frontiers in Sustainable Food Systems

ORIGINAL RESEARCH
published: 04 January 2022
doi: 10.3389/fsufs.2021.768445

The Art of Letting Go: Transforming Participatory Research on Adaptation Practices Among Local Livestock-Keepers in East Africa in Times of Covid-19

Birgit Habermann[1], Todd A. Crane[1], Leah Gichuki[1], Tigist Worku[1], Roland Mugumya[1], Nathan Maiyo[2], Emmaculate Kiptoo[2], Shenkute Goshme[2], Fuad Mohammednur[2], Geoffrey Tugume[2], Kamango Alphaeus Satia[2] and Joel Reagan Siamito[2]*

[1] Sustainable Livestock Systems, International Livestock Research Institute (ILRI), Nairobi, Kenya, [2] Research Consultants, International Livestock Research Institute (ILRI), Nairobi, Kenya

OPEN ACCESS

Edited by:
Stefanie Lemke, University of Natural Resources and Life Sciences Vienna, Austria

Reviewed by:
Michael Spies, Eberswalde University for Sustainable Development, Germany
Ann Waters-Bayer, Prolinnova, Germany

***Correspondence:**
Birgit Habermann
b.habermann@cgiar.org

Specialty section:
This article was submitted to Social Movements, Institutions and Governance, a section of the journal Frontiers in Sustainable Food Systems

Received: *31 August 2021*
Accepted: *06 December 2021*
Published: *04 January 2022*

Citation:
Habermann B, Crane TA, Gichuki L, Worku T, Mugumya R, Maiyo N, Kiptoo E, Goshme S, Mohammednur F, Tugume G, Satia KA and Siamito JR (2022) The Art of Letting Go: Transforming Participatory Research on Adaptation Practices Among Local Livestock-Keepers in East Africa in Times of Covid-19. Front. Sustain. Food Syst. 5:768445. doi: 10.3389/fsufs.2021.768445

Participatory action research (PAR) puts high emphasis on the interaction of the research participants. However, with the onset of the Covid-19 pandemic in March 2020, the central role of researchers in participatory research processes had to be questioned and revisited. New modes of PAR developed dynamically under the new circumstances created by the pandemic. To better understand how Covid-19 changed the way PAR is applied, we analyzed PAR in agricultural research for development carried out in the Programme for Climate-Smart Livestock Systems (PCSL) implemented by the International Livestock Research Institute (ILRI) at five research sites in Kenya, Ethiopia, and Uganda. To understand how PAR changed in a component on adaptation research in the PCSL we facilitated a reflexive study with livestock keepers and researchers to document their experiences of PAR during the Covid-19 pandemic. The analytical framework focuses on highlighting the core characteristics and the underlying ethos of PAR in this case study. The lessons learnt in the process of adapting to the realities of doing participatory research in the middle of a pandemic provide important arguments for further amalgamating the PAR philosophy into similar research designs. The onset of the pandemic has led to a further decentering of the researcher and a shift of the focus to the citizen, in this case the local livestock keeper, that made it more participatory in the stricter interpretation of the term. Letting go of controlling both narrative and implementation of the research will be challenging for researchers in many research fields. However, this shift of power and this transformation of research methodologies is inevitable if the research should remain relevant and impactful. Ultimately, the transition into a Covid-19 future and the awareness that similar pandemics could dramatically interrupt our lives any time, will have an impact on how projects are designed and funded. More long-term funding and less pressure on providing immediate results can build community trust and ownership for research at a local level.

Keywords: participatory action research, COVID-19, participation, citizen science, adaptation

INTRODUCTION

"Participation" is often used as a placeholder to fill gaps between groups of people whose main differences lie in their motivation to engage with each other, as well as differences in power, access to resources, differences in their social worlds and epistemologies. However, in times of crisis, the resilience of more democratic ways of knowledge production is a convincing argument to rethink popular participation in the social production of knowledge (Gaventa, 1991; Call-Cummings et al., 2020). In the wake of Covid-19, supporting citizen science approaches has been one important way of keeping research and engagement activities in agricultural research for development (AR4D) going.

The most recent discussions on the future of participation in response to Covid-19 highlight aspects not reflected to the same extent before, such as the potential of groups in our societies previously not considered to be able to deliver research results such as children and young people (Cuevas-Parra, 2020), and in our case farmers themselves. The debate about widening our perception of who can do research where and how has been accelerated by the circumstances created by Covid-19 such as restricting movement and social interaction. Some of the emerging key issues in participatory action research (PAR) at this time are the strengthening of existing mechanisms for community participation, building capacities of stakeholders situated in communities while building new partnerships, and developing new approaches for data collection (Al Siyabi et al., 2020). In building on critical PAR, more space has been created for people's knowledge, and for a critical look at the limitations of PAR in this new context created by an unprecedented global crisis (Call-Cummings et al., 2020).

While some of these debates have taken place in AR4D long before the pandemic (Chambers et al., 1989; Pretty, 1995), the reality is yet to live up to the promises already made in the last few decades. This suggests higher commitment to higher involvement of local people in research design and implementation (Habermann et al., 2021). The obstacles are partly institutional and partly epistemological (Neef and Neubert, 2010; van de Gevel et al., 2020). Participatory approaches have been criticized for being mere managerial tools that lack substantive involvement of local people's perspectives, knowledges, priorities, and skills. For example, "*agricultural economists, on their part, believed they were already employing participatory methods when they interviewed farmers or traders with a standardized questionnaire*" (Neef and Neubert, 2010, p. 182). Participatory research has been critiqued as being unable to compete with traditional research in terms of scientific rigor or quality (Neef, 2008), as well as for glossing over on what really is consultation to legitimize decisions already taken (Cornwall, 2008). However, "*ethical research is produced through negotiated spaces and practices of reflexivity that is critical about issues of positionality and power relations at multiple scales*" (Sultana, 2007, p. 375). Thus, what participation means to different people involved depends very much on the context, as well as the mode of engagement between participating parties (Habermann et al., 2021): there is often a lot of difference between the idealized textbook definition of participation and what is implemented practically (Harrison, 2002).

As social scientists, we design participatory procedures embedded in analytical frameworks to avoid the pitfalls of participatory designs outlined above, with a similar sense of control as biophysical sciences. These procedures often allocate a central role to social researchers, merely unfolding in different ways than traditional (non-participatory) research. The gaps seem obvious to farmers, but researchers often come with their own technical or theoretical agendas, as well as professional needs (Bennett, 2004; Habermann et al., 2021), some of which are substantially shaped by external funding providers (Eelderink et al., 2020). Thus, participation is neither a means to simply increase efficiency, nor a fundamental right: there are many nuances in-between (Pretty, 1995).

PAR is both a heterogenous practice and an idealized type of participation, and it puts a high bar on what should constitute participation (Cook et al., 2017; Benjamin-Thomas et al., 2018; Duijs et al., 2019; Call-Cummings et al., 2020; Dedding et al., 2021). Independent of the field of study, the goal of PAR is transformation of social reality to improve people's lives through active participation and creating awareness for more self-reliant development (Omondi, 2020; Stewart, 2021).

The pandemic led to strict travel restrictions for most of 2020. This necessitated methodological innovations to overcome the hurdles of the Covid-19 era. Some of these innovations involved virtual contact with "the field," such as moving in-person workshops and trainings online (Tunstall, 2021), shifting to remote photo and video diaries *via* smartphones (Marzi, 2020), and telephone surveys (Ali et al., 2020; Tilford, 2020). All these methods have been scrutinized and have undergone a critical review in the past year and the on-going learning curve has been steep (Leal Filho et al., 2020; Ramvilas et al., 2021; Santana et al., 2021).

While there have been many positive experiences in avoiding excessive travel, there are limits to how much time people can effectively spend online in meetings (Ramvilas et al., 2021; Santana et al., 2021). Virtual research substantially diminishes important personal contacts between urban/international research teams and rural people with low internet access and unreliable telephone networks, or even lack of electricity (Marhefka et al., 2020; Zhou et al., 2020; Santana et al., 2021). People already disadvantaged and marginalized are further excluded if research moves online and building trust and mutual accountability can become a challenge if the community is not already familiar with the researchers (Santana et al., 2021).

The objective of this paper is to use the principles of PAR to assess Covid-19-driven changes in the research design and methodologies of our participatory agricultural technology assessment. The analytical framework (**Table 1**) applied to achieve this understanding is based on systematic action research analysis (Greenwood and Levin, 1998; Bargal, 2006; Burns, 2007). We have chosen this approach because it explains well how PAR is different from more traditional research, and it explains both what PAR is and what it stands for (Burns, 2007).

We use the frameworks' principles to understand how Covid-19-driven changes were interacting with PAR approaches in our

TABLE 1 | Analytical framework adapted from Burns (2007).

i) The core characteristics of PAR	ii) The underlying ethos of PAR
Context bound and addresses real life problems	Combines a systematic study of a problem with endeavors to solve it
Both researchers and participants contribute to knowledge	Spiral process of data collection to determine goals and assessment of results
All participants' contributions are taken seriously	Feedback to all parties involved in the research
Diversity of experiences and capacities of local group as opportunity	Continuous cooperation between researchers and practitioners
Meanings in inquiry process lead to social action	Relies on principles of group dynamics, mutual decision-making in public way
Reflections on action lead to new meanings	Considers issues of values, objectives, power needs of the parties involved
Actions arise from the research to solve problems	Serves to create knowledge, formulate principles of intervention, develop instruments for selection, intervention, and training
Actions increase participants' control over own situation	Puts much emphasis on recruitment, training, and support of the participants

case study. The research questions we posed to document this were as follows:

What lessons have we learnt in the process of adapting to the realities of doing PAR in the middle of a pandemic?

Here we look at how different actors perceive the emergence of "digital space" in PAR in the pandemic, and to what extent the re-localization of the Participatory Adaptation Analysis (PAA) research process has led to a shift toward more co-production.

How has the onset of the pandemic changed the role of the researcher vs. the role of the citizen/local livestock keeper in PAR?

We illuminate changes in capacity development during the pandemic, and the shift of power from one "expert" to another.

What arguments emerge from our experience for further amalgamating the PAR philosophy into similar research designs?

We argue that PAR is needed to develop more resilient research designs, as well as long-term PAR partnerships to make research designs more resilient to crises.

The next section explains more about the case study project that was used for this research, and which methods were applied to reach a more in-depth understanding of the impact of the Covid-19 pandemic on the way we understand and implement PAR.

