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Addressing Food Scarcity in Marginalized Mountain Environments

A Participatory Seed Management Initiative with Women and Men in Eastern Nepal

Experiences with a participatory seed improvement initiative as a strategy for combating food deficits in a remote community in eastern Nepal are outlined. On the basis of participatory methods of problem assessment, food deficits were attributed to several factors, such as limited arable land, poor soils, and lack of access to improved seeds and other agricultural services arising partly from the lowland and gender biases of national planners. Additionally, an increase in the number of households headed by women and the greater agricultural burden placed on women as a result of male out-migration have contributed to the problem of food deficits.

During times of scarcity, women's preferences for nutritional value and easy postharvest preparation are subsumed by the more immediate need for higher yields. Most of the crop varieties preferred by women are landraces; hence, it is proposed that these crop varieties become the focus of future crop improvement initiatives to sustain crop diversity while addressing the needs of women.

A strategy to develop capacity among women and men engaged in farming through a local community development organization was devised in consultation with the community, on the basis of criteria for participation by innovators and in recognition of gender-differentiated knowledge and the respective roles of women and men. The outcomes of the initiative were the development of a seed bank and plans for more advanced technical training to enhance local breeding practices, with an awareness of the gendered aspects of crop selection.

Keywords: *Participatory research; seed technologies; gendered knowledge; food security; capacity building; local organizations.*

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Introduction

The Village Development Committee (VDC) in Tamku, a remote community in the Sankhuwasava District of Eastern Nepal (Figure 1), is a microcosm of the general conditions that confront mountain inhabitants in the Himalayan region. Biophysical constraints such as limited arable land and poor soils in powerful combination with socioeconomic factors such as out-migration of men severely limit crop production in the Tamku VDC. Lack of access to improved seeds and other agricultural services compounds the problem of food deficits.

Improving and enhancing the existing skills of women and men farmers in the Tamku VDC to develop and manage their own seed production systems is an important step in addressing the problem of food shortage. Such steps also need to be operationalized within a framework for developing local organizational capacity to manage and disseminate newly generated seed technology in sustained and socially equitable ways.

Drawing on participatory methods of research and development, a seed improvement initiative was launched in the Tamku VDC in early 1999. What follows is a discussion of experiences framed in the larger context of participatory methodologies and theoretical perspectives for mountain development.

Background

The land

The Tamku VDC is part of the Arun river basin ecosystem situated in the Middle Mountain region of the High Himalayas. Here, the monsoon starts early and lasts longer than in other parts of the country; recorded annual rainfall averages between 1783 and 3759 mm and contributes to the extensive diversity of the region's natural ecological system (Shrestha 1989). The Arun river basin is characterized by high relief, with 75% of its area sloping more than 40°. Concentrations of human settlement are found between 500 and 2000 m, where land distribution patterns, steep slopes, and shallow soils place severe constraints on agricultural productivity (Shrestha 1989).

Agricultural production in the Tamku VDC can thus be undertaken only on the small percentage of land that is arable. It is estimated that of the total available land in the VDC, only 10% is suitable for agriculture (Khanal 1992). Of this, 54% has slopes of 40° and soil depths not greater than 20 cm (Goldsmith 1982). As a result, it is not uncommon for most of the households in Tamku to be affected by severe food deficits that last anywhere from 3 to 6 months (Gurung 1997). The severity of these food deficits has a direct bearing on the low level of household seed savings because people are compelled to consume seed grains in times of hardship.

The people

The major ethnic group inhabiting Tamku and the adjoining VDCs is an ethnically distinct but heterogeneous group of people known as the Rai. Together with the Limbu, a related group, they refer to themselves as Kirats, a term used to unify the various clans and tribes as well as to make a conscious political statement to dis-

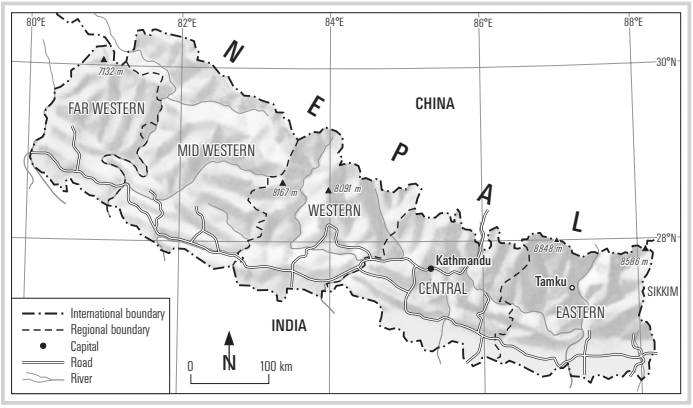

FIGURE 1 Location of the area studied. (Map by Andreas Brodbeck)

tinguish this group from the dominant lowland Hindu majority.

