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Integrating Gender and Nutrition within Agricultural Extension Services

Technology Profile

Type of Technology:

Intangible (practice)

Conservation Practices for Vegetable Production

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The Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) project works to improve agricultural livelihoods focusing on strengthening extension and advisory services to empower and engage smallholder farmers, men and women. The technology profiles support INGENAES's goal of improving the dissemination of gender-appropriate and nutrition-enhancing technologies and inputs to improve women's agricultural productivity and enhance household nutrition. The technology profiles identify issues and opportunities to make technologies more attractive for men and women farmers, to increase men's and women's benefits from using technologies, and to design distribution models for extension agents, input suppliers, and mobile devices to get the technologies into men's and women's hands.

Despite significant poverty reductions over the past 20 years, Nepal remains one of the poorest countries in the world. The largely rural population has nearly tripled since 1960 putting pressure on land and natural resources (CIA World Factbook 2015). Agriculture dominates the economy, accounting for 35% of national GDP and 70% of employment (USAID 2015). There are three main geographic regions, each with unique social and agricultural systems: the Himalayan mountains in the north, the mid hills, and the terai (plains) to the south. The majority of the population and agricultural production are based in the hill and terai regions (WFP and NDRI 2010). Communities in the hills may lack basic infrastructure, are more remote and have higher poverty rates than the terai. The population is largely self-employed in agriculture, managing small rain-fed landholdings (DFID 2013). Many are still producing at a subsistence level, and while efforts to increase on-farm incomes through commercialization are on the rise (Brown and Shrestha, 2000), households are often forced to make difficult tradeoffs between rural agricultural livelihoods and migration in search of alternative employment.

Men's increasing rate of migration, coupled with women's significant involvement in agricultural activities is driving a feminization of agriculture. As of 2011, women accounted for 84% of total employment in agriculture (CBS 2011). In this patriarchal society where social dynamics are strongly influenced by gender, caste, and ethnicity, women tend to be disempowered as compared to male counterparts (WHO 2009). Baseline data from the Women's Empowerment in Agriculture Index (WEAI) indicates that women in Nepal score a 0.80 out of 1 (with higher scores representing greater empowerment). The WEAI domains in which women were least empowered include community leadership, time allocation, production decision-making and access to productive resources (USAID 2014). The feminization of agriculture trend may positively or negatively impact women who become de facto household heads, by increasing labor burdens and/or decision-making power (Gartaula et al., 2010).

Opportunities may exist to build on this trend and improve gender relations within the agricultural sphere. Working to close gaps in women's access to productive resources and knowledge, and ensuring that agricultural technologies do not place additional burdens women's limited time and labor, will be critical to capitalizing on these opportunities (FAO 2011).

Technology Design and Dissemination

The goal of conservation agriculture is to reduce water and soil losses while improving fertility and yield. Conservation agriculture has been applied to cereal crop production through a variety of strategies. Application to vegetable cultivation has been less explored, especially in the smallholder context. Over the past two years, iDE Nepal has conducted a trial on conservation practices appropriate for Nepali smallholders, with support from the Feed the Future Horticulture Innovation Lab. In the Lalitpur, Surkhet, Banke and Dadeldhura districts, 24 women farmers have compared the production of tomatoes and bitter gourd using conservation practices and commonly used farmer practices. The formal trial ended in December 2016, and iDE will expand training to all farmer groups across their network.

The set of practices includes three components:

1. **Reduced tillage through the use of a "holemaker."** Tillage disrupts soil structure and can increase runoff and soil erosion. Reducing tillage can increase soil fertility and water holding capacity by maintaining soil structure over time. A holemaker is a handheld auger used to dig small holes into which transplants, compost, and fertilizers are placed. Typical tillage practices involve hand hoeing the entire plot, a task that is most often performed by men. While there are an array of tillage reduction strategies and tools, the holemaker can be made locally for about $20 U.S.D. and is promoted by iDE for use in vegetable systems. Holemakers are shared informally amongst trial participants.
2. **Mulching practices** intend to keep soil covered, preserving soil moisture and reducing weed pressure. Fertility increases as mulches break down over time. For best results, it is recommended that mulch is at least 3 inches thick around plants. Mulching materials are selected based on what is locally available including living and dead leaves, grasses, rice straw, and leaves or vegetative byproducts from other crops (if not damaged by pests or disease).
3. **Drip irrigation**. The drip irrigation system includes a 55-gallon drum and plastic drip tape. In typical farmer practices, typically women collect water each day and water plants by hand. Trial