METHODS

Case Study

The research under review for this publication is embedded within the Programme for Climate-Smart Livestock Systems (PCSL). The PCSL takes a multifaceted and interdisciplinary approach to address climate change adaptation and mitigation issues in five East African livestock systems in Kenya, Ethiopia, and Uganda (**Figure 1**). The PCSL focuses on the combination of scientific data collection (both social and biophysical). This paper is based on one component of the PCSL: Participatory Adaptation Analysis (PAA). Underpinned by "positive deviance"[1] research approaches (Lapping et al., 2016; Albanna and Heeks, 2019; Steinke et al., 2019), the PAA involves participatory technology assessment of adaptation to climate change practices that are already being implemented by innovative farmers and pastoralists in the research sites, the "pioneers of adaptation."[2]

The PAA research aimed to address local livestock keepers' existing solutions relating to climate change adaptation. The research was designed to document pioneers' practices; socioeconomic and agroecological needs and benefits; and areas where research might make contributions in the future.

PAA research involves an iterative data collection process that provides many options for feedback. The fact that there are only a few purposively selected participants makes it easier to facilitate discourse and knowledge exchange among the pioneers and the external researchers.

The research design followed the steps highlighted in **Figure 2**. It shows both the original plan pre-Covid-19, and the adaptations made after the onset of the Covid-19 pandemic. It involved regular field visits, semi-structured interviews (SSIs) and a monthly ODK survey.[3] The training of field research assistants (FRAs) and research officers (ROs) served to introduce them to the planned research design. The on-site training served to introduce the FRAs and pioneers to the monthly data collection such as feed sampling and weighing of animals (Goopy et al., 2018). Finally, there was a needs-based training organized specifically for the pioneers on improvement of adaptation practices.

PAA research took place in different livestock production systems. The managing research team started with the premise that researchers can learn from, and with, pioneers to support adaptation efforts in their communities more broadly and to contribute to more appropriate adaptation pathways and technologies for local livestock keepers.

In the pre-Covid-19 stage of the research (2019 and early 2020), pioneers were identified through community-based processes not explained further in this publication. A full presentation of this research is beyond the scope of this paper,

[1]Rather than identifying failure and analyzing problems, positive deviance leads us to understand why "some people exhibit good outcomes "against the odds." (Lapping et al., 2016, p.129). Positive deviance helps us to identify local land users who stand out, having successfully implemented adaptation practices under the same stress factors as others.

[2]The term "deviant" carried many negative connotations in the research sites and was therefore replaced with "pioneer".

[3]ODK derives from Open Data Kit. It is a standard data collection tool (https://opendatakit.org/).

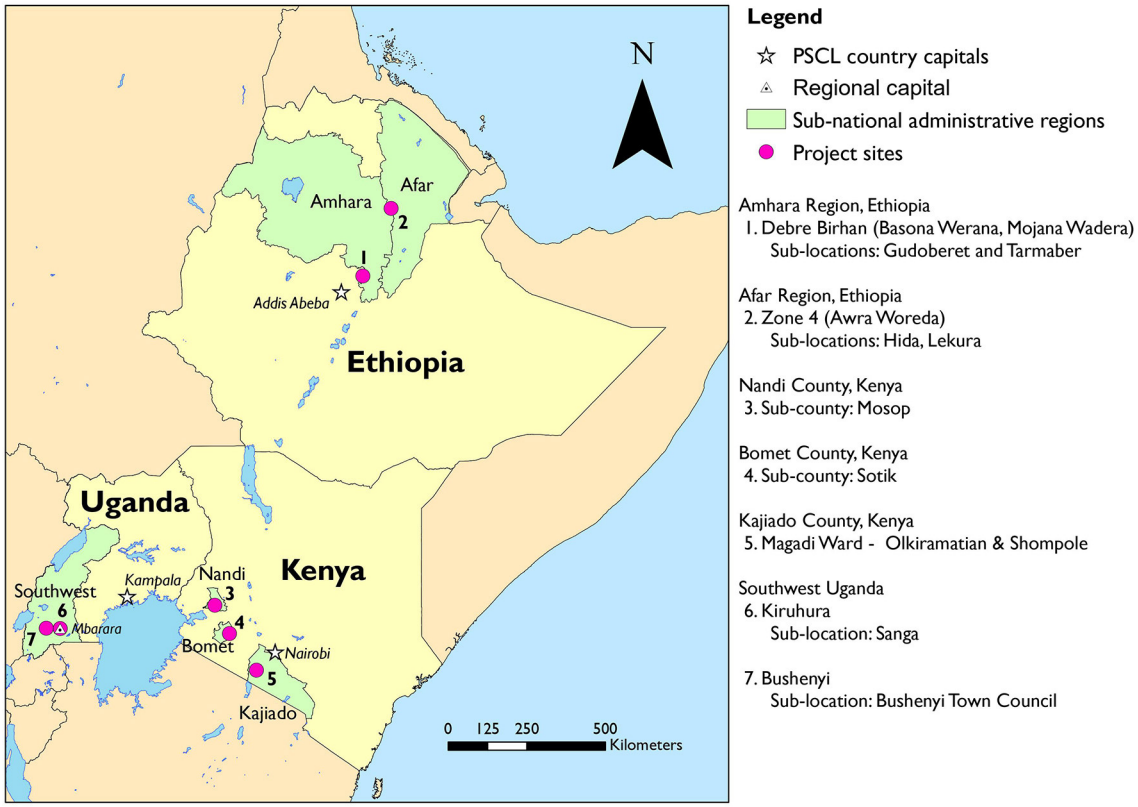

FIGURE 1 | Map of the five research sites. Amhara: Tarmaber and Gudoberet, Debre Birhan in Amhara Region, Ethiopia; Afar: Hida and Lekura, in Afar Region, Ethiopia; Kajiado: Olkirimatian and Shompole Group Ranches, Kajiado, Kenya; Nandi and Bomet Counties, Kenya; SW Uganda: Sanga in Kiruhura District, Uganda. Source: Michael Graham, ILRI.

which focuses specifically on how we changed our engagement strategy in response to Covid-19. The pioneers of adaptation became partners in our research: the pioneers selected the livestock to be part of this study, they determined the timing for collecting data, they actively participated in the data collection as well as collecting data independently (see **Figure 2**). They were active in the planning and implementation of the field days. The pioneers decided about the people to invite, and the topics to talk about. As a research team, we considered the values, objectives and power needs of both pioneers and researchers involved in this research by engaging in an open dialogue with them from the beginning, by enabling them to give feedback to us continuously, and by integrating their recommendations and preferences to adapt the research to their needs. For example, if the pioneers were not comfortable with ear-tagging the animals, alternative methods for identification were applied such as taking photographs of the animals for future identification. While pioneers had a substantial role in the research process even in the pre-Covid-19 phase, their roles expanded in the Covid-induced redesign.

In the PAA research, a different practice is analyzed for each site, responding to producers' innovations and prioritizations, as well as the research teams' preliminary evaluations. Based on the findings of the scoping study undertaken pre-Covid-19, we briefly outline the nature of these practices as background.

1. In Debre Birhan in the Ethiopian Highlands' mixed crop-livestock system, sheep fattening for market sale is emerging as a novel adaptation practice. This is a response to the decreasing viability of beans as a cash crop due to increasing frequency of frost. While sheep fattening had been practiced before, it is now done by implementing different technologies. The main challenge farmers deal with is the accessibility and quality of feed for sheep fattening, as well as the selection of the right breeds for fattening at an extreme high-altitude climate.
2. In Ethiopia's arid pastoral Afar region, the focus of the research is on changes in livestock management among the (agro-) pastoralists in response to the multiple challenges the Afar are facing in relation to climate change (Tilahun et al., 2017; Fenta et al., 2018; Mekuyie et al., 2018). The changes we are looking at is e.g., a shift from large to small ruminants to increase resilience in times of drought, and the impact on grazing and feed management caused by this shift. There are also other changes that have aggravated shortages of grazing lands making it harder for pastoralists to adapt accordingly (Rettberg, 2010; Schmidt and Pearson, 2016; Tilahun et al., 2017).

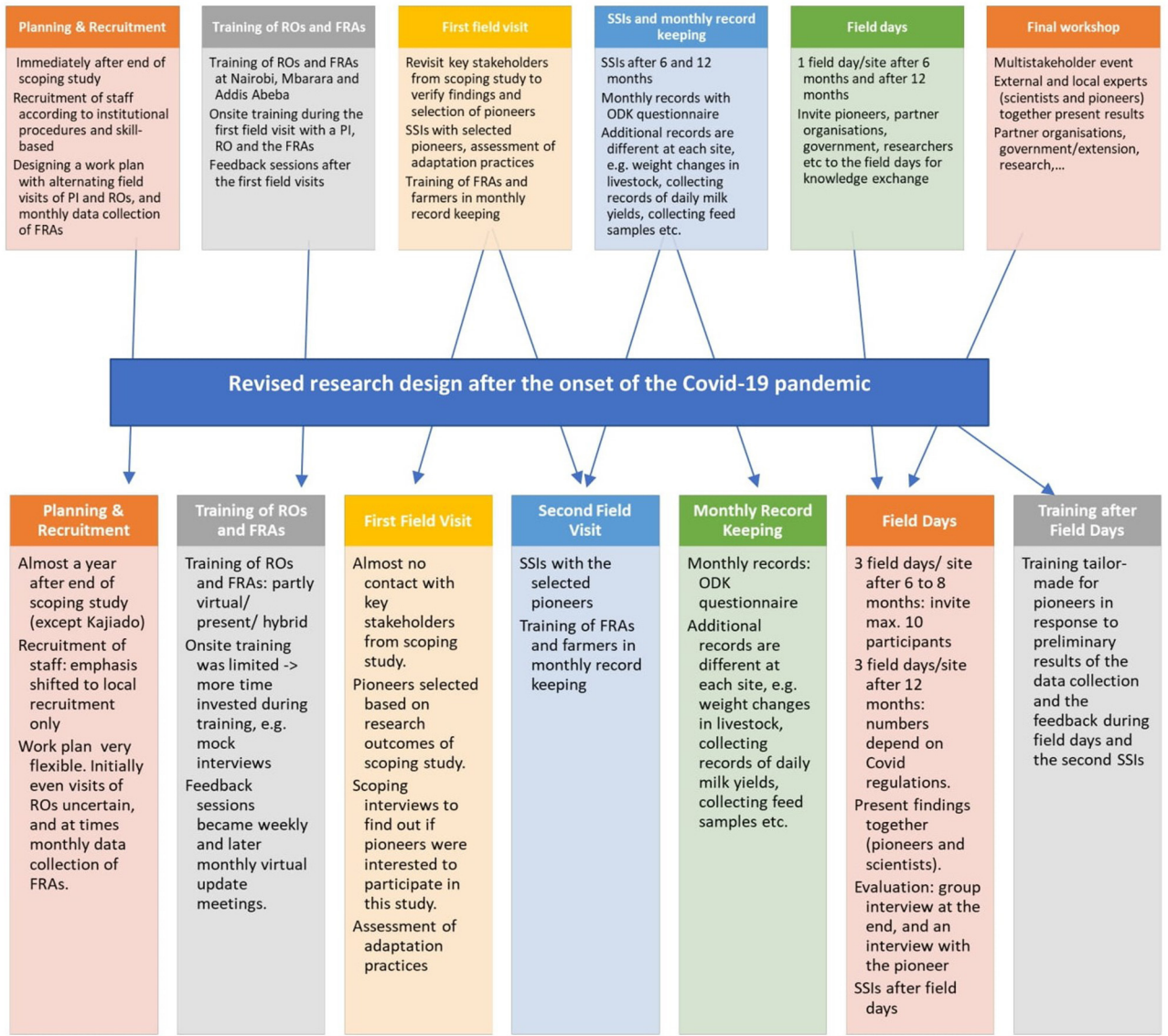

FIGURE 2 | Research design of the case study before and after the onset of the Covid-19 pandemic. The arrows indicate the direction we took after the onset of the pandemic.

