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***Guti* Fertilizer Producers: Sustainability Assessment
(2015 *Boro* Season)**

Accelerating Agriculture Productivity Improvement (AAPI)

USAID-BANGLADESH

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Acronyms

AAPI	Accelerated Agriculture Productivity Improvement
BADC	Bangladesh Agricultural Development Corporation
BCIC	Bangladesh Chemical Industries Corporation
BFA	Bangladesh Fertilizer Association
BMO	Briquette Machine Owner
DAE	Department of Agricultural Extension
DAP	Diammonium Phosphate
DCF	Discounted Cash Flow
FDP	Fertilizer Deep Placement
FMO	Field Monitoring Officer
GM	Gross Margins
IRR	Internal Rate of Return
kg	kilogram
L	liter
MOP	Muriate of Potash
mt	metric ton
NPK	Nitrogen, Phosphorus and Potassium
PBP	Pay-Back Period
Tk	Bangladesh Taka
USAID	U.S. Agency for International Development

***Guti* Fertilizer Producers: Sustainability Assessment**

(2015 Boro season)

Executive Summary

The AAPI project, funded by the U.S. Agency for International Development (USAID), is engaged in a rapid fertilizer deep placement (FDP) technology diffusion program, concurrently building demand for FDP products and a supply system to afford farmers access. *Guti* urea and *Guti* NPK fertilizer supply in the AAPI districts is based upon micro-enterprise level manufacturers. Currently there are 1,261 briquette machines in the 22 AAPI districts. The *Boro* rice season represents the main FDP market and AAPI is being supplemented by a Walmart Foundation-funded activity for women entrepreneurs producing *Guti* products for female vegetable producers.

In the 2014 *Boro* season, there was a marked decline in *Guti* (briquettes) fertilizer demand in some districts covered by the AAPI project. Several briquette machines were not operated, and many only operated at well below the design capacity. Demand for *Guti* products improved in *Boro* 2015, but still many briquette machine owners (BMOs) were under-utilizing their machines or not operating them at all. The sustainable supply of *Guti* urea and *Guti* NPK to meet demand is essential for farmers to benefit from FDP technology. The purpose of this survey was to evaluate the current situation and sustainable growth in *Guti* supply.

A 10 percent random sample survey of 39 BMOs and eight retailers in six districts of Bangladesh covered by the AAPI project (Mymensingh, Jessore, Jhenaidah, Barisal, Madaripur and Jhalokati) was conducted over a three-week period in April/May 2015. Interviews were conducted with the BMOs and retailers following fixed questionnaires. The results were analyzed using Excel® spreadsheets and segmenting the data by *Boro* season machine utilization, by district and by type of BMO.

Results are presented by major characteristics of the BMOs including the gross margins generated by the *Guti* operations. The greater utilization of the machines during the *Boro* season had a significant impact on the gross margins (GM) obtained. BMOs using machines above 100 percent of theoretical capacity (180 mt) during the *Boro* season had almost 10 times the total GM of the lowest utilization BMOs (less than 20 percent utilization). Almost 90 percent of the committed BMOs with the highest briquette machine usage produced NPK *Guti*, compared to less than 50 percent in the mid-range group and less than 25 percent of those in the low usage group. Generally *Guti* NPK produced higher GM (Tk 4/kg) than for *Guti* urea (Tk 2/kg). Also the high machine utilization group of BMOs (more than 100 percent of capacity utilization) had on average more than 50 percent of their sales to retailers compared to 5 percent for the least used machine group. Gross margins for *Guti* are very strongly influenced by the urea purchase price because Bangladesh Chemical Industries Corporation (BCIC) registered dealers have a concessional ex-factory purchase price approximately 10 percent lower and urea accounts for 91 percent of the variable production costs.

The operation of a briquette machine is very profitable if the usage during the *Boro* season is 50 percent or more of the theoretical capacity (180 mt). The survey results show an average GM of 13 percent for *Guti* urea and 19 percent for *Guti* NPK. A financial analysis based on investment in a new unsubsidized briquette machine (Tk 167,200) and average sales of *Guti* urea and *Guti* NPK to farmers and retailers of a total of 180 mt at current prices in year one and with a 10 percent annual growth in *Guti* urea sales and a 20 percent annual growth for *Guti* NPK results in an Internal Rate of Return (IRR) over five years of 114 percent and a pay-back period (PBP) of approximately one year. The loss of gross margin on the mark-up for prilled urea sales (1.3 kg lost sales for each kg of *Guti* urea sales) reduces the IRR to 111 percent and extends the PBP by one month.

BMOs are very optimistic in forecasting *Guti* sales for the 2016 *Boro* season. An increase in *Guti* urea sales of 72 percent is forecast across all six districts and an increase of 76 percent in *Guti* NPK sales in Mymensingh and Jessore districts. The major constraint to increased farmer demand for *Guti* fertilizer is the lack of a suitable applicator that will reduce labor requirements. Second to this is the need for BMOs to become more self-reliant in promoting *Guti* to their

farmer customers and less dependent on the efforts of the AAPI project and the Extension Service (DAE).

The quality of *Guti* NPK is highlighted as another major constraint. Two problems exist; the use of run of pile muriate of potash (MOP), which has a very fine particle size that segregates when mixed with urea and diammonium phosphate (DAP). Imported coarse or granular MOP for *Guti* NPK production will overcome this problem and only add less than Tk 400/mt of *Guti* NPK. The second serious problem is the critical relative humidity of *Guti* NPK, which is only 40 percent, and therefore the product absorbs moisture and has a short shelf-life. This can be overcome by using polyethylene bag liners with a minimum gauge of 100 to 120 microns to prevent moisture ingress to the finished product. A third problem that needs to be addressed is the hand-mixing of urea, DAP and MOP for *Guti* NPK manufacture. A simple, low-cost mechanical mixer design needs to be provided to BMOs to improve the physical mixing and prevent labor unrest and reduce labor requirements.

BMOs keep excellent production and sales records but fail to keep adequate production cost records and AAPI should address this problem in future training.

BMOs who are not using their machines were found to be mainly entrepreneurs with no basic fertilizer marketing experience and large existing business interests and do not deem it worthwhile to enter into *Guti* production. One BMO claimed a lack of demand as the reason for not operating, but a few miles away another BMO was operating his briquette machine at 150 percent of capacity. In each case the non-use or severe under-use of existing machines is due to a reason specific to that individual BMO. The AAPI project needs to find suitable fertilizer dealers interested in buying these machines and facilitating their purchase and ultimate use.

Overall, in the intensive *Boro* rice areas the investment in a briquette machine is highly profitable for owners and for their farmer customers. To date the benefits of FDP have been directed at farmers, so more emphasis needs to be placed on the benefits to BMOs and their retailers and the need to fully utilize machines for peak market demand periods.

The AAPI Walmart Foundation Activity for female entrepreneurs show excellent results for the first year of operation. Out of 25 BMOs established, 16 are already in a profitable position with average *Guti* production and sales of 79 mt per annum each. The remaining nine BMOs have estimated annual *Guti* sales of only 10 mt each. The AAPI project needs to assist these producers ensuring that their market area has sufficient market potential to expand annual sales to at least 50 mt each.

1. Background

The AAPI project, funded by USAID, is engaged in a rapid fertilizer deep placement (FDP) technology diffusion program, concurrently building demand for FDP products and a supply system to afford farmers access. *Guti* urea and *Guti* NPK fertilizer supply in the country is based upon micro-enterprise level manufacturers that are located in areas of close proximity to demand areas, spaced according to a catchment area estimation per briquette producer (1,000 hectares rice area per machine) in a specific rice season. Availability and supply of quality *Guti* products is of major concern for sustaining FDP technology. To date there are 1,261 *Guti* producers in Bangladesh in the AAPI districts.

Guti fertilizer suppliers include, among others, Bangladesh Chemical Industries Corporation (BCIC) registered dealers, sub-dealers and individual entrepreneurs that invest in briquette making machines; women *Guti* urea dealers comprise 15-20 percent of the total number of dealers under AAPI, including women entrepreneurs being supported under the AAPI Walmart Foundation Activity. Most *Guti* producers both sell briquettes to farmers directly (retail) and sell briquettes to a network of local fertilizer and agro-input retailers (wholesale). Many suppliers are only serving the *Guti* fertilizer market, and not participating in fertilizer sales in a broader context. Moreover, most do not appear to be active in growing their business operations, nor working to develop embedded or associated services for farmers related to FDP or balanced fertilization. Furthermore, even at the height of the *Boro* season in AAPI areas, which is the highest demand period for FDP, it has been observed that not all briquette machine operators (BMOs) are active, while many of them are manufacturing *Guti* at less than full capacity. FDP cannot be sustained without a robust briquette supply chain; therefore, assessing issues with, and options for, the expansion and sustainability of the fertilizer briquette supply chain is an important step to ensuring the long-term viability of FDP in the country.