Box 1 Data Collection

Data collection took place during August 2016. Staff from iDE Nepal coordinated individual and group interviews with users and non-users of the technology. Users are classified as men or women who are growing vegetables with any combination of the three conservation practices. Individual interviews were conducted with 24 users of the full set of practices. Group interviews (mixed users and non-users) were conducted with 53 women and 12 men. Non-users are farmers who were not using conservation practices. All users and non-users, were members of at least one farmer group. Additionally, 16 women non-users from a microfinance group were interviewed. No one in the microfinance group was a member of a farmer group. The members of the microfinance group all cultivated a small area of vegetables for home consumption, but none of them were members of a farmer's group or had heard of the conservation practices. This indicates that knowledge of commercial vegetable production and conservation practices may be very limited outside the iDE network.

participants were provided with subsidized drip irrigation systems (50% of the cost covered by iDE, 50% by farmers).

Either plant diversity or crop rotation is typically included as a central tenet of conservation agriculture. Most smallholder farmers in Nepal grow an array of crops and rotate season-to-season and between fields. Therefore, for the purposes of this assessment crop diversity was not considered a new practice under the training umbrella for vegetable conservation practices.

Farmer groups are the foundation of iDE's network in each community. Groups were established prior to engagement with iDE in each of the districts except Dadeldhura, where iDE helped to organize the creation of a vegetable-farming group. Groups meet monthly to coordinate their activities. These meetings give extension agents an opportunity to share pertinent information or respond to concerns. Groups aggregate their production at collection centers (established by iDE in 2014 and 2015), which are managed by marketing committees that operate separately from farmer groups, though there is some overlap in membership. Farmers sell their produce at the collection center and after aggregation it is delivered to buyers. There is a collection center in Lalitpur, Surkhet and Banke, but not in Dadeldhura, where farmers sell at a local market. Additionally, Community Business Facilitators (CBF) support farmer groups in securing seed, biopesticides, fertilizer, drip line, and other inputs from suppliers. The CBFs attend group meetings to take orders for inputs and hear farmers' concerns, which are then communicated to local extension agents and iDE staff. iDE also provides training to CBFs on production and marketing.

Holemaker © Schneider, 2016

In the communities where iDE is conducting the trial, farmer groups were mixed users and non-users. While most users were trial participants, some users had partially adopted practice based on observation or learning from those who were participating in the trial. The numbers of users and non-users interviewed are detailed in the table below.

Interview Respondents	Full set of practices	Mulching Only	Drip Only	Holemaker Only	Do not use practices
Farmers' group member and trial farmer	20 Women 4 Men	0 Women 0 Men	0 Women 0 Men	0 Women 0 Men	0 Women 0 Men
Farmers' group member and non-trial farmer	0 Women 0 Men	23 Women 10 Men	17 Women 0 Men	0 Women 0 Men	13 Women 2 Men
Not a member of farmer's group or trial	0 Women 0 Men	0 Women 0 Men	0 Women 0 Men	0 Women 0 Men	16 women 0 men

Gender Analysis

Dry straw mulch around tomato plants © Schneider, 2016

Smallholder farmers in Nepal typically grow a wide variety of crops for home consumption, including vegetables. Interview respondents said they farm on less than two acres, most on less than one acre. Usually women are responsible for vegetable production and thus more women than men farmers were interviewed. Many of the women users work collaboratively with men in their family, including spouses. Men from farming households often have off-farm employment, especially in Lalitpur and Banke, which are close to city centers. Women whose husbands worked off-farm, were primarily responsible for vegetable cultivation, but their husbands would help with vegetable cultivation before or after work. Five women said their husbands had migrated to find alternative employment.

In addition to vegetable production, women have many other responsibilities. These may include, but are not limited to, collecting water for home and agricultural use, gathering fodder for animals, collecting firewood for cooking, caring for children or other family members, and preparing meals. In most cases women's responsibilities are in the domestic sphere and do not generate income. Women may also participate in farmer groups or savings groups.

To understand the potential gender and nutrition impacts of the conservation practices, interview data was analyzed using three intersecting areas of inquiry: food availability, quality, and safety; income and assets; and time and labor. Due to the complementary nature of conservation practices' potential impacts will be discussed as a whole, unless specified. Additionally, there were some cases of environmental factors, which negatively impacted users' perceptions of the growing season but were not specifically associated with the conservation practices.