The Kirats, who are one of the oldest ethnic groups in the region, until recently practiced a distinct system of communal land tenure known as *kipat*. In the decades following a "unification" drive in the mid-18th century to unite Nepal under its present system of monarchs, the Kirats were confronted with numerous challenges to their traditional way of life. The influence of the dominant lowland Hindu groups, combined with the self-interested activities of local headmen or tax collectors (*jimmawal* N), led to fundamental transformations of sociocultural practices and land management systems. Extensive areas of forest where traditional swidden practices once dominated were replaced with the ubiquitous rain-fed (*bari* N) and irrigated terraces (*khet* N) suitable for wetland paddy crops (Sagant 1996; Gurung 1997). Perhaps the most significant outcome of the unification drive was the gradual out-migration of Kirats eastward to Sikkim and beyond because lowland Hindus were actively encouraged to migrate to upland *kipat* areas (Regmi 1965; Caplan 1970; McDougal 1979). This historical precedent anticipated the increasing trend in out-migration today, with men now seeking employment in urban centers, a trend that has far-reaching consequences on women's lives and agriculture.

Gendered spaces in agriculture

One significant outcome of the out-migration of men has been an increase in the number of households headed by women in the Tamku VDC. In addition to their already extensive participation in production systems and their roles as caregivers and providers for the family, women in Tamku, as elsewhere in Nepal, are compelled to take on additional farming responsibilities (Gurung 1997).

But gender roles in agricultural production are characterized by traditional concepts of what is considered culturally appropriate work for women and men. The concept of outdoor work (*bairo ko kam* N) and indoor work (*bhittro ko kam* N), a distinction intimately linked to traditional notions of masculinity and femininity, is commonly used to explain gender roles. Thus, men's work is heavy work, involving activities such as plowing, clearing land for swidden, planting, and harvesting, which by their very nature are conducted outdoors. By contrast, the home or domestic space is associated with femininity and indoor work such as caring for the family, cooking, etc. Seed management is an important agricultural activity that is considered indoor work (Figure 2). In the traditional scheme of the Kirats, the role of women in managing household seed systems is perceived as synonymous with feminine fertility and, as a result, is classified within the domestic space of the household.

Kirati women play a key role in local seed systems, particularly seed storage, one of the least visible

FIGURE 2 Women's knowledge of seed varieties, cultivation, storage, and use is a valuable form of human capital often ignored by policy and decision makers. Here, women construct a "seasonal calendar." (Photo by authors)

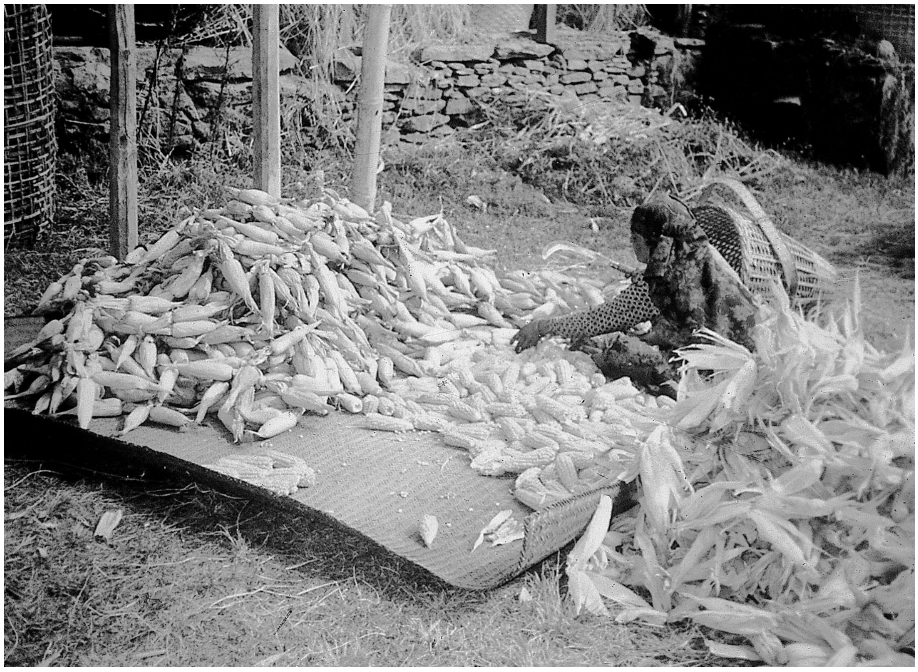

FIGURE 3 Gendered activities such as selecting seeds for consumption or the next year's planting are a vital postharvest task that ensures adequate nutrition in mountain communities. (Photo by authors)

