Community Based Seed Production System in the Hills of Nepal: Experiences and Learning on Gender Equity and Social Inclusion (GESI) Mainstreaming from the Hill Maize Research Project

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Introduction

Maize (*Zea mays L.*) is widely-cultivated cereal crop throughout the world. From a global cereal perspective, maize ranks first in terms of production and second in terms of area, after wheat. In 2012, the total area under maize was 177.4 million hectares and production was 872 million metric tons (FAO, 2013). Estimated world maize production for 2014-2015 is 987.52 million metric tons (USDA, 2014). The United States alone produces 40 percent of the world's production; other top producing countries include China, Brazil, Mexico, Indonesia, India, France and Argentina. Production of maize is increasing each year, and more so than any other grain.

In Nepal, maize is the second-most important cereal crop in terms of both area and production. It is grown at about 0.85 million hectares or 27 percent of the cultivated land (MoAD, 2013). About 78 percent of the total maize cultivated area is in the hills. Maize is a major cereal crop in the mid-hills of Nepal, particularly among poorer families and disadvantaged groups (DAGs)[7]. In the hills, maize is a multi-purpose crop useful for food, feed, fodder and fuel. There is a common saying *"if there is no maize… there is nothing to eat"* illustrates the importance of the maize crop for especially poor, small-holders and disadvantaged groups for improved food and nutrition security and livelihoods..

In Nepal, about two-thirds of Nepalese farmers grow maize which supplies 26 percent of the food grains and accounts for 20 percent of calorie intake. Maize alone contributes about 2.5 percent of total GDP and 7.5percent of agricultural GDP with maize yield at the farmer level a mere 2.35 tons per hectare (t/ha) (MoAD, 2013) compared to an attainable yield of 5.7 t/ha (Gurung, 2012). Lower-productivity is mainly constrained by poor-access to improved seed, inputs and the lack of availability of new- and improved-small holder and women-targeted technologies, as well as labor shortage due to migration. Harsh climate including a particularly long dry-season during sowing, and heavy rainfall during the crop growth period are other abiotic factors limiting the production of maize. Increasing out-migration of male youths has left agricultural sector management as one of the major tasks of women especially in the rural hills. Currently, 26 percent of households (HHs) are *de-jure* and other HHs are largely *de-facto* women-headed. Unfortunately, there is a limited systematic effort to address the feminization of agriculture resulting from out-migration.

Hill Maize Research Project

The Hill Maize Research Project (HMRP), started 15 years ago, with funding from the Swiss Agency for Development and Cooperation (SDC). This project is one of the most important and successful projects in maize research and development in Nepal. The project is implemented by CIMMYT, Int. (International Maize and Wheat Improvement Center) as the Executing Agency (EA) in partnership with an array of public- and private- sector institutions in Nepal.

The initial four-year period (Phase I, 1999 to 2002) of the project, focused on applied research, in partnership with Nepal Agriculture Research Council (NARC) to develop, identify and validate maize varieties and technologies for the benefit of poor farmers in the hills of Nepal. Phase II of the project (2003 to 2007), emphasized gender equity and social inclusion (GESI), multiplication of seed from improved maize varieties selected by farmers through participatory varietal selection (PVS), community-based seed production (CBSP), and a balance of applied (on-station) and adaptive (on-farm) research, including coordination of diverse small-grants projects in collaboration with the Department of Agriculture (DoA) . Phase III (2008 to 2010), activities continued the validation and dissemination of the improved maize varieties and technologies, participatory approaches for technology adoption, GESI mainstreaming, and strengthening of the partnerships with local stakeholders through non-governmental organizations (NGOs).

[7] Disadvantaged Groups (DAGs) as defined in the Swiss Cooperation Strategy are groups of economically poor people who additionally suffer from social discrimination based on gender, caste/ethnicity and regional identity.

