal considerable variability across specialization (Figure 3). Of the eight questions, specialized collectors account for the highest proportion in three: farmers who were worried they would run out of food because of a lack of money or other resources (54%); those who were unable to eat healthy and nutritious food because of a lack of money or other resources (62%), and households that ran out of food because of a lack of money or other resources (43%). Multiple food collectors also

accounted for the highest proportion of affirmations in three of the eight questions: those who ate only a few kinds of foods because of a lack of money or other resources (56%), those who ate less than they thought they should because of a lack of money or other resources (48%) and, those who were hungry but did not eat because there was not enough money or other resources for food (100%). Non-collectors, account for the highest proportion of respondents who went without eating for a whole day because of a lack of money or other resources (61%) as well as those who are food secure (75%).

Most (84%) of the specialized collectors and 60% of the non-collectors are either moderately insecure or food secure. Conversely, 80% of the multiple food collectors experience moderate to severe food insecurity. This finding reaffirms diversification as a risk-spreading strategy to cope with uncertainty. There was no statistically significant relationship between the frequency of wild food harvest and food insecurity. Likewise, the percentage contribution of wild food to household income is not a good indicator of food insecurity. Regardless of income contribution, 63% of farmers in the severely food insecure category indicated that wild food harvest is very important to their family—compared to 15% of those who are food secure. In terms of the use, 57% of those who are severely food insecure indicated they use wild food for both sale and household consumption. Of the farmers who are food secure, 67% indicated that they primarily use wild food for household consumption.

Farmers who are more food insecure tend to go further in the forest for wild food. More specifically, 83% of the farmers who travel more than three miles in the forest are either moderately or severely food insecure. Combined, there is a higher proportion of female farmers in the mildly insecure and food secure categories (55%) compared to male farmers (40%). None of the female farmers were found to be severely food insecure. Younger farmers (below the median age 55) are generally more food insecure than older farmers (above the median age 55). Of the total number of farmers in the severely insecure category, 75% are in the younger cohort. The opposite is the case for the food secure category with 75% falling in the older cohort.

Livelihood Satisfaction and Wild Food Harvest

Prior to the survey, semi-structured and informal interviews were conducted with farmers in the community to determine what is most important to their livelihood. The qualitative data from the surveys is reported elsewhere. We note this aspect of our data collection here to provide context of our broader research approach. Eight factors emerged from the discussion: (1) overall income from farming, (2) soil quality, (3) water availability, (4) ability to manage hazards (erosion, landslide, flooding and pest and diseases), (5) extension support received, (6) market for produce, (7) types of crops cultivated and; (8) ability to support family from farming. From these factors, a livelihood satisfaction scale (LSS) was developed to determine how farmers feel about these aspects of their livelihood. Farmers indicated their level of satisfaction (2 = satisfied, 1 = neutral and 0 = dissatisfied), which were then combined into a composite variable to reflect

