

Integrating Gender and Nutrition within Agricultural Extension Services

Technology
Profile

Type of
Technology:

Physical

Mini-Tiller

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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).¹ 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).

¹ This section is excerpted from: Schneider, L. 2016. "Conservation Practices for Vegetable Production." Prepared for the USAID and US Government Feed the Future project Integrating Gender and Nutrition within Extension and Advisory Services (INGENAES).

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 mini-tiller is a mechanized plow used to prepare land for agricultural production. It can plow land more efficiently than plows that rely on animal draft power, and at the same time reduce drudgery. In Nepal, in one hour the mini-tiller ploughs 1 to 1.5 ropanis² compared to a bullock-drawn plow, which takes one day to plow 3 to 4 ropanis. The mini-tiller is similar in purpose to the power-tiller, but is more compact, making it easier to operate on narrow plots of terraced land typically found in Nepal's mid-hill region. China and India manufacture the mini-tiller and Nepal imports it, totaling its cost at 50,000 NPR. Both diesel- and petrol-fueled mini-tillers have been imported, running on a v-belt or shaft. Petrol-fueled mini-tillers are preferred by farmers because they are lighter than diesel-fueled mini-tillers. Mini-tillers typically use rope starts; however, some use a hand start and others self-start with an electric button, although the self-start model is significantly more expensive. The mini-tiller is also designed to utilize various attachments for agricultural production, processing, and transport including adjustable ridgers, seeders, reapers, threshers, water pumps, and load carriers among others.



DIESEL-FUELED MINI-TILLER FOR SALE IN BANEPA, NEPAL. © C. NORDEHN 2016

In Nepal, farm power predominantly comes from animals and human labor rather than machines (Shrestha 2013). However, this is slowly changing in Nepal with the increased spread of small-scale mechanized technologies like the mini-tiller. The mini-tiller was first imported to Nepal in 2006 with demand increasing in 2011. Estimated 6000-7000 mini-tillers are currently in Nepal, concentrated in the mid-hill region where agricultural land is commonly terraced (Dilli Bahadur KC and Gokul Paudel, pers. comm.).

In 2014, the Ministry of Agricultural Development's (MOAD) Agricultural Mechanization Policy (AMP) (2014/2070) called for the spread of small-scale mechanization to farmers. The policy also promotes the spread of environmentally friendly agricultural mechanization for women and youth farmers. This commitment to

increasing the spread of agricultural technology to women is bolstered by the 2014 Agricultural Development Policy, which includes goals and strategies for addressing Gender Equality and Social and Geographic Inclusion (GESI) in the agriculture sector. Public extension has taken several approaches to implementing the AMP policy including demonstrations, training for farmers, mechanics, and blacksmiths;

BOX 1 DATA COLLECTION

Data collection took place during December 2016 in Kathmandu and the mid-hills region of Kavrepalanchowk District, Nepal. Staff from CIMMYT coordinated individual and group interviews with users and non-users and with three CIMMYT project staff.

Group and individual interviews were conducted with 5 men and 10 women in Kavre Vaniyang; 3 men and 2 women in Parchkhal; and 12 men and 5 women in Sankhupati Chaw (Eklekhel). The farmers in Vaniyang were part of a 30-member cooperative. Farmers in Vaniyang and Parchkhal grew crops including rice, maize, potato, and vegetables. In Eklekhel, the farmers grew maize, rice, vegetables, and oranges. Interviews with the head of District Agriculture Development Office and staff were held in Dhulikhet. One mini-tiller trader and 2 mechanics were interviewed in Banepa.

² One hectare is equivalent to approximately 19 ropanis.

providing subsidies for mini-tillers up to 50 percent of the cost; establishing processing centers; and holding exhibitions on mechanized technology (Gauchan and Strestha 2013).