The ongoing Phase-IV (2010 to 2014) of HMRP, is jointly-funded by the SDC and the United States Agency for International Development (USAID). The current focus is on improving food security and income mainly of resource-poor farm households in the hills of Nepal by raising productivity, sustainability and profitability of maize-based cropping systems and seed marketing. Along with three organizations (NARC, DoA, NGOs) the private sector (seed companies) has been included in this phase to implement the project activities in a public-private-partnership environment. Currently, activities in 20 mid-hill districts of Nepal, are implemented in collaboration with 10 NARC research stations, 20 District Agriculture Development Offices (DADOs) and five Regional Seed-Testing Laboratories (RSTLs), the National Seed Board (NSB), Seed Quality Control Center (SQCC), 16 NGOs, and five private companies/organizations.

HMRP Phase IV focuses on technology validation, dissemination, source seed production, marketing, seed quality control, and training using a value-chain approach with emphasis on promoting sustainable maize-seed production and marketing system. Efforts continue to: foster wider-adoption of improved maize varieties and technologies for sustainable food security, nutrition and livelihoods of hill farmers; strengthening partnerships and inclusive development of research and extension services; enhance strategic linkages and synergies with other SDC and USAID-funded projects; promote decentralized source-seed production systems with technical knowledge and infrastructure support to NARC's Agriculture Research Stations. This infrastructure support (seed processing and storage facilities) enables CBSP groups and cooperatives to graduate into cooperatives and seed companies. Seed quality-control systems are implemented through public-private partnership. Additionally, seed revolving funds are made available to seed producing groups/ cooperatives/companies to ensure that the seed produced by poor farmers is purchased in a timely manner. These activities are implemented through strategic alliances of public, private and community based organizations. These systems ensure that poor and disadvantaged populations including women, benefit from participation in the value chain and ensures that activity modality, institutional arrangements, policy feedback and investment plans mainstream their needs into the value-chain-systems' approach.

Community Based Seed Production

In Nepal, seed multiplication for improved maize varieties occurs through the Community Based Seed Production (CBSP) program managed by the Hill Maize Research Project (HMRP) since 2000. This has been a very successful model and significantly contributed to increased production of improved seeds and increasing seed replacement rate (SRR). In 2000, seven CBSP groups produced 14 tons of improved maize seed and in 2013 a total of 1,216 tons of improved seed was produced through 223 CBSP groups (HMRP, 2013). CBSPs approach involves forming a community-based farmer group comprised of 15 to 25 members registered with the District Agriculture Development Office (DADO). The CBSP group produces improved maize seed for the most-preferred varieties best suited to the locality. This approach also aimed to strengthen the capacity of the local seed producer community to undertake seed production and marketing activities and graduating these groups into cooperatives and then selectively establishing private seed companies for seed trading. The ultimate target of this approach is to increase the role of the private sector in maize seed production and marketing in a sustainable way. The precise outcome of this approach is to empower and engage poor, small holders and women in the seed management system, which ultimately benefits them through maize-based technology adoption.

Gender equity and social inclusion

GESI is an approach to facilitate the empowerment process, to promote equitable access to opportunities and to support value capture of benefits for fostering systemic changes. In Nepal, gender and social (caste, ethnicity and class based status) exclusion remains one of the strong determinants of access to public resources and relevant services. Therefore, social exclusion is a formidable structural constraint that hinders both the social and economic opportunities especially for women and disadvantaged groups. Realizing this constraint development partners adopted gender equity and social inclusion as a crosscutting theme in their programs. To coordination and harmonization, the development partners formed a Social Inclusion Action Group to share knowledge and experience and to influence policy development at the national level. The SDC is one among the agencies that have developed workforce diversity policies to promote inclusiveness in their organizations (ADB, 2010). Moreover, targeting for inclusive development, resource tracking through fund flow analysis (FFA) and promoting inclusive work force diversity (WFD) are some other supplementary approaches promoted by SDC, which is very crucial for inclusive development in research and rural advisory services as well.

The proportion of economically active women in Nepal is high compared to other South Asian countries. This is due, in part, to the predominance of subsistence agriculture and male migration especially from rural parts of the hilly terrains. According to the 2008 Labor Force Survey, 80.1 percent of women are

economically active (compared to 87.5 percent of men). Of those employed, 89 percent of women are engaged in agriculture and forestry compared to 70 percent of men (ADB, 2010).