3. In SW Uganda, we work in a commercial dairy production system based on extensive production, where water harvesting innovations help address farmers' persistent water shortages. Beyond water harvesting, we investigate milk productivity and different feed types (De Vries, 2018).
4. In Kenya, the two upland sites in Nandi and Bomet Counties are characterized by mixed crop and dairy farming, where we look at different feed production and preservation strategies to overcome feed shortages in the prolonged dry seasons (Tavenner et al., 2019).
5. In Kenya's lowland pastoral site in Kajiado County, we analyze breed diversification and management as a possible adaptation practice. Even though there had been attempts to introduce exotic breeds by external agencies, what the pastoralists were doing to effect adaptive traits in their livestock breeds is exceptional. The main challenge is increasing livestock productivity while grappling with the survival of livestock during drought and unplanned migrations (Campbell et al., 2000; Mwangi, 2019).

All sites have a variety of factors that influence the pioneers' decisions relating to production practices. As such, while all the practices relate to adaptation to climate change, they respond to other needs as well.

The selection process of pioneers at four of the sites was done in the scoping study phase in 2019. In the fifth site, Kajiado, pioneer selection was to have started in March 2020, but was delayed until October/November 2020. It then took place at

the same time when the PAA had already started at the other sites. Thus, most of the work with the pioneers happened during the pandemic.

Analyzing the Research Process Regarding the Impact of Covid-19

Participants in the research were asked to reflect on how Covid-19 changed their engagement with the project and how that affected their relationship with the study. In addition to the first two authors, who were the Principal Investigators (PIs), three groups of actors were included: the three research officers (ROs) supervising the field research in Ethiopia, Uganda, and Kenya (ILRI staff and co-authors) and the seven temporary field research assistants (FRAs, temporary field staff and co-authors) implementing the data collection. Both ROs and FRAs were given a questionnaire. They were asked to return the answers in written format. The pioneers were interviewed partly by the FRAs and partly the ROs (**Figure 3**). Those who did the interviews then translated and transcribed the feedback. The interviewees were four out of six pioneers from Uganda, six from Nandi and Bomet Counties, eight from Kajiado, four from Debre Birhan and five out of six from Afar. Three were missing because they could not be reached at the time when these interviews were done. The SSIs took place on the phone and in person where possible. The first author tailored the questions to each group to capture perceptions and perspectives that are particular to their project relationship (**Figure 3**).

The time frame covered in the interviews for this paper was from March 2020 until April 2021, however this varied between different respondents. Most of the research analyzed here was done between October 2020 and April 2021.

The submitted transcripts of all three groups were analyzed in NVIVO using an analytical framework based on systemic action research analysis (Burns, 2007, pp. 12-13). The first author adapted Burns' criteria for an analytical framework focused on highlighting the core characteristics and the underlying ethos of PAR in this case study (**Table 1**). Core characteristics are to address real life problems; both researchers and participants contributing to knowledge; creation of new meanings; actions arising from the research and others. The underlying ethos of PAR means amongst others to combine the study of a problem with endeavors to solve it; providing feedback to all involved; considering values, objectives, power; and mutual decision-making. This framework helps to understand to what extent the PAA research was aligned along the principles of PAR.

Our analysis emphasizes key themes that emerge from the data. Because respondents did not necessarily address all themes in the framework, we focus on the themes that emerged most clearly in the empirical data. Illustrative quotes are included as references to the original data. The Results section is structured by the three main groups of actors implementing the project: first the ROs, then the FRAs, and the pioneers themselves. The Discussion section highlights how our findings can be taken forward by PAR in the hopefully eventual post-Covid-19 era.

RESULTS

In the results, we first present how the ROs perceived the implementation of our PAR and the changes required by Covid-19, and then we move to the FRAs and look at their experiences. These two parts include observations by the first author, when appropriate. Thirdly, we follow the pioneers' perceptions of the research process. The questions in the interviews related to the analytical framework, but they were adapted individually to the three groups interviewed. In each of the following sections, we apply the criteria explained in the analytical framework above. The framework laid out more criteria than we could apply, and not all the criteria turned out to be applicable.

Perspective of Research Officers

The three ROs were hired by the PCSL team to facilitate the adaptation and mitigation research in their respective countries (Kenya, Ethiopia, and Uganda). They were directly supervised by the PCSL management team, specifically by the two main authors of this paper. The ROs themselves supervised the work done by the local FRAs. The FRAs were hired to do the actual data collection on site.

The ROs were asked to rank how well they thought our research was responding to the criteria listed in **Table 2**. This table was only filled in by the ROs, because for the FRAs and pioneers many of the statements were difficult to rate. The following section explains the responses of the ROs, as well as highlighting issues from the stories that they had submitted in response to the interview questions.

According to the ROs, the highest agreement was regarding "all participants' contributions are taken seriously." Among the other criteria, it was noticeable that "diversity of experiences and capacities of local group as opportunity" seemed less applicable in Uganda than in the other countries. Regarding the underlying ethos of PAR, the respondents agreed mostly on the high relevance of the iterative process of data collection to determine goals and assessment of results in this research. There was agreement on the fact that the research combines a systematic study of a problem with endeavors to solve it, and that it considers issues of objectives and serves to create knowledge.

The following section provides some examples from the contributions submitted by the ROs. This serves to illustrate how they perceived PAR in the case study, and how it was influenced by Covid-19. The ROs explained how they felt about the changes imposed by the pandemic; how they then responded to it; what it was like to go back to personally meet FRAs and pioneers; and what changes in PAR they noticed.

> There was a lot of uncertainty in the beginning. We were lucky because we were at the beginning of the new stage of our research, no field work was under way at that moment in Ethiopia. [RO, Ethiopia]
>
> At this point [when the first Kenyan lockdown was implemented in March 2020], I almost gave up on the project. It was hard to think of a normal situation, cases in the country were on the rise, and every day I was only worried about the number of infections being reported. [RO, Kenya]

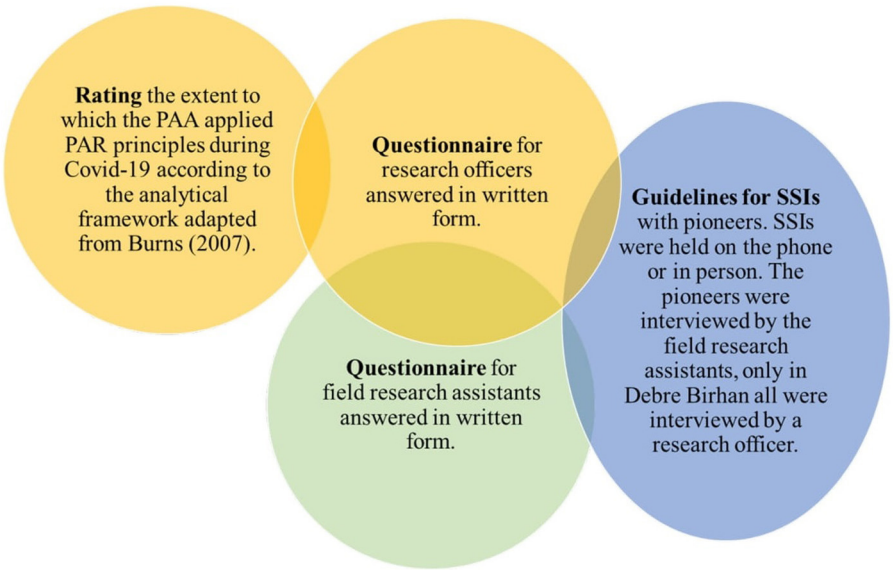

FIGURE 3 | Research design to understand how PAR was implemented during the Covid-19 pandemic. Different tools were applied for ROs, field research assistants and pioneers. All were developed based on the analytical framework adapted from Burns (2007).

TABLE 2 | Perception of the PCSL ROs in Ethiopia, Uganda, and Kenya regarding the performance of the Participatory Adaptation Analysis as PAR during the Covid-19 pandemic from March 2020 until April 2021.

Please rate the extent to which the statement applies to the Participatory Adaptation Analysis (PAA) in PCSL in your personal experience during the Covid-19 pandemic in 2020-2021.			
1 = not applicable, 2 = applies to some extent, 3 = applies fairly well, 4 = applies very well, 5 = a major focus, 6 = this corresponds 100%. 0 means that no answer was given.	Ethiopia	Uganda	Kenya
Core Principles			
Context bound and addresses real life problems	3	0	5
Both researchers and participants contribute to knowledge	4	3	5
All participants' contributions are taken seriously	6	6	6
Diversity of experiences and capacities of local group as opportunity	6	2	5
Meanings in inquiry process lead to social action	2	2	3
Reflections on action lead to new meanings	3	2	4
Actions arise from the research to solve problems	2	5	6
Actions increase participants' control over own situation	5	5	5
Underlying Ethos			
Combines a systematic study of a problem with endeavors to solve it	4	4	5
Spiral process of data collection to determine goals and assessment of results	6	5	6
Feedback to all parties involved in the research	2	3	6
Continuous cooperation between researchers and practitioners	6	5	4
Relies on principles of group dynamics, mutual decision-making in public way	5	2	5
Considers issues of….			
Values	5	2	4
Objectives	5	4	4
power needs	5	3	4
of the parties involved.			
Serves to create knowledge	5	5	6
Serves to formulate principles of intervention	6	3	6
Serves to develop instruments for selection, intervention, and training	4	3	6

The RO in Uganda explained that in the beginning of the first lockdown in Uganda, it did not look as if the research would still get started in 2020. However, he points out that in this situation it would have been good to communicate this to the people we had spoken to before the lockdown. But, as we were all in shock, we failed to let them know where we stood and what we were planning to do.