Farmers access mini-tillers through purchase at retailers, the government, and NGOs. Agro-vet dealers and importers like BTL Pvt. Ltd., Guatum traders, ShrethaAgri Inputs, SK Traders, and AMC Pvt Ltd. sell mini-tillers at market centers (CIMMYT 2015). In Kavrepalanchowk (Kavre) District, the District Agriculture Development Office (DADO) is disseminating mini-tillers through six local service centers. In 2010, CIMMYT in coordination with MOAD began disseminating and testing mini-tillers in its projects. Through the Cereal Systems Initiative for South Asia (CSISA) Nepal project CIMMYT disseminated 400 mini-tillers and attachments to farmers in eight districts including Makwanpur, Nuwakot, Kavre, Sindhupalchowk, Dolkha, Ramechhap, Khotang, and Solukhumbu (USAID 2016). CIMMYT extended its reach to zones affected by the 2015 earthquake through its Earthquake Recovery Support Program. In these zones, mini-tillers have been introduced as a replacement for draft animals like bullocks killed during the earthquake.

In addition to disseminating the mini-tiller to farmers, both DADO and CIMMYT have offered training to farmers on the operation and maintenance of the technology. DADO has demonstrated the use of the mini-tiller to 40 people, which included four women. Through the CSISA project CIMMYT trained the 400 mini-tiller recipients on mini-tiller operation and maintenance (USAID 2016). In an effort to ensure mini-tiller owners' access to service providers, CIMMYT trained 81 mechanics in eight districts on repair and maintenance. DADO has trained eight people on repair and maintenance who were selected based on established government guidelines³.

CIMMYT has made efforts to specifically target women farmers to teach them how to use the mini-tiller. In Makwanpur district, Nuwakot district, and Rolpa district CIMMYT has held demonstrations for women on how to use the mini-tiller, giving them the opportunity to operate the machine. They are also exploring the introduction of micro-credit loans to assist women with purchasing machinery like the mini-tiller.

To date 400 mini-tiller attachments have been disseminated throughout the country. CIMMYT field-tested these attachments including adjustable ridgers, seeders, reapers, threshers, water pumps, and load carriers prior to dissemination. Through this field testing CIMMYT found differences in men's and women's preferences for attachments related to their roles on the farm. Women preferred the thresher and winnowing attachments while men preferred the water pump and seeder (Dilli Bahadur KC and Gokul Paudel, pers. comm.). CIMMYT plans to continue exploring the potential of different mini-tiller attachments to reduce women's and men's time and labor on various tasks.



TERRACED LANDSCAPE OF KAVRE DISTRICT. MEN IN A COOPERATIVE DISCUSS THEIR EXPERIENCE USING THE MINI-TILLER. © C. MANFRE 2016

Gender Analysis

In the mid-hill region of Nepal men typically plow fields with bullocks or increasingly mechanized technology like the mini-tiller. Women are largely responsible for harvesting and processing crops such as maize, rice, potato, and vegetables. Men's increasing migration to urban areas in Nepal and other countries⁴ is shifting men's and women's roles and decision-making power in agriculture. The 2015 earthquake also affected the ways farmers plow because many of the bullocks died in the aftermath of the natural disaster. Through government subsidies more farmers, mostly men, are able to purchase mini-

³ The details of these guidelines for selection were unclear.

⁴ In 2011, just over 7 percent of Nepal's population was living outside the country of which 95 percent were men (ILO 2015: 7, 20).

tillers to replace their bullocks. Men and women are learning to use and maintain the mini-tiller and its compatible attachments through extension services provided by DADO and CIMMYT.

This gender analysis explores the direct and indirect effects of the mini-tiller and dissemination efforts on men and women in the mid-hill district of Kavrepalanchowk, examining these effects around three key areas of inquiry: time and labor; food availability, quality, and safety; and income and assets. This analysis is based on interviews with men and women mini-tiller users, non-users, public and CIMMYT extension providers, retailers, and mechanics (See Box 1).

Time and Labor

Women reported that significant migration of men has increased women's time and labor on agricultural activities. In the communities visited, women said that many of the men had migrated to Malaysia, India, or the Gulf countries for work. In Eklekhel, one woman said that following the earthquake some men returned home to reconstruct their homes and stayed in the community. If they had not come back for that purpose she said there would be no men in the village. In the absence of men, women now take on the bulk of the on-farm activities related to maize, potato, rice, and vegetable crops in addition to household activities like cooking, cleaning, and childcare. This includes manual tilling, bringing manure to the fields, burning of stalks, weeding, planting, harvesting, and marketing crops.