Understanding the circumstances, the Ministry of Agricultural Development (MoAD) has started integrating women into various development programs such as setting-up of farmers' consultative committees and village agriculture committees to ensure farmers' participation in agriculture related activities and decision-making processes by ensuring proportionate representation of women, Dalits, Madhesis, and Adivasi Janajatis in these committees. Likewise, the Ministry of Federal Affairs and Local Development (MoFALD) developed specific provisions to ensure inclusion and/or allocation of resources for the benefit of women and disadvantaged groups in the local grant allocation and utilization procedures. More importantly, specialized forums such as Citizen Awareness Centers (CACs) and Ward Citizen Forums (WCFs) are formed at the local level to facilitate the demand-making process. Some of the provisions are made mandatory in terms of the minimum conditions and performance measurement of the local governance entities.

Project's Major Achievements from GESI lenses

Varietal development: Through strategic partnerships with NARC, DoA, NGOs, private sector, and farmers groups/ cooperatives, HMRP made significant achievements in maize research and development in Nepal. The HMRP in collaboration with NARC/NMRP, NSB, DoA and CIMMYT's Global Maize Program, facilitated the development and release of seven farmer-preferred maize open pollinated varieties (OPVs) including one Quality Protein Maize (QPM) (Poshilo Makai 1) and several other new maize genotypes have been identified for release. Several droughts, gray leaf spot (GLS) tolerant and QPM genotypes have been introduced from CIMMYT's sources and are being tested on-station and on-farm for their adaptability and superior agronomic traits. Protocols for maize cropping and soil management, including intercropping of maize with vegetables, are being developed and tested in farmers' fields for validation. The field experiences show that women and small-holders had an opportunity to engage in the varietal selection process. For example, the womens' groups from Sukra Nagar, Chitwan and Palpa districts claimed the QPM maize they used for milking animals resulted in high milk production and the women personally recognized that eating QPM increased their energy.

Seed production and marketing*:* Community-based seed production has been successfully implemented in several remote, hilly areas, ensuring seed self-sufficiency as a result of increased seed production. In 2000, 14 tons of seeds were produced through seven CBSP groups. Thirteen years later 1,216 tons were produced through 223 CBSP groups. During 2011-2013 of HMRP Phase IV a total of 2,872 tons of improved seed were marketed out of 3,398 tons marketable surplus. Moreover, the value of even a marginal gain from research and development contributes to income and food security of marginal farmers. For example, a dalit (the "untouchable" caste) woman from Dailkekh district participated in the CBSP and produced improved maize seeds from her limited piece of land. From the same piece of land that she formerly grew the local variety, she was able to produce more from the combined technology package she used, and this enabled her to sell the improved maize as seed at the rate of Rs. 35/kg and purchase grain maize at the rate of Rs. 15/kg, which effectively, doubles her food security.

Project beneficiaries: In HMRP IV project activities reached to 56,389 poor and disadvantaged households (71 percent disadvantaged households and 63 percent women) against the target of 35,000 households. The targeted beneficiaries represent about 80 percent of the food insecure families whose food self-sufficiency is less than 6 months annually. The targeting is possible due to informed choice of the beneficiaries based on the demographic representation of the project target groups, and an inclusive workforce with access to improved outreach and resource tracking systems through FFA. Such combined efforts are taken as one of the steering mechanisms to improve inclusive development.

Policy advocacy: HMRP influenced policy to support inclusive and participatory research systems and changes to improve sub-sector performance: previously, source seed production only at NMRP and NARC limited the availability of seed at CBSP groups; hence, the project advocated for the production of seed at regional stations and engagement public and private sector partnership; the concept of decentralized source seed production was adopted and implemented through NARC stations, private seed companies and CBSP groups/cooperatives and this significantly increased breeder and foundation seed production (66.8 tons in 2010 and 103 tons in 2013). This policy change enabled sufficient source seed production to meet demand in the hills of Nepal. Similarly, DoA's DISSPRO and HMRP's CBSP groups were integrated into the "Community Based Seed Self-Sufficiency Program." Additionally, formation and strengthening of District Seed Coordination Committees (DSCC) in

20 project districts supports the implementation of the National Seed Vision (2013-2025).