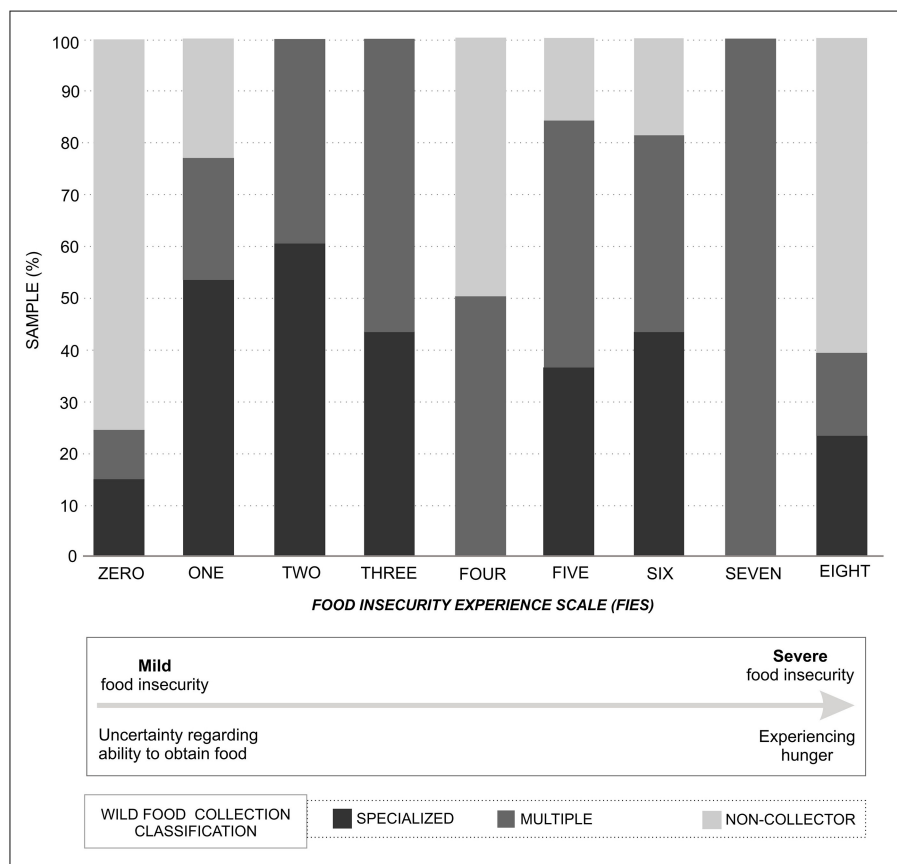


FIGURE 3 | Food Insecurity Experience Scale (FIES) and wild food harvest.

TABLE 3 | Livelihood satisfaction by wild food harvest and FIES.

		Wild food harvest (%)			Food insecurity (FIES %)				
		Specialized	Multiple	Non-collector	Total	Secure	Mild	Moderate	Severe
Livelihood satisfaction	Low	17.4	60.9	21.7	100	21.7	17.4	43.5	17.4
		30.8	70	50.0	53.5	62.5	36.4	50	100
	High	45	30	25	100	15	35	50	0
		69.2	30	50	46.5	37.5	63.6	50	0
	Total	30.2	46.5	23.3	100	45	30	9.3	25
		100	100	100	100	100	100	100	100

overall livelihood satisfaction. The scores were normalized, and the median score was used to define high (above median) and low (below median) livelihood satisfaction. A slightly higher (54%) proportion of the farmers have low livelihood satisfaction compared to those in the high category (Table 3). There is no statistically significant association between wild food harvest and livelihood satisfaction. In part, this implies that the factors influencing wild food harvest extend beyond the livelihood domain to include intangible cultural attributes/values.

The importance of the forest to the well-being of the farmers in Millbank is reflected in the community rules and norms related

to the use of forest resources. Seventy-five percent of the farmers acknowledge awareness of rules among community members regarding the use of the forest. The most common rules identified are related to the removal of trees and the use of agrochemicals. It is customary for farmers to replant food crops after harvest and to limit the use of agrochemicals. The predominant sentiment among the farmers is that farming activities have declined over the past two decades resulting in fewer, older, male farmers involved in small-scale shifting cultivation primarily for subsistence. Just over half (51%) of the respondents indicated that they practice agroforestry. Agroforestry is widely promoted

