Government of Bangladesh

Chars Livelihoods Programme

Relative Profitability of Crossbred versus Local Cattle Rearing Under ATP (DRAFT)

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1 Executive Summary

The cornerstone of the Chars Livelihoods Programme's (CLP's) approach to poverty alleviation is the provision of investment capital with which participants purchase income-generating assets. Most participants choose cattle. The CLP has been promoting crossbred, rather than local cattle, as they are widely viewed as being more profitable. This study explores whether this is indeed the case, in order to assess whether the CLP should continue to promote crossbred cattle as the programme moves into its second phase.

In theory, crossbred cattle are more profitable for two reasons: they grow faster and dairy cattle produce more milk. However, crossbred cattle are also seen as more difficult to manage. Owners have to adhere to specific deworming and feeding requirements in order to prevent disease and maximise profitability. In combination with the larger size of crossbred animals (which means they require more feed), this makes them more costly to rear than local cattle, in terms of both time and money.

In light of this theory, (i) relative profitability was determined by assessing relative increase in asset values (i.e overall increase in asset value since purchase divided number of months owned) and relative net monthly incomes (i.e. gross monthly incomes minus gross monthly costs) and combining these elements to give figures for net monthly financial gain/loss; and (ii) the study also explored also explored time dynamics, relative morbidity and mortality and whether crossbred cattle owners were following the ideal management regime for crossbred cattle. Respondent preferences for crossbred versus local cattle and reasons behind these preferences were also investigated.

Data were collected by an independent company, the Grameen Bikash Foundation, over a four-day period in February 2010. The sample comprised four strata: (i) owners of crossbred beef cattle, (ii) owners of local beef cattle, (iii) owners of crossbred milk cattle and (iv) owners of local milk cattle. Respondents were selected through cluster sampling to give a total sample size of 167. Four separate structured questionnaires were used. Enumerators also undertook a basic physical examination of cattle to determine any visible signs of disease and measured their girth and length in order to calculate approximate current weight.

All milk cattle owners owned one cattle plus one calf, whilst all beef cattle owners owned a single cattle each. Figures for milk cattle and calves were aggregated to give household-level figures, although a disaggregation is provided in the case of monthly nominal asset value increase.

The key findings are as follows:

- nominal monthly asset value increases of crossbred cattle (both milk and beef) are approximately double those of local animals;
- the mean current value of crossbred calves is 25% higher than that of local calves although they are approximately the same age on average;

- net monthly incomes of crossbred milk cattle are almost double of those local animals, because the much higher monthly incomes from milk sales they generate significantly outweigh the higher monthly maintenance costs they incur;
- beef cattle only bring in small incomes from dung sales, which are outweighed by monthly maintenance costs, meaning they are being reared at a loss until point of sale. This loss is bigger in the case of crossbred cattle as the slightly higher incomes they generate from dung sales are considerably outweighed by higher monthly maintenance costs;
- thus, whilst CLP recognises this and provides asset maintenance stipends to ATP participants during the first six months of ownership to help with feeding costs and vouchers to pay for veterinary services, it is important to monitor carefully whether crossbred beef cattle owners sell their assets in periods of financial distress;
- overall, crossbred cattle (both milk and beef) are twice as profitable, whilst milk cattle (both crossbred and local) are twice as profitable as beef cattle;
- the fear that crossbred cattle take more time to rear and thus their ownership adds to the already heavy time burdens of female participants is unfounded. The extra time expended is minimal, and in any case approximately cancelled out by time savings from reduced need to collect fuel as a result of higher dung production;
- incidence and frequency of sickness is slightly higher amongst crossbred cattle, but a clear picture of relative morbidity and mortality could not be ascertained due to the small sample size, which was calculated based on the requirement of the key indicator (i.e. relative overall profitability of crossbred versus local cattle) rather than the needs of individual indicators;
- crossbred owners are generally adhering to the additional deworming and feeding requirements for crossbred cattle, although less so for crossbred calves;
- the majority of owners report preferences for crossbred rather than local cattle.

Several recommendations stem from these findings:

- It would be fruitful to investigate the reasons behind non-adherence to feeding and deworming requirements for crossbred calves and formulate suitable responses. For example, in the case of deworming, this may be providing vouchers for the deworming of calves, in addition to those provided for cattle;
- the reduced value of investment capital provided to the first cohort of ATP participants under CLP2 may mean they won't be able to afford to purchase crossbred cattle - this issue needs to be investigated by the Livelihoods Unit;
- it is important to record weight at purchase for all cattle, as without this data growth rates cannot be calculated.
- whilst this study has touched on the issue of opportunity cost associated with cattle rearing, the dynamics involved are clearly complex and would benefit from more detailed investigation, ideally through qualitative methods, such as focus group discussions/in-depth interviews.

2 Background and Survey Objectives

2.1 The CLP's Asset Transfer Project and the Promotion of Crossbred Cattle

The Chars Livelihoods Programme (CLP) aims to improve the livelihood security and reduce the vulnerability of the poorest households residing on the Jamuna *chars.* The cornerstone of the CLP's approach to poverty alleviation is the provision of investment capital through the Asset Transfer Project (ATP) which is used by participant households to purchase income-generating assets (IGAs) of their choice[1]. In addition to providing the initial investment capital, the CLP offers financial support in the form of a livelihoods maintenance stipend for the first 18 months and an asset maintenance allowance for the first 6 months following asset transfer. This is intended to reduce the risk of asset sale in the event of emergencies such as floods, family illnesses and employment shortages. The CLP also assists participants with asset purchase, veterinary support and training in livestock husbandry.

During CLP-1 four cohorts of asset transfer were undertaken, each involving an increasing number of households (Table 1). In total, 55,000 households received IGAs.