Agronomic practices: Improved crop and soil management technologies have been validated and successfully adopted by resource farmers as innovators who shoulder certain levels of risk. The project's participatory validation and dissemination of new maize based technologies approach focused on maize-vegetable intercropping, composting technologies, weed management, insect pest control, post- harvest management and validation of key resource conservation technologies. Results showed that these technologies, in combination with quality seeds of improved maize varieties, have the potential to enhance maize productivity up to 50 percent. For example, even resource- rich farmers in Rumjatar, Khotang district are involved in maize seed production and these farmers also save seeds without any constraints and serve as an additional resource for ensuring seed security. The agronomic practices motivate both resource- rich and poor farmers to adopt tested technologies, which are crucial to seed system sustainability.

Collaboration with public (e.g. NARC, DoA) and private institutions (e.g. SEAN): The HMRP IV has contributed for the success of GoN's Mid-hill Mega Maize Production Program (MMM-PP) by providing improved seed produced by CBSP groups within and outside of HMRP districts covered by MMM-PP. This collaboration will continue for the remaining two-years of the MMM-PP of DoA. The credibility gained by the CBSP is largely based on the enthusiasm, honesty and competence attained by the small holders and women farmers to produce, store and sell quality seeds. Moreover, the pre-season contractual arrangements made through joint consultation among the seed producers and private sectors such as SEAN members, agro-vets and public institutions is crucial to ensure that participatory management is part and parcel of system operations and functionality. The district-based seed coordination committee led by DADO, includes producer farmers and private sector members. It is another important mechanism established at the local level that benefits small holders and women farmers as suppliers and consumers of quality seed. This loop ensures access to the seed market, market-driven systems and inclusive engagement of different actors in the value chain.

Technological advancement (hybrid maize development): Though HMRP is not directly involved in hybrid maize varieties development and release, the national maize research system of the country regularly receives hybrid germplasms through the CIMMYT CRP Program. The technological advancement of hybrid variety development is in high demand especially due to increased demand by the feed industries, green cobs demand in the urban and peri-urban areas due to increased road access and increased demand in the food processing industries such corn flakes. In such scenarios, small holders and women have a better opportunity to engage and benefit from maize-based technological advancement.

Maize based food diversification: HMRP conducted four regional-level training on maize food preparation. This training program was conducted in collaboration with DFTQC and the Tourism Board Association. Members of CBSP groups, restaurant operators and entrepreneurs participated in the training which exposed them to nutritional value and food utilization, as well as diet diversification using a dozen recipes for maize-based dishes. This not only promoted food security but could serve as an innovative entry point for enterprise development.

Increased participation*:* The HMRP has fully adopted the principle of GESI in all aspects of project activities beginning with the composition of members on executive committees of partners' and farmers' groups. At the field level the project implements the research and development works in collaboration with local service providers (NGOs, cooperatives, companies), cooperatives and farmers' group. Involvement of discriminated members (45.4 percent) and women (76.4 percent) in executive committees is the highest in farmers' groups whereas it is about 35 percent each in the local service providers' committee. In case of cooperatives, representation of discriminated members is about 42 percent and women, 52 percent (Table 1).

Table 1. Summary of composition of members in the executive committee.