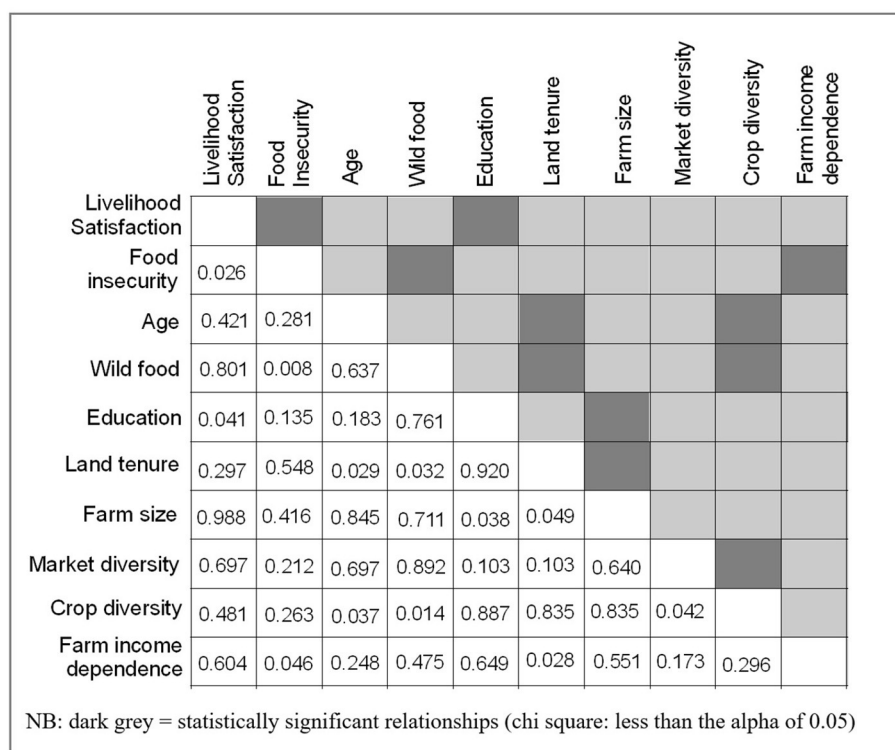


FIGURE 4 | Relationships between food insecurity, wild food harvest, livelihood satisfaction and key socioeconomic and agronomic factors.

across Jamaica as an ecosystem-based adaptation practice with sound conservation value and economic potential for small farmers (Davis et al., 2017).

Agrobiodiversity provides multiple co-benefits to food security in rural farming communities (Hickey et al., 2016; Asprilla-Perea and Diaz-Puente, 2018). In SIDS, biodiversity loss from traditional agroecosystems has been identified as one of the most serious threats to food and livelihoods security (Balzan et al., 2018). Agroecological approaches that included community planning, indigenous knowledge, attention to inequalities and a range of practices such as agroforestry, kitchen gardens, cover crops, polycultures, and forest conservation have been found to provide multiple co-benefits to food security, biodiversity conservation, improved well-being, and climate adaptation (Davis et al., 2017; Buckwell, 2019). Davis et al. (2017) found that the food security challenges facing Jamaican farmers can be alleviated by improved marketing of fruit tree products—which also provide multiple benefits to watershed management. Agrobiodiversity is one of the most important resources farmers have to combat climate change and food insecurity challenges.

All of the farmers who experience severe food insecurity exhibit low livelihood satisfaction. For farmers who are food secure or mildly food insecure, the difference in livelihood satisfaction is marginal (when the two categories are combined). Sixty percent of the farmers who are moderately and severely food insecure exhibited low livelihood satisfaction. There was

no significant relationship between livelihood satisfaction and collection of wild foods. This implies that how farmers feel about their livelihood is independent of decisions to collect wild foods.

The survey results revealed strong evidence of an association between market diversity and crop diversity ($\chi^2 = 0.042$, $p < 0.001$) (Figure 4). During the qualitative interviews, one farmer noted that cultivating a wide range of crops is an important strategy to reduce risks associated with market failures—from a commercial standpoint. The main cash crops cultivated by farmers in the study area are dasheen (72%), banana and plantain (23%), and yam (5%). Farmers indicated that private exporters have established a relatively stable market for dasheen in the past 5 years or so. As such, most farmers in the area have increased production of the crop. The United States and Canada account for 98% of all dasheen exports from Jamaica. A small volume (2%) is processed locally for the production of chips (MICAF, 2020). Farmers in Millbank are primarily dependent on “higglers” (market purveyors) to sell their produce. Farmers often credit their produce to higglers, who are notoriously unreliable (deceptive in many cases) with payment. Diversifying crop production systems is therefore, an important risk minimization practice among farmers in Millbank. Farmers in Millbank still practice barter, and wild foods are often traded for food items such as rice, flour, sugar, and tin fish. This barter system exemplifies the degree of trust within the community—an invaluable resource to cope with hardship and uncertainty.

DISCUSSION

Our findings around the patterns of wild food harvesting and food (in)security are exploratory and provide the first insights on community level food foraging in Jamaica. These findings suggest that Maroon practices of food harvesting persist into the present and serve two functions: (1) wild food harvesting enacts a claim to the forest as a commons, preserving cultural traditions of Maroon ancestors; (2) wild food harvesting serves to ameliorate food insecurity among residents. In both of these ways, the forest is broadly imagined by residents as a space akin to tropical home gardens. We discuss both functions in turn.