The first opening to restart our research was in September 2020. At that moment, ROs felt it was important to seek contact with local leaders and people on the ground to get a better feeling for the situation there. The new ILRI rules for field work during Covid were restrictive, and we were required to seek separate authorization for field work in relation to Covid-19 and to deliver bi-weekly reports. The new directive was quite detailed about all the precautions to be taken, and the Ethiopian RO felt uncertain about how this could be implemented.

> I prepared a fieldwork permit document [...]. But since the pandemic is a very serious and life-taking disease, with the fact that our field work could contribute to the spread of Covid-19, it was somehow challenging for me to promise to follow all the government guidelines and ILRI's directives on Covid-19, trusting the research assistants while I can't be at the field every time. [RO, Ethiopia]

In effect, ILRI's Covid-19 rules caused the research team to devolve greater responsibility to FRAs, who were casual employees based in the field sites, but whom we hardly knew. The managing research team had little leverage to hold them accountable for gathering high data quality or respecting ILRI rules regarding Covid-19 or other aspects of our field ethics. However, the managing research team decided that the only way to continue data collection was with FRAs on site. In some cases, like Nandi and Bomet Counties, this was easier because the FRAs had already done the scoping study and were well-known to ILRI researchers. It was more challenging at other sites. All in all, many challenges related to recruitment were not new. They were just aggravated by the fact that in addition to their professional competencies, the FRAs had to be in the research area as much as possible.

After recruitment, the next step was the training for the new FRAs. Normally, the first author would have done trainings on site, or she would have invited FRAs to the capital city for a joint training with the other FRAs within the country. However, because of travel restrictions, she trained one FRA after the other using a hybrid approach, partly physically present, partly online. In Addis Abeba, she provided training for two FRAs who were physically present at two different occasions given the challenges with internet connectivity outside of Addis. One day had to be shifted to an online training because the first author, who was the trainer, had symptoms of a cold. The training for the FRA in SW Uganda was held online only. In Kenya the training for the two FRAs in Nandi and Bomet Counties was only online, but for Kajiado it was done differently because of the difficulties with the internet connection there. The RO went from Nairobi to the site and met the two FRAs, while the first author did the training from Addis Abeba. The hybrid trainings were not always easy, as becomes clear from the descriptions of the FRAs later in this publication, and by comments of the ROs.

> When it came to training, we were facing some challenges. Our research assistant was challenged with the use of online communication tools in the beginning, and it took some time before he was confident with it. An advantage of online trainings is certainly the reduction of cost. But the actual time used for training was not less, and it had to be spread out over longer time, as online sessions can be really tiresome. [RO, Uganda]

As a trainer, the first author found online trainings extremely exhausting, especially as she had to repeat the same training five times within a few weeks' time. She missed the feedback that comes with direct personal interactions with the trainees, e.g., reading the look on their faces if they were following or not. Using video was out of the question due to bandwidth and internet stability constraints. The training sessions were evaluated, and the feedback was encouraging, however both the ROs and the first author agreed that this was a mere compromise and far from ideal.

As a whole team we tried to improve, and we used the experiences of the trainings after the data collection had already started. The managing research team held regular virtual meetings with the FRAs, first weekly and later monthly, using Zoom, Teams and WhatsApp. Eventually, the first author created a WhatsApp group and we held group meetings where all team members were invited. It was only later that we realized that this medium may have led to more exchange between us than our initial plan would have.

While the first 6 months of the pandemic stimulated the reorganization and led to the experiences described above, national travel restrictions were eventually loosened, enabling us to return to meeting FRAs and pioneers again in person. International travel was still impossible. Consequently, the first author located in Addis Abeba could not visit the sites in Kenya and Uganda. Wherever possible the return to fieldwork was done on a new footing, which gave us new perspectives on how changes in our project became necessary and noticeable.

Following ILRI's strict risk management protocols, the ROs joined the FRAs during different stages of the research in the field, especially at times when the first author usually would have traveled to the field but was not able to now. While the activities could have been carried out by the FRAs on their own, this was still reassuring in terms of maintaining both PAR principles and data quality.

We learned quickly that the farmers and pastoralists perceived the pandemic quite differently from people living in urban areas, like the PIs and ROs. The impact was felt much less, and they were overall much more optimistic about the situation. The ROs believed that for the pioneers, it did not seem a big issue that we continued the research, although it was quite distinct at different sites:

> In the Nandi and Bomet Counties, I felt like the participants had somehow lost hope, they didn't expect the project to continue for another year as promised during the scoping study. So,

> when the ILRI team showed up for the second phase they were very appreciative. In Kajiado, we started during the Covid-19 time and the scoping study involved meetings and household visits. The participants were at first hesitant to interact with outsiders, especially those from Nairobi, because there was a general perception at the time that Covid-19 was coming from Nairobi. But the reaction in the two sites in Kenya was very different. In the Nandi and Bomet Counties, the pioneers had experienced a few Covid positive cases in the neighborhood and they were keener to wear masks and to sanitize. Kajiado was completely the opposite, there were no positive cases in the area and the people attached the disease to people coming from Nairobi. Interestingly the masks are referred to as "corona" and so because we were the only ones who would put on masks we were called "the corona people." [RO, Kenya]

At both sites in Ethiopia, the RO had the impression that Covid-19 was not seen as something very serious in the first year of the pandemic. She was initially surprised about how relaxed farmers were about the disease.

> When I went to Debre Birhan for the first time [during the pandemic], I was expecting farmers are aware of the pandemic, however, no one was wearing a face mask. Most of the pioneers wear the facemask we provided for the first time. Except for T., she was aware [of the importance of wearing a face mask]. All farmers were inviting us to enter to their house to eat food and have tea, we were not able to say no because they were insisting us to enter their house. When we denied, they were thinking like we are afraid of not to be poisoned by their food, but the reality was that we were caring for them. [. . .] Especially during my first field visit, the interaction of almost all farmers was the same as pre-Covid-19. [. . .] But during my last visit, which was for 2 weeks, I saw some change from my first visit in terms of prevention and awareness about Covid-19. Old farmers who were invited to attend the field day at W.'s house, talking to each other to keep their distance. [. . .] they told me since the pandemic happened, they stopped greeting by handshaking and hugs, also they told me that they stopped kissing the holy bible and church wall on Sunday church gathering. [RO, Ethiopia]

In pre-Covid-19 times we often felt judged based on our ability to conform with the local customs of greetings and behaviors. However, after the onset of Covid-19 the importance of such customs was rapidly diminishing under the pressure to conform to social distancing rules. The ROs quickly adapted to this new situation, although it was surprising to them how fast this changed. Only in Uganda, the RO did not perceive much impact on how people were interacting with each other.

> The local innovators carried out their work as-business-as usual, without fear of contracting Covid-19. The majority did not wear face masks, neither did they sanitize their hands regularly. They claimed that the community where they resided did not have Covid-19, and that instead Covid-19 was in busy towns like Kampala. [RO, Uganda]

Regarding the changes that were necessary in terms of how PAR was conducted, the main impact the ROs reported was regarding the direct interaction with the pioneers, as explained above, and how they had supervised the FRAs. In terms of the interaction, it was a clear-cut disruption to pre-Covid-19. Following local norms and customs relating to greetings, socialization and hospitality is a central aspect of cultural respect which is fundamental to successful PAR collaboration. However, following Covid-19 safety protocols put us in direct tension with basic local practices such as handshaking and sharing meals.

Regarding the supervision of the research, we implemented regular online meetings. In-between the meetings, the ROs held many phone calls with the FRAs. Planning had to be more detailed, and we always had to keep an eye on the ever-changing dynamics of the pandemic. The managing research team had to respond to changing national rules in all three countries, with Ethiopia being the one with the least restrictions, Kenya under changing conditions with partial lockdowns being re-introduced in 2021, and Uganda finally under full lockdown in July 2021. Almost all responsibilities for field work were delegated to the FRAs and the pioneers. The ROs had to trust that the work would continue in a manner suitable for the research needs without their on-site supervision. This devolution of responsibility from ILRI staff based at the research center to FRAs based near the sites was one of the major changes we implemented. The next section explains how this process was perceived by the FRAs.

Perceptions of the Field Research Assistants

The FRAs are short-term researchers hired by the PCSL team to implement the PAA research. They are the people in the field, working directly with the pioneers. They are supervised by the respective national ROs. In this section, we present the responses of the FRAs to the interview questions, and we supplement their experiences by explaining the adjustments that we had to make due to Covid-19. The questions were the same as those of the ROs. We wanted to know what it was like for the FRAs to be called to work as researchers in the middle of the Covid-19 pandemic; how they experienced the period from their recruitment up to April 2021 in terms of the changes that we had to make to our PAR due to Covid-19.

The managing research team started recruiting FRAs in September 2020, but the recruitment phase lasted until February 2021, because the team was operating all sites at different timetables. Therefore, the FRAs had variable degrees of experience and exposure to the project at the time of data collection for this paper in April 2021. Three of the FRAs had already been working for PCSL during the scoping study, while the remaining four team members were newly recruited.

The FRAs were instrumental in designing the specific research plan for each site, in the selection of the adaptation practice, the selection of the pioneers, carrying out the actual data collection with the pioneers, developing a tailor-made training for the pioneers, and coordinating the field days. As explained above, Covid-19 substantially changed our hiring criteria because we needed people who were embedded within the communities. This has a big impact on the relation of the FRAs and the pioneers. The pioneers find it a lot easier to trust and relate to people from their own localities. Some FRAs even have a farming background and

keep livestock themselves. To avoid bias the ROs hired additional translators at the beginning of data collection to cross-check the quality of the data, especially for the scoping interviews and SSIs.

The FRAs were asked to respond to the interview questions in writing. Their responses varied substantially from very detailed and very personal essays to much shorter and more factual stories. Yet most of their responses provided rich insights into how the FRAs experienced conducting research during the pandemic, ranging from emotional to observational. Most FRAs were facing financial worries due to job insecurity and were glad when this work opportunity came along. The opportunity outweighed the fear of the risks taken by starting to work again and exposing themselves to unknown risks and a lot of uncertainty.

> I was happy that after a long time not being able to get out working with different people. I was going out at last. Though I was excited, I was still a bit worried about the Covid-19 pandemic, is it safe out there? Is the job worth the risk? Are we even going to be able to work? When I was called about the job, I wasn't sure that it will actually happen. The country was in lockdown, restricted movement and social gatherings were prohibited. [FRA, Kajiado, Kenya]

The responses were very similar across all the five research sites. People had been out of work for many months, and the situation was tough. Fears and uncertainty were there, but at the same time it felt good to move out of the stalemate created by the pandemic.