Individual investments in briquette machines, while not very high, are characterized by highly seasonal demand and production patterns that leave machines idle for a good part of the year. It is therefore important to utilize the machines to their full potential to meet peak demand.

A key concern regarding the diffusion of FDP technology is the productivity and sustainability of *Guti* fertilizer dealers and *Guti* supply. Sustained access to a high-quality supply of *Guti* fertilizer products is essential. Understanding the factors that impact the *Guti* urea business and alleviation of constraints is needed; these likely include, but are not limited to, issues with farmer demand and briquette manufacturing operators' (BMO) marketing approaches, policy-related constraints, and BMO profitability vis-à-vis other business lines. Supply of high-quality *Guti* urea is a key concern and market growth through product differentiation to include NPK *Guti* and use of *Guti* urea/NPK *Guti* in other crops may impact the sustainability and profitability of BMOs. Specific issues in the *Guti* supply chain as they are currently observed include market-related issues, technical issues and identification of reasons for non-use of briquette machines by certain entrepreneurs.

Table 1 illustrates the under-utilization of briquette machines in *Boro* season 2015 for five districts that were selected for this survey.

Table 1. Number and Use of Briquette Machines for Five Districts in Boro Season 2015

District	HYV+ Hybrid Area Boro 2014 (Ha)	Number of Machines in District	Number of Machine Produced GUTI in Boro 2015	% of Machine Produced GUTI in Boro 2015	Production of GUTI Urea (MT)	Production of NPK GUTI (MT)	Total Production of GUTI (Urea+NPK) (MT)	Machine Utilization as percent of theoretical
Mymensingh	261,960	138	136	98.55%	16,695	1,847	18,542	75%
Jessore	149,925	121	99	81.82%	11,067	1,815	12,882	58%
Jhenaidah	82,638	56	53	94.64%	8,152	2,165	10,317	102%
Barisal	40,718	58	31	53.45%	3,891	187	4,078	39%
Madaripur	40,000	41	34	82.93%	3,832	81	3,913	53%
Jhalokati	8,400	24	8	33.33%	773	10	783	18%

The *Boro* season rice represents the largest FDP market. Mymensingh, Jessore and Jhenaidah districts are representative of extensive *Boro* rice areas and in 2015 had the largest number of briquette machines, their highest utilization and the highest production of *Guti* urea and *Guti* NPK. Barisal and Madaripur districts with smaller areas of rice in the *Boro* season have less machines, lower utilization in Barisal and less production of briquettes. Jhalokati district, with

the smallest area of *Boro* season rice has the lowest number of briquette machines, the lowest utilization and the lowest production.

This study was conducted to assess *Guti* BMO's operations, factors which impact sustainability and productivity levels, and measures to alleviate constraints, improve marketing and associated services, and address supply chain weaknesses. The study reviews the sustainability and productivity of the *Guti* fertilizer supply system, identifies constraints and defines solutions with an action plan, formulating actions that can be taken by the AAPI project in the short (and potentially medium) terms and by the Bangladesh Fertilizer Association (BFA) (and potentially the Government of Bangladesh) in the medium and long terms.

2. Method

A random survey of 39 *Guti* producers in the districts of Mymensingh, Jessore, Jhenaidah, Barisal, Madaripur and Jhalokati was undertaken by an IFDC Agribusiness consultant during a three week period in April 2015. In addition, a non-random sample of eight *Guti* retailers in the same districts was completed along with informal interviews with farmers when occasions arose.

The AAPI project field monitoring officers (FMOs) collect *Guti* production data from all BMOs and owners of briquette machines in all AAPI areas. This data is collated at the AAPI headquarters office. In order to segment the producers into machine utilization groups, a theoretical *Boro* 2015 production season was calculated at 180 mt per machine. The basis for this was 3.6 mt per day (450 kg per hour for 8 hours) for 50 days. The production of each producer was expressed as a percent of the theoretical production and then the dealers sorted by ascending order of the percent production.

The sorted data for each of the districts was then split into four categories:

1. Zero production in *Boro* season 2015.
2. Less than 20 percent of theoretical production.

3. Between 20 and 100 percent of theoretical production.
4. More than 100 percent of theoretical production.

Samples of approximately 10 percent of each of the categories were then randomly selected for surveying, plus spares for replacements when needed. Table 2 shows sample numbers by region and machine utilization classification.

Table 2. Total and Sample Population Numbers

	Not used	Under 20%	20%-100%	over 100%	Total		Not used	Under 20%	20%-100%	over 100%	Total	% sample
Mymensingh	2	6	109	21	138		0	1	10	1	12	8.70%
Jessore	21	10	64	25	120		3	2	4	0	9	7.50%
Jhenaidah	3	3	25	25	56		0	1	4	1	6	10.71%
Barisal	27	3	18	10	58		1	1	3	1	6	10.34%
Madaripur	7	1	33	0	41		1	0	2	0	3	7.32%
Jhalokati	14	3	5	0	22		1	1	0	1	3	13.64%
Total	74	26	254	81	435		6	6	23	4	39	8.97%

As can be seen in Table 2, the highest number of unused machines was in Jessore, Barisal and Jhalokati districts. The reasons for non-use of machines were to be determined from the six interviews of non-machine use dealers.

The distribution of the sample population in terms of *Boro* 2014 production of *Guti*, both urea and NPK, is illustrated in Figure 1. There was a wide variation in production per dealer in group 3 (20-100 percent machine utilization). However most dealers were above the 50 percent machine utilization rate.

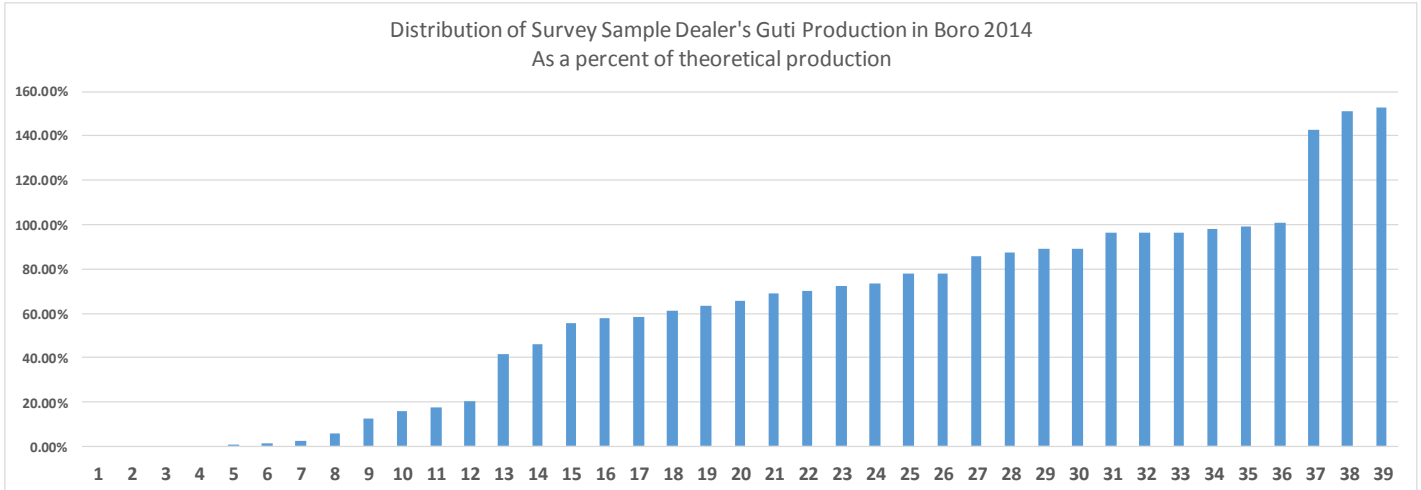


Figure 1. Boro Season 2015 Production Distribution for 39 Dealers in Sample

Retailer selection was made in the field by requesting names of retailers in a locality served by the surveyed dealers. Time constraints reduced the number of interviewed retailers to eight, located in the following upazilas: Bhaluka, Phulpur, Mymensingh Sadar, Jessore Sadar, Avoyagar, Moheshpur and Banaripara.

3. Survey Questionnaires

Two questionnaires were developed: one for *Guti* producers and one for retailers. These are presented in Annex 1 and Annex 2. For producers these questionnaires covered gender, education and business experience, *Guti* urea and *Guti* NPK production in 2014, 2015 and forecast production and sales for 2016. Other agro-input sales activities, including prilled urea sales, were recorded. In addition, machine and associated investments, history and machine operations were recorded and variable costs of production broken down into raw material costs, labor, packaging and machine maintenance. Details of marketing and promotion programs were explored and the dealers’ constraints in *Guti* manufacture and marketing together with sales forecasts for 2016.

