



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Integrating Gender and Nutrition within Agricultural Extension Services

Technology Profile
Type of Technology:
Intangible (practice)

Fertilizer Deep Placement

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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.

Bangladesh is one of the world's most densely populated nations. It is located in South Asia, bordered by India and Myanmar (Burma). Independent since 1971, the country's agricultural sector provides 18.6 percent of the country's GDP and employment to 45 percent of the total labor force. In recent years, the country's positive economic growth has helped to achieve national food security and some reduction in poverty levels. Both the proportion of underweight children and children with severe stunting have seen rapid and dramatic declines in recent years (Bhagowalia, Menon, Quisumbing, and Soundararajan 2012: 1). However, poverty and malnutrition remain a serious problem for one-fourth of the population who have few assets and are often vulnerable to shocks from disease, economic crises, and extreme weather. Gender disparities are significant. Although 78 percent of employed women work in agriculture (compared to 53 percent of men), their contributions are not fully recognized because of cultural norms that value female seclusion and undervalue female labor. These norms also limit women's ownership of land in their own names (3.5%) and restrict access to and control over other productive assets. The Bangladesh national baseline survey of the Women's Empowerment in Agriculture Index in 2011 found that the domains contributing most to low levels of empowerment were weak leadership and influence in the community (33.8 percent), lack of control over resources (23.6 percent) and lack of control over income (15.0 percent) (Sraboni et al. 2013; Scalise 2009). In this context, providing women income-earning opportunities that are not tied to land or which require geographic mobility could be promising avenues for strengthening women's empowerment.



Technology Dissemination and Design

Fertilizer Deep Placement (FDP) or urea deep placement (UDP),¹ a fertilizer application technology, involves placing a nutrient-dense briquette under the soil surface by hand or with an applicator to stimulate crop growth and productivity. In rice production, urea briquettes are typically used. Urea briquettes are used on 14 additional crops, with promising results. These briquettes are manufactured by locally-produced machines that compress the urea into a briquette or a mixture of nitrogen (N), phosphorous (P), and potassium (K) into a small “NPK” briquette. The urea briquette releases nitrogen into the soil and the NPK briquettes release three nutrients into the soil: nitrogen, phosphorous, and potassium, which foster crop growth. In irrigated transplanted rice production, after the rice is line transplanted, the farmer places the briquettes at the center of four plants underneath the soil near the plants’ roots. Once placed under the soil, these briquettes dissolve and supply key nutrients over the course of a plant’s lifecycle.

On average, using FDP increases rice yields by 15-20 percent compared to other fertilizer application techniques like surface broadcasting. Because the fertilizer is placed under the surface at about 3 to 4 inches (7-10 cm) depth, as opposed to being applied on the surface of fields, there is less nutrient loss through water runoff or volatilization. This means more nutrients can be absorbed to stimulate crop growth and productivity (IFDC 2013b; IFDC n.d.). Since the fertilizer is continuously available to the plant, it receives nutrients when it needs them rather than relying on the farmer to estimate the correct amount and times to broadcast the fertilizers.

The International Fertilizer Development Centre (IFDC) developed FDP through research focusing on improving nitrogen-uptake efficiency (Kawa et al. 2013). IFDC has researched this technology in Bangladesh since 1986. It began trialing the technology with farmers in 1999-2000 and scaling the technology at the farm level in 2007. By 2013, over 2.5 million farmers in Bangladesh were using FDP (IFDC 2013b). Currently, under the USAID-funded Accelerating Agriculture Productivity Improvement (AAPI) project (2010-2016), IFDC is promoting FDP adoption in 22 districts in Bangladesh. Farmers are trained by project staff and extension officers from the Department of Agricultural Extension under the Ministry of Agriculture. This is primarily done through farmer training, motivational meetings, distribution of promotional materials, media campaigns, field days, motivational field visits, crop cuts, demonstrations, trials, and evening educational video viewings called “sky shows.” The shows, held after sunset, are often well attended by men but fewer women are able to go because of their responsibilities in the home. Farmers purchase the key input, *Guti* urea or urea briquettes, from village-level private-sector agro-dealers developed by IFDC, who manage the FDP briquetting machines and then either sell briquettes directly to farmers or through networks of agro-input retailers.