postharvest activities that includes grain storage, food processing, and food preparation. As grains or other crops come in from the fields, women decide what will be stored, processed, and saved for next year's crops (Figure 3). In making these decisions, women concentrate on providing adequate and nutritious food for their families throughout the year. They must consider factors such as taste and the texture of the food, depending on the meals that will be prepared and whether the food will be fed to children, adults, older people, or particular animals. These decisions are based on considerations that take account of the multiple uses of crops (Sachs 1996, 1997).

Within the domestic space, women's activities also involve strategic considerations to counter environmental contingencies such as food deficits. Because most Tamku households cannot subsist on crop yields alone, many women turn to alternative sources to meet their needs. They generally forage for foods such as wild vegetables and root crops from the forest (*kandamul* N) and prepare food using special combinations of grains (millet, corn, and rice) to ensure enough substance so that "they last longer in the stomach" (*digo* N). In extreme circumstances, women have also been known to visit their native homes to acquire additional means such as food grains or money to support their families.

Women's strategic experiences in combating food deficits and saving seeds are depicted in stories, songs, sayings, and proverbs. Women demonstrate particular skill in giving poignant expression to the phenomenon of food scarcity through sayings such as "*khana ko abab hunu*" N ("to be short of edibles"), "*dhayrai/chitto bhok lagnu*" N ("to experience hunger pangs sooner and more frequently than normal"), and "*chasum na hunu*" M ("to lack prosperity"), laments in the Kulung dialect "*Etenay sisawa udanai lay tay ho wumche*" K ("Dear friends and brothers ... how do we survive the *sisawa* [food shortage]?"), or the more common instructional verses admonishing people to save seeds to combat food shortage "*Almal ma jiyu bachhaunu, Anikal ma biyu bachhaunu*" N ("save yourself in times of confusion, [but] save seeds in times of [food] shortage") or "*Chha geda sabai mero Chhaina geda sabai tendo*" N ("having seeds, all is mine; [not] having seeds, all is not mine").

According to mythico-historical accounts contained in the creation myth (*muddum* M), food scarcity is an ever-present condition resulting from an ancestral curse following an incident of fratricide. Reference to this ancestral episode underlines the importance of the Kirati system of belief, which is based on the worship of an ancestor cult that defines Kirati ethnicity and forms the basis for the sacred relationship between the inhabitants and the land they occupy.

The problem

The problem of food shortage among the Kirats of the Tamku VDC can be viewed in light of several contributing factors such as the biophysical constraints that limit arable land, changes in land tenure and farming practices, the diminished capacity for local organization, the increasing out-migration of men, and the subsequent increased burden on women. But it is also important to consider how the larger context of national development processes contributes to and compounds local food deficit problems.

Despite the existence of an extensive literature arguing for appropriate mountain development policies (Leopold 1949; Rhoades and Thompson 1975; Brush 1976; Jodha 1990), there is a lack of proportion between the importance of mountain ecosystems and cultures and the attention they receive in the national development policies of the Himalayan region. This is especially acute in light of the important contribution

of women to agricultural production in the mountains and their exclusion from agricultural training and extension services (Bajracharya 1994).

Most public sector institutions in the Himalayan region involved in agriculture and natural resource management exhibit a "gender blindness" in their research, extension, and training programs that excludes women from research and extension activities (Gurung 1999). Past studies in eastern Nepal, for instance, found that only 12% of those attending extension demonstrations were women, whereas women accounted for a mere 5.1% in agricultural training programs (Maskey 1993). In addition to a gender bias, there is also a lowland bias, as illustrated by a report stating that women from the flatlands of Nepal (Terai) had 4.5 times more contact with extension and training services than women from hill and mountain regions (Shrestha et al 1984; Kiff 1991; Maskey 1993). Because households headed by women were less likely recipients of training services than male-headed households (Kiff 1991), mountain households that are headed by women such as those in Tamku are doubly marginalized.