Similar questions were asked of retailers concentrating primarily on *Guti* urea and *Guti* NPK sales in *Boro* seasons 2014 and 2015 together with forecasts for *Boro* 2016. In addition, information was gathered on prilled urea sales, other agro-input sales activities and marketing and promotion activities for *Guti* products.

4. Survey Data Accuracy

All dealers interviewed had maintained production and sales records for *Guti* and the production records for *Boro* 2015 agreed with the data that was earlier recorded by the FMOs for input into the database for total producers. In the Mymensingh and Jessore districts, the standard of recordkeeping was higher than in other districts.

Production cost records were less complete except for the purchase prices for urea, DAP and MOP and the *Guti* sales prices to retailers and farmers. For example, very few dealers kept details of labor costs or machine maintenance costs. Labor cost per 50-kg bag of *Guti* had to be calculated from the production per day records and the unit labor cost. Some producers paid labor on a contract basis of a certain amount of Taka per bag and others on a fixed daily rate basis. In the Barisal and adjoining districts the former contract payments were more common and related to shortages of casual labor.

Machine maintenance costs for grease, oil and repairs were the most difficult to obtain. A standard cost of Tk 1200 for oil was applied for all producers for the *Boro* season in addition to the small amounts estimated for grease. Repair costs, which were infrequent, were more accurately recalled by dealers.

Bagging costs were generally negligible as the dealers reused the urea bags for *Guti*. Where dealers sold small packs of *Guti* the cost of these polyethylene bags was included, but they represented a very small cost item.

Marketing and promotion costs were minimal and had to be estimated from statements such as, “We did ‘miking’ three times.” Miking is the practice of bicycle or motorized loudspeaker advertising in a local area.

5. Segmented Analytical Results

Excel® spreadsheets were used to sort data first by machine utilization then by class of dealer and then by district to examine differences in characteristics of the dealers. Averages calculated exclude zero data.

Table 3 data show that the most significant differences between the three dealer groups arranged by machine utilization are related to prior experience as agro-dealers, the larger range of agro-input products sold, the total investment in *Guti* production and the number of retailers supplied. The highest machine utilization group characteristics reflect a full commitment to agro-input sales compared to the lowest machine utilization group where almost 40 percent of the dealers did not sell any other fertilizer at all. The committed agro-dealers also started *Guti* production in 2006/07 before the other two groups and invested more in *Guti* production before subsidized machine prices were introduced.

Table 3. Dealer Characteristics Sorted by Machine Utilization 2015 Boro Season

Machine Utilization Boro 2015	< 20%	20%-100%	>100%
Sample Number	9	21	9
Male Producers (%)	88.90%	90.50%	100.00%
Education Grade *	2.30	2.00	1.90
Agrodealer before (%)	55.60%	80.90%	77.80%
Agrodealer years	17.60	13.50	18.40
BCIC Dealers (%)	22.20%	47.60%	33.30%
Fertilizer Sales % of dealers	66.70%	85.70%	88.90%
Seeds Sales % of dealers	33.30%	57.10%	44.40%
Pesticides Sales % of dealers	44.40%	66.70%	77.80%
Tools Sales % of dealers	0.00%	42.90%	22.20%
Other Sales % of dealers	22.20%	33.30%	33.30%
Number of machines	1.00	1.14	1.33
Number of rollers	2	1.9	2
Make NPK	22.20%	47.60%	88.90%
Machine investment	34,500	37,467	48,667
Supplementary investment	667	10,150	22,667
Guti Urea production 2014/dealer	22	75	149
Guti Urea production 2015/dealer	16.00	117	199
Guti Urea production 2016F/dealer	35.00	185	322
Guti NPK production 2014/dealer	1	16	17
Guti NPK production 2015/dealer	4	33	60
Guti NPK production 2016F/dealer	8	55	111
Guti Machine utilization 2015	6.50%	69.90%	136.20%
Percent Guti Sales to Retailers/dealer	5.00%	38.50%	51.50%
Total Guti Gross Margin 2015 Tk./dealer	69,029	361,811	648,698

*Education levels recorded as: 1-Primary; 2-Secondary; 3-Tertiary.

The greater utilization of the machines during the *Boro* season had a significant impact on the gross margins (GM) obtained. BMOs using machines above 100 percent of theoretical capacity during the *Boro* season had almost 10 times the total GM of the lowest utilization BMOs. Details of the GM analysis are given in section x. Almost 90 percent of the committed BMOs with the highest briquette machine usage produced NPK *Guti* compared to less than fifty percent in the mid-range group and less than 25 percent of those in the low usage group. Generally *Guti* NPK produced higher GM per kilogram than for *Guti* urea.

Table 4 illustrates the main characteristics of the dealer types. BCIC dealers were the first to produce *Guti* starting in 2008, three to four years before the other registered and unregistered dealers (retailers). They produced more *Guti* in 2015 Boro season and obtained the highest average GM. BCIC dealers receive allocations of urea fertilizer from the factories at lower prices than other dealers, and as raw material costs are the largest cost item in *Guti* manufacturing, this provides the reason for the higher GM. There is an apparent anomaly in the GM obtained by the small unregistered dealer group.

Table 4. Dealer Characteristics Sorted by Dealer Type 2015 Boro Season

Dealer Type	BCIC	Registered	Non-Registered
Number	16	16	7
Male %	93.70%	93.70%	86%
Education level	2.25	1.81	2.14
Agrodealer before %	87.50%	75.00%	42.90%
Years as Agrodealer	19.2	14.6	7
BCIC dealer (number)	16	0	0
Fertilizer Sales % of dealers	93.70%	81.20%	57.10%
Seeds Sales % of dealers	62.50%	56.20%	0.00%
Pesticides Sales % of dealers	62.50%	81.20%	28.57%
Tools Sales % of dealers	43.70%	25.00%	0.00%
Other Sales % of dealers	31.20%	37.50%	14.29%
Started <i>Guti</i> production	2008	2011	2012
No. of machines	1	1	1
No. of rollers	2	1.88	2
<i>Guti</i> NPK production % of dealers	36.36	56.20%	57.10%
Average Machine Investment Tk	35,682	34,129	39,043
Supplementary Investment Tk	7817	9,625	26,667
Production <i>Guti</i> Urea 2014/dealer (mt)	100	68	57
Production <i>Guti</i> Urea 2015/dealer (mt)	149	101	104
Production <i>Guti</i> Urea 2016 F./dealer(mt)	237	185	170
Production <i>Guti</i> NPK 2014/dealer (mt)	11	18	17
Production <i>Guti</i> NPK 2015/dealer (mt)	45	42	30
Production <i>Guti</i> NPK 2016F/dealer (mt)	76	75	58
<i>Guti</i> urea sales to retailers 2015 (%)	51%	44%	55%
Total <i>Guti</i> Gross Margin 2015/dealer (Tk)	421,974	322,514	443,593
Total <i>Guti</i> Gross Margin 2015 for 6 non-registered dealers(Tk)			300,534

The smaller sample size and the fact that one of these unregistered dealers had above average production and sales of *Guti* account for the high average GM for this group. The remaining

unregistered dealers had low production and as shown in in Table 4 had only average total GMs from *Guti* of 300,500 Taka per dealer.

The segmented average sample data by district, presented in Table 5, appears to have some anomalous results with Jhenaidah and Jhalokati district dealers obtaining the highest GM per dealer. However, these can be explained by consideration of how the high GMs were obtained by both groups together with other characteristics.

