Supplementary material 1 Climate change impact on agriculture and reasons of change

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| **Crop** | **10 years ago** | **20-30 years ago** | **Reason of change** | **Relation to climate change** |
| **RICE** |  |  |  |  |
| **Land preparation**Puddling of rice field without wait period. The number of tillage is also reduced because of sandy fields and use of harrow and tractor. | Wooden and Mould Board plough used for tillage. Animal-drawn six blades harrow used. | Only wooden plough. Land preparation starts after the onset of rain in *Jeth/Asar (chirna)*, 2nd ploughing after rainfall and left for 7-10 days to decay weeds. 3rd ploughing *‘lewa’* for transplantation. | The land is flooding more frequently than earlier. So, sand deposition reduced tillage number.Tillage equipment makes easy to cultivate.Direct puddling does need the removal of weeds at least one time. | Delay monsoon, drought |
| **Seedling preparation**12–24 hr soaking in water and 24 hr piling in heap covering, with moist jute bag or plastic | 24 hr soaking in water and 24 hr piling and pressing on the floor | 24 hr soaked seed in water in wooden *dodwa*. Piling and covering with leaves, *khar* and pressing with weight for at least 24 hr | Faster and higher germination of hybrid varieties than improving and the local one. No change in process of seedling germination. | Piling and pressing seeds during germination grow hardy rice seedlings. |
| **Transplantation**15–20 cm spacingOne seedling per hill | Hybrid rice was started but local varieties were also common8–10 cm spacing, 3–4 seedling per hill | 8–10 cm spacing with 3–4 seedlings per hillLandrace: Kumaliya, Sugapankhi, Burma, Latera, Sohawat were common | Wide planting space because of high number of tillers, less seed/seedling is required in hybrid. So it is faster to transplant and 2–3 times higher yield than the local one. | Wide planting space, tall plants induce lodging during post-monsoon. |
| **Intercultural operation**Inorganic fertiliser and weed removal are compulsory | No de-weeding Both farmyard manure and inorganic fertiliser in use | Compost and farmyard manure use only,No weed removal needed | Now direct puddling, wide planting space and use of inorganic fertilizer need weed removal (normally twice) | Weed infestation increased. |
| **Harvesting, threshing, and storage**Manual harvesting is common, but tractor harvesting is started in Thapuwa. Threshing is by tractor-operated thresher and many farmers sell rice directly from the field. | Manual harvesting, tractor run threshing was common.Threshing with bullock was also there | Manual harvesting with a sickleSpread in *nihna* (row) for drying; Transport by the cart, manual on head and shoulders and made *kharhi* (pile) at *khenhwa* (yard). Threshing with the bullock.Storage for next year in *dehari* | Harvesting is still manually, but threshing is done by tractor to save time, availability of technology, nuclear family and scarcity of farm labour | No relation to climate change |
| **MAIZE** |  |  |  |  |
| **Land preparation**Monsoon maize is almost completely replaced by rice. Instead, hybrid maize becomes the spring crop. Bullock, tractor and use of rotavator (tillage, breaking clods and levelling) at Thapuwa | Local Raksi maize was common. Broadcasting by 2–3 times tilling at the end of *Jeth* (May-June) | Local Raksi maize was common. Broadcasting for 2–3 times tilling at the end of *Jeth* (May-June). | Local maize farming is considerably decreased because of 2–3 times more production from hybrid maize.Line sowing, one seed per hill reduces the seed rate. | Maize cannot grow in waterlogged condition. |
| **Intercultural operation**8–9 times irrigation, 3 times inorganic fertiliser application, 1 time weed removal | 1 time weed removal. No need for irrigation as it grows in monsoon (Jun–Sep).Both compost and inorganic fertiliser are used. | 1 time weed removal. No need for irrigation as it grows in the rainy season.Farmyard manure use only. | Frequent irrigation is needed for spring maize. Farmyard manure use is replaced by inorganic fertilizer. | Weed infestation increased. |
| **Harvesting, Threshing, and storage**Only the cob is harvested and the upper portion of the stalk is used for animals, and the lower portion of stalk mixed in the soil for compost.Machine threshing, followed by drying and sold. | Either the whole plant or only cob is harvested. Stalk used as hay for livestock. Manual de-husking and threshing by machine.  | Either whole maize plant or only cob is harvested. Stalk used as hay for livestock. Manual de-husking and threshing.  | Manual threshing is replaced with a machine, cob husk removal is still manually. Improved varieties of maize cultivation is basically for selling and local one for human consumption.  | No relation to climate change |
| **WHEAT** |  |  |  |  |
| **Land preparation**1-time tractor harrowing, second-time seed sowing followed harrowing and levelling or using rotavator | 2-3 times tillage with tractor harrow, bullock harrow, Mould Board plough  | 6-8 times tillage with the wooden ploughMoisture trapping – dew by ploughing at evening and night and levelling in the next day morning | Reduced number of rounds of tillage passes because of harrow and rotavator | Post-monsoon delays wheat sowing |
| **Intercultural operation**1‒2 times irrigation, urea top dressing, and herbicide use | 1‒2 times irrigation, urea top dressing and no herbicides | No irrigation facility | Irrigation and inorganic fertiliser top dressing is common nowadays | New/weed increased |
| **Harvesting and Threshing**Manual harvesting and threshing with a tractor-operated thresher. In Thapuwa, combine harvester is also used | Manual harvesting and threshing with a tractor | Manual harvesting and threshing with the bullock | Manual harvesting is dominant but harvesting is by the thresher. Combine harvester is also introduced at Thapuwa | No relation to climate change |
| **MUSTARD/LENTIL/PEA** |  |  |  |  |
| **Cultivation practice**Both relay and tilled sowing are practiced. Relay cropping is either in upland to trap soil moisture or low land where tillage is not possible because of high soil moisture.Mixed cropping is common | Lentil relay in rice field but in pea mostly after at least one-time tillage | Lentil, grass pea, linseed relay in the rice field.Mustard cultivation mostly in the upland field (*dihwa*) after harvest of monsoon maize | Relay cropping is decreased, but mixed cropping is increased. | Mixed cropping reduces risks of complete failure |
| **Harvesting and Threshing**Manual harvesting, threshing with tractor except for peas because it splits seed cotyledons | Manual harvesting, threshing with both bullock and tractor | Manual harvesting and threshing by a bullock | Manual harvesting is common practice from the beginning. Bullock walking threshing is replaced by the tractor-operated thresher | No relation to climate change |