Table 1: Asset distribution dates and total number of participating households in the four cohorts of ATP under CLP1

	Total number of participating households	**Asset distribution dates**
ATP1	3,174	Jan-June 2006
ATP2	8,246	Dec 2006-May 2007
ATP3	18,850	Dec 2007-May 2008
ATP4	24,730	August 2008-Feb 2009

Over 95% of ATP participants choose cattle as their main IGA. The CLP has been promoting the purchase of crossbred cattle[2] since the first cohort of asset transfer as they are widely viewed as being more profitable. This support comprises assistance in their purchase and provision of additional training on how to take care of them. Under CLP2, whose first phase of asset transfer is being undertaken in May 2010, purchase of crossbred cattle will continue to be encouraged through the Crossbred Cattle Project. This project will work to support the purchase of 10% of cattle purchased being crossbreds (up from 7.5% from the last cohort of CLP1, during which no

[1] Under the first two cohorts of CLP1, the value of this capital was Tk. 13,000 or around £100, whilst for ATP3 it was Tk. 15,000 and ATP4 it was Tk. 17,000. The proposed sum for the first cohort of asset transfer under CLP2 is Tk. 15,500.

[2] Whilst a distinction can be made between 'crossbred' and 'local improved' cattle, as well as 'Pabna variety cattle' (most of the crossbred cattle purchased through ATP come from the Pabna area), for the sake of simplicity, this paper will use the term 'crossbred' to cover all three categories.

specific target was set)[3]. Its aim is for the profits from cattle rearing of project participants to exceed those of ATP participants rearing local breeds by 25%.

2.2 Theoretical Explanation of the Higher Profitability of Crossbred Cattle

In theory, crossbred cattle are more profitable for several reasons[4]:

- **Faster growth rates** – up to the age of 3.5-4 years (i.e. when they have a full set of teeth), crossbred cattle can gain between 700g-1kg per day if looked after properly (if they are not looked after properly, this drops to approx. 250g/day), whereas local cattle tend to grow at 100g/day, although this can increase up to 450g/day with proper feeding;

- **Beef cattle can be sold earlier** –thus crossbred beef cattle can be sold at a good profit from the age of 1 year, whereas local beef cattle do not generate a significant profit if they are sold before the age of 2 years [5];

- **Milk cattle produce more milk** – crossbred milk cattle can produce milk from the age of 25-30 months, whereas local milk cattle generally do not produce milk until the age of 30-35 months; crossbred lactations are longer and produce more milk than those of local cattle (800-2000 litres of milk per lactation period of 200-260 days, versus 250-350 litres of milk per lactation period of 160-200 days).

However, crossbred cattle are also considered to be more difficult to manage. In particular, two aspects of cattle management are crucial to ensuring crossbred cattle's profitability is maximised:

- **Deworming** – crossbred cattle are more susceptible to disease than their local counterparts as they are less adapted to the local environment, feeding and management, thus it is especially important to strictly follow the deworming routine for cattle i.e. deworming them at the ages of (i) 21 days to 1 month, (ii) 3 months, and (iii) 6 month intervals thereafter;

- **Feeding** – in order to prevent damage to their digestive systems, crossbred cattle cannot be fed straw/grass before the age of 2 months, should be fed 1-4 litres of milk per day up to the age of 4 months, and require at least 5kg of fodder per day.

2.3 Survey Objectives

Whilst three studies looking at the economic impact of cattle transfers have been conducted by the CLP (Marks, 2007; Marks and Sultana, 2009; Marks and Sultana, forthcoming), none of

[3] Under ATP4, the proportion of cattle purchased that were crossbred was 7.54%; records are not available for earlier phases.

[4] Source: Prof. Hafezur Rahman, Dept. of Paraistology, Bangladesh Agricultural University, Mymensingh (retired)

[5] However, bulls sold for slaughter for *Eid-Ul-Azar* must be at least 2 years, thus this is potentially not such a great advantage, as *Eid-Ul-Azha* is the most profitable time of year to sell bulls due to high demand.

these explored the relative profitability of crossbred versus local cattle. This issue has been informally investigated by the CLP's Asset Transfer Project Manager and the resulting report demonstrated the greater profitability of crossbred cattle. However, before final operational decisions are made with regards to the Crossbred Cattle Project under CLP-2, the Operations Director has requested a more formal study to confirm whether crossbred cattle are indeed more profitable.

This study aims to determine the relative profitability of crossbred milk and beef versus local milk and beef cattle through investigating:

- whether crossbred cattle grow and increase in value faster and bring in higher monthly incomes than local cattle;
- if so, whether this is outweighed by higher monthly costs or not;
- whether crossbred cattle require more time to look after than local cattle and thus incur higher opportunity costs;
- whether crossbred cattle have higher morbidity and mortality rates than local cattle.

The study also explores two other issues: (i) whether crossbred cattle owners are following the ideal management regime for crossbred cattle in terms of feeding and deworming, and (ii) whether cattle owners prefer local or crossbred cattle and why.

3. Methodology

The study was designed and managed by the core team of the Innovation, Monitoring and Learning (IML) Division of the CLP, with key technical input provided by the Livelihoods Unit and Professor Md. Mostafizur Rahman from the Department of Microbiology and Hygiene, Bangladesh Agricultural University, Mymensingh[6]. The questionnaires were developed and then field tested as part of the training of the data collection team. Data collection took place over a four-day period in February 2010. Data collection, entry and cleaning were contracted out to an independent company, the Grameen Bikash Foundation (GBF), and data analysis was undertaken by the author of this report.

Data were collected through four separate structured questionnaires, one for each of the four sources of data. In addition to completing the questionnaires, enumerators undertook a basic physical examination to determine any visible signs of disease. They also measured cattle girth and length, from which approximate weight can be calculated using a simple formula[7]. Whilst cattle growth is not expected to follow a linear pattern, it was anticipated that data on current weight could be compared with data on weight at purchase contained in the passbooks possessed by all ATP participants to generate nominal monthly growth rate figures.