Table 5. Dealer Characteristics by District

District	Mymensingh	Jessore	Jhenaidah	Barisal	Madaripur	Jhalokati
Sample Number	12	9	6	6	3	3
Male Producers (%)	100.00%	77.78%	100.00%	100.00%	66.67%	100.00%
Education Grade	2.17	1.89	2.17	2.33	2.00	1.33
Agrodealer before (%)	58.33%	66.67%	100.00%	83.33%	66.67%	100.00%
Agrodealer years	11.58	14.67	20.50	16.50	12.67	19.67
BCIC Dealers (%)	58.33%	16.70%	66.70%	33.30%	33.30%	0.00%
Fertilizer Sales % of dealers	91.67%	55.56%	100.00%	83.33%	66.67%	100.00%
Seeds Sales % of dealers	25.00%	22.22%	83.33%	66.67%	66.67%	100.00%
Pesticides Sales % of dealers	58.33%	33.33%	100.00%	66.67%	66.67%	100.00%
Tools Sales % of dealers	33.33%	11.11%	33.33%	16.67%	33.33%	66.67%
Other Sales % of dealers	16.67%	22.22%	16.67%	66.67%	33.33%	66.67%
Number of machines	1.17	1	1.33	1.17	1	1
Number of rollers	2.00	2	2	2	2	2
Make NPK	58.33%	66.67%	66.67%	33.33%	0.00%	0.00%
Machine investment	44,708	38,700	50,250	30,167	26333	29,667
Supplementary investment	4,091	16,667	19,667	16,667	0	0
Guti Urea production 2014/dealer	79	74	105.50	75.00	113	54
Guti Urea production 2015/dealer	141	74	139	113	124	88
Guti Urea production 2016F/dealer	218	149	237	194	225	150
Guti NPK production 2014/dealer	11	21	26	3	0	0
Guti NPK production 2015/dealer	30	45	80	1	0	0
Guti NPK production 2016F/dealer	52	80	110	1	0	0
Guti Machine utilization 2015	87.93%	56.19%	99.12%	63.24%	68.90%	49.07%
Percent Guti Sales to Retailers/dealer	54.00%	55.00%	50.00%	68.00%	29.00%	39.00%
Total Guti Gross Margin 2015 Tk./dealer	370,678	366,548	548,883	224,626	313,380	450,727

Jhenaidah dealers have the most experience as agro-dealers, the highest proportion of BCIC dealers and all of them sell other fertilizers and pesticides and over 80 percent also sell seeds. They had the highest machine utilization in *Boro* 2015 and the highest average *Guti* NPK production (80 mt) and almost the highest *Guti* urea production (139 mt) during the 2015 *Boro* season. As presented in Table 7 these dealers had high *Guti* urea and *Guti* NPK gross margins

per kilogram. The high urea GM was obtained by having a below average variable cost arising from the lower BCIC dealer price for urea.

A similar situation also applied to *Guti* NPK. Combined with the highest average *Guti* NPK production per dealer this contributed to the high average GM for Jhenaidah dealers.

The three Jhalokati dealers in the sample only produced *Guti* urea and only had a 49 percent machine utilization but sold over 60 percent of the *Guti* urea directly to farmers, enabling them to obtain the highest GM per kilogram for *Guti* urea in spite of having slightly above average urea purchase costs because none of them are BCIC dealers. All the three dealers were agro-dealers before starting *Guti* production and sales and as with the Jhenaidah dealers sell a range of agro-inputs to farmers.

Sales through retailers, at 50 percent or more of total sales increase the market reach of individual BMOs but reduce the average GM obtained because of the lower wholesale prices to retailers.

6. Variable Production Costs and Gross Margins for *Guti*

Details of the variable production costs by district for both *Guti* urea and NPK are provided in Table 6. The cost of the fertilizer raw material is the largest cost item accounting for 94.2 percent and 95.8 percent of total variable costs for *Guti* urea and *Guti* NPK, respectively. It should be noted that all *Guti* NPK producers use the same ratio of 50 percent urea, 30 percent DAP and 20 percent MOP. This *Guti* NPK is used on both rice and vegetables.

The next largest cost item is labor at approximately Tk 0.5/kg, with a range from Tk 0.4-0.7/kg. Most *Guti* producers paid for labor on a daily rate basis, but in areas where casual labor is in short supply (such as Barisal) labor contracts of a certain amount per bag are used. Also of particular note are the lack of bagging expenses and marketing/promotion expenses. All producers of *Guti* reuse urea bags for bagging *Guti* urea and urea, DAP and MOP bags for *Guti*

NPK. One kilogram and five kilogram polyethylene bags are used for small sale quantities of both *Guti* urea and *Guti* NPK, and these costs account for the bagging costs recorded. No producers of *Guti* NPK use moisture resistant polyethylene liners for 50-kg bags, which creates a short shelf-life problem for these products (see Section 12 for details).

Marketing and promotion expenses are minimal for virtually all producers. *Guti* shop signs and notice boards, mainly supplied by the AAPI project, are displayed but otherwise little is done by the majority of dealers to promote the use of *Guti*. A small proportion of dealers, the more aggressive marketers, use some “miking” to locally advertise *Guti* urea and *Guti* NPK availability and benefits. This is a fairly low-cost activity and most producers rely on the AAPI project and Department of Agricultural Extension (DAE) support to promote *Guti* through demonstrations, field days and farmer meetings.

Briquette machine running and maintenance costs per kilogram of *Guti* are low, approximating only Tk 0.23/kg. Thirty-three of the 39 *Guti* producers operate diesel motors and only six have electric motors. Diesel fuel costs average around Tk 70/L in all areas, and oil and grease costs are also fairly standard. However, the standard of recordkeeping on all operating costs was either non-existent or minimal. The data recorded are, at best, informed estimates after discussions with the producers. This is an area of recordkeeping that needs to be improved.

Table 6. Variable Production Costs for Guti Urea and Guti NPK by District

Producers / Districts	All	Mymensingh	Jessore	Jhenaidah	Barisal	Madripur	Jhalokati
Variable Cost Item	Taka per Kg of Guti Urea						
Prilled Urea Cost (Tka/kg)	15.32	15.63	15.96	14.97	15.32	15.15	15.40
Labor cost per kg	0.50	0.41	0.46	0.55	0.71	0.39	0.50
Diesel cost per kg	0.22	0.25	0.19	0.16	0.20	0.08	0.18
Electricity cost per kg	0.05	0.01	0.00	0.01	0.04	0.01	0
Oil and Grease Cost (Tka/kg)	0.01	0.01	0.01	0.01	0.01	0.005	0.01
Packaging cost per kg	0.05	0.01	0.03	0.06	0.06	0.00	0.01
Marketing cost per kg	0.03	0.03	0.03	0.01	0.01	0.002	0.00
Warehouse rent (Tka per Kg)	0.08	0.02	0.00	0.00	0.00	0	0
Total cost (Tka/kg)	16.26	16.37	16.67	15.75	16.35	15.64	16.09
Producers / Districts	All	Mymensingh	Jessore	Jhenaidah	Barisal	Madripur	Jhalokati
	Taka per Kg of Guti NPK						
Urea Cost per kg of NPK Guti	7.86	7.93	8.06	7.48	7.70		
DAP cost per kg of NPK Guti	7.64	7.35	8.12	7.21	8.10		
MOP cost per kg of NPK Guti	2.86	2.83	2.95	2.79	2.82		
Total Ingredient cost	18.36	18.10	19.13	17.49	18.62		
Labor cost per Kg	0.47	0.47	0.42	0.62	0.40		
Diesel cost per Kg	0.22	0.23	0.20	0.14	0.23		
Electricity cost per Kg	0.02	0.01	0.00	0.01	0.00		
Oil and Grease Cost per Kg	0.01	0.01	0.01	0.01	0.01		
Packaging cost per Kg	0.04	0.02	0.01	0.03	0.06		
Marketing cost per Kg	0.04	0.00	0.04	0.01	0.02		
Total cost (Tka/kg)	19.16	18.84	19.81	18.30	19.34		

7. Gross Margins for Guti

Guti urea provides an average GM of 13.05 percent as shown in Table 7 and *Guti* NPK an average GM of 19.36 percent. The highest *Guti* urea GM obtained by the three producers in Jhalokati was realized by having the highest sale price and slightly below average costs. The high price was obtained because of the high proportion of sales to farmers. Jhenaidah producers gained from BCIC urea prices. The differences in gross margins between dealer classifications are summarized in Table 8.

Table 7. Summary of Guti Urea and Guti NPK Gross Margins by District

	Average	Mymensingh	Jessore	Jhenaidah	Barisal	Madaripur	Jhalokati
Guti Urea	Taka per kg						
Average revenue/kg	18.70	18.63	18.17	18.78	19.01	18.12	19.48
Average Variable Cost/kg	16.26	16.37	16.67	15.75	16.35	15.64	16.09
Average Gross Margin/kg	2.44	2.26	1.50	3.03	2.66	2.48	3.39
Average GM percent	13.05%	12.13%	8.26%	16.13%	13.99%	13.69%	17.40%
Guti NPK							
Average revenue/kg	23.65	23.57	23.68	23.2	24.17	-	-
Average Variable Cost/kg	19.07	18.84	19.81	18.3	19.34	-	-
Average Gross Margin/kg	4.58	4.73	3.87	4.90	4.83	-	-
Average GM percent	19.36%	20.07%	16.34%	21.12%	19.98%	-	-

* Weighted average revenue from sales to farmers and retailers.

