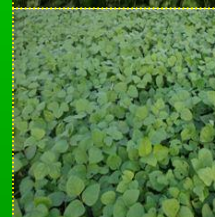
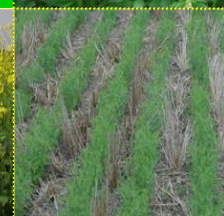


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Pulses De-husking Mill for Smallholders: A Case Study of Commercialization of Machinery for Small Entrepreneurs in Bangladesh

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Introduction

Pulse crops such as lentil, mungbean, blackgram and lathyrus are important in the traditional diet of Bangladesh. However, the production of pulses has been declining over the last two decades. The bulk of the pulse grains are consumed as *dal* and therefore need to be de-husked. Currently farm households de-husk pulses by locally-fabricated rudimentary devices, known as *jata* or *daki*, resulting in a high percentage of crushed (~35% dust), broken or split grain (>90%). Such *dal* receives a lower price than properly milled de-husked full grain. Thus, farmers sell unhusked pulses grain in the local market and ultimately that goes to a large mill for de-husking. The large pulse de-husking mills are mostly located in the bigger cities of Rajshahi and Dhaka division of Bangladesh which are remote from small pulse growers. There is a significant price gap between unhusked pulses at the farm gate and de-husked *dal* at the final point of sale. On the other hand, mechanized de-husking mills where farmers can de-husk pulses and produce quality *dal* for family consumption or to sell at higher price are not commonly available in small towns. The lack of mills to de-husk small quantities of pulses (~5 kg) has also discouraged farmers from growing pulses. These factors are contributing to decline in pulse production by small and marginal farmers. To overcome the problem, the pulse de-husking mill (Mini Mill) was developed in 2009 and commercialized in Bangladesh. The present paper is a case study of a development and commercialisation process for mechanisation of farm operations for smallholders in Bangladesh. In this short paper we describe the Mini Mill, its uses, initial experiences with its promotion and marketing.

Materials and methods

With the ACIAR Project LWR/2005/001 funding support the Mini Mill was fabricated with locally available materials and can be powered an 8 hp diesel engine or electric motor. The main functional parts of the Mini Mill were: the wooden platform, power transmission pulley, feeding chamber, sieve, collecting tray, safety cover, ball bearings, etc. Performance evaluation of the Mini Mill was completed through laboratory tests and on- farm monitoring. A few cycles of improvements were made based on feedback from farmers, operators and manufacturers. Data were also collected to determine the costs of de-husking, efficiency, recovery, and number of runs required for full polish *dal*. From the beginning, Masuda Engineering Workshop (MEW) was engaged to fabricate the first prototype of the Mini Mill with the condition that once the prototype was shown to be successful MEW would produce and market it commercially. It was also agreed that the project would initially support MEW with demonstrations and other promotional activities in several districts. To create demand, the Project procured 5 Mini Mills and demonstrated with 50% price support to the service providers in the project working districts in 2010 through the network of the project partnering organizations (Bangladesh Agricultural Research Institute [BARI], Rangpur and Dinajpur Rural Services [RDRS], ICARDA, CIMMYT). Since 2012, the ACIAR funded

project LWR-2010-080 has provided technical support to MEW for improvement and commercialization of the Mini Mill.

Results and Discussion

As in large scale mills, the Mini Mill for pulses uses an abrasive roller to polish seed. It removes 99% of the seed coat of whole de-husked lentil, and >70% in the case of mungbean and blackgram grains. The recovery rate of the de-husked grain was 85% of the original un-husked. Full polishing of the pulses requires about four runs through the mill (as is the case with large mills). Ex-factory price of the Mini Mill was Tk. 22,000 (US\$300) per unit. Attachment of additional tools at the cost of Taka 16,000 allows for de-husking of chickpea, lathyrus, pigeon pea, and making wheat and maize flour. Since 2010, a total of 25 units of the Mini Mill have been commercially manufactured and marketed by MEW. Since the setup of the initial four Mini Mills in February 2011 to the end of May 2012, a total of 77.5 t of lentil, mung bean and black gram have been de-husked providing service to 1,676 pulse growing farmers in these areas. The maximum de-husking was accomplished in Rangpur (60 t, mostly black gram), followed by Magura (11 t, mostly lentil), Faridpur (5 t, mostly lentil), and Madaripur (2 t, mostly lentil). The maximum number of farmers (757) served using the Mini Mill was in Magura, followed by Rangpur (429), Faridpur (346), and Madaripur (145). The Mini Mill Service Providers have been charging Taka 5 per kg of pulses in Faridpur, Magura and Madaripur districts, but only Tk. 3-4 per kg in Kurigram. Other than Kurigram, the pulses farmers have brought small quantity of pulses (mostly 5 - 25 kg each) for de-husking. In Kurigram, in addition to small pulse farmers, small pulse marketing businessmen have emerged to buy un-husked pulses from local markets of that area and use the Mini Mill for processing and sale to the larger markets at upazila or district level market. The Mini Mill owners have not reported major difficulties yet with operation and maintenance of the mill and no design and manufacturing defects were identified. The demand for Mini Mills in the pulse-growing farmers' community has been increasing to enhance consumption by farmers of their own pulses even a small quantities (e.g. 5 kg). Alternatively, pulse farmers can de-husk their own grain and sell directly to local markets for higher profit.

At the beginning, MEW tried to involve local agricultural machinery dealers to sell the Mini Mill. However, demand was not sufficient to attract dealers to sell Mini Mill through their network. Project-led promotional efforts with MEW e.g., operation, repair and maintenance training; demonstrating the Mini Mill at local agricultural fairs; project -led video display, distribution of leaflets, demonstration during farmers' training programs at BARI and RDRS; awareness raising; etc were the major interventions to commercialize sales of the Mini Mill in Bangladesh. All of the Mini Mills were sold by MEW directly to the small rice and wheat mill owners of the pulses growing areas, based on information support from existing Mini Mill owners (who purchased mills with 50% price support), BARI and RDRS, etc. There is no simple, shortcut approach to commercialize small-scale agricultural machinery in the smallholder community (Haque et al., 2013), however, a multi-dimensional approach e.g., initial price support; demand creation and technical support by project staff and stakeholder institutions (BARI, RDRS, ICARDA, CIMMYT) helped to commercialize the Mini Mill. Further interventions may yet be needed to accelerate and disperse sales more widely in target pulse growing areas.

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