3.1 Additional Factors Considered when Designing the Study

It was agreed not to analyse findings by district, but focus data collection on Bogra/Sirajganj districts, for two reasons:

- the vast majority of crossbred cattle have been purchased by ATP participants in these districts (only around 200 crossbred cattle in total have been purchased from the other three districts that make up CLP1's working area[8]);
- the Livelihoods Unit have informed IML that the difference in profitability between crossbred and local cattle is anticipated to be smallest in Bogra/Sirajganj districts, due to the greater profitability of local cattle in these districts in comparison with the other three districts. Thus if a significant difference in profitability within these two districts is identified, it follows that the difference in the other three districts is also likely to be significant.

Furthermore, it was decided that data collection would focus on current cattle owned (these may or may not have been the cattle transferred to participants under ATP), rather than recording data for all cattle received through ATP/purchased later. This approach was taken for two reasons: (i)

[6] Prof. Rahman is a veterinary expert who was provided consultancy services to the CLP in the past.

[7] Body weight of cattle = $\frac{L'' \times (G'')^2}{300 \times 2.2}$ kg

[8] Namely Kurigram, Gaibandha and Jamalpur

the focus of the study is on relative profitability, rather than developing a picture of cattle sale and purchase patterns,[9] and (ii) potential for recall errors in relation to cattle already sold.

Finally, whilst specific type of local or cross breed is a factor affecting profitability of cattle, it could not be analysed through this study, as specific breed of cattle purchased is not recorded in participants' passbooks. Moreover, even if this information were available, analysing by breed would require samples from every breed for each of the four strata, greatly increasing costs of data collection.

3.2 Sampling Technique and Sample Size

A cluster sampling technique was used to identify respondents from Bogra and Sirajganj districts[10]. The sample size was calculated based on the key indicator (i.e. relative profitability of crossbred versus local cattle), using a standard equation for indicators expressed as means (Magnani, 1997, p12). Data used in this equation was taken from the aforementioned previous study undertaken by the Asset Transfer Project Manager and statistical significance was set at 90%, whilst statistical power was set at 80%.

Sample size was calculated separately for milk and beef cattle and it was found that samples of 23 and 33 respectively were required. However, the sample size was set at 40 for each strata for two reasons: (i) with a sample size of less than 30, it is difficult to undertake a statistical comparison of means[11], and (ii) it was thought prudent to utilise a greater sample size than necessary, to allow for non-response. The actual sample size was 167 (comprising 45 owners of local beef cattle, 42 owners of crossbred milk cattle and 40 owners each of local milk and crossbred beef cattle).

[9] This has already been covered by the aforementioned economic impact studies.

[10] For the rationale for focusing on these districts, see 3.1.2.

[11] This turned out not to be necessary anyway as the figures were so different for crossbred and local animals.

4. Results

Section 4.1 compares nominal monthly increases in asset values for crossbred and local cattle (i.e. overall increase in value since purchase divided by number of months owned), whilst Section 4.2 looks at relative net monthly incomes (i.e. gross monthly incomes minus gross monthly costs). Section 4.3 brings these two elements together to present net financial gain/loss figures, which are used to indicate relative profitability of crossbred versus local beef and milk cattle. Sections 4.4 through 4.7 look at other factors contributing to relative profitability, namely (i) relative labour requirements and consequent opportunity costs, (ii) morbidity and mortality rates, and (iii) whether owners of crossbred animals are following the ideal management regime for crossbred cattle in terms of feeding and deworming requirements. Finally, section 4.8 provides a complement to the 'hard' data by exploring respondent preferences for crossbred versus local cattle.

4.1 Nominal Monthly Increase in Asset Values

4.1.1 Crossbred versus Local Milk and Beef Cattle

Nominal monthly increases in asset values were calculated by subtracting purchase price from current value of cattle and dividing by number of months animals had been owned for. As shown in Table 2, figures for crossbred cattle (both milk and beef) are almost double those for local cattle. The difference is slightly greater in the case of milk cattle (197% versus 186%). The higher nominal monthly increase in asset values of crossbred cattle can be assumed to reflect higher growth rates, which unfortunately could not be measured in the manner anticipated[12]. This was because, although current weight was estimated using a formula based on girth and length, both of which were measured by enumerators, data on weight at purchase were not recorded in sufficient numbers of participant passbooks to be able to calculate nominal monthly growth rates.

Table 2: Mean nominal monthly increase in asset values of local versus crossbred milk cattle

		Mean purchase price (Tk.)	Mean current value (Tk.)	Mean nominal monthly increase
Beef Cattle	**Local (45)**	18,050	24,655	2,363
	Crossbred (36)13	20,323	32,138	4,385
Milk Cattle	**Local**	16,415	27,250	996

[12] i.e. measuring girth and length and using the formula given in Section Three of this paper to calculate current weight, subtracting weight at purchase and dividing the result by number of months owned, to get a figure for nominal monthly weight increase

[13] Excludes 4 cattle who were offspring of cattle transferred through ATP

	Crossbred	16,798	42,000	1960

Differences in mean purchase price of local and crossbred cattle were much smaller than disparities in mean current value, as demonstrated by Figures 3 and 4 below. Indeed, in the case of milk cattle, differences in mean purchase price was negligible at Tk. 383, whilst even for beef cattle, the Tk. 2,273 difference in mean purchase price was less than a third of the difference in mean current value, at Tk. 7,483. This highlights the added value associated with rearing crossbred cattle in comparison with their local counterparts.