Table 8. Summary of Guti Gross Margins by Dealer Classification

	Average	BCIC	Registered	Unregistered
Guti Urea	Taka per kg			
Average revenue/kg	18.70	18.22	18.69	19.13
Average Variable Cost/kg	16.26	16.37	16.67	15.75
Average Gross Margin/kg	2.44	1.85	2.02	3.38
Average GM percent	13.03%	10.15%	10.81%	17.67%
Guti NPK				
Average revenue/kg	23.65	23.83	23.06	23.14
Average Variable Cost/kg	18.98	18.84	19.81	18.3
Average Gross Margin/kg	4.67	4.99	3.25	4.84
Average GM percent	19.73%	20.94%	14.09%	20.92%

Differences in the cost of urea account for much of the direct production cost differences. The advantages for BCIC dealers are illustrated in Table 9. Both registered and unregistered dealers are penalized on urea purchase prices by the concession on urea pricing to BCIC dealers. The unregistered dealers make up for this with higher *Guti* fertilizer prices to farmers. In the past concessional pricing for urea was provided to all *Guti* manufacturers but the system was unworkable and abandoned because ownership of a briquette machine did not guarantee that the concessional-priced urea would be converted to *Guti*.

Table 9. Guti Ingredient Costs by Dealer Classification

	Average Raw Material Costs per kg*		
	BCIC Dealers	Registered Retailers	Unregistered Retailers
Urea	15.02	15.79	15.98
DAP	24.25	26.79	24.50
MOP	13.85	14.68	14.20

* Including transport to store.

8. Gross Margin Comparisons of Guti and Prilled Urea

Obviously, the gross margins obtained from *Guti* urea production are very attractive at Tk 2/kg and even more so from *Guti* NPK at up to Tk 4/kg. However, when farmers accept the recommendations for *Guti* urea on rice then they may use approximately two-thirds of the nitrogen rate compared to using prilled urea. Comparisons between *Guti* and prilled urea GMs illustrate the differences in gross margin generation in Table 10. The gross margins for prilled urea used in the comparisons are based only on the purchase price less the sales price.

The survey data indicate that on average for each kilogram of *Guti* urea sold there is an additional GM of Tk 0.5 compared to selling 1.5 kg of prilled urea. The incentive to produce *Guti* urea is therefore present even though the total sales of urea may be lower for a given market demand.

Table 10. Comparisons of Guti and Prilled Urea Equivalent Gross Margins

Per Dealer	Average	Mymensingh	Jessore	Jhenaidah	Barasil	Madaripur	Jhalokati
	Taka per kg						
<i>Guti</i> Urea Sales (mt)	120.67	141	74	139	113	124	133
GM <i>Guti</i> Urea/kg (Tk)	2.44	2.26	1.50	3.03	2.66	2.48	3.39
Total Gross Margin (TK)	294,427	318,660	111,000	421,170	300,580	307,520	450,870
Urea sales (mt)	842.00	4181	223	282	214	139	15
GM urea /kg (Tk)	0.91	0.92	0.6	1.12	0.48	1.53	0.67
Total Urea GM (Tk)	766,220	3,846,520	133,800	315,840	102,720	212,670	10,050
GM from 2kg <i>Guti</i> Urea(Tk)	4.88	4.52	3.00	6.06	5.32	4.96	6.78
GM from 3 kg Urea (Tk)	2.73	2.76	1.80	3.36	1.44	4.59	2.01
<i>Guti</i> advantage per kg (Tk)	1.08	0.88	0.60	1.35	1.94	0.19	2.39

Gross Margins from *Guti* for Retailers

Most BMOs sell both directly to farmers and to retailers. This strategy provides additional market reach to farmers. One might expect however that there is little incentive for retailers to replace urea sales with lesser quantities of *Guti* urea but this is not the case. Table 11 summarizes data collected from the eight retailers interviewed, and Table 12 shows the gains in GM for retailers from the sale of *Guti* urea compared to prilled urea.

The retailers were almost all committed agro-dealers selling a complete range of agro-inputs and a quarter of them also selling other items. The purchase prices for *Guti* urea ranged from Tk 17.4-20/kilogram and retailed for between Tk 18/kg and Tk 22/kg. The average mark-up per kilogram was Tk 0.84/kg. For *Guti* NPK the equivalent average prices and GMs were 23.2 and 24.4 with a mark-up of Tk 1.2/kg. The average mark-up for prilled urea was Tk 0.5/kg. A comparison of the margins between one kilogram of *Guti* urea and 1.33 kg of prilled urea presented in Table 12 shows an average benefit from each sale of one kg of *Guti* urea of Tk 0.18. It is therefore profitable for retailers to sell *Guti* urea. The increasing demand for *Guti* both urea and NPK needs to be addressed by retailers.

Table 11. Retailer Characteristics and Data on Sales of Guti and Prilled Urea

Retailers	Average	Maximum	Minimum
Number	8	1	1
Male %	100.00%	100.00%	100.00%
Education level	1.9	3	1
Registered Retailer	100.00%	100%	100%
Selling Guti since	210	2001	2014
Sell Guti Urea	100%	100%	100%
Sell Guti NPK	63%	100%	0%
Fertilizer Sales % of retailers	100.00%	100%	0%
Seeds Sales % of dealers	75.00%	100%	0%
Pesticides Sales % of dealers	100.00%	100%	100%
Tools Sales % of dealers	63.00%	100%	0%
Other Sales % of dealers	25.00%	100%	0%
Guti Urea Sales Boro 2015 (mt)	17.20	2000.00	2.00
Purchase price of prilled urea (Tk/kg)	18.06	20.00	17.40
Selling price of Guti Urea (Tk/kg)	18.90	22.00	18.00
Mark-up on Guti Urea (Tk/kg)	0.84	2.00	0.40
Total Mark-up from Guti Urea (Tk) for Boro 2015	9,875	40,000	1000.00
Guti NPK Sales Boro 2015 (mt)	1.89	5.00	0.10
Purchase price of Guti NPK (Tk/kg)	23.2	22.00	24.00
Selling price of Guti NPK (Tk/kg)	24.4	24.00	25.00
Mark-up on Guti Urea (Tk/kg)	1.2	2.00	1.00
Total Mark-up on Guti NPK (Tk) for Boro 2015	2,467	7,000	100
Urea Sales Boro 2015 (mt)	57.8	150.00	3.50
Purchase price of prilled urea (Tk/kg)	15.8	16.00	15.50
Selling price of prilled urea (Tk/kg)	16.30	17.00	15.70
Mark-up on prilled Urea (Tk/kg)	0.50	1.00	0.20
Total Mark-up prilled urea (Tk)	25,453	93,750	3,000

Table 12. Retailer Gains from Selling Guti Urea Compared to Prilled Urea

	Average	Maximum	Miniumum
GM from 1 kg Guti urea (Tk)	0.84	2.00	0.40
GM from 1.33 kg of prilled urea (Tk)	0.67	1.33	0.20
Net benefit on GM from Guti Urea (Tk)	0.18	0.67	0.20

9. Demand for *Guti*

BMOs and retailers were asked for *Guti* sales data from both *Boro* seasons 2014 and 2015 and for their estimated sales forecasts for *Boro* 2016. These are presented in Table 13 by district.

Table 13. Actual and Forecast Sales of *Guti* by District 2014-2016

District	Mymensingh	Jessore	Jhenaidah	Barasil	Madaripur	Jhalakati
	Mt					
Guti Urea production 2014/dealer	79	60	106	75	113	54
Guti Urea production 2015/dealer	141	74	139	113	124	133
Guti Urea production 2016F/dealer	218	149	237	194	225	225
Forecast Growth rate 2016 (%)	54.81%	101.58%	71.02%	71.94%	81.45%	69.81%
Guti NPK production 2014/dealer	11	21	26	2.83	0	0
Guti NPK production 2015/dealer	30	45	80	1.00	0	0
Guti NPK production 2016F/dealer	52	80	110	1.17	0	0
Forecast Growth rate 2016 (%)	73.81%	77.04%	38.08%	16.67%		

There are optimistic forecasts for *Guti* urea sales in all districts and strong growth forecast for *Guti* NPK in Mymensingh, Jessore and Jhenaidah. None of the BMOs in Madaripur or Jhalokati districts showed any interest in *Guti* NPK due to either perceived difficulties in production, lack of labor and/or lack of demand. The increased growth in *Guti* NPK forecast in other areas is arising from the demand by rice farmers due to the field results obtained.

The most serious demand constraint reported by BMOs is the inadequacy of existing briquette application equipment for farmers. The plunger applicator and the push applicator are considered inadequate, and a mechanized applicator will enhance the demand by farmers for FDP.