Food Availability, Quality, and Safety

Vegetables such as tomatoes, cauliflower, cucumbers and leafy greens are common in Nepali dishes. However, poor transportation infrastructure may limit hill communities' access to fresh vegetable markets. For this reason, nearly all respondents, both users and non-users of the conservation practices, said that they cultivated vegetables for home consumption (only one respondent had never grown vegetables). Some women users reported that growing vegetables was more affordable than buying them.

Increased vegetable supply is linked to increases in home consumption and marketing of vegetables. Of 24 total users, 21 reported having increased yields in response to use of the conservation practices. Nineteen users said that they were consuming vegetables grown under conservation practices at home. Ten of those users (8 women and 2 men), or about 40% of total users, said that they were consuming more vegetables than before adoption. Both women and men users said they prioritized consumption of

vegetables over marketing, and only sold if there were extra available. Some women users also indicated an increase in dietary diversity, as selling gave them an opportunity to purchase other vegetables they were not growing.

Seven women users said that the vegetable quality, particularly with regard to fruit size, was improved using the conservation practices. The rest of the women and all of the men said the quality was the same or noticed no difference between farmer practices and conservation practices. A few women trial farmers in Lalitpur expressed a desire to grow vegetables organically. They perceive that growing vegetables without the use of pesticides increases produce safety. However, they are facing intense pest pressure from the tomato pest, Tuta absoluta, and are unable to avoid use of pesticides at this time.

Income and Assets

While almost all users stated that they continue to prioritize home consumption, in many cases, demand for vegetables was already being met by home production. This means that increased yields enabled women and men users to sell more vegetables than they had prior to adopting the practices. Some women farmers said that the trial allowed them to sell vegetables for the first time, especially in Naubasta where flat topography favors cereal production. In Chinchhu and Lele vegetable production is common, but most users said they were able to sell more vegetables now that yields are higher. Men and women sell vegetables either at community collection centers or local markets, which are located within walking distance from their homes. In a few cases produce was sold to customers directly from their homes.

Tomatoes are weighed at a collection center © Schneider, 2016

Women, who in many cases do not have other income generating activities, said they felt good to be contributing to household income and could spend money how they pleased. Of the 20 women users interviewed, 16 stated that they had some level of control over the income derived from vegetable crop production under the conservation practices. Only three women users interviewed said they did not have any control over how income was spent, with money instead being controlled by their husband or father-in-law. Of the five men users, only one claimed independent control over income, the other four said that even when they contributed to production or marketing of vegetables, their wives controlled the income or they made decisions together. Even in cases where men were responsible for the delivery or sale of vegetables, women users controlled income or shared in decision making about purchases. Of the women who claimed control of income, most said they would spend money on small purchases such as tea, sugar or other food goods. For large purchases, women farmers said they make decisions jointly with their spouse or other family members. Many women users, especially in Lalitpur, said that income derived from vegetable production allowed them to

participate in savings groups. A few women also talked about their ability to pay for children's school fees, weddings, and ceremonies.

Time and Labor

Women and men users said they saved time using the conservation practices, particularly with respect to soil preparation, watering, and weeding. This is supported by an iDE survey (2016) in which trial farmers reported spending the same amount or less time on vegetable production using the conservation practices than farmer practices. The reduction in time spent on soil preparation was attributed to use of the holemaker, which allows users to only dig where planting, versus plowing the entire area. However, only a few are shared amongst an entire farmer group and there is no formal order for accessing so farmers may have to wait to prepare soil until the holemaker is available. The holemaker also changes women's perception of their ability to prepare soil. Eighteen women non-users had an opportunity to try the holemaker, but were unable to use it regularly due to a shortage of tools. Seven of these women said that they hire someone (typically a man) to prepare soil using standard plowing practices and would be interested in using the holemaker if it meant they could prepare beds themselves. This also indicates a willingness to spend additional time preparing soil instead of paying someone else to do so. Those who claimed that the conservation practices saved time said they used additional time to care for animals, tend to other crops, collect fodder or perform household tasks. One woman said she was able to participate in a collective farming group, because she spent less time on vegetable production.