Figure 1: Purchase prices of local versus crossbred cattle

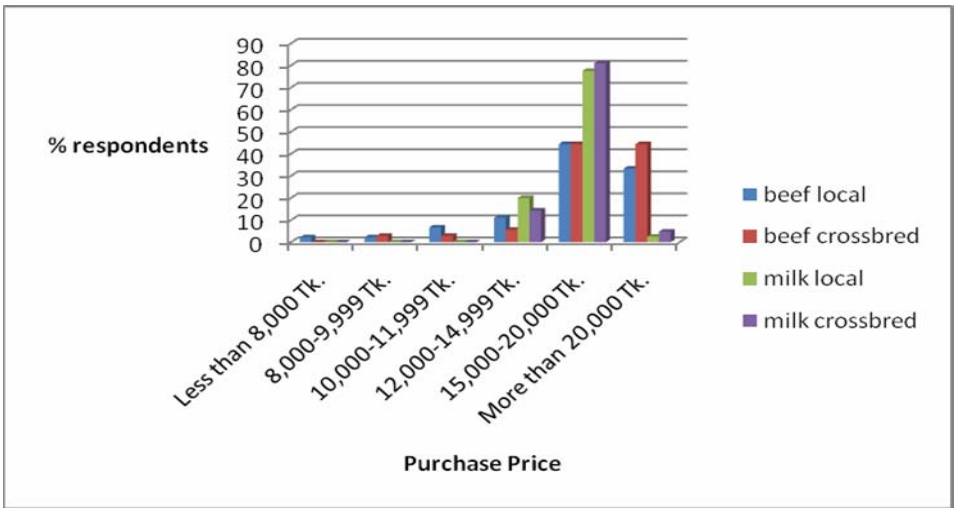
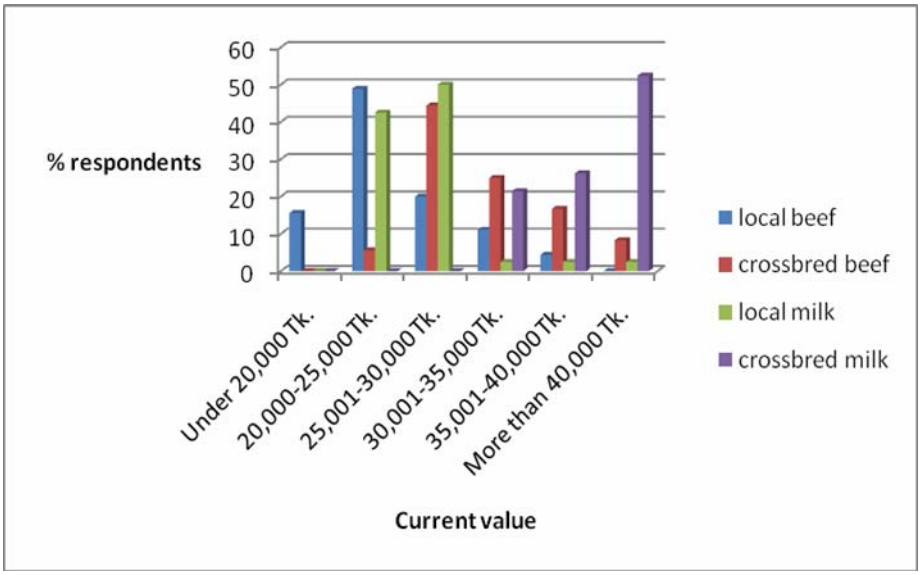


Figure 2: Current values of local versus crossbred cattle



A point to note is that the first cohort of ATP participants under CLP2 will receive a reduced sum with which to purchase income-generating assets (Tk. 15,500, whilst participants from the last cohort of CLP1 each received Tk. 17,000). This reduced sum is below the mean purchase price for all four types of cattle. This has implications for the affordability of crossbred cattle, whose purchase prices are higher than that of local cattle, especially in the case of beef animals. The issue should be further investigated by the CLP's Livelihoods Unit to confirm the feasibility of the Crossbred Cattle Project meeting its target of 10% of cattle purchases being crossbreds.

Respondents were asked how long they had owned cattle for, as well as when they anticipate selling their cattle and why. Whilst distinctions can be made between owners of milk and beef cattle, there were no significant differences in response between owners of local and crossbred cattle. All owners of beef cattle, whether crossbred or local, had owned their current cattle for an average of 3.8 months, and, unsurprisingly, anticipated selling them in November/December 2010. This is just before the *Eid-ul-Azha* festival, when the demand for cattle will be at its highest[14]. Milk cattle owners had purchased their animals an average of 12.8 months ago in the case of local animals and 13.1 months in the case of crossbreds. Equally unsurprising was the fact that these owners reported not knowing when they will sell their cattle. Whilst beef cattle are purchased in order to fatten up and sell, milk cattle are retained, in order to produce calves and generate income from milk sales.

4.1.2 Crossbred versus Local Calves

Whilst all beef cattle owners surveyed, whether their animals were crossbred or local, owned just a single cattle, all milk cattle owners surveyed owned one milk cattle plus one calf. Calculating mean nominal monthly increase in the asset value of calves born to milk cattle presented a challenge as there were no purchase price data. Therefore, the CLP's Asset Transfer Project Manager was consulted to provide estimates of the value of newborn crossbred and local calves, as shown in Table 3 below. These values were subtracted from current values and the result was divided by number of months since birth to provide figures for nominal monthly asset value increase. The mean current value of calves was found to be nearly Tk. 2,000 or 25% higher for crossbred calves, despite the fact that they were slightly younger on average (mean figures were 2.1 months old versus 2.5 months old). Furthermore, the mean nominal monthly increase in value of crossbred calves is over Tk. 200 or nearly 20% more than that of local calves.