Maroon Practices of Food Harvesting as a Cultural Tradition

As a satellite community of Moore Town, populated by residents with Maroon ancestry, the patterns of wild food harvest are inseparable from a Maroon ecology, the distinctive subsistence practices that are anchored in ancestral connections to the Blue and John Crow Mountains as lands bequeathed to present day Maroons for their use and protection (Favini, 2018; Connell, 2020; Castellano, 2021). Indeed, the Maroon communities of the Blue Mountains were given land grants in the mid-eighteenth century as part of treaties that the British signed with the Maroons to end an internecine period that had threatened total ruin of the island's plantation economy. Given that Maroon communities came out of defiance to the system of slavery and were accorded territorial recognition by the British, we argue that the patterns of wild food harvesting serve as performative claims-making that asserts Maroon autonomy. Our reading here is supported by the key informant interviews we conducted and by a broader body of scholarship (Barker and Spence, 1988; Otuokon et al., 2012; Malm, 2018; Connell, 2020) including by Maroon scholars from the Upper Rio Grande Valley (Carey, 1997; John et al., 2010). This literature describes how African diaspora communities in the Americas see their provisions grounds and traditional haunts as Black commons that are symbolically and materially important to their sovereignty (Roane, 2018; Castellano, 2021; Williams et al., 2021). The “Black commons represents the elaborated sense of place outside mastery expressed through human-to-human connection within the delicate ecologies of the wider biosphere.” (Roane, 2018, p. 244). The continued imagining and use of the forests as a Black commons extend the Maroon provisioning into the present and necessarily challenges the symbolic enclosure of the Blue and John Crow Mountains as National Park and World Heritage Site.

Overwhelmingly, the key informants we interviewed, described the forest as having this quality of the Black commons rather than just a space to access and produce food. The forest is a spiritual ecosystem rooted in their ancestry and embedded in their memories, emotions, and overall subjective well-being. Therefore, the forest is more than an ecosystem providing food production services to the communities; it is a metaphysical space in which farmers position themselves as Afroindigenous. Our results show strong cultural and spiritual connections to the forest, which informs community-scale institutions and value systems. This sense of Afroindigeneity underlies the conception

of the forest as a commons to be kept both for posterity and as a place for the ancestors to continue to provide for the community—their actions centuries ago started the ecological process that allows wild food today. These physco-social dimensions of wild food consumption induce a distinct “*affective atmosphere*” (Anderson, 2009). The reciprocal relationships between farmers, and between farmers and the non-human world, are normatively orientated toward symbiotic life.

Since these understandings are social constructions of nature rooted in the symbolic interactions of the farmers with the material forest, successful protected area management is possible only if managers pay attention to the interpretative scheme of the farmers. Or else, farmers and protected area managers will be concerned with two different landscapes and realities. On the one hand, farmers will be concerned with maintaining connections to place through wild food consumption, while managers will be concerned with curtailing perceived human degradation. Ancestrality and the sense of a commons inform farmers' perception of wild food consumption and forest use and shape their temporal and spatial sense of place that conservation measures cannot ignore. Where conservation managers might be interested in ecosystem services, nutrient flows, species synergies, over long-term timescales at scale of the forest, farmers experience the forest as an expansive and constantly renewing provider on which their wild food harvesting barely registers. The farmers' temporal-spatial understandings also account for the calculative rationalities about other livelihood choices.

Wild Food Harvesting as a Food Security Strategy

Beyond the social-cultural dimensions of the wild food harvesting, our findings suggest that the wild food harvests also serve a material purpose—it provides a food safety net for a poor rural community. This function also clearly also characterizes the original practices of fugitive foraging and the practice of keeping both slave and Maroon provisions grounds. Other studies have warned that broad generalizations should not be made about patterns of food (in)security between foraging/wild food harvesting communities and agriculturalists (Harris and Hillman, 1989; Benyshek and Watson, 2006; Erskine et al., 2019), our research suggests that at least in the case of Millbank, and we imagine, in the case of similar traditional Afro-Caribbean communities, levels of foraging are a meaningful indicator of food security. What our findings also suggests is that it is not potential food insecurity alone that influences wild food harvesting, the patterns of harvesting suggest that wild food harvesting is also based on anecdotal evidence (from oral histories and cultural traditions) about the nutritional potential of forage food stuff. So that even in times of nominal food security, wild food harvesting still features in the food economy because it does not only serve as a buffer against food insecurity but a de-commoditized contribution to diets. Food security and food sovereignty are, therefore, intertwined (Bunge et al., 2019). A belief that the wild food primarily harvested are of high nutritional content might also explain the spatial patterns of food

harvesters. Yam, banana, plantain, and wild pigs require high energy and time input to gather and prepare relative to cultivating crops and livestock production.