10. Return on Investment

It is obvious from the gross margins obtained that *Guti* production is very profitable for BMOs and profitable for retailers. A simple discounted cash flow (DCF) analysis to calculate the Internal Rate of Return (IRR) for BMOs is presented in Table 14 together with a Depreciation

schedule, a Profit and Loss statement and an IRR calculation after accounting for the loss of prilled urea sales. All of these calculations are made on the basis that investment in an unsubsidized briquette machine and the cash flows from its production are incremental to the main agro-dealer business, and no account has to be made for the existing fixed cost overheads of the business. Assumptions used in the DCF are:

- A. New briquette machine investment Tk 167,2000.
- B. Additional investment based on survey average Tk 10,686.
- C. 100 percent of theoretical briquette machine utilization for the *Boro* season.
- D. Average sales prices for 2015 to farmers and retailers.
- E. A 10 percent per annum increase in *Guti* urea sales per BMO.
- F. A 25 percent increase in *Guti* NPK sales per BMO.
- G. Average production costs for 2015.
- H. Additional working capital based on 1 month's raw material costs.
- I. Briquette machine life of 5 years.

Under these assumptions there is an excellent IRR of over 100 percent both before and after deduction of prilled urea income loss. The pay-back period is approximately 12 months. After 5 years the machine utilization for the *Boro* season is 86 days or 172 percent of theoretical capacity. This would entail starting production earlier and storing *Guti* for an additional month to meet the increased demand and purchase of a second machine in year six. Halving the sales assumptions still provides an IRR of over 90 percent. The investment in *Guti* briquette machines is a very attractive investment for fertilizer dealers in Bangladesh. Why then have machines been purchased but lie unused in 2015?

Table 14. Depreciation Schedule, Profit and Loss (P&L) Statement and Investment Analysis

Depreciation Schedule							
Year	0	1	2	3	4	5	Book Value
Machine Investment	167,200	25,080	21,318	18,120	15,402	13,092	74,188
Other Investment	10,868	1,087	978	880	792	713	6,418
Total Depreciation	178,068	26,167	22,296	19,001	16,195	13,805	80,605
Profit and Loss							
Sales Guti Urea Mt		66	73	80	88	97	
Price per Kg to farmers		19.01	19.01	19.01	19.01	19.01	
Revenue 1		1,254,505	1,380,126	1,518,139	1,669,952	1,836,948	
Sales Guti Urea Mt		70	77	85	93	102	
Price per Kg to retailers		18	18	18	18	18	
Revenue 2		1,253,437	1,378,966	1,516,863	1,668,549	1,835,404	
Sales Guti NPK Mt		29.50	36.88	46.09	57.62	72.02	
Price per Kg		24.00	24.00	24.00	24.00	24.00	
Revenue 3		708,000	885,000	1,106,250	1,382,813	1,728,516	
Sales Guti NPK Mt		15.69	19.49	24.36	30.45	38.06	
Price per Kg		22.66	22.66	22.66	22.66	22.66	
Revenue 4		355,562	441,587	551,983	689,979	862,474	
Total Revenue		3,571,503	4,085,679	4,693,235	5,411,294	6,263,342	
Purchases Urea		2,441,097	2,736,420	3,075,160	3,464,050	3,912,171	
Purchases DAP		16,595	20,696	25,870	32,338	40,422	
Purchases MOP		6,390	7,970	9,962	12,453	15,566	
Total Purchases		2,464,082	2,765,086	3,110,993	3,508,840	3,968,159	
Running Expenses		135,832	154,403	176,184	201,729	231,809	
Marketing Expenses		3,622	4,117	4,698	5,379	6,182	
Depreciation		26,167	22,296	19,001	16,195	13,805	
Total Expenses		2,629,703	2,945,902	3,310,876	3,732,143	4,219,955	
Net Profit before Tax		941,800	1,139,777	1,382,359	1,679,151	2,043,387	
Tax at 15%		141,270	170,967	207,354	251,873	306,508	
Net Profit After Tax		800,530	968,810	1,175,005	1,427,278	1,736,879	
Loss of Urea Income		22,732	28,331	35,391	44,214	55,240	
True Net Benefit		777,798	940,480	1,139,614	1,383,064	1,681,638	
Machine Use for Boro Season							
mt		181.11	205.87	234.91	268.97	309.08	
days		50	57	65	75	86	
percent of 181mt		100.00%	114.37%	130.51%	149.43%	171.71%	
Investment analysis							
Year	0	1	2	3	4	5	Recovery
Fixed Investment	-178,068						80,605
Working Capital	-821,361		-25,084	-28,826	-33,154	-38,277	946,701
Revenue less depreciation		3,597,670	4,107,975	4,712,236	5,427,488	6,277,147	
Expenses		2,603,536	2,923,606	3,291,875	3,715,948	4,206,150	
Net Cash Flow	-999,429	994,134	1,159,286	1,391,535	1,678,386	2,032,720	1,027,306
Cum NCF	-999,429	-5,295	1,153,990	2,545,525	4,223,911	6,256,632	
NPV @ 15%	4,070,955						
IRR	114%						
PBP	13 months						
Investment Analysis after Prilled Urea Income Loss							
Net Cash Flow	-999,429	994,134	1,159,286	1,391,535	1,678,386	2,032,720	1,027,306
Less Urea income loss		22,732	28,331	35,391	44,214	55,240	
Net net Cash Flow	-999,429	971,402	1,130,955	1,356,144	1,634,172	1,977,480	1,027,306
NPV @ 15%	3,953,752						
IRR	111%						
PBP	14 months						

11. Unused Briquette Machines

All but one of the BMOs interviewed who did not use their briquette machines in Boro 2015 had a specific reason for not doing so. The most common reason was that these briquette machine owners had another substantial source of income. For example, one had a large rice mill, another had a large fish farm and another a large fuel business. With substantial incomes from these enterprises these entrepreneurs had little interest in using the briquette machines. There was one instance of family sickness that had resulted in non-use of the *Guti* machine and one where a lack of seasonal labor was given as the reason. Only two BMOs claimed that lack of demand was the reason for non-use, one in Mymensingh and one in Jessore. Three BMOs with very low machine utilization claimed that demand was too low for them to bother operating the machines. These were located one each in Jhalokati, Barisal and Jessore. None of these BMOs are making any effort to promote *Guti* and are resigned to selling their machines.

A reason why the large entrepreneurs bought briquette machines in the first place is probably that they were an easy way to meet sales targets with subsidized machines but in most cases were not established fertilizer dealers. As such, interest in *Guti* production and sales soon waned and most are now willing to sell the machines. These people can be targeted by AAPI to sell their machines to fertilizer dealers in areas of strong *Guti* demand. As has been demonstrated from the survey data the demand for *Guti* is building rapidly and the business is highly profitable for fertilizer dealers.

12. Technical Considerations

A. **Machine Maintenance:** All machines inspected had been properly stored after the *Boro* season operations with the press rollers greased and the machines clean and under protective cover. Approximately half of the BMOs used AAPI personnel when repairs or adjustments are required. The other BMOs rely on local mechanics trained by AAPI or are capable of maintenance repairs themselves. Only one BMO reported a major gearbox failure, and this

appeared to be due to continuous running of the machine without stopping to allow the rollers to cool as was instructed by AAPI engineers.

- B. **Product Quality:** No BMO reported any problems with *Guti* urea production but all BMOs making *Guti* NPK reported production problems in mixing urea, DAP and MOP and with poor shelf life of the finished product. Mixing is carried out by hand and labor is always complaining of skin rashes resulting from this hand-mixing even when wearing protective gloves. A simple mechanical mixer is required to overcome this problem. In addition, it was observed that all MOP available for *Guti* NPK production was fine, powdery, run of the mill product. Due to the different fine particle size of this MOP it segregates from the urea and DAP during mixing, during loading of the feed hopper and in the feed hopper. AAPI has developed a hand operated baffle mixing system for the feed hopper but this does not solve the segregation problem completely. It is recommended that BAC be recommended to import sufficient granular or coarse MOP to satisfy *Guti* NPK demand. The granular product is only approximately \$15/mt more expensive than run of pile MOP and would only add \$5/mt to the cost of *Guti* NPK. Unless the segregation problem is overcome there can be no guarantee on the nutrient content of *Guti* NPK briquettes.

When MOP is added to a mix of urea and DAP the critical relative humidity of the mixed product drops from around 70 percent to less than 40 percent and moisture is absorbed under most prevailing climate conditions in the tropics. As a result the *Guti* NPK in briquette form becomes damp and loses structural strength and the shelf life is very short. It is essential that *Guti* NPK is bagged with a moisture proof polyethylene liner (100-120 microns) and that small poly bags should also be moisture-proof.