Table 3: Nominal monthly asset value increase of crossbred versus local calves

	Mean current value (Tk.)	**Estimated newborn value (Tk.)**	**Mean nominal monthly asset value increase (Tk.)**
Local	6,825	4,000	1,324
Crossbred	8,524	6,000	1,575

14 During this festival, cattle and other livestock are slaughtered as a sacrifice.

4.2 Net Monthly Incomes

This section looks at net monthly incomes associated with rearing crossbred versus local milk and beef cattle. Gross monthly incomes are presented first, followed by monthly costs (excluding labour costs as these tend to be of an opportunity rather than financial nature). Cost figures are then subtracted from those for gross monthly income to give net monthly incomes.

4.2.1 Gross Monthly Incomes

In the case of beef cattle, gross monthly income comes solely from cow dung sales, whilst milk cattle generate income from the sales of both milk and cow dung. Respondents were also asked whether they had derived any income from using their cattle in field cultivation and beef cattle owners were asked whether they had gained any income from using their animals to service cows, but no respondent from any strata had used their cattle for either of these two purposes. Calves did not generate any monthly income.

Table 4 reveals that, on average, crossbred milk cattle produce nearly double and their owners sell more than double the monthly volume of milk in comparison with their local counterparts. Thus, average monthly income from milk sales generated by crossbred cattle is more than double (210%) that associated with local cattle. Whilst consumption figures show less discrepancy between crossbred and local cattle, they show that owners of crossbred cattle and their families are still consuming an average of 2.2 litres more milk per month than households with local cattle. The fact that households consumed milk for an average of less than 1 day per month before purchasing cattle suggests that rather than being a cost saving, this consumption of milk from one's own cattle is instead likely to be a consumption gain, with associated positive nutritional impacts.

Table 4: Milk production, sales and consumption of crossbred versus local cattle

	Monthly production level (litres)	**Average volume sold/month (litres)**	**Average monthly income from milk sales (Tk.)**	**Average volume consumed/month (litres)**	**Average no. of days per month consumed milk before had cow**
Local (40)	120.0	71.4	1,785	17.7	0.2
Crossbred (42)	217.4	146.1	3,748	19.5	0.9

Respondents were also asked to cite the maximum daily volume their cattle have produced as well as the average length of lactations. The findings reinforce the idea that crossbred milk cattle are significantly more productive – and thus profitable – than their local counterparts. as

demonstrated by Table 5, the mean figure for maximum daily production for crossbred cattle is nearly double that for local animals, whilst lactation lasts an average of over 20 days more.

Table 5: Maximum daily production and average length of lactations of crossbred versus local cattle

	Mean maximum daily production (litres)	**Mean length of lactations (days)**
Local (40)	4.85	187.4
Crossbred (42)	8.25	209.3

Crossbred cattle, whether beef or milk produce more dung than local animals, thus owners sell a greater volume of dung each month, which means they earn more from dung sales. However, the figures involved are very small, so cow dung sales are not a major factor contributing to the relative profitability of crossbred versus local cattle.

Table 6: Production and sales of cow dung and incomes generated from these sales: crossbred versus local cattle

		Mean monthly volume produced (kg)	**Mean monthly volume sold (kg)**	**Mean monthly income from sales (Tk.)**
Beef Cattle	**Local (45)**	280.5	46.3	43.3
	Crossbred (40)	355.5	60.1	57.1
Milk Cattle[15]	**Local (40)**	299.25	53.25	50.6
	Crossbred (42)	384.88	81.01	77.0

Indeed, as Table 7 demonstrates, the majority of dung produced by cattle (approximately 70% across all four strata) is used for fuel rather than sold. Using cow dung as fuel reduces the need to collect firewood, hence the advantage of crossbred cattle in terms of higher dung production is essentially manifested in the form of a time saving rather than an income boost. The mean additional time saving associated with crossbred cattle as a result of reduced need to collect firewood is exactly the same for milk and beef cattle at 0.3 hours, or 18 minutes, per day.

[15] Figures combine cow dung production by milk cattle and their calves

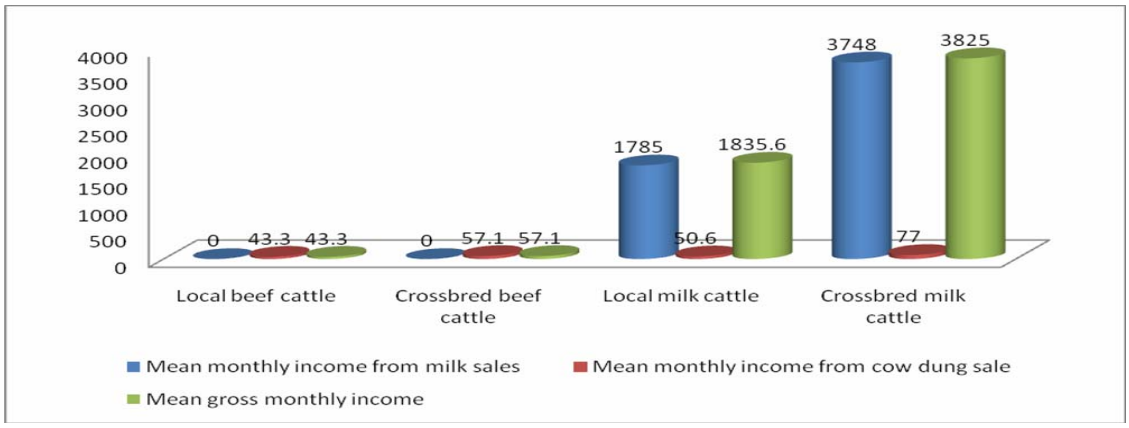
Table 7: Use of cow dung for fuel and composting – crossbred versus local cattle

		Use for Fuel		Mean monthly volume composted (kg)
		Mean monthly volume used for fuel (kg)	Mean time saving as a result of no longer having to collect firewood (hrs/day)	
Beef cattle	**Local (45)**	205.5	1.2	25.5
	Crossbred (40)	244.5	1.5	46.5
Milk cattle	**Local (40)**	198.75	1.0	47.25
	Crossbred (42)	257.56	1.3	58.54

Turning finally to composting, it can be seen from Table 7 above that crossbred cattle owners are also composting significantly more cattle dung than their local counterparts (nearly double in the case of beef cattle and nearly 25% more in the case of milk cattle). As with the data on household milk consumption, this is likely to represent a consumption gain rather than a cost saving as it is unlikely these households would purchase compost if they did not own cattle.