The FRAs were hired to carry out the actual data collection on site. Each country had one RO for supervision, but the number of FRAs varied. There was only one in Uganda, two in Ethiopia, and four in Kenya. Their number depended on the research sites and was partially influenced by Covid-19. Usually, the managing research team did not worry about the home base of the FRAs, if it was agreeable for them to travel to the research sites whenever needed. But with the possibility of further lockdowns to be imposed any time, this became important.

The managing research team developed a mix of quantitative and qualitative methods for the monthly visits by the local FRAs to collect data related to the selected adaptation practices. This monthly data collection was designed following the model of citizen science approaches with the aim of encouraging local livestock keepers to take ownership of the data collection and thus focus the research more on data relevant to them (van de Gevel et al., 2020). This is a joint exercise involving the pioneer and the FRA. In some cases, pioneers keep daily records that they share with the researcher at the monthly meetings. The high and frequent level of engagement and interaction that our research requires has made the relationship that the FRAs have with the pioneers very personal. When we hold online meetings, many FRAs talk about the pioneers as if they were close friends or family. Most of them know about personal situations, family issues, and have gotten to know the characters of the different pioneers quite well, especially those FRAs who had started the research already in 2020 and had visited the pioneers many times.

As the FRAs went back to fieldwork after a pause imposed by the first lockdown and the interruption of their work by Covid-19, some experienced mixed feelings, uncertainty and even fear, while others were more relaxed about the situation. Because of the uncertainty of field visits by the supervising ROs, the level of responsibility delegated to the FRAs was higher than they usually experienced. It was new for the FRAs that we allowed them to do most field work independently. This made them more responsible and accountable. One FRA explains how this new situation and doing research in the pandemic time made him feel:

> Going to the field in a pandemic period you can't anticipate for anything. It made me more flexible knowing that fieldwork can be halted at any time depending on the situation. It also gave me some sense of more importance and responsibility in planning and carrying out work even when alone, in the instances where supervision and planning is done *via* phone or online. It is only important for supervision to keep in touch with what is happening in the fields by checking up and probably making visits whenever an opportunity presents itself, considering safety and rules put in place. The monthly meeting has been so helpful in bridging the employer's expectations with the actual fieldworks. [FRA, Nandi and Bomet Counties, Kenya]
>
> There was not much field attendance by the supervisors, the field research assistants did most field work independently, making them more responsible and accountable. It is working well, with frequent online meetings. [FRA, Kajiado, Kenya]

The FRAs generally felt confident about their activities, and highly appreciated having the possibility to access backstopping at any time. Before sending the FRAs to the field, they attended a training. For most of the FRAs, this was an online event, but in Ethiopia they were invited to Addis Abeba due the problems with the internet connection. The following is the story of one of the FRAs that shows the level of uncertainty people were facing:

> When you invited me to come for the training [to town] everyone was worried about me. I was told by all my friends and family to be careful. All heard that the risk of Covid-19 transmission is high in the town. [...] On the first training day when I saw Birgit [first author] in the training room, I was shocked. I started worrying because as foreigners usually travel from place to place across the world, they have high exposure to Covid-19. After we finished the fourth-day training [...] I saw myself [in the mirror]. My eyes were red. I got shocked and I said "Oh my God, I got Covid." Then I started feeling headache. I was so confused and worried a lot. Then after few minutes, I went to the bathroom and looked into the mirror again. Now the color of my eyes was normal. I laughed at myself because I realized that the light in my bedroom was somehow blurred. The mirror had a reflection of red-colored light from outside through the window. When I noticed that I become calm. [FRA, Afar, Ethiopia]

This shows how much confusion and misinformation there was around in the beginning of 2021. Fears and uncertainty ruled over rational minds. The managing research team spoke to the FRAs very clearly about the risks and their duty not only to protect themselves, but also to protect others. There was a protocol to be followed, issued by ILRI, that specified a lot of detail on how to organize field work and how to work with farmers in the field. While we perceived this as an additional burden, it was

an assurance that we could minimize risks if we all followed the protocols.

When working with the pioneers, it was important to first inform local authorities and alert them to the fact that the PCSL was becoming active again. We followed the new protocols regarding the use of masks and sanitizers, and distancing. This was met with different reactions in the field, from relief to skepticism. But even in the communities where the level of accurate information about Covid-19 was low, this worked out well in the end:

> I was not afraid to start work with the community, and I was not worried about the possibility of Covid-19 transmission from them to me. Instead, I was worried and thinking about how we could go to pastoralists and work with them wearing a facemask. I was expecting that could cause challenges from the pastoralists. They may perceive our wearing face mask in the wrong way, as if we had negative feelings for them. But when we went to the field though, we explained to them everything prior to the interview things were different, they were OK with the facemask and all the prevention measure we were taking. [FRA, Afar, Ethiopia]

This risk of being misunderstood was one of the first author's main fears as well. How can we do PAR that requires openness and trust when we have to act as if we are in a sanitary hot zone? The disruption in how to interact with people within their own cultural norms could have had a significant impact on our relationship with them:

> I would not say nothing changed, because everything changed: talk about masks, sanitizers, the way of greeting each other as we are used to hugging and handshakes. So, a lot changed. [FRA, Uganda]

Both FRAs and pioneers gradually got used to these new ways, and pioneers accepted the reasons for these changes. FRAs continued coming to farms and homesteads, and temporary settlements of pastoralists as long as there was no lockdown preventing them to do so. Due to Covid-19, we tried to involve the pioneers in the actual data collection even more than we had initially planned PAR project. We had to make sure that the pioneers were able to continue the research as much as possible even without us coming to visit.

> Pioneers are involved in the research at the field phase, it was a wonderful thing that we taught them how to do most of the activities we were carrying out. In fact, I gave them an opportunity to do the girth measurements with me, doing the milk records and weighing of feeds and so forth. [FRA, Nandi and Bomet Counties, Kenya]
>
> About their involvement in the research, pioneers are happy to involve as much as required, some are happy to improve their creativity and add new ideas. That is what I understood from my regular visit. For example, K. records the weighing during every monthly record and monitor the status of his sheep. [FRA, Debre Birhan, Ethiopia]

The empowering role of engaging in the research affects how pioneers perceive the relevance of the research and their own role in it. However, even if Covid-19 restrictions led the managing research team to enhance FRAs and pioneers' roles more than originally planned, the commitment and involvement of some pioneers showed that there was still more scope for strengthening this.

After about 6 months, the FRA at Debre Birhan, who started the PAA, first started preparing the field days and the trainings for farmers. ILRI restricted the group size for meetings to 10 participants, independent of the different country regulations. We adjusted our plans to that, and we realized later that this was a good decision in terms of PAR principles. The smaller groups during the field days enabled much more interactive discussions and it was a special opportunity for pioneers to explain their practices to others. At the field days, the pioneers invited neighbors and friends for on-farm knowledge exchange. They explained about their livestock, about e.g., feeding and watering practices, breeding. The field days also involved group interviews and SSIs with the participants and the pioneers to assess their experiences and perceptions of the field day. A training event was then organized specifically for the pioneers and interested household members, based on emerging topics during the field days and SSIs. The FRA held the first training in 2021 in Debre Birhan together with some colleagues from his research center, and he received very positive feedback. The training was practical and interactive in a way it would not have been with larger groups.

Therefore, some of the adjustments due to Covid-19 were beneficial for our research in terms of PAR criteria. However, the other side of the coin is that the PCSL has clear targets, set in conjunction with the donor, on numbers of farmers reached by our trainings. Limiting the number of participants has made it more difficult to achieve this donor valued metric. While the donor partners have been sympathetic to the challenges imposed by Covid-19, this underscores the tension between prioritizing effective PAR and pressures to "achieve impact at scale."

From the Viewpoint of the Pioneers

Pioneers were the farmers and pastoralists who were selected for the PAA. They had been interviewed in 2019/2020 and were then re-visited when our research could start again during the Covid-19 pandemic. The visits started at different times at the five different research sites. First, the pioneers were visited and asked if they were interested to continue working with us. If they agreed, we continued with more interviews, and then we went on with the training for the joint data collection for the following 12 months. This section documents what it was like for the pioneers when the researchers returned after the long break caused by the pandemic. It also reflects on their perception of their own involvement in the research.

In April 2021, when the data for this publication were collected, the research had reached different stages at the five sites (Debre Birhan month 5, Nandi and Bomet Counties month 6, SW Uganda month 4, Afar month 3, Kajiado month 2). Data collection was ongoing everywhere, and the pioneers had already received part of the incentives, a compensation for the time they spent working together with us. We agreed on these in the beginning, when many of them could not yet see the benefit

that the participation in this research could bring for them, even though they volunteered to take part in it. The incentives gained more importance in Covid-times because of the increased involvement of the pioneers in the research, but also because of Covid-related economic hardships. It was decided together with the pioneers, what the incentives could be, for example feed, mineral salt, dewormers and others. The next step in the research process were the field days. The only site where field days had taken place at the time of data collection for this publication was Debre Birhan, and at the time of writing Nandi and Bomet Counties and Kajiado.

While many issues were raised regarding the impact of Covid-19, the feedback regarding the actual research was largely positive. Some pioneers said that they would have refused to meet researchers in the beginning of the lockdowns, because they were afraid what was to come. Only the Afar pastoralists had very little information about Covid-19. For the Maasai in Kajiado, the return of the researchers seemed like a positive sign that things were going back to normal. However, there was a lot of uncertainty if the researchers would contribute to spreading the disease from homestead to homestead. Coming from Nairobi, the probability of them bringing the disease was perceived as much higher than the local spread of the virus.

A key theme that emerged from the pioneers' interviews was their feeling of ownership of the research process through learning. This underlines the fact that they felt that their contributions were taken seriously, and that their experiences and capacities were seen as something positive, as an opportunity for them to manage the challenges posed by climate change. For example, in Nandi and Bomet Counties, where the PAA focuses on feed conservation and quality, it is important for farmers to know the quality of feed. The farmers in both Nandi and Bomet Counties and in SW Uganda emphasized the benefit of learning more about milk record keeping and about observing the cattle's development regarding body condition and weight gains and losses. It gave them the feeling that they owned this research, and that they were more than just a part of it. This boosted the pioneers' morale in many cases.