13. Marketing Effort by Producers and Retailers

Given that *Guti* manufacture and marketing is highly profitable in Bangladesh, there is a strong case for BMOs to become less project- and DAE-dependent for promotion of the benefits of FDP to farmers. Some BMOs complained of lack of motivation by farmers to use FDP but had no plans to educate farmers and stimulate demand themselves. Only two BMOs interviewed had

ever organized a field demonstration and in both cases the demonstrations were on their own farms just to show farmers their own rice fertilized with *Guti*. It may be argued that, with the strong demand growth expected by BMOs, there is little need for them to increase their marketing and promotion efforts. However, this current demand stimulation is created by activities by the AAPI project and the support of the DAE service.

14. Future Strategies and Recommendations

Selection of Dealers and Dealer Density

The strategy of matching BMOs to current and expected demand growth for FDP and relying on both direct sales to farmers and sales to retailers should be maintained. The number of BMOs required in districts with a limited *Boro* season rice crop should be limited. Existing owners of briquette machines that are not being used or used at less than 10 percent of capacity (approximately 18 mt) during the *Boro* season should be encouraged to either sell their machines to identified fertilizer dealers or to stimulate demand through farmer motivation or signing up additional retailers to increase sales and machine utilization. Selection of new BMOs should be limited to existing fertilizer dealers in areas where there is a minimum market demand of 30 mt during the *Boro* season for the individual *Guti* producer. At this initial demand level and with a 10 percent annual growth, a 19 percent IRR can be obtained with a four year pay-back period. Below this demand level there will be a negative net present value at a 15 percent discount rate. The AAPI field officers should be encouraged to better estimate existing and realistic potential demand in each area and match the supply to the demand.

Marketing and Promotion

During the final months of the AAPI project a serious effort should be made to encourage the BMOs to invest more on promotion of FDP and rely less on the project and the DAE to promote *Guti* to farmers. Any BMO producing about 90 mt of *Guti* during the *Boro* season (approximately 50 percent machine capacity utilization) can afford to spend at least 5 percent of the earned gross margins on marketing and promotion. Training BMOs on establishing demonstration plots and holding field days should be encouraged. More project publicity about

the profitability of FDP for BMOs and retailers could provide the stimulus to break the BMO's project dependency on promotion.

The AAPI project should concentrate most resources to the development of a mechanized applicator of the type currently being developed and tested. Such an applicator would have a marked stimulation on farmer demand for *Guti*.

Recordkeeping

The AAPI project has done an excellent job of training BMOs to keep production and sales records. The standard of recordkeeping on production costs is very poor and as a result some BMOs are not achieving the full potential gross margins because they only have an approximate idea of the full production costs.

Product Quality

It is recommended that the Bangladesh Fertilizer Association be encouraged to lobby the Bangladesh Agricultural Development Corporation (BADC) to import either coarse or granular MOP to meet *Guti* NPK demand or that their members import these quality products rather than run of pile MOP.

All *Guti* NPK producers should be advised on the need for moisture-proof bag liners for 50-kg bags of NPK *Guti* and for small packs only to use moisture proof polyethylene (minimum specification 100-200 microns).

Guti NPK producers could be given designs for simple mechanical mixers that would eliminate hand-mixing and labor requirements.

15. AAPI Walmart Foundation Activity

In 2014 additional activities were added to the AAPI project funded by the Walmart Foundation. These activities are designed to establish female entrepreneurs as BMOs producing *Guti* products

for female vegetable producers. As of May, 2015 there were 25 female entrepreneurs operating briquette machines and selling *Guti* products for vegetable production. These BMOs are located in Mymensingh, Sherpur, Chuadanga, Jessore, Jhenaidah, Khulna, Rajbari, Satkhira and Bhola districts. Most of these BMOs started operating between June and December 2014. Production and sales recorded to May 15 have been converted to annualized estimates. The average annualized production estimate is 83 mt with a range from 3.8 mt to 333 mt. There are nine BMOs with estimated annualized production of less than 20 mt. Given that their operations are at an early stage the other 16 BMOs are in a profitable position. The low sales estimates for the remaining nine need addressing by the AAPI project to ensure that there is sufficient market demand to make these profitable operations.

Annex 1.

Questionnaire for *Guti* Urea Dealers: Sustainability Assessment

Accelerating Agriculture Productivity Improvement (AAPI) Project

Funded by USAID

Questionnaire for *Guti* Fertilizer Producers: Sustainability Assessment

(2015 Boro season)

Organized by

IFDC – An International Center for Soil Fertility and Agricultural Development

P.O. Box 2040

Muscle Shoals, Alabama 35662, USA

April/May 2015

Interviewer Instructions:

Explain the reasons for the interview, namely to assess the sustainability of the *Guti* urea business based on sales and profitability, other business activities, promotion activities, business planning and constraints such as urea supply and cost, equipment (briquette machinery) reliability, product quality and future demand.

Explain that the information is for use by IFDC employees only and will be treated as highly confidential. The results of the survey will not identify any individual business. The results of the survey will be used to identify assistance measures that will provide the most support to the makers and marketers of *Guti* urea.

Ensure that you are speaking to the right person (owner/operator) in private.

Thank them for their time and indicate how long the interview should take.

Questionnaire for *Guti* Urea Dealers: Sustainability Assessment
Urea Briquette Producers at AAPI Project Locations (2015 Boro Season)

Interviewer's Name: _____ Date: _____ Questionnaire No. _____

1. Dealer Profile:

- a. Name of shop _____
- b. Name of Owner: _____
- c. Owner is male or female? Male _____ Female _____ (use √)
- d. Highest education level of Owner? primary__ secondary__ tertiary_____
- g. Were you a fertilizer dealer before starting in *Guti* business? Yes ___ No ___
If yes, how many years have you been in fertilizer dealer business? _____
- h. What other items do you sell from your *Guti* shop? other fertilizer _____; seed _____, CPP _____;
agriculture tools _____; other items _____
- i. What year did you begin to manufacture *Guti* urea? _____
- j. How many *Guti* urea machines do you own? _____
- k. Does your machine have two sets of rollers? _____
- l. Do you make NPK *Guti*? _____

Business Status

- a. What is your legal status for doing the *Guti* urea business:
BCIC dealer _____ Registered retailer _____ Non-registered retailer _____
- b. Are you member of BFA? Yes ___ No _____

2. Business Operation

- a. Did you purchase the machine through IFDC? Yes ___ No ___
- b. If "No", where did you buy the machine? _____
- c. How much did you pay for the *Guti* urea machines (Taka)?
Machine #1 _____ Machine #2 _____ Machine #3 _____
- d. Which year did you buy the machine? #1 _____ # 2 _____ #3 _____

e. Did you make any investments in your *Guti* business since you bought the first *Guti* machine?
 Yes ____ No ____

If yes what was the investment for? (Please Tick \checkmark and specify total investment)

- i. More machines bought ____ Tka _____
- ii. More space added _____ Tka _____
- iii. Shop improvement _____ Tka _____
- iv. Other (please specify) _____ Tka _____

f. Describe the use of briquette machines that you operated for **production and sales of *Guti* urea and *Guti* NPK in Boro season 2015**

Briquette Machine	Start & End Date of Production for Boro Season		Total Days of Operation	Estimated Hours of Operation per Day	Total Production (MT)	Average Production per Day	Total Sales of <i>Guti</i> Urea (MT)	Total Production and Sales 2014 <i>Boro</i> Season
	Start	End						
<i>Guti</i> # 1								
<i>Guti</i> # 2								
NPK <i>Guti</i> #								

g. If you are not a BCIC dealer/registered retailer, what are the sources of urea used for *Guti* urea production by percentage and what was the average cost of urea in 2015 from each source?

BCIC Dealers ____ (%) Retailers ____ (%) Farmers ____ (%) Other (please specify) ____ (%)

BCIC Dealers ____ (Tk) Retailers ____ (Tk) Farmers ____ (Tk) Other (specify) ____ (Tk)

h. How many times did you purchase prilled urea for *Guti* manufacture in 2015? _____

Did you also sell prilled urea during the 2015 Boro season? Yes ____ No ____

Quantity bought (MT) _____

Price paid (Tk/50-kg bag) _____

Quantity sold (MT or Bags) _____

Price sold for (T/kg) _____

3. Variable Production Costs

Please provide the following information for 2015 (Boro Season)

Item	Units	Total No. of Units	Unit Cost (Taka)	Total Cost (Taka)	Source
Prilled urea used for <i>Guti</i> Source 1	MT				
Prilled urea used for <i>Guti</i> Source 2	MT				
Prilled urea used for <i>Guti</i> Source 3	MT				
DAP for NPK <i>Guti</i> production					
MOP for NPK <i>Guti</i> production					
Labor	Per Person/day				
Diesel	Liter				
Electricity	Per Month				
Machine Maintenance Costs	Per year				
Repair costs	Per year				
Packaging cost	Per 50 Kg Bag				
Office and factory rent	Per Month				
Warehouse rent (if any)	Per Month				
Office Expenses :	Per Month				