Given the location of the Millbank community on the edge of the Nation Park-World Heritage Site, accounting for both the subjective-symbolic and the functional-material purposes of wild food harvesting, will be key to successful biodiversity conservation measures and protected area management. Approaches that ignore the Maroon element of the local land-use history often will cause spatial injustices that undermine food and livelihood security, as well as cultural heritage.

Strengthening Domestic Food Systems

Recent environmental and technological transformations have reshaped global food systems resulting in novel health, food, and nutrition security challenges (FAO, 2019; IFPRI, 2020), which threatens aspirations for a world without food insecurity, malnutrition, and hunger (FAO, 2019) under the 2030 agenda for Sustainable Development. The Caribbean is now one of the world's most import-dependent regions (Weis, 2007). This is fuelled by a pervasive lack of consciousness about food—"a separation between the head and the belly of this society" (Lamming, 1996, p. 26). The prevalence of undernourishment and severe food insecurity are the main indicators used to monitor progress toward eradicating hunger (SDG indicator 2.1.1). The "State of Food Security and Nutrition in the World" reports for 2018 and 2019 incorporated the Food Insecurity Experience Scale (FIES) as a core indicator for monitoring SDG Target 2.1.2: the Prevalence of Moderate or Severe Food Insecurity (FAO, 2019). However, in both reports data were lacking for the Caribbean in all dimensions of the measure.

In most cases, the Caribbean region is grouped with Latin America, which decreases the "resolution" of the data—thereby masking country-specific conditions. The FIES, along with livelihood satisfaction and subjective well-being measures, are promising tools that can be leveraged to fill this research gap. The emergence of these tools reflects the increased recognition of identity, geography, and socio-cultural relationships in shaping food security outcomes. This study represents an initial step toward filling this research gap by utilizing the FIES and measures of livelihood satisfaction.

The underdevelopment of Jamaica's domestic food system is a product of limited institutional innovation and dietary transition to unhealthy foods. From as far back as the 1930s, negative attitudes toward local food (e.g., yam, banana, plantain) were reported among Jamaican society (Bailey, 1939). Cheap imported food flooded local markets, magnifying nutrition transition, and the vulnerability of small-scale farmers. In recent times, local food production has plummeted due to complex changes in Jamaica's political economy (Gamble et al., 2010; Popke et al., 2016). Ironically, the decline in local food production has occurred alongside numerous policies geared toward "revitalizing" the agriculture sector—even though in reality, food imports have increased. One of the repeated mistakes of agriculture development policy in Jamaica is the exclusion of small farmers' voice and values. To strengthen domestic food systems in Jamaica, sensitivity to local food knowledge is an

absolute imperative. Local knowledge remains one of the most important resources available to poor farmers (Beckford, 2012; de Medeiros et al., 2021). In part, this research proposes a bottom-up approach to highlight the role of local knowledge in key food production systems that contribute to food heritage and farming households' livelihood security.

Contemporary migration patterns in the Millbank community contribute minimally to food production and food sovereignty. Remittances are primarily used to purchase imported foods such as rice, canned fish, and other processed food as substitutes for traditional foods such as yam and banana. This has contributed to the emergence of a social stigma associated with collecting wild foods and an ascription of superior socioeconomic status associated with the capacity to purchase imported food items. The transboundary risks associated with overdependence on food imports have been well-documented (Weis, 2004; Campbell et al., 2010) and have been magnified by the COVID-19 pandemic.