With an increasing number of men working abroad, **fewer men are available to plow the land.** MOAD and CIMMYT considered the issue of men's migration when selecting the mini-tiller for dissemination, because the mini-tiller requires less time and labor to plow than other alternative methods (Dilli Bahadur KC and Gokul Paudel, pers. comm.). Among the communities visited, the mini-tiller has largely replaced preparation of land with draft animals. In Eklekhel, men said the mini-tiller is mainly used because of the male labor shortage.



WOMEN IN VANIYANG WHO RENT THE MINI-TILLER THROUGH THE COOPERATIVE ©C. MANFRE 2016

While fewer men are available to plow the land, men continue to dominate this task because of perceptions that women should not plow or are unable to plow as easily as men. Women perceived the mini-tiller to require a lot of strength to operate and therefore believed that men, who women perceived to be stronger, should operate the machine. The DADO officer said women do not operate the mini-tiller because it is believed women should not do “hard work.” Beliefs that farms could be negatively affected by outside forces if women plow may also contribute to this division of labor. For example, two women said women should not plow because the rains will not come because the land is like a woman. Although women do not operate the mini-tiller themselves, the men in their households or men that women hire will operate the mini-tiller. As an alternative to the mini-tiller, women exchange labor with other women to prepare the land by hand. Women said they prefer to exchange labor with women who cannot afford to rent the mini-tiller than rent the mini-tiller for themselves.

Women who tried using the mini-tiller without any training reported issues in the ease of use. Women said it was difficult to turn and use because of the vibrations. One woman said after trying the mini-tiller it pulled away because she thought she lacked physical strength to control it. However, the women who tried it believed if they gained experience using the mini-tiller they would not have the same difficulties. Men also said they thought women could use the mini-tiller if they learned to operate it; however, they thought women could get tired more easily than men because women are perceived to have less strength than men.

Based on experience either renting or operating the mini-tiller, **men and women reported that using the mini-tiller reduces time and labor associated with land preparation compared to other**

methods. Men in Vaniyang reported that it takes one hour to plow 1.4 ropanis with the mini-tiller compared to one day to plow 3 to 4 ropanis with bullocks. In the same community, women said the mini-tiller was more efficient than the bullock, but did not provide specific figures. Women in Eklehkheth said that without the mini-tiller it can take seven days to plow their land. While women were not plowing the fields prior to the introduction of the mini-tiller, there was a perception among men and women that women saved time now that the mini-tiller was used to plow the land. Men and women said after replacing the bullocks with the mini-tiller women did not have to take time to prepare rice snacks for the bullock drivers, which allowed women to shift time to other activities. Women also no longer used time to care for the bullocks by feeding and bathing them (S. Parui, pers. comm.). As a result, women's time is shifting to other income-generating activities including cow milk and vegetable production.

Food Availability, Quality and Safety

During the April 2015 earthquake many of the bullocks used for plowing died. Women reported that because they have access to the mini-tiller they did not need to purchase replacement bullocks for plowing. Instead, women said that the bullocks were substituted for dairy cows, which women in Vaniyang care for and milk. In a neighboring village one man who owned a mini-tiller said he no longer has bullocks but has two cows which women feed and milk and he sells the milk. **As an indirect result of the introduction of the mini-tiller men and women have increased availability of cow milk.** Women said using the mini-tiller allows them to spend more time on vegetable production, which also increases the availability of vegetables.

Repeated use of the mini-tiller over time changed soil quality affecting crop yield and quality. CIMMYT extension staff said the mini-tiller can affect soil quality depending on how long it has been used. After one to two seasons the mini-tiller will not affect the soil quality, but after three to four years of use it can make the bed pan harder. This was experienced by men who said after three to four years the bed pan became harder. A group of women also reported that after using the mini-tiller multiple times it made the soil too fine.