> As we continue working, I also continue enjoying it because I am learning a lot. The process of weighing the cows, recording the expenses and the proceeds from the same cow. I am learning about proper management so that it becomes profitable. [Pioneer, Nandi and Bomet Counties, Kenya]
>
> I felt good welcoming them at my home and expected a lot from them in terms of help on my problems affecting my livestock. The research is a good experience. We came to know new things like heart girth and body condition score measurement and on that we learnt to measure our cows on the body weight. I learnt about adaption practices like paddocking i.e. planting trees and water harvesting. [Pioneer, Sanga, Uganda]

Many pioneers mentioned that they appreciated this cooperation, the commitment of the researchers, and the fact that they respected the precautions regarding Covid-19. The fact that Covid-19 forced them to stay at home enabled some pioneers to pay more attention to the research. In Kenya, many emphasized that the pandemic was no reason to interrupt the research, as they could answer questions on the phone if needed and provide the reports by themselves.

> I feel like I am part of the research team. Whenever you guys come you notify me, and I have to be here to assist you with whatever is needed of me. And because of the team spirit am happy to be in the research. [Pioneer, Kajiado/Olkirimatian, Kenya]

While there were more similarities in the responses from Kenya and Uganda regarding how they felt about the research, the responses at the two Ethiopian sites were more general:

> After a long time when I met you again, I was so happy. For few months most of the experts, including the development agent, were not coming to us. The information we were hearing about how Covid-19 was affecting the other world was so frustrating. Your visit is very helpful for us. It is only when we are visited by educated people like you, we get knowledge and different experiences. So, after a long time when I met you in full health, I was so happy. [Pioneer, Debre Birhan/Gudoberet, Ethiopia]

These statements reflect a different attitude toward research. The expectation seems to be that the researchers bring knowledge, provide expertise, trainings, etc. regarding the technologies brought from the outside to this area. Therefore, to what extent the research we are doing can be called PAR depends on the context where the research is being implemented:

> My involvement in the research is welcoming you whenever you visit me, I give you all the information you need, and discuss with you all the challenges we have regarding livestock and supporting S. when he comes every month for weighing the sheep, but because of Covid-19 nothing has changed. [Pioneer, Debre Birhan/Gudoberet, Ethiopia]

The managing research team expected more involvement by the pioneers in Ethiopia, especially with delegating more responsibilities to the pioneers and FRAs. However, in the Ethiopian Highlands, farmers are used to an extension environment that is very hierarchical and directive. The expectations on the research team on the other hand are higher, especially in the site called Tarmaber, because there are no other development initiatives there:

> I was happy when I met you and S. Since the lady who came at the first visit didn't tell me about your return, and we didn't make any agreement for such a regular visit, I was not expecting your second visit. I never thought about you. But I am so happy about your visit. Not only me, but your visit is also very motivational for all the community. [Pioneer, Debre Birhan/Tarmaber, Ethiopia]

Regarding the expectations of this community, the RO had to be very clear at the time of the field day. The field day was intended to enable the pioneer to share his experiences with others, to show them his sheep, and how he was fattening them. But when we arrived, a group of government officials and village representatives had already gathered with an intention to hold a meeting regarding the construction of a road to the next town and they wanted to get us involved in this project. This was

the first time that the first author could travel to the field site herself after more than a year, which seemingly had raised bigger expectations. After the RO had clarified that this was not our mandate, the pioneer could then hold the field day without any further interference.

In the Nandi and Bomet Counties, farmers often work in groups to organize certain farming activities. This was already the case prior to our research. But now that social interaction has decreased, group meetings take place only one time per month, rather than weekly, as before. Visiting other farmers to learn from them, to seek advice and support, is more difficult under Covid-19 restrictions. One pioneer emphasized that the interaction with others had become limited, and that there were no more workshops and other training opportunities. He mentioned that the lack of interaction had an impact on knowledge exchange. For example, he wanted to get seeds for planting sorghum, but could not find out where to get the seeds:

> Nowadays, I am not able to go out to enquire about where I can get them. From the workshops I used to attend before, I used to go see other things and then come and practice them which would have helped in the research, but they are not there now. There is no workshop I have attended recently. [Pioneer, Nandi and Bomet Counties, Kenya]

Like in Ethiopia, pioneers in the Nandi and Bomet Counties were missing the access to knowledge that comes with social circulation, and they appreciated the fact that this research gave them the possibility to stay in touch with the outside world and to get relevant information for livestock management. The way the research was implemented provided the pioneers with knowledge, skills and some small support through the incentives, and the motivation to continue working toward a better future despite the dire situation the world found itself in in the first year of the Covid-19 pandemic.

While PAA activities are still underway, it is unpredictable whether they will result in new meanings or actions to solve problems, which are important criteria for PAR. However, at all sites the research has already given participants more control over their own situation in enabling them to appreciate their knowledge in livestock management. The participants are also learning about methods for better observing how their livestock is developing in response to their own management practices. The linkages created between the pioneers and other farmers made them less dependent on outside sources of information.

The results above presented perception of the three main groups of research actors regarding the changes in PAR during Covid-19. In the discussion we will summarize the lessons learned from these perceptions and we will highlight that is useful with and without Covid-19 remaining in our lives so dominantly.

DISCUSSION

In the discussion, we revisit the analytical framework defining the core characteristics and the underlying ethos of PAR and the negotiations observed in this case study (**Table 1**).

Core Characteristics of PAR

In this section we discuss how the pandemic created an opening to allow more room for citizen scientists to expand their agency in the research process in correspondence with the core characteristics of PAR. Citizen science is one method of PAR that enables local actors to take an active part in the research process, from project development, data collection to a peer review process of results (Ryan et al., 2018). What makes citizen science appealing is that "*large tasks can be accomplished by distributing small tasks to many volunteers and combining the results.*" (Van Etten et al., 2016, p. 3). We recommend that citizen science can be more than collecting large data sets with local actors. We recommend applying the principles of citizen science in a qualitative research setting. It is not the size of the sample that matters to us, but the role of the farmer or citizen in data collection. Many farmers experiment with different practices but don't bother documenting these experiments in a format accessible to scientists. Data quality—accuracy, completeness, and timeliness—can be an issue in PAR, and this also applies to citizen science. But there are mechanisms to navigate these risks such as the verification of submitted data by both scientists as well as citizen scientists together and comparing with similar data collected by scientists in comparable settings (Lukyanenko et al., 2016; Aceves-Bueno et al., 2017; Wehn et al., 2020).

The individualized approach of the PAA, where researchers were focusing their attention on a small, carefully selected group of positive deviants or "pioneers of adaptation," led to positive effects regarding the core characteristics of PAR. In applying citizen science approaches we addressed the characteristics of "both researchers and participants contribute to knowledge," "all participants' contributions are taken seriously" and "context bound and addressing real life problems." Pioneers felt they were taken seriously, they had the feeling that we were doing this together with them, they learned how to do record keeping and gained more autonomy. This was intended from the outset of the project, prior to the pandemic. But we delegated more responsibility to the pioneers than originally planned due to Covid-19 travel restrictions. For the managing research team, continuing data collection without going to the field sites was novel. While most of the time this mainly concerned the PIs, at times not even the FRAs could go to the sites. Then the pioneers continued the data collection on their own. Thus, through the pandemic, the above-mentioned core characteristics of PAR became even more prominent in the PAA than before. Prior to the pandemic the pressure to provide scientifically sound research outputs according to the expectations of donors and institutions of science was often in the way of implementing PAR according to its core principles.

Other important core characteristics of PAR implemented in the PAA were the connections to action, as in meanings leading to social action, action arising from research to solve problems, and actions increasing the participants' control over their own situation. Often "participatory" approaches are used simply to gain access to data for researchers' needs (Bennett, 2004). Farmers may be involved in some part of the data collection, but neither in the design of technologies to be tested,

nor in the analysis of the data collected, nor in the presentation of the results (Habermann, 2014). Increasing the responsibilities of the pioneers in the PAA research created an opportunity for them to think about solutions—and action—for some of the problems they were experiencing with adaptation practices. Hence in the research, we had both data that were more interesting from the scientists' point of view, and other data that were collected because they were of interest to the pioneers, and some overlap between the two. With the knowledge and skills acquired in the PAA, the pioneers were able to assess themselves whether the implemented adaptation practice was working for them or not, thus corresponding to the characteristic of "actions increase participants' control over own situation."

Another important component was the Covid-19 adapted format of the field days: this brought about a very positive change because the interactions in the smaller groups were more intense and sustainable. It was novel to the pioneers that we asked them to decide on many issues together with us, such as the whole set up of the field days, and that they were playing the experts' role in the facilitation of the field days. Furthermore, working in smaller groups enhanced social action and addressed the PAR characteristic "diversity of experiences and capacities of local group as opportunity." Smaller groups for field days have made a positive contribution to producers' ownership of both the content and the process, and this was one of the lessons learned from the pandemic that will influence how we organize such events in the future.

Livestock keepers were particularly self-motivated to organize and attend the field days. Covid-19 travel restrictions limited the possibility to meet others, to obtain information and to attend trainings. However, the way PAR was implemented in the PAA opened opportunities for learning and this created high motivation among pioneers, FRAs and ROs. For instance, following the field days in the Nandi and Bomet Counties, livestock keepers decided to continue meeting for knowledge exchange.

More consideration for the core characteristics of PAR has made the PAA more action-oriented and more citizen-oriented. The experiences made during the pandemic so far have led to a rethinking of "whose needs" are prioritized by the scientific and the donor community. We hope that more research will be refocused in the direction of citizen science to enhance co-production and social impact.

Underlying Ethos of PAR

This section discusses more in depth about how we managed to incorporate the underlying ethos of PAR in the data collection process. Our individualized, positive deviance approach has been beneficial for adapting to Covid-19. Delegation of more responsibility and knowledge to the pioneers reassured us that in case of more lockdowns, most of the pioneers can continue collecting data on the farm, and information sharing can continue.

Hiring people as FRAs who were more local was also beneficial for the PAA in this regard. The FRAs developed a high sense of responsibility for and ownership of the research. This was partially because they were visiting the pioneers so often, and if they held meetings, these were only in small groups. These meetings became locally embedded social nodes of connection and exchange among the pioneers themselves, as well as between the pioneers and the rest of the communities. In short, implementation of the PAA activities became more personal. Holding meetings in larger groups than 10 was not permitted by ILRI. Thus, stakeholder meetings that would have involved mutual decision-making were not held.

The ethical requirements of creating knowledge, formulating principles of intervention and to develop instruments for selection, intervention and training were important pillars of the PAA from the beginning, but they were all altered in one or the other way by the adaptation to the pandemic. An important change was how the RO's, FRA's, and pioneers' trainings were organized. The mainly virtual training for the FRAs and ROs showed us the limitations of online methods: the interactions were limited, especially as some of the trainings were only held for one trainee at a time. In addition, bandwidth limitations made communication difficult sometimes. We learned that it is better to gather more people in one training and facilitate more interactive moments.