The more recent adoption of participatory community-based approaches to sustainable agriculture and natural resource management in mountain regions (see Rhoades 1997) has the promise and the potential to include ethnic groups and women in mountain development. But with the universal proliferation of participatory approaches, there is a need to examine such developments in light of more rigorous methodological reflections.

Methodological reflections on participatory approaches to mountain development

It is important to define what is meant by a "participatory approach" in research and development for several reasons. With the recent surge in such approaches, there has been a proliferation of definitions to suit various contexts and interests. This poses a real danger that participatory approaches will become trivialized (Ashby 1996), especially because they are appropriated by those seeking to suit external conditions imposed by donor requirements (Cooke and Kothari 2001). There is a potential risk that "a catch-all definition of participatory approaches is destined to fall out of fashion and to be discarded as fashion changes, without ever receiving the serious scientific evaluation of its potential that rigorous but less trendy use of the term would invite" (Ashby 1996, p 15). Hence, it becomes important to address the following 3 questions:

- What is meant by a participatory approach?
- Who participates?
- How is the participatory approach conducted?

First, there is a need to distinguish among the different types of farmer participation that can occur in the research and development process. One type of participation is distinguished from another by the level of involvement and decision making required of the farmer or researcher and development worker. Following Biggs' (1989) definition, 4 types of participation can be distinguished: contractual (farmer lends land and labor to researchers), consultative (farmer's opinions are sought), collaborative (farmer is involved in implementing some research steps), and collegial (researchers are involved in strengthening farmer's own research) (Biggs 1989).

Second, consideration of "representation" and "specialist knowledge" helps clarify who will participate in a given participatory research and development process. The process that has empowerment of the community as a primary goal may privilege representative participation. On the other hand, if the process is determined by functional concerns, then participation by those with specialist knowledge may be prioritized. But certain processes may be driven by the objective of satisfying both functional and empowerment goals.

The issues of representation and specialist knowledge are at the heart of the need to apply gender analysis as an integral part of any participatory process. Gender is a basic determinant of representation because men and women in agricultural societies fulfill such different roles and responsibilities. Gender, therefore, often determines specialized domains of knowledge related to gender-differentiated functions—for example, saving seeds as a woman's function, which means that women often select the next generation of plants.

Third, involving local people in an analysis of the root causes of their problems and generating potential solutions is an important element in participatory approaches. Combined with a focus on capacity development among local people, collaborative initiatives can have positive effects, especially for marginalized populations such as those that reside in fragile mountain ecosystems (see Ashby 1996).

The case study

Assessing problems and solutions for action planning

The first step was the formation of a collaborative research team comprising the project team and members of a local organization (Silichong). Three women trained in agricultural extension and 2 male schoolteachers were selected from Silichong, whereas the project team consisted of 3 men and 2 women with training in anthropology, agronomy, community development, and gender analysis. The local members were selected on the basis of the women's professional training and the interest and leadership positions of the 2

FIGURE 4 A participatory exercise in the study area. (Photo by authors)

men in Silichong. A workshop was conducted so that the team could define common research objectives, followed by training in concepts and methods of Participatory Rural Appraisal (PRA) and gender analysis. The objective of the research was to gather information on existing crops and varieties cultivated in Tamku VDC, with a particular emphasis on the role of women and men in the management of crops and other livelihood strategies. This initial research was conducted over a period of 3 months, and the results, particularly those factors that contribute to low productivity in crop yields, formed the basis for the next stage in the assessment.

Focusing specifically on food scarcity, the second step sought increased community participation through collaborative problem assessment designed to increase critical awareness and thus generate potential solutions (Figure 4). In a 1-week workshop attended by 30 women and men, an assessment was conducted using the primary method of posing problems through code presentations. This method is based on the principle that all development should start with identification of the issues that local people speak about with excitement, hope, fear, anxiety, or anger. Codes are representations of familiar problems that evoke these emotions and thus generate critical awareness of a particular problem (Freire 1970, 1973, 1978).

On the basis of their findings, the team prepared codes in the form of a drama, several stories, appropriate sayings and songs, and some posters associated with the problems of agriculture, particularly food deficit.

In summary, the root causes of food shortage as identified by community assessment are given below.