The AAPI project under IFDC has specific gender guidelines and strategies to include women in the project. In 2011, the project used the model village approach to gain women’s participation through pre-existing women’s agricultural groups. The objectives of this approach include maximizing FDP adoption,

BOX I DATA COLLECTION

Research was conducted in Jessore, Bangladesh in August 2015. IFDC was instrumental in coordinating interviews. Two men and two women using FDP were interviewed individually. On average the farmers had used FDP for nearly three years. Two men and one woman who were not using FDP were also interviewed. Seven men and six women participated in group interviews. A woman urea briquette machine owner and distributor was also interviewed. One man and one woman extension officer also offered their perspectives on disseminating the technology to farmers in the region.

¹ FDP and urea deep placement (UDP) refer to the same basic technology. FDP involves point placement of a large fertilizer pellet (up to 3.4 grams by weight) near the root zone of the plant. This reduces fertilizer nitrogen losses, increases crop uptake efficiency of the fertilizer and is an environmentally friendly technology.

promoting men's and women's equitable access to resources and benefits, and introducing demand-driven interventions suitable for each village (Sonia Kutubuddin, pers. comm.).

The AAPI project set a 20 percent target for women's participation in all AAPI activities and in late 2012 the target was increased to 50 percent. Since 2013, with funding and in collaboration with the Walmart Foundation, the project has trained 40,000 women to use FDP for vegetable and fruit production (IFDC 2015a). The sale of the vegetables and fruit is intended to be an income-generating activity for women. The project also aims to increase women's consumption of vegetables and fruits to improve women's nutrition. Women rice producers are also targeted. Women who switched from broadcasting prilled urea to using *Guti* urea through deep placement earned, on average, USD \$55 more per year (IFDC 2013a). Farm households using the improved technology have on average increased their rice production by 139 kg (IFDC 2013a). In 2015, 25 briquetting machines were sold to women with the goal of increasing women's income and empowerment (IFDC 2015b).

Gender analysis

Food Availability and Quality

Men and women reported increased rice production after using FDP. FDP increases rice yields on average by 18 percent (IFDC 2013c), meaning more rice is available to store or sell. Men and women said the surplus rice is marketed rather than stored for household consumption. The interviews suggest that FDP has had little effect on rice consumption in the household. No change in the quality of the rice was reported by either men or women.

Time and Labor

The tasks involved in irrigated transplanted rice production include growing seedlings, land preparation, line transplanting, applying fertilizer, weeding, irrigation, harvesting, and processing. Men and women reported changes in time and labor allocated to each of these tasks when using the FDP fertilizer application method. These changes have different implications for men and women based on their levels of participation in each task. **This makes it difficult to understand which men and which women gain or lose from any reductions in time or labor as a result of FDP.**

A few men, women, and two extension agents reported that more labor is needed for line transplanting when using FDP. In rice production, both men and women participate significantly in line transplanting suggesting that an increase in time spent on this task has implications for both men and women (Roy et al. 2015). Yet, women said less time and labor is needed to apply fertilizer and pesticides when using the FDP method. Men also reported that the labor required for applying fertilizer is reduced, because it is applied one time instead of three to four times. This task is primarily done by men, although women also apply fertilizer (Roy et al. 2015). Applicators² that dispense and put the urea briquettes deep into the soil can save farmers 3-4 days per hectare applying fertilizer compared to placing the briquettes by hand deep under the soil (Hossen et al. 2013). The applicator tool also reduces drudgery, because the farmer does not need to bend over when putting the briquette into the soil (IFDC n.d).



K. Mulligan interviews a woman rice farmer in rural Bangladesh © 2016

² These applicators are available in two forms, an injector-type self-loaded applicator and a single row applicator (Kawa et al. 2013).