Overall, crossbreds bring in higher gross monthly incomes in the case of both milk and beef cattle. However the distinction is much more significant in the case of milk cattle, because the figures involved are much larger. Whilst crossbred cattle bring in approximately Tk. 15 more a month from cow dung sales than their local counterparts in the cases of both milk and beef cattle, crossbred milk cattle generate nearly Tk. 2,000 more per month from milk sales than local milk cattle.

Figure 3: Gross monthly incomes associated with local versus crossbred cattle



4.2.2 Monthly Costs

This section explores monthly costs associated with rearing of crossbred versus local milk and beef cattle. The following points should be noted:

- labour costs are dealt with separately in section 4.4 as they are essentially of an opportunity rather than a financial nature;
- figures for milk cattle are presented at the household level (i.e. they include costs for calves), as field-testing demonstrated that it was easier for respondents to give figures at the household level than individually for cattle and calves;
- ATP participants receive asset maintenance stipends of Tk. 250/month for the first six months of asset ownership (i.e. until they begin to generate an income) as well as livelihoods stipends of Tk. 350/month for the 18 months during which they receive direct CLP support., and vouchers for deworming and vaccination services, with a total value of Tk. 420;
- total feed costs include estimated value of grass consumed – in the vast majority of cases, grass is collected by participants, rather than purchased. Thus two figures are provided for total feed costs – one inclusive and one exclusive of grass costs.

Table 8 presents mean monthly costs associated with rearing crossbred versus local milk and beef cattle. The following analysis focuses on figures that exclude cost of grass. It is these figures that are input into the calculation of monthly net financial gain/loss below. On average, total monthly costs associated with rearing crossbred cattle are around Tk. 100 higher in the case of beef cattle and Tk. 120 higher in the case of milk cattle. For beef cattle, the difference essentially comes from difference in veterinary costs (over Tk. 100), as there is little distinction in total feed costs for crossbred and local animals once grass has been excluded. For milk cattle, the reverse is true: veterinary costs are only slightly higher for crossbred cattle (around Tk. 30), whilst feed costs are significantly higher, at nearly Tk. 100.

Table 8: Mean monthly costs associated with crossbred versus local cattle

	Beef Cattle		Milk Cattle	
	Local (45)	**Crossbred (3616)**	**Local (40)**	**Crossbred (42)**
Mean monthly total feed costs (including value of grass)	455.9	500.0	552.7	668.1
Mean monthly total feed costs (excluding value of grass)	330.9	316	390.7	482.1
Mean monthly total veterinary costs	83.9	198.3	246.8	279.6
Mean monthly other costs	32.0	27.3	9.5	6.4
Mean total monthly costs (including value of grass)	571.8	725.6	809.0	954.1
Mean total monthly costs (excluding value of grass)	446.8	541.6	647.0	768.1

For both local and crossbred cattle, monthly expenditure required to rear milk cattle is over Tk. 200 more than that needed to rear beef cattle. This to be expected, as those who own milk cattle have to spend money on calves as well as cattle. However, although lower, monthly costs associated with beef cattle are more significant. This is because they are only offset by small incomes from cow dung sales, which means beef cattle generate negative net monthly incomes. Thus the higher monthly costs associated with crossbred cattle in comparison with their local counterparts will be more difficult for beef cattle owners to absorb. These additional costs represent an extra investment that is not released until the animal is sold (i.e. Eid time). Hence there is a risk that crossbred beef owners may be forced to sell their asset if the family runs into distress; for example, if they are hit with a health shock.

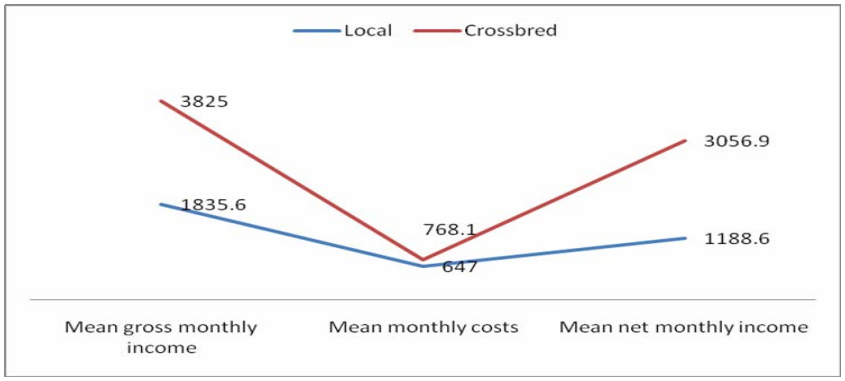
4.2.3 Net Monthly Incomes

Net monthly incomes were calculated by subtracting monthly costs (excluding labour costs) from gross monthly incomes (from milk and cow dung sales). Figures for milk cattle are presented at the household level (i.e. they include those for both cattle and calves) because, as indicated above, monthly rearing cost figures were not disaggregated into those for cattle and those for calves. However it can be assumed that calves generate negative net monthly incomes, as they do not generate any gross income.

As highlighted by Figure 4, crossbred milk cattle generate over double the net monthly income of local milk cattle. Whilst monthly costs incurred in rearing crossbred milk cattle are about Tk. 120 higher, this is more than outweighed by the much higher gross monthly incomes they generate (Tk. 1989.4 higher, or more than double). As detailed above, these higher gross monthly incomes come from the higher volumes of milk produced and sold by crossbred dairy cattle.