The training on monthly record keeping on site would normally have taken place under the supervision of the first author. In the pandemic it was organized at most sites for ROs and FRAs, and then the knowledge was passed on from the FRAs to the pioneers. Only in Nandi and Bomet Counties pioneers participated in a joint training. We learned from that experience that the training on monthly record keeping is best organized jointly for pioneers and FRAs. Joint training further improves the cooperation between the FRAs and the pioneers, and possibly other local actors such as the extension agents.

The improvement of digital tools brought on by the pandemic offers new opportunities for improving the cooperation between researchers and pioneers as citizen scientists in PAR. Some tools can be adapted to be used by pioneers for data collection and sharing, provided the technical infrastructure is accessible. Most importantly the designs need to align with the local situation to help pioneers to assume more responsibilities in PAR. Yet, we agree with others that virtual research *only* will not serve the purpose of PAR for rural people in geographical isolation and with lack of adequate infrastructure (Marhefka et al., 2020; Zhou et al., 2020; Santana et al., 2021). While in our case, the research was more decentralized due to Covid-19, we still maintained a substantial amount of personal contact between the ROs, the FRAs and the pioneers.

Implications for Changing Roles in PAR During Covid-19 Times

The relational identities between researchers and pioneers started to shift with our changing implementation of PAR in the PAA, decentralizing responsibilities, creating more motivation, and more ownership especially among FRAs and pioneers. The role of the PIs, especially the first author, was reduced to a remote supervisor. A lot of what was originally part of the role of the first author had to be delegated to the ROs. Thus, the first author was removed from an active participant to a

virtual observer for most part of the research. From the point of view of the pioneers, there were differences in their own roles and identities in this research. While in the pioneers' past experiences, researchers came to collect data on their farm, and the pioneers identified merely as assistants in gaining access to these data, they now started to identify much more with being researchers themselves, collecting data and talking to other people about them. Such a visible change provides great entry points for implementing citizen science approaches in agricultural research.

Covid-19 altered the ILRI research team's perception of themselves and their own role in collecting data with the pioneers. The research team including the PIs, ROs and FRAs was comprised of people of different nationalities, different localities, and different positions in the project. In the pandemic, especially in the beginning, these things began to matter in completely different ways. Foreigners could not travel to the field anymore, due to travel restrictions, and to protect rural people, but partly due to safety concerns for themselves, because animosities started to increase when foreigners were seen as the ones bringing Covid-19. That meant that as foreigners we were suddenly grounded in our research centers and could no longer travel to the field.

For the PIs, these privileges contributed to our inability to continue our work as we had intended to. Being in the center meant that accessing field sites was challenging after the onset of the Covid-19 pandemic. Having such privileges like access to health care put some of us in the research team in an awkward position where we were both associated with bringing the disease but privileged enough to be able to handle the consequences in terms of economically surviving a lockdown, gaining access to medical treatments (including emergency evacuations and vaccinations). None of these were accessible to our rural partners. In fact, this shone more light on the inequality even among us as researchers, let alone between the researchers and the pioneers.

Nevertheless, the international researchers or PIs, had no other choice than remaining in the centers and altering the research in a much more decentralized way due to the imposed travel restrictions. We have learned from this experience, that PAR can be reframed to an even more people-centered approach than it already is, however with the novelty that our role as researchers shifts from the center to the periphery. In the case of the PAA, in taking a step back, we allowed other knowledges to flourish, we allowed other ways of knowing to become more important and realized that other ways of seeing uncertainty were not equally recognized before (Gonda et al., 2021).

With the shift of power from "expert researchers" to local research assistants and livestock keepers, research will have to be driven by local interests to much further extents than it has in the past. A more thorough understanding of how AR4D operates in terms of working with local livestock keepers requires an approach that integrates perspectives from anthropology, as well as science and technology studies to analyze the dynamics of the participatory research itself (Crane, 2014).

PAR is best placed in long-term research programs because such projects will enhance local partnership and ownership and will make it easier to use localized digital tools to improve communication and data collection. This calls for more citizen science approaches to be adapted for PAR for agricultural research for development. Shifting the responsibilities and capacities to the local level requires adequate tools to create more adapted, sustainable, and resilient research designs. These must be responsive to different situations and require contextualized development of PAR designs beyond the current pandemic. While we had a lot more possibilities to delegate tasks and could have used digital apps for data collection in the Nandi and Bomet Counties, this would not have been possible in Afar, because of pastoralists' high mobility and low digital literacy and lack of access to electricity and internet. In short, Covid-19 made the gaps between us and other researchers, us, and the pioneers, and between the different research sites much more apparent, and in the future, we must find better ways to respond to these gaps.

Our research designs should further build on the element of taking actions on the knowledge resulting from the research (Smith et al., 2010). However, we are convinced that the lessons we have learned in the process of adapting to the realities of doing PAR in the middle of a pandemic provide important arguments for further pushing PAR approaches into similar research designs. The pandemic has led to a further decentering of the researcher and a shift of the focus to the citizen, in this case local livestock keepers, that made it more participatory in the stricter interpretation of the term. While it is important that the designers of research projects develop an in-depth familiarity with the sites they are studying, we must acknowledge the fact that in some cases this emersion in field studies may no longer be possible for all people involved in the research process.

CONCLUSION

Based on the PAA experience, we conclude that the pandemic has opened new pathways for PAR transformation. Implementing PAR during the pandemic has shown us that further shifting the focus away from external researchers as central actors of the research process has many advantages: well-trained field research assistants on site in long term data collections can become useful resource persons for local land users. As they share culture and language, it reduces barriers in communication, and building trust is less of an issue as compared to interacting with outsiders. With careful triangulation, data quality can be secured. Delegating responsibility and letting go of control promises to make PAR more impactful. Power is shifted from the central research location to rural actors and communities. Furthermore, decentering researchers supports the selection of remote sites for research rather than the more accessible, but often over-researched communities. Yet, we need to be cautious in overly relying on the use of digital tools as lack of access to these technologies may further marginalize remote communities. If research becomes a hybrid form of virtual and real encounters,

rather than fully virtual, then capacity can be built locally among both land users and researchers. Moreover, it will become more attractive for locally based researchers to remain in their areas and build networks and skills there. The central researchers and designers of the research can learn to accept that they can't control every step of the research process. This has significant implications not only for how projects are designed, but also for how they are funded. In calling for more long-term funding, less pressure on providing immediate results, and in supporting long term engagement with more trust in the community, and more ownership for research on a local level, we challenge forward-thinking donors to develop new modes of funding together with an innovative, open-minded PAR research community.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available due to confidentiality as per the informed consent statement in our research.

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

BH and TC jointly drafted the outline of the paper. BH wrote the first draft that was edited for scientific content and language by TC, as well as further draft versions of the paper. LG edited the final draft. The other authors were involved both in research design and data collection, as well as contributing to refinement of the manuscript. All authors contributed to the article and approved the submitted version.

FUNDING

This work has been financed by the GIZ commissioned by the Government of the Federal Republic of Germany (Grant Number: 2017.0119.2).

ACKNOWLEDGMENTS

The authors would like to acknowledge the contributions of the pioneers in this research. They have been a pillar of strength in this unusual time and have once more shown how amazingly resilient and strong they are. We would also like to thank our peers in the CCHILLL group for valuable feedback on the draft version of this publication, as well as the two reviewers for their constructive and helpful comments.

REFERENCES

Aceves-Bueno, E., Adeleye, A. S., Feraud, M., Huang, Y., Tao, M., Yang, Y., et al. (2017). The accuracy of citizen science data. A quantitative review. *Bull. Ecol. Soc. Am.* 98, 278–290. doi: 10.1002/bes2.1336

Al Siyabi, H., Al Mukhaini, S., Kanaan, M., Al Hatmi, S., Al Anqoudi, Z., Al Kalbani, A., et al. (2020). Community participation approaches for effective national COVID-19 pandemic preparedness and response: an experience from Oman. *Front. Public Health* 8:616763. doi: 10.3389/fpubh.2020.616763

Albanna, B., and Heeks, R. (2019). Positive deviance, big data, and development: a systematic literature review. *Electronic J. Information Syst. Dev. Countries* 85:e12063. doi: 10.1002/isd2.12063

Ali, Z., Azlor del Valle, L., Fletcher, E. K., Josephat, J., and Salisbury, T. (2020). *Challenges of Remote Surveying During COVID-19.* Available online at: https://r4d.org/blog/remote-surveying-during-covid-19-challenges/

Bargal, D. (2006). Personal and intellectual influences leading to Lewin's paradigm of action research: towards the 60th anniversary of Lewin's "action research and minority problems (1946)". *Action Res.* 4, 367–388. doi: 10.1177/14767503060701010

Benjamin-Thomas, T. E., Corrado, A. M., McGrath, C., Rudman, D. L., and Hand, C. (2018). Working towards the promise of participatory action research: learning from ageing research exemplars. *Int. J. Qual. Methods* 17:1609406918817953. doi: 10.1177/1609406918817953

Bennett, M. (2004). A review of the literature on the benefits and drawbacks of participatory action research. First *Peoples Child Fam. Rev.* 1, 19–32. doi: 10.7202/1069582ar

Burns, D. (2007). *Systemic Action Research. A Strategy for Whole System Change*. Bristol: The Policy Press.

Call-Cummings, M., Hauber-Ozer, M., Rowell, L., and Ross, K. (2020). The roles and responsibilities of action research networks in times of crisis: lessons from the action research network of the Americas. *Can. J. Action Res.* 20, 19–35. doi: 10.33524/cjar.v20i3.486

Campbell, D. J., Gichohi, H., Mwangi, A., and Chege, L. (2000). Land use conflict in Kajiado District, Kenya. *Land Use Policy* 17, 337–348. doi: 10.1016/S0264-8377(00)00038-7

Chambers, R., Pacey, A., and Thrupp, L. A. (eds.). (1989). *Farmer First. Farmer Innovation and Agricultural Research*. London: Intermediate Technology Publications.