In Eklehkhel, both men and women said they preferred using the mini-tiller because it reduced clots in the soil. However, men and women reported that one year of improper use of the mini-tiller disturbed the roots of their orange plants. **This misuse of the mini-tiller affected the productivity of their orange trees.**

Income and Assets

Most men reported that using the mini-tiller was more cost effective than using bullocks to plow the fields. In Vaniyang, men said they previously spent 15000 NPR on bullocks during plantation but spend 5000 less with the mini-tiller, primarily for potato production. Men said the mini-tiller allowed them to grow three crops in one year instead of two. By increasing their production men said they earned an additional 5000 to 10000 NPR per year. Men mentioned that mini-tillers occasionally need repair, but the costs were not significant.

Among the men and women interviewed only men controlled mini-tillers obtained through subsidies or purchased at full cost. For example, one man in Panchkhal was selected by the government to receive a 90 percent subsidy to purchase the mini-tiller. He made decisions about how to use the mini-tiller often renting it out for use by farmers in the community. In Eklehkhel, five men individually own mini-tillers that they purchased without a subsidy. They also make decisions about when to use it or who to rent it to. An NGO introduced the mini-tiller to the cooperative in Vaniyang which they purchased with a 75 percent subsidy from DADO. That mini-tiller, while purchased by the cooperative, is managed by a man who received training on how to operate it. The only decision women made related to the mini-tiller was whether or not to rent it from men to till the land.

Both men and women were aware of mini-tiller attachments, but neither men nor women reported owning any. While attachments have been disseminated in some communities by CIMMYT, they have not

yet reached the villages that were visited. Men who were aware of mini-tiller attachments said the attachments were difficult to access and were expensive.

Men's and women's access to the mini-tiller is influenced by differences in men's and women's perceived need for the mini-tiller, social relationships, and access to inputs. CIMMYT staff reported that mini-tiller owners tend to prioritize renting to women over men because there is a perception that women are in greater need due to male labor shortages within the household. The women interviewed reported being able to rent the mini-tiller through the cooperative when they wanted it, suggesting that their needs were either perceived to be equal to or greater than men's. In the communities CIMMYT targets, about 80 percent of women are renting the mini-tiller from men (Dilli Bahadur KC and Gokul Paudel, pers. comm.). Men in Vaniyang reported that having good social relations within the cooperative is necessary to access the mini-tiller. Access to inputs also affects men's and women's access to the mini-tiller. When fuel was scarce during the 2015 fuel crisis those with access to this important input were given priority access to the mini-tiller over those without. It is unclear if there were differences in men's and women's access to this input.

Women's limited access to income affects their ability to rent the mini-tiller. Women in Vaniyang said they rent the mini-tiller from men and pay men to operate at a cost of 450-500 NPR per hour. This rate was too costly for some women. Even the women who said they could afford to rent it through their village cooperative do not always opt to. Instead, **women said they prefer to exchange labor** to manually till the land with women in their village who cannot afford to rent the mini-tiller.

Women said they believed they could use the mini-tiller if they were trained on how to use it. **While none of the women in the communities visited have participated in training on operating the mini-tiller, they identified barriers to accessing formal training.** Leadership committee members in Ekhlikhet said women have difficulty attending trainings far from home because people in their household will not allow them to leave behind their household responsibilities like caring for children. There was also a perception among men and women that it is unsafe for women to travel long distances for training. A woman who led the farmer association in Ekhlikhet said men and women are selected within their group to attend trainings based on their capacity or physical strength and relationships with government offices. Under these criteria, women who are perceived to have less physical strength than men, would be less likely to be selected to attend trainings.

Men in Vaniyang participated in a one-day training on operating the mini-tiller. The men who had not attended any formal training on the mini-tiller in Parchkhal and Ekhlikhet said they taught themselves how to operate and repair their own mini-tillers through practice and observing others. One of those men said he also bought a mini-tiller operation and repair manual. He now teaches men in his village how to operate and repair the mini-tiller.

Currently, there is greater opportunity for men to earn income from the mini-tiller than women. Men's higher rate of ownership, control, and knowledge of how to operate the mini-tillers gives them this advantage. Men who own or control mini-tillers can earn income by renting the mini-tillers directly to farmers. With the knowledge of how to operate the mini-tiller only men in the communities visited are hired, primarily by women, to operate the mini-tiller. Men reported earning anywhere from 450 to 500 NPR per hour for their services.