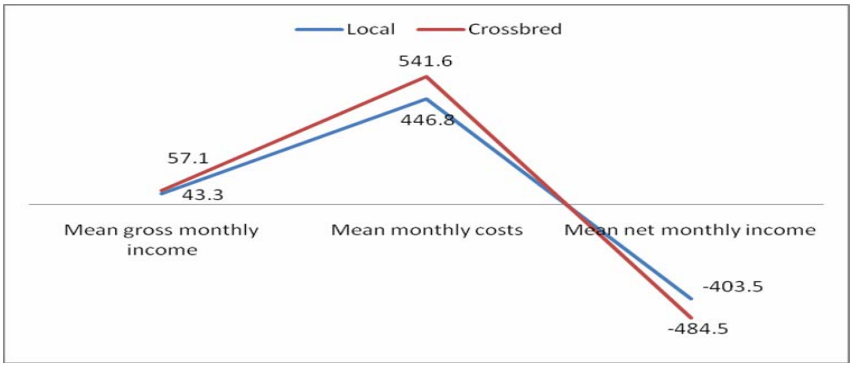
Figure 4: Mean net monthly incomes – crossbred versus local milk cattle

[16] See previous footnote



However, as demonstrated in Figure 5, the figures for beef cattle show a different story. Both local and crossbred beef cattle generate negative net monthly incomes. This is because the negligible incomes beef cattle derive from cow dung sales[17] are significantly outweighed by their monthly rearing costs. Furthermore, the slightly higher monthly incomes crossbred cattle bring in from dung sales are more than offset by the higher monthly costs. Thus negative values for net monthly incomes are higher for crossbred beef cattle than for local beef cattle. crossbred

Figure 5: Mean net monthly incomes – crossbred versus local beef cattle



4.3 Monthly net financial gains/losses

Net monthly incomes have been added to monthly nominal increases in asset values to provide overall net monthly financial gain/loss figures, which are used to indicate relative profitability. For milk cattle, figures are given at the household level (i.e. figures for calves are added to those for milk cattle).

It is clear from Table 9 and Figures 6 and 7 that the average monthly net financial gain from crossbred cattle is roughly double that for local cattle in the cases of both beef and milk cattle.

Table 9: Mean net monthly financial gain/loss – crossbred versus local milk and beef cattle

[17] Milk cattle also generate income from cow dung sales, but as the amounts gained from milk sales as so much more significant, the analysis above focuses on these.

		Mean net monthly financial gain/loss	Mean nominal monthly increase in asset value	Mean net monthly cash income
Beef Cattle	**Local (45[18])**	1,959.5	2,363	-403.5
	Crossbred (36[19])	3,900.5	4,385	-484.5
Milk Cattle	**Local (40)**	3,508.6	2,320	1188.6
	Crossbred (42)	6,591.9	3,535	3056.9

Figure 6: Mean monthly net financial gain/loss – local versus crossbred beef cattle

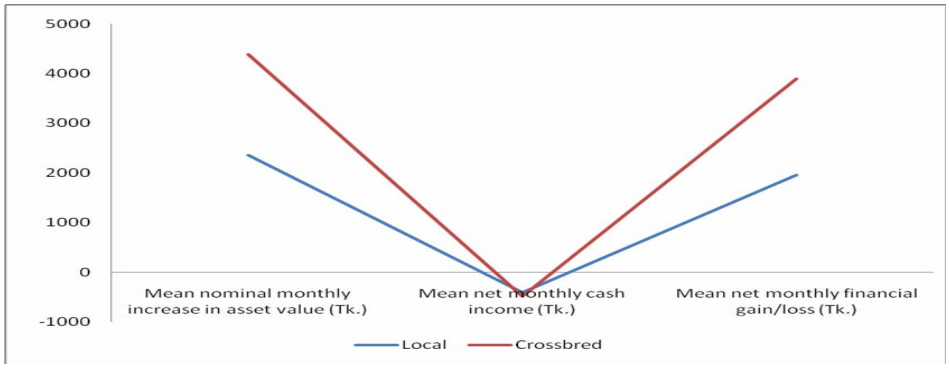
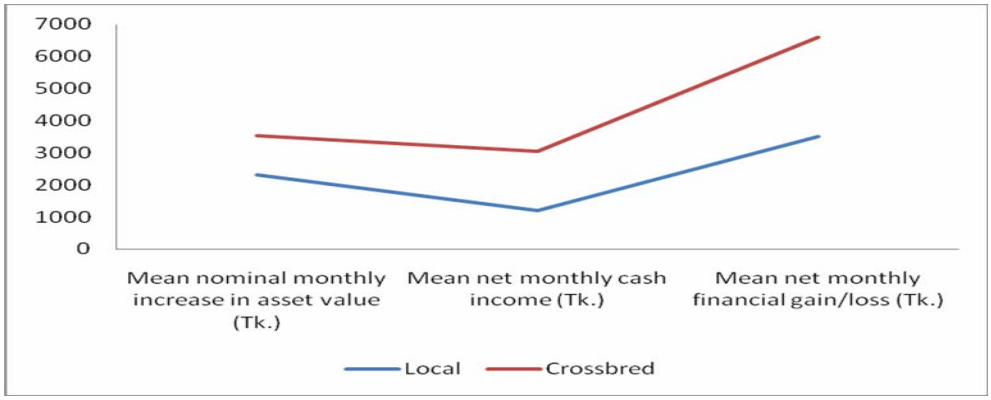


Figure 7: Mean monthly net financial gain/loss – local versus crossbred milk cattle



Furthermore, whilst the aim of the study is to compare crossbred and local cattle, the results also show that within the categories of crossbred and local, milk cattle generate almost double the monthly net financial gains compared to beef cattle.