Cook, T., Boote, J., Buckley, N., Vougioukalou, S., and Wright, M. (2017). Accessing participatory research impact and legacy: developing the evidence base for participatory approaches in health research. *Educ. Action Res.* 25, 473–488. doi: 10.1080/09650792.2017.1326964

Cornwall, A. (2008). Unpacking 'participation': models, meanings and practices. *Commun. Dev. J.* 43, 269–283. doi: 10.1093/cdj/bsn010

Crane, T. A. (2014). Bringing science and technology studies into agricultural anthropology: technology development as cultural encounter between farmers and researchers. *Cult. Agric. Food Environ.* 36, 45–55. doi: 10.1111/cuag.12028

Cuevas-Parra, P. (2020). Co-researching with children in the time of COVID-19: shifting the narrative on methodologies to generate knowledge. *Int. J. Qualitative Methods* 19:160940692098213. doi: 10.1177/1609406920982135

De Vries, M. (2018). *Vulnerability and Adaptation Strategies of Dairy Farming Systems to Extreme Climate Events in Southwest Uganda*. Wageningen: Wageningen Livestock Research. Available online at: https://edepot.wur.nl/468558

Dedding, C., Goedhart, N. S., Broerse, J. E. W., and Abma, T. A. (2021). Exploring the boundaries of 'good' participatory action research in times of increasing popularity: dealing with constraints in local policy for digital inclusion. *Educ. Action Res.* 29, 20–36. doi: 10.1080/09650792.2020.1743733

Duijs, S. E., Baur, V. E., and Abma, T. A. (2019). Why action needs compassion: creating space for experiences of powerlessness and suffering in participatory action research. *Action Res.* 19, 498–517. doi: 10.1177/1476750319844577

Eelderink, M., Vervoort, J. M., and van Laerhoven, F. (2020). Using participatory action research to operationalize critical systems thinking

in social-ecological systems. *Ecol. Soc.* 25:16. doi: 10.5751/ES-11369-250116

Fenta, M., Jordaan, A., and Melka, Y. (2018). Vulnerability of Southern Afar pastoralists to climate variability and change, Ethiopia. *Jamba* 11, 575–575. doi: 10.4102/jamba.v11i1.575

Gaventa, J. (1991). "Toward a knowledge democracy: Viewpoints on participatory research in North America," in *Action and Knowledge: Breaking the Monopoly with Participatory Action-Research*, eds O. F. F Borda and M. A. Rahman (London: Intermediate Technology), 121–131.

Gonda, N., Leder, S., González-Hidalgo, M., Chiwona-Karltun, L., Stiernström, A., Hajdu, F., et al. (2021). Critical reflexivity in political ecology research: how can the Covid-19 pandemic transform us into better researchers? *Front. Human Dyn.* 3:652968. doi: 10.3389/fhumd.2021.652968

Goopy, J. P., Pelster, D. E., Onyango, A., Marshall, K., and Lukuyu, M. (2018). Simple and robust algorithms to estimate liveweight in African smallholder cattle. *Animal Production Sci.* 58:1758. doi: 10.1071/AN16577

Greenwood, D., and Levin, M. (1998). *An Introduction to Action Research: Social Research for Social Change.* Thousand Oaks, CA: Sage Publications.

Habermann, B. (2014). Ways of knowing of farmers and scientists. Tree and soil management in the ethiopian highlands (DPhil Development Studies). University of Sussex, Sussex, England.

Habermann, B., Vogl, C. R., Mekonnen, K., Bekele, K., and Felt, U. (2021). Farmers and scientists in AR4D: looking at a watershed management project through an STS lens. *NJAS Impact Agric. Life Sci.* 93, 126–151. doi: 10.1080/27685241.2021.1993095

Harrison, E. (2002). 'The problem with the locals': partnership and participation in ethiopia. *Dev. Change* 33, 587–610. doi: 10.1111/1467-7660.00271

Lapping, K., Marsh, D. R., Rosenbaum, J., Swedberg, E., Sternin, J., Sternin, M., et al. (2016). The positive deviance approach: challenges and opportunities for the future. *Food Nutr. Bull.* 23(4_suppl. 2), 128–135. doi: 10.1177/15648265020234S217

Leal Filho, W., Azul, A. M., Wall, T., Vasconcelos, C. R. P., Salvia, A. L., do Paco, A., et al. (2020). COVID-19: the impact of a global crisis on sustainable development research. *Sustain Sci.* 16, 1–15. doi: 10.1007/s11625-020-00866-y

Lukyanenko, R., Parsons, J., and Wiersma, Y. F. (2016). Emerging problems of data quality in citizen science. *Conserv. Biol.* 30, 447–449. doi: 10.1111/cobi.12706

Marhefka, S., Lockhart, E., and Turner, D. (2020). Achieve research continuity during social distancing by rapidly implementing individual and group videoconferencing with participants: key considerations, best practices, and protocols. *AIDS Behav.* 24, 1983–1989. doi: 10.1007/s10461-020-02837-x

Marzi, S. (2020). *Conducting Transnational Participatory Research With Women During Covid-19 Remotely: An Impossibility?* Available online at: https://blogs.lse.ac.uk/internationaldevelopment/2020/05/22/conducting-transnational-participatory-research-with-women-during-covid-19-remotely-an-impossibility/

Mekuyie, M., Jordaan, A., and Melka, Y. (2018). Understanding resilience of pastoralists to climate change and variability in the Southern Afar Region, Ethiopia. *Climate Risk Manage.* 20, 64–77. doi: 10.1016/j.crm.2018.02.004

Mwangi, M. (2019). In pursuit of livelihood sustainability and drought resilience: the human dimension of drought-adaptation in the Maasai pastoralists coupled socio-ecological systems across Kajiado County, Kenya. *Environ. Socio Econ. Stud.* 7, 1–11. doi: 10.2478/environ-2019-0001

Neef, A. (2008). Integrating participatory elements into conventional research projects: measuring the costs and benefits. *Dev. Pract.* 18, 576–589. doi: 10.1080/09614520802181632

Neef, A., and Neubert, D. (2010). Stakeholder participation in agricultural research projects: a conceptual framework for reflection and decision-making. *Agric. Human Values* 28, 179–194. doi: 10.1007/s10460-010-9272-z

Omondi, L. A. (2020). Learning together: participatory rural appraisal for coproduction of climate change knowledge. *Action Res.* doi: 10.1177/1476750320905901. [Epub ahead of print].

Pretty, J. N. (1995). Participatory learning for sustainable agriculture. *World Dev.* 23, 1247–1263. doi: 10.1016/0305-750X(95)00046-F

Ramvilas, G., Dhyani, S., Kumar, B., Sinha, N., Raghavan, R., Selvaraj, G., et al. (2021). Insights on COVID-19 impacts, challenges and opportunities for India's biodiversity research: From complexity to building adaptations. *Biol. Conserv.* 255:109003. doi: 10.1016/j.biocon.2021.109003

Rettberg, S. (2010). Contested narratives of pastoral vulnerability and risk in Ethiopia's Afar region. *Pastoralism* 1, 248–273.

Ryan, S. F., Adamson, N. L., Aktipis, A., Andersen, L. K., Austin, R., Barnes, L., et al. (2018). The role of citizen science in addressing grand challenges in food and agriculture research. *Proc. Biol. Sci.* 285:1891. doi: 10.1098/rspb.2018.1977

Santana, F. N., Hammond Wagner, C., Berlin Rubin, N., Bloomfield, L. S. P., Bower, E. R., Fischer, S. L., et al. (2021). A path forward for qualitative research on sustainability in the COVID-19 pandemic. *Sustain. Sci.* doi: 10.1007/s11625-020-00894-8. [Epub ahead of print].

Schmidt, M., and Pearson, O. (2016). Pastoral livelihoods under pressure: ecological, political and socioeconomic transitions in Afar (Ethiopia). *J. Arid Environ.* 124, 22–30. doi: 10.1016/j.jaridenv.2015.07.003

Smith, L., Bratini, L., Chambers, D. A., Jensen, R. V., and Romero, L. (2010). Between idealism and reality: meeting the challenges of participatory action research. *Action Res.* 8, 407–425. doi: 10.1177/1476750310366043

Steinke, J., Mgimiloko, M. G., Graef, F., Hammond, J., van Wijk, M. T., and van Etten, J. (2019). Prioritizing options for multi-objective agricultural development through the positive deviance approach. *PLoS ONE* 14:e0212926. doi: 10.1371/journal.pone.0212926

Stewart, T. J. (2021). "I don't feel studied": Reflections on power-consciousness in action research with college student sex workers. *Action Res.* doi: 10.1177/14767503211023127. [Epub ahead of print].

Sultana, F. (2007). Reflexivity, positionality and participatory ethics: negotiating fieldwork dilemmas in international research. *ACME* 6, 374–385.

Tavenner, K., van Wijk, M., Fraval, S., Hammond, J., Baltenweck, I., Teufel, N., et al. (2019). Intensifying Inequality? Gendered trends in commercializing and diversifying smallholder farming systems in East Africa. *Front. Sustain. Food Syst.* 3:10. doi: 10.3389/fsufs.2019.00010

Tilahun, M., Angassa, A., and Abebe, A. (2017). Community-based knowledge towards rangeland condition, climate change, and adaptation strategies: the case of Afar pastoralists. *Ecol. Processes* 6, 1–13. doi: 10.1186/s13717-017-0094-4

Tilford, J. (2020). Young Lives at Work: a revised approach in response to the COVID-19 pandemic. *Young Lives News & Events.* Available online at: https://www.younglives.org.uk/content/young-lives-work-revised-approach-response-covid-19-pandemic

Tunstall, J. (2021). Seven *Things We Learned When We Moved Our Public Events Online*. Available online at: https://www.iied.org/seven-things-we-learned-when-we-moved-our-public-events-online?utm_source=IIED&utm_campaign=f82c0dbe3d-EMAIL_CAMPAIGN_2021_04_20_NEWS&utm_medium=email&utm_term=0_4c206cf0b2-f82c0dbe3d-89875945

van de Gevel, J., van Etten, J., and Deterding, S. (2020). Citizen science breathes new life into participatory agricultural research. A review. *Agron. Sustain. Dev.* 40, 1–17. doi: 10.1007/s13593-020-00636-1

Van Etten, J., Beza, E., Calderer, L., Van Duijvendijk, K., Fadda, C., Fantahun, B., et al. (2016). First experiences with a novel farmer citizen science approach: crowdsourcing participatory variety selection through on-farm triadic comparisons of technologies (Tricot). *Exp. Agric.* 55, 275–296. doi: 10.1017/S0014479716000739

Wehn, U., Goebel, C., Bowser, A., Hepburn, L., and Haklay, M. (2020). *Global Citizen Science Perspectives on Open Science*. Available online at: https://en.unesco.org/sites/default/files/csgp_csos_cop_short_paper_on_open_science_may_2020.pdf

Zhou, X., Snoswell, C. L., Harding, L. E., Bambling, M., Edirippulige, S., Bai, X., et al. (2020). The role of telehealth in reducing the mental health burden

from COVID-19. *Telemed. J. E Health* 26, 377–379. doi: 10.1089/tmj.2020.0068

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.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.