Men and women reported spending less time weeding. When urea is applied under the surface, weed growth is reduced (IFDC 2013a). This change is likely to affect both men and women who weed during rice production (Roy et al. 2015). However, since FDP increases rice yields, there is more rice for men and women to harvest. The time spent harvesting, men and women reported, also increased after using FDP. A recent study in Bangladesh shows that UDP use increased labor, primarily for harvesting and processing the higher yield of rice, by 12 days per hectare, amounting to 1.4 additional days for women within the household and 0.9 days for women who were hired (IFDC 2013a).

Men and women who were not using the technology held the perception that if they started to use FDP they would have to hire more laborers to perform certain tasks. Women who were not using FDP said they assumed FDP would require hiring more laborers for transplanting and briquette application. A few men who were not using the technology also held the perception that FDP would require hiring additional labor. Men said they were reluctant to use it because labor is scarce, which would mean paying laborers higher prices.

Income and Assets

Men and women farmers interviewed reported higher yields of rice when using FDP compared to other methods. Those surplus yields, men and women said, are sold. The average gross margin per ha is significantly higher when using FDP in Bangladesh, earning farmers Taka (Tk) 22,089 or USD \$273, compared to the broadcasting method which earned farmers Tk 5,745 or about USD \$71 (IFDC 2013c). Men and women reported that they used additional income to purchase food, including nutritious foods like mutton, hilsa fish, chicken, shrimp, eggs, and milk. The income was also spent on livestock, education, healthcare, and home improvements. A few women reported that none of the income from the surplus rice sold is controlled by them. An unmarried woman said she controlled the income.

While evidence shows that FDP can increase farmers' income and saves fertilizer cost, men reported higher costs associated with certain aspects of FDP than with the broadcasting method. Men said the fertilizer used in FDP costs more, which was a disadvantage. An extension agent said labor costs are also higher because laborers are hired to transplant the rice.

Issues and opportunities

Switching from the broadcast fertilizer application method to FDP may save labor in weeding but may increase labor requirements for fertilizer application and harvesting. Higher yields also mean more labor is needed for harvesting rice. FDP also decreases weed growth, reducing time and labor for weeding. Greater analysis is needed to understand how these shifts in time and labor affect men and women differently because of differences in the division of tasks between men and women on and off the farm. The analysis should also consider men's and women's access to the briquette applicator, which reduces the amount of time needed to apply fertilizer as well as the drudgery of the task (Hossen et al. 2013).

In Bangladesh, women are responsible for the bulk of household work. Their mobility outside the home is limited by this work as well as social norms, which value women's seclusion (Cole et al. 2014). These constraints on women's time and mobility limit women's access to extension information when it is provided far from the home or during times when women are working in the home. For example, women farmers were not attending sky shows, a key pathway for gaining information about FDP,



Women farmers plant rice by hand in rural Bangladesh © K. Mulligan 2016

because the shows were held at times when women could not participate because of responsibilities in the home (Sonia Kutubuddin, pers. comm.). IFDC is using other dissemination strategies like farmer training, field days, and motivational meetings where women's participation has been significant. In the future, gender-based constraints should be considered when designing all information dissemination strategies to ensure men and women have equitable access to information.

Increased rice production through FDP has led to new employment opportunities for traders, processors, and transporters (IFDC 2013a). Development of the key input, fertilizer briquettes, has also increased economic opportunities for men and women. The AAPI project in 2015 sold 25 briquetting machines to women as a means to increase women's income and empowerment. Currently, women make up 15 to 20 percent of the briquette dealers associated with the APPI activity (IFDC 2015c). In the Jessore District, three women purchased fertilizer briquetting machines and 13 women were trained on how to use the machines and manage their fertilizer briquette businesses (IFDC 2015b). While the sale of briquettes is a promising and profitable entrepreneurial activity grown out of increased demand for FDP (IFDC 2015b), the extent to which women directly benefit from this vocation is unknown and further analysis is recommended.

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