Women reported earning additional income as an indirect result of using the mini-tiller. After replacing bullocks, previously used for plowing, with cows women said they now earn and control income from milk sold in local markets. Other tasks that women were previously responsible for like bathing and feeding the bullocks and cooking food for the bullock drivers were no longer necessary. This change in responsibilities likely contributed to women's participation in other income generating activities like vegetable production. Women said that they were manually tilling the land, but did not report doing this more or less frequently since the introduction of the mini-tiller. If access to the mini-tiller changed how often women till the land manually this could have also affected women's increased participation in income-generating activities like milk and vegetable production.

There are employment opportunities to repair the mini-tiller and other mechanized technologies; however, those positions are more likely to be held by men. A retailer said that he has only hired men as mechanics because there is a perception that women are less familiar with similar systems like motorcycle repair. He said because women are less familiar with other systems they would not know how to easily fix an engine or piston, a common repair needed for the mini-tiller. He said women have shown interest in being mechanics, but do not enter that field because women cannot do “heavy work.”

Issues and Opportunities

The influx of male migration from Nepal to the Gulf States, Malaysia and other countries continues to affect the agricultural labor force in Nepal. Women are absorbing the tasks previously done by men and now do nearly all of the work on the farm and in the household. These additional tasks further strain women’s time and labor. While women take on many of men’s tasks, plowing is still largely done by the men who remain in the farming communities. The mini-tiller was introduced as a more efficient method of plowing than previous methods like using bullocks. Farming communities are using mini-tillers to plow in part because of the male-labor shortage.

Women tend not to use the mini-tiller themselves and instead rent the mini-tiller from men and hire men to operate it. Perceptions among men and women that women are not strong enough to use the mini-tiller and other beliefs about the appropriateness of women to plow restricts women’s operation of the mini-tiller. However, both men and women said they believed if women receive training on operating the mini-tiller they could use it themselves. CIMMYT has made efforts to target women and train them to use the mini-tiller. Continuing to target women through mini-tiller demonstrations will build women’s confidence to operate the machine. Identification of lead women farmers who after receiving training can return to their communities and operate the mini-tillers could help change perceptions among men and women about women’s ability to plow. Lead women farmers could also train other women within the community to use mini-tillers.

Women who have limited access to income cannot always afford to pay mini-tiller rental and operation fees. Instead of using the mini-tiller, some women are opting to till the land manually through labor exchange with other women. This group of women choosing to exchange labor includes women who can afford mini-tiller fees and those who cannot. Women who could afford it reported preferring to help women in their community who could not afford the mini-tiller through labor exchange rather than renting the mini-tiller. Further investigation is needed to understand the value of labor exchange for women. A study, in communities where the mini-tiller has been introduced, could examine changes in women’s preferences for tilling over time including operating the machine themselves, hiring men or women operators, or participating in labor exchange with other women. The study could also examine women’s perceptions of the benefits of using these different methods.

Mini-tiller attachments have not been widely distributed and men’s and women’s knowledge of them is limited. However, the mini-tiller attachments have the potential to reduce men’s and women’s time and labor on a range of tasks. This opportunity is particularly relevant for women who are taking on more agricultural tasks because of men’s migration. CIMMYT’s initial assessments of men’s and women’s preferences for attachments found that women preferred attachments for threshing and winnowing, which are both time- and labor-intensive tasks. Additional assessment of men’s and women’s preferences could help inform CIMMYT’s selection of attachments to promote. Demonstrations for both men and women on how to use the attachments would increase their familiarity with and ability to use the attachments as well as knowledge of the benefits. Increasing both men’s and women’s knowledge of the benefits of attachments preferred by women is important because men tend to make decisions about purchasing mini-tillers and it is likely men will also make decisions about the purchase of compatible attachments.

Often mini-tiller pistons break and are in need of repair. Mechanics servicing the mini-tillers typically require farmers to pay for transport of broken machinery to their services centers in addition to paying for the service and the parts. Women’s limited access to income and restrictions on mobility affect their

direct access to these services. Decentralizing service centers through a mobile small-scale machinery clinic could improve women's access and willingness to invest in mini-tillers.

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