- Low production resulting from "poor seed quality." The major reasons for poor quality were (1) ineffective means of preventing pest attacks during storage, and (2) deteriorating knowledge of seed management practices. Regardless of the quality of the seeds, many households were unable to save seeds because all available grains are consumed during the food deficit period.
- Lack of access to quality seed. For access to seed sources, especially maize and millet, many households in Tamku depend on reciprocal relationships of exchange with the Tamang, a Tibeto-Burman-speaking ethnic group that resides at higher elevations, where the cold climate prevents pest occurrence. But in the last 6 years, many Tamang farmers either migrated to urban areas or have been unable to store seeds in large quantities for exchange. As a result, Tamku farmers have been compelled to rely on external sources. One such source is the Agriculture Input Corporation (AIC), a public sector initiative that distributes seeds in the form of "mini kits" supplied through the District Agriculture Development Organization. But this source is inconsistent, and even when the kits were available, farmers expressed uncertainty about the quality of the seeds on the basis of their poor performance under local conditions. Another source is established seed dealers in the market towns, but shop owners usually purchase their seeds from the same source as the AIC. A third source is farmers who have been contracted to produce stable seed material distributed by national agricultural research centers. Thus, the problems associated with accessing these sources were threefold: inconsistent supply, uncertainty about seed quality, and the sources' location in District Headquarters, a full day's walk from Tamku.

Potential solutions to this problem are as follows:

- Acquiring seed management skills. The majority of the participants identified their own urgent need for improved preharvest selection and postharvest storage skills. Two strategies were identified to meet this objective. One was to establish full-time project staff within Silichong to manage the seed management initiative. The second was to establish a systematic institutional mechanism to select farmers for the project.
- Improving access to external sources of seed. Silichong members emphasized their willingness to

develop institutional mechanisms to obtain seeds for the community on a regular basis through seed suppliers and established arrangements with suppliers in District Headquarters and National Research Centers.
- Development of a more elaborate action plan based on the following considerations: (1) assessment of Silichong to identify areas for capacity building, (2) development of selection criteria for selecting farmers to participate in the program, and (3) selection of crop varieties for improvement through training in improved breeding practices.

Assessing local organizational capacity

An assessment of Silichong was conducted to determine strengths and weaknesses and define areas for capacity development. A guided institutional self-assessment among members, followed by extensive interviews with community members revealed the following:

- Despite extensive experience in community development through collaboration with external organizations, many in the community felt that the organization lacked transparency, especially in the use of funds received for the development of the community. As a result, many felt alienated and removed from the management process.
- The institutional assessment revealed a strong leader-oriented focus in the decision-making process; this structural hierarchy presented problems of accountability.
- A major recommendation emerging from the assessment was the need to integrate participatory processes in decision making as much as possible.
- In order to improve organizational capacity, many identified the need to develop skills in effective communication, leadership, bookkeeping and accounting, and management.

Developing selection criteria for farmer participation

Eighteen women and 7 men were selected for the first phase of training in seed management practices. On the basis of discussions between Silichong and project members, it was determined that for the first phase of the project, farmers would be selected on the basis of the following criteria: extent of knowledge of agriculture; availability to participate during the whole season; and equitable representation of women and men who fulfilled the first 2 criteria.

Farmer innovation

The experiences of some women and men farmers were considered important in 2 ways: they could share their extensive knowledge with others and, through more advanced training, become "sources of knowledge" within the community. Two types of innovation described by farmers focused on local breeding practices and strategies for pest control during postharvest storage.

One male farmer, selecting specifically for larger panicles, denser grain quality, and tall height in a landrace (*punche dhan* N), was successful in producing a "variety" subsequently named after him (*changkhu dhan*: "Changku's rice"). This rice variety has been widely adopted by other farmers in the community.

In seed storage technology, 5 women farmers had experimented with leaves of a locally available plant (*bojo* N, *Acorus calamus*) to ward off pest attacks on maize seeds. Seeds are stored between layers of dried leaves in an airtight container designed to ward off pests.

In another instance, a woman farmer, noticing that millet grains were free of pests that attacked maize seeds, began mixing a handful of millet grains in the container where maize seeds were stored. This relatively simple practice was based on her observation that millet seeds were free from the pests that attacked maize seeds when these were stored in close proximity.

Farming for subsistence

Because many farmers (especially male) tend to seek seasonal employment in urban centers and their return is uncertain, 1 important requirement for selection was the availability of the participant because the skill-building process would be extended over 2 seasons.

Finally, the joint team also took into consideration that women and men had separate sets of knowledge arising from their different experiences in agricultural production. Thus, it was essential to have women and men equally represented in training and skill-building programs.

Crop and varietal selection for improvement

Separate assessments were conducted for male and female participants to determine which crop variety to select for improvement through the application of breeding practices.