Food Security and Local Land Use Planning

Amartya Sen's work in the 1970s was influential in the transition from production to consumption-centered food policies. Sen's analysis of household-level food-deficit shaped the reconceptualization of food access through the lens of entitlement. For many small farmers, farming is the only domain where they enjoy freedom and control to craft possibilities for alternative futures. Yet, small farmers in Jamaica are often caught on the wrong side of a systemic pattern of exclusion (Barker, 1993). In 2015, the Blue and John Crow Mountains were designated a UNESCO World Heritage Site based on its cultural and natural heritage. The management team of this National Park has already started to use this new prestigious status to boost the region's tourism appeal. New hiking trails are being developed, and the local Maroon culture is used to represent locals' lifestyle. For farmers in the Millbank area, the benefits of the new statues are less obvious. Local conservation-based economies should incorporate strategies to promote diversity of consumption possibilities to unlock multiple pathways toward zero hunger (SDG 2), good health and well-being (SDG 3), and responsible/sustainable consumption and production (SDG 12).

The possibility of wild food contributing to Jamaica's policies on food security and poverty is unexplored. This reflects the existing knowledge gap in general, and the quantification and valuation in particular. The economic, health, and biodiversity value of the services provided by Jamaican wild foods is fertile ground for future research. Valuation of wild food can put a price tag on the economic savings to governments (Hickey et al., 2016) and halt the disappearance of wild and biodiverse agricultural landscapes. Additionally, the wild food collection analysis in the Millbank area could be expanded to include freshwater wildlife and ecosystem. The river system supports a significant portion of the consumption diversity of households in the study area. In fact, in the 1780s, the Upper Rio Grande Valley communities were described as "fishing villages" (Agorsah, 1994). Based on our research and descriptions of places visited to harvest wild food crops, it seems that they are harvested from

abandoned farmland rather than from isolated farm plots located and actively managed in the forest. Further research is needed to verify these impressions but, if true, the implications are that harvesting wild food is not a threat to the forest ecosystem's physical integrity, as would be the case if farmers were actively clearing patches of forest to cultivate.

Promoting inclusive conservation measures can also disrupt intergenerational poverty cycles and associated food insecurities (IFPRI, 2020) in the study region. There is a need to “foster pro-poor and inclusive structural transformation focusing on people and placing communities at the center to reduce economic vulnerabilities and set ourselves on track to ending hunger, food insecurity and all forms of malnutrition” (FAO, 2019, p. 8). Conservation measures should incorporate socioeconomic and multicentric policy responses that are congruent with local knowledge systems to drive equity and resilience. In the Millbank area, these issues take on deeper cultural and spiritual significance due to historical customary access to forest land. The forest is symbolic as much as it is a material-physical space. The wild foods of the forest, are both material resources and socio-cultural patrimony. Protected area management is seen as the imposition or encroachment of an external value system. This is a tension between conservation of biodiversity or the preservation of traditional life.

CONCLUSION

The research reported here is the first to document wild food sources in the Caribbean region and explore issues relating to food security, agrobiodiversity, and protected area conservation. Whilst some of these food sources are derived from native and non-native species in the rainforest (such as fruits, medicinal plants, and wild pigs), the bulk of the wild food is obtained from land abandoned to farming, either in recent decades or over much longer periods. We suggest that this makes wild food sources in the Caribbean fundamentally different from those in other parts of the world, such as Africa and South America, where forested areas may form part of a long fallow system of shifting cultivation, in which forest plots are cleared for cultivation then later abandoned. In the Caribbean region, the margin of cultivation has fluctuated over the centuries as new forest lands were cleared for farming and small plantations, then abandoned as fluctuating economic circumstances rendered their operations marginal or non-viable. As a result, in forest areas such as the Blue Mountains and the margins of Cockpit country, there is evidence of former cultivation, in the form of food crops that have regenerated naturally (without agrochemicals), and these represent the bulk of wild food sources reported here. This is

an important distinction. In Africa and Latin America, as fallow periods shorten, the integrity of the forest may come under threat as the land is cleared for agriculture, posing threats to forest conservation.

On the other hand, in the Caribbean region, wild food is harvested from long-abandoned farm plots. As far as we know, the forest areas where such food is harvested, are not actively “managed” so they pose no threat to the forest through forest clearance. The long history of dependence on the forest has resulted in a rich tradition of sustainably managing food resources in the forest. The high level of farmers’ dependence on the forest’s biological resources should position them at the center of local conservation planning.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

DC, AM, and DB: writing, data collection, and data analysis. TM and LS: data collection/editorial. LS, JT, and TW: data collection. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2021.663863/full#supplementary-material>

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