Guti Urea and NPK *Guti* Income

	MT/bags	Tk per 50 kg	Total Revenue	Number of Customers
<i>Guti</i> Sales to farmers				
<i>Guti</i> Sales to Retailers				
<i>Guti</i> sales to prilled urea suppliers				
NPK <i>Guti</i> sales to Farmers				
NPK <i>Guti</i> sales to retailers				

4. Constraints/Problems/Challenges

- a. Who do you contact if the *Guti* urea manufacturing machine breaks down? (Please Tick)
- i. Local mechanic
 - ii. *Guti* machine manufacturer
 - iii. Others (please specify) _____
- b. Have you had any mechanical problem with *Guti* manufacturing machine? Yes ___ No ___
- i. If yes, explain problem _____
 - ii. Who made the repair to machine? _____

Marketing

- i. Did you prepare any of the following items for promotion/advertisement of your *Guti* urea business? (Please Tick)
- Leaflets _____ Posters _____ Brochures _____ Signboard _____
- Promotional bags _____ T-Shirts _____ Established *Guti* urea demo plots _____
- Others (explain) _____
- j. Does your shop have a sign board that shows you are a *Guti* dealer? Yes ___ No ___
- If yes, who paid the cost for the signboard? _____
- k. Did you participate in any *Guti* urea demonstration program? Yes ___ No ___
- If yes explain how you participated and what cost you incurred _____
- _____
- _____
- l. Did you participate in any *Guti* urea field day program? Yes ___ No ___
- If yes explain how you participated and what cost you incurred _____
- _____
- _____
- m. What other activity did you do to promote or advertise sale of *Guti* urea?
- _____
- n. Are you planning to start any advertising or promotion of *Guti* urea? Yes _____; No _____.

o. If yes what will you do to promote and advertise? Please explain

p. Is the DAE giving any support or help in training farmers or advising farmers on use of *Guti*?

Yes___ No ___

q. What do you consider to be your biggest need to improve your *Guti* urea business?

Recordkeeping

a. Do you keep **written records** on your *Guti* urea business operations? Yes ___ No ___

If yes, how do you keep records---accounting ledger__ Note books__ Computer___ Other__

What type of records do you keep?

i. Records on amount of *Guti* urea produced? Yes___ No___

ii. Records on amount of *Guti* urea sold? Yes___ No___

iii. Records on amount of urea/other fertilizer you purchased to make *Guti*? Yes___

No___

iv. Records on sales volume? Yes___ No___

v. Records on cost of operating business? Yes ___ No ___.

Constraints

What are the constraints or problems you faced to operate your *Guti* urea business? (Use \surd for all that apply)

Low demand from farmer ___ Short supply of prilled urea ___

High operation cost ___ Machine operation problem ___

Scarcity of labor ___ Interference by local authority ___

High cost of *Guti* urea? _____ Interference by others _____

Poor quality of *Guti* _____ Other (please specify) _____

Application equipment _____ Mixing for NPK _____

5. Opportunities/Plans

a. Are you happy with the profit of your *Guti* urea business?

Very happy__ Moderately happy__ Not Happy ___ Most Unhappy __

b. If Not happy or unhappy, what do you suggest to improve/sustain your business?

c. Do you think there is enough demand for *Guti* urea? Yes ____ No ____

d. How much *Guti* urea do you expect to sell in the 2016 Boro season? ____ Mt

e. How much *Guti* NPK do you expect to sell in the 2016 Boro season? ____Mt

f. Are you planning to expand your business? Yes ____ No ____

If yes, how will you expand your business? (Please Tick)

Increased machine utilization__ More machines __ More labor__ Shop improvements ____

Improved marketing____

Other (please specify):

Thank you for your cooperation!

Annex 2.
**Questionnaire for *Guti* Fertilizer Retailers: Sustainability
Assessment**

(2015 *Boro* Season)

Accelerating Agriculture Productivity Improvement (AAPI) Project

Funded by USAID

Organized by

IFDC – An International Center for Soil Fertility and Agricultural Development

P.O. Box 2040

Muscle Shoals, Alabama 35662, USA

April/May 2015

Interviewer Instructions:

Explain the reasons for the interview, namely to assess the sustainability of the *Guti* urea business based on sales and profitability, other business activities, promotion activities, business planning and constraints such as urea supply and cost, equipment (briquette machinery) reliability, product quality and future demand.

Explain that the information is for use by IFDC employees only and will be treated as highly confidential. The results of the survey will not identify any individual business. The results of the survey will be used to identify assistance measures that will provide the most support to the makers and marketers of *Guti* urea.

Ensure that you are speaking to the right person (owner/operator) in private.

Thank them for their time and indicate how long the interview should take.

Questionnaire for *Guti* Urea Retailers: Sustainability Assessment

Interviewer's Name: _____ Date: _____ Questionnaire No. _____

1. Dealer Profile:

- a. Name of shop _____
- b. Name of Owner: _____
- c. Owner is male or female? Male _____ Female _____ (use √)
- d. Highest education level of Owner? primary__secondary__tertiary_____
- e. When did you start selling *Guti* urea? ____
- f. Do you sell *NPK Guti*? _____
- g. What other items do you sell from your *Guti* shop? other fertilizer _____; seed _____, CPP _____; agriculture tools _____; other items _____

Business Status

- a. What is your legal status for doing the *Guti* urea business:
BCIC dealer _____ Registered retailer _____ Non-registered retailer _____
- b. Are you member of BFA? Yes _____ No _____

2. *Guti* Sales in Boro Season 2014

- a. *Guti* urea (No. of bags) _____
- b. *Guti* NPK (No. of bags) _____
- c. Prilled urea (No. of bags) _____

3. *Guti* Sales in Boro Season 2015

- a. How many bags of *Guti* urea did you sell in Boro 2015? _____
- b. What was the selling price in Tka per Kg? _____ or per bag _____
- c. What was your purchase price for *Guti* urea in Tka per Kg? _____ or Tka per bag _____
- d. What was the transport cost and into store cost for the *Guti* urea? Tka per Kg _____ or Tka per bag _____
- e. From whom did you buy the *Guti* urea? _____
- f. How many times during the season did you buy *Guti* urea? _____

- g. Did you supply prilled urea to a *Guti* manufacturer and buy back the *Guti* urea? _____
- h. If yes, then how much was the transport cost each way (Tka per bag)? _____
- i. And how much was the processing cost (Tka per bag)? _____

4. Prilled Urea sales Boro Season 2015

- a. How many bags of prilled urea did you sell in the Boro season 2015? _____
- b. What was your purchase cost for prilled urea into store (Tka/bag)? _____
- c. What was your selling price for prilled urea (Tk/bag)? _____
- d. How many times during the season did you buy prilled urea? _____

5. *Guti* Promotion

- a. Did you prepare any of the following items for promotion/advertisement of your *Guti* urea business? (Please Tick ✓)

Leaflets _____ Posters _____ Brochures _____ Signboard _____

Promotional bags _____ T-Shirts _____ Established *Guti* urea demo plots _____

Others (explain) _____

- b. Does your shop have a sign board that shows you are a *Guti* dealer? Yes ___ No ___

If yes, who paid the cost for the signboard? _____

- c. Did you participate in any *Guti* urea demonstration program? Yes ___ No ___

If yes explain how you participated and what cost you

incurred _____

- d. Did you participate in any *Guti* urea field day program? Yes ___ No ___

If yes explain how you participated and what cost you

incurred _____

- e. What other activity did you do to promote or advertise sale of *Guti* urea?

- f. Are you planning to start any advertising or promotion of *Guti* urea? Yes _____; No _____.

- g. If yes what will you do to promote and advertise? Please explain

Constraints

What are the constraints or problems you faced to operate your *Guti* urea business? (Use \surd for all that apply)

- Low demand from farmer ____ Short supply of prilled urea ____
- High operation cost ____ Machine operation problem ____
- Scarcity of labor ____ Interference by local authority ____
- High cost of *Guti* urea? ____ Interference by others ____
- Poor quality of *Guti* ____ Other (please specify) _____
- Application equipment _____ NPK Mixing _____

6. Opportunities/Plans

- a. Are you happy with the profit of your *Guti* urea business?
Very happy__ Moderately happy____ Not Happy ____ Most Unhappy __
- b. If Not happy or unhappy, what do you suggest to improve/sustain your business?

- c. Do you think there is enough demand for *Guti* urea? Yes ____ No ____
- d. How much *Guti* urea do you expect to sell in the 2016 Boro season? ____ Mt
- e. How much *Guti* NPK do you expect to sell in the 2016 Boro season? ____Mt
- f. _____
- g. How do you determine demand for *Guti* urea?

Thank you for your cooperation!