[18] Numbers in brackets denote sample sizes for each strata.

[19] Excludes 4 cattle who were offspring of cattle received under ATP

There are two reasons for this. Firstly, beef cattle generate negative net monthly cash incomes, whilst milk cattle bring in regular cash incomes through milk sales[20]. Secondly, figures for milk cattle include calves. Whilst calves generate negative net monthly incomes, as they do not generate any gross income but do incur costs, it seems likely that these negative net monthly incomes are outweighed by their monthly nominal increase in value (Tk. 1,324 for local and Tk. 1,575 for crossbred calves) 500-600 Tk. to rear. The exact picture could not be ascertained - as highlighted above, monthly rearing cost figures were not disaggregated into those for cattle and calves because field testing showed that disaggregated data were likely to be inaccurate due to respondent difficulties in providing disaggregated figures. However, consultation with CLP's Asset Transfer Project Manager provided an estimation of average monthly calving rearing costs of Tk. 500-600, which is less than 50% of the figures for monthly nominal increase in calf asset values. Thus calves are contributing to, rather than detracting from, overall net financial gains from rearing milk cattle.

4.4 Labour Inputs

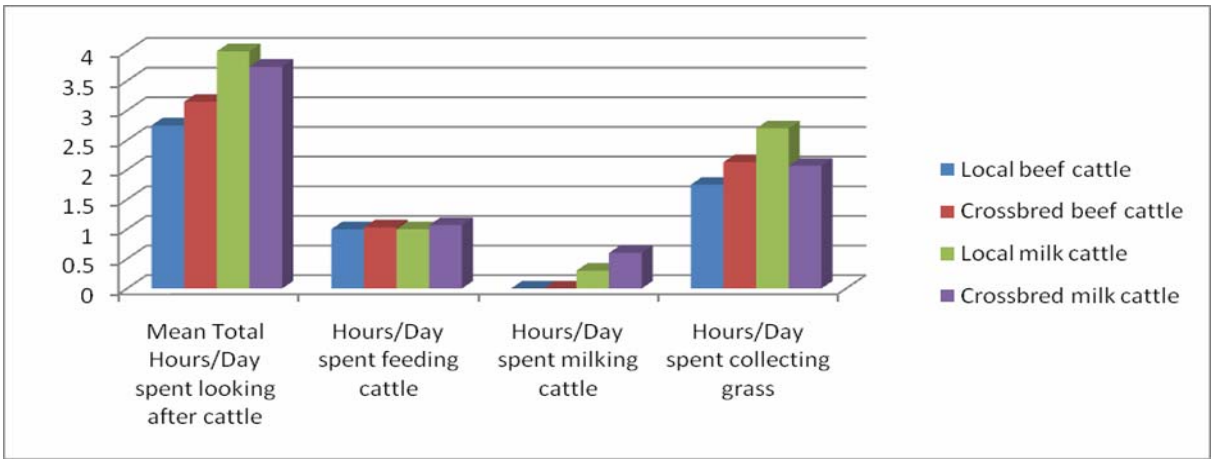
4.4.1 Hours per day spent looking after cattle and who does what

It was anticipated that costs associated with cattle rearing were likely to be manifested in terms of time rather than money. Thus labour costs are considered separately here, rather than included in the monthly costs section and input into monthly financial net/gain figures above.

To determine an idea of opportunity costs associated with rearing different types of cattle, respondents were asked several questions. Firstly, they were asked how many hours a day they spend looking after their cattle. The results are presented in Figure 8 below. They reveal that whilst crossbred beef cattle require slightly more time per day (24 minutes) to look after than their local counterparts, the opposite is true in the case of milk cattle, with crossbred owners spending an average of just over 15 minutes less per day looking after their cattle than owners of local animals. In both cases, the difference essentially comes from the extra time spent collecting grass; in the case of milk cattle, this additional time spent collecting grass for local cattle outweighs the extra time needed to milk crossbred cattle as a result of the greater volumes of milk they produce.

Figure 8: Hours per day spent looking after crossbred versus local cattle

[20] Although both beef and milk cattle also bring in income through sales of cow dung, the figures involved are much lower than the monthly costs of cattle rearing, hence net monthly cash incomes for beef cattle remain negative, as highlighted later in the report.



Respondents were also asked who was predominantly responsible for undertaking each task. The results showed that the female ATP participant is primarily responsible for both feeding and milking cattle across all four strata, although the husband takes responsibility for feeding in a minority of cases where the household owns crossbred cattle, whether beef or milk, and for milking in just under 10% of cases, whether cattle are crossbred or local.

Figure 9: Responsibility for feeding cattle: crossbred versus local cattle

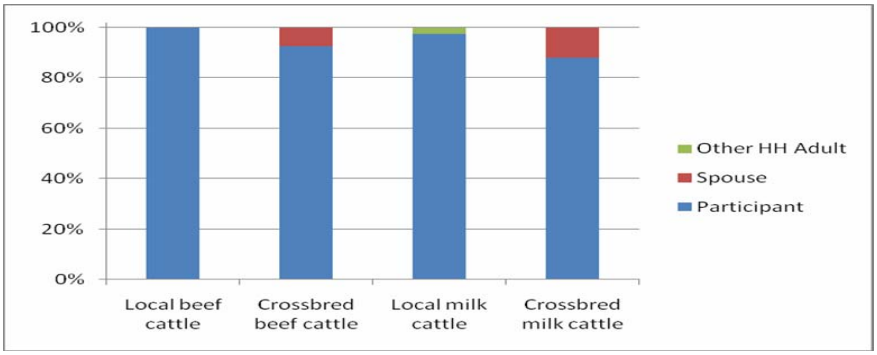