Project Partner	Members in Executive Committee (No.)	Discriminated members in Executive Committee		Women members in Executive Committee	
		No	percent	No	percent
Local service provider	168	60	35.7	59	35.1
Cooperatives	449	189	42.1	236	52.5
Farmer groups	1,230	558	45.4	940	76.4
Total	**1,847**	**807**	**43.7**	**1235**	**66.9**

Source: HMRP 2013

Promotion of women friendly technologies: Contribution of women in maize farming is several-fold larger than men. It starts with land-preparation, and with the exception of ploughing, involves cultural operations such as weeding, gap-filling/thinning, earthing-up, harvesting, drying, de-husking, storage, shelling, cooking and even marketing. Increased migration of men further constrains women. Realizing this situation, HMRP has introduced farm mechanization by facilitating the availability of women-friendly mini-tillers to prepare the land. Similarly, HMRP also supports hand and electrical maize-sheller, seed drying tarpaulins, seed packaging materials for better storage and safe transport to strengthen return on investment through better market prices and reduced post-harvest losses. These were some of the mainstreamed approaches to strengthen gender equity and social inclusion through a consolidated partnership and efforts of NARC, DoA, NGOs, private sectors, and farmers.

Lessons learned

A number of lessons have been learned from the past three phases of the HMRP. Some of these are: (i) maize is of strategic importance for livelihoods in the hills for food and employment which has immense potential to benefit specially small holders and women farmers; (ii) gender equity and social inclusion (GESI) approach is a successful model for reaching targeted beneficiaries and bringing equitable benefits to all; (iii) small grant projects can enhance transparency, competitiveness, and effectiveness by inclusive engagement of beneficiaries and multi-stakeholder forums; (iv) the participatory and partnership mode of implementation has made project achievements gradually become mainstreamed and sustained; (v) a complete value-chain approach can assure markets and sustain seed businesses program synergies with other projects which also opens avenues for combined on- and off- farm opportunities using maize as a core commodity; (vi) involvement of the private sector in seed production and marketing is critical if community-based seed production is to succeed; (vii) monitoring of project activities, as well as the use of project funds, is essential to achieving the project's outcomes and outputs; (viii) a pre-sowing seed contract is crucial to ensure fair-pricing and purchasing-guarantees specially for risk-vulnerable small holders and women farmer s; and (ix) it is possible to expand investment of private sector in maize business (seed, grain and feed) through motivation , strengthening and streamlining.

Challenges

Like any other commodity sub-sector development and market, maize is not an exception, some of the major challenges faced by the project are:

***Market distortion*:** in certain years, there were sudden increases in seed demand. For example, as a compensation for rice failure in western hills of Nepal in one of the years, FAO purchased maize seeds at a very high rate. The situation created seed shortages in the districts as it distorted the pre-contract made among the seed producers and agro-vets. Moreover, the producer cooperatives had a difficult time convincing their fellow members about the particular scenario and possible implications for a sustained seed market. This situation was particularly seen in the women's cooperative.

Technology generation and sustainability: technology development and sustenance is quite delicate if quality assurance is not guaranteed. For example, QPM is gaining momentum in terms of its quality contribution to food and feed supplements. However, quality deterioration of QPM is becoming a major concern among the actors. Equitable benefits from research and development to small holders and women in specific will be challenging if quality declines.

***Harmonizing the GESI approaches*:** all of the development actors consider GESI, the major method to promote inclusive development. However, there are challenges in its implementation and intensity of focus differs. It creates demand on implementing agencies and or projects to invest on diverse and competing donor requirements.

***Low private sector investment*:** there is a high-scope of private sectors for investing in maize-based commodity development. However, there is a lack of systematic engagement of private sectors in investing in research. In such a scenario, GESI focus would be of challenge while the private sector becomes the dominant actor in the commodity promotion.

***Threat to local landraces and indigenous knowledge and technologies*:** The increasing trend of globalization and this has direct implications on local seed systems. Nepal being a member of the World Trade Organization (WTO), Convention of Biological Diversity (CBD) and party to International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) are some of the important international provisions which have brought challenges and opportunities to promote indigenous seeds and associated knowledge and technology promotions. If not well thought-though with visionary approaches developed, there is a high-risk of negative impact on small holders and women who could lose their access and control over these genetic resources. Ultimately, the private companies may become dominant through establishment of Intellectual Property Rights (IPRs) but the benefits of IPR not bestowed on the poor and disadvantaged.

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