Less time is spent on overall vegetable production, and within the time spent, labor shifts from land preparation to mulch collection. Mulching is the only conservation practice that increases time and labor allocation. Mulching material varies by region and season. In the hill regions of Dadeldhura and Surkhet, users live close to forests where they can collect mulch in less than a few hours. Users who own forested land did not identify mulch supply as a barrier to use. However, the time and labor impact of collection varies widely depending on the proximity of the forest to their home. Users who don't have a privately-owned forest walk to a community forest area to collect mulch. In Banke and Lalitpur, which are closer to cities and further from forests, access to mulch is a challenge. Women farmers often travel on foot for many hours to gather mulch. Community forests may be restricted in certain seasons or closed to the public on particular days. Each community forest user group has autonomy in setting restrictions, which makes barriers to access site-specific. Rules are well intentioned, as conservation of forest areas is a priority in Nepal. Smallholders depend on forest areas for food, medicinal plants, fodder and firewood. Were restrictions not in place, forest areas would quickly face a tragedy of the commons scenario, reducing the sustainability of resources. Unfortunately, these restrictions create difficulties for farmers accessing community forests for mulch and may limit adoption of mulching practices to certain seasons.

Farmer spreads living mulch around tomato transplants © Schneider, 2016

For irrigating, both men and women users perceived that the drip irrigation system decreased labor time. Water is still collected to fill the irrigation drum, typically by women (water sources varied between communities). However, women users reported their water needs for vegetables grown with conservation practices were half that of farmer practices (primarily due to mulch coverage). Once the irrigation drum is filled watering happens automatically and farmers are not required to go to each plant individually to water as in the farmer practice. This also reduces time spent watering, often a responsibility of women. In an iDE survey in June 2016, farmers reported using about 50% less time in irrigation activities when using conservation practices compared to farmer practices.

Issues and Opportunities

Both women and men users perceived that conservation practices improve yield and reduce time spent on vegetable production. Women's involvement in vegetable production positions them to benefit the most from these improvements. Income effects are particularly compelling, as user experiences indicate that in the case of the iDE trial, adoption can increase women's income control and decision-making power. Time savings are also beneficial, as time and labor burden is one of the areas most limiting to women's empowerment. Further research would be needed to determine whether time is saved with regard to marketing specifically, especially for those who are selling vegetables for the first time. Additionally, further investigation would be required to determine if adoption of practices outside the iDE network is linked to similarly positive outcomes.

Farmers not participating in the trial have been hesitant to use conservation practices due to a lack of understanding of potential benefits. Many non-users expressed interest in adopting the following season after seeing the positive outcomes of the trial. Particularly in the case of reduced tillage, which men and women users and non-users exclusively associated with the use of the holemaker, further explanation of underlying principles could increase adoption. Despite sufficient interest, those outside the trial do not practice reduced tillage when the holemaker is unavailable. Demonstration of alternative methods, such as strip tilling, or digging holes for transplants with other tools, coupled with testimonies from users, could bolster confidence about adoption.

References

Brown, S., & Shrestha, B. (2000). Market-Driven Land-Use Dynamics in the Middle Mountains of Nepal, Journal of Environmental Management. 59, 217-225. doi: 10.1006/jema.2000.0355, http://dx.doi.org/10.1006/jema.2000.0355

CBS (Central Bureau of Statistics). (2011). Nepal Living Standard Survey. National Planning Commission Secretariat, Government of Nepal.

CIA World Factbook. (2015). https://www.cia.gov/library/publications/the-world-factbook/geos/np.html

Department for International Development (DFID) (2013) 'Regional Dimensions of Poverty and Vulnerability in Nepal'. Discussion Paper. Kathmandu: UK Department for International Development.

FAO (2011). The State of Food and Agriculture 2010-2011: Women in Agriculture: Closing the Gender Gap for Development. (FAO, Rome, 2011).

Gartaula, H. M.; Niehof, A.; & Visser, L. (2010). Feminisation of agriculture as an effect of male out-migration: Unexpected outcomes from Jhapa District, Eastern Nepal. The International Journal of Interdisciplinary Social Sciences. Vol 5(2), 565-577.

INGENAES. (2015). Nepal Landscape Analysis. https://agrilinks.org/sites/default/files/resource/files/ING%20Landscape%20Study%20(2015)%20Nepal%20-%20published%202015_11_15.pdf

USAID. (2014). Women's empowerment in agriculture index: Baseline report. https://feedthefuture.gov/sites/default/files/resource/files/ftf_progress_weai_baselinereport_may2014.pdf

USAID. (2015). Nepal: Agriculture and food security background. https://www.usaid.gov/nepal/agriculture-and-food-security

WFP and NDRI (2010). The Food Security Atlas of Nepal, Kathmandu: National Planning Commission, Government of Nepal.

World Health Organization (WHO). (2009). Perspectives on sexual violence during early years of marriage in Nepal: findings from a qualitative study: social science research policy briefs.

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