Step 1: A preference ranking was conducted for the major cereal crops cultivated in Tamku. This exercise revealed that although rice is the preferred staple, both women and men considered maize more important for various reasons. First, only 30% of all households own irrigated land (*khet*) for rice cultivation, whereas maize is cultivated by all households. Second, maize has multiple uses (staple food, beer production, animal feed, etc). Third, maize can be cultivated in rain-fed conditions and performs better than millet or wheat under conditions of poor soil fertility. Maize is considered the

TABLE 1 Overview of the seed-generating technologies introduced and the outcomes produced by local initiative.

Introduced technologies	Local terminology	Principles	Season	Outcome
Isolation	Nonexistent	• Isolated parcel of land • Staggered planting • Natural barriers • Tassling and silking of different varieties	February/March	• Isolation of crops • Late planting • Convincing neighboring farmers to do the same
Plant selection-I	*Kadne-phadne*	• Selection based on height of plant, size and number of cobs, early maturing, state of health	May/June	• Selection conducted by members of local organization on the basis of training received
Plant selection-II	*Kadne-phadne*	• Same as above	July/August	• Same as above
Cob selection	*Chutaune*	• Selection based on size and health of cob, thick husk, grain maturity test (black layer of grain)	August	• Same as above
Grain selection	*Biyu chutaune*	• Selection of healthy seeds from the middle area of the cob	September/October	• Existing practice

"best crop" to cultivate as insurance against food insecurity under rain-fed conditions.

Step 2: The criteria for breeding objectives were identified on the basis of eliciting women's and men's preferences through varietal assessment of the 8 existing varieties of maize. The varietal assessments revealed that because of immediate considerations based on poor soil conditions and food insecurity, women tend to suppress their "qualitative" preferences in favor of "quantitative" considerations. Thus, although women's preference for maize varieties was based on postharvest considerations such as ease of preparation, taste, ease in grinding, and "good" food color, they were compelled by circumstances to select "men's" preferences that have high yield potential, mature early, and are resistant to drought.

Implementation: Enhancing seed management technologies

The implementation stage was conducted in several phases (see Table 1). During the first stage, participants were introduced to a 1-week training course on the principles of "isolation" to prevent cross-pollination, a major cause of deterioration in existing maize seeds. Crop breeding techniques such as "rogueing" and "mass selection" were introduced as strategies to prevent cross-pollination. Participants were also introduced to postharvest seed selection practices, such as determining the qualities to look for in cob and grain selection for seed. Appropriate seed storage techniques were discussed, and exposure visits were arranged to sites in District Headquarters, where airtight seed containers were available.

The second stage of implementation consisted of developing an inventory of local selection practices to develop a basis for introducing new concepts and practices. Although there was no equivalent local category for the principle of isolation, there were generally equivalent terms for other practices (Table 1).

Conclusions: Outcomes and lessons

Outcomes

Although it is still too early to evaluate the outcomes, several encouraging developments have emerged. A relatively good amount of "quality" seed was produced (500 kg) in the first season, and seeds will be sold at subsidized cost to the community from the newly established seed bank.

With 2 women and 1 man trained in seed development technologies, Silichong has initiated a similar seed improvement initiative with 50 households from the adjoining VDCs. Under the second phase of the project, there are plans to share experiences with similar farmer groups in neighboring Sikkim and Darjeeling in Northeast India.

Members of Silichong have expressed interest in conducting training programs on farmer-led participatory breeding, similar to successful experiences elsewhere in Nepal.

Lessons

Considering the development of crop improvement initiatives in marginal mountain environments, several factors must be addressed. First, it is important to view such initiatives at several stages of development. In the first

stage, immediate concerns such as food insecurity are major factors in determining the type of initiative that will be undertaken. Developing a source of improved seeds and improving access to them may be the major objective. In addition, gender-differentiated preferences in the selection of crops or varieties for improvement are considered more on the basis of immediate "quantitative" needs such as high production—associated with men's preferences—than on women's "qualitative" preferences, such as nutritional quality.

Second, only after creating local capacities to develop and manage improved seed sources can a second stage in the participatory crop initiative be considered. This would involve the introduction of more sophisticated technical training to improve and enhance local breeding practices, with a focus on selecting for farmer-desired traits. Future participatory crop improvement initiatives must consider the gendered aspects of crop and varietal selection that are ignored during the first stages of crop improvement. A similar de-emphasis on women's preferred crops has important implications in terms of the potential long-term loss of crop diversity and in terms of how such losses might increase future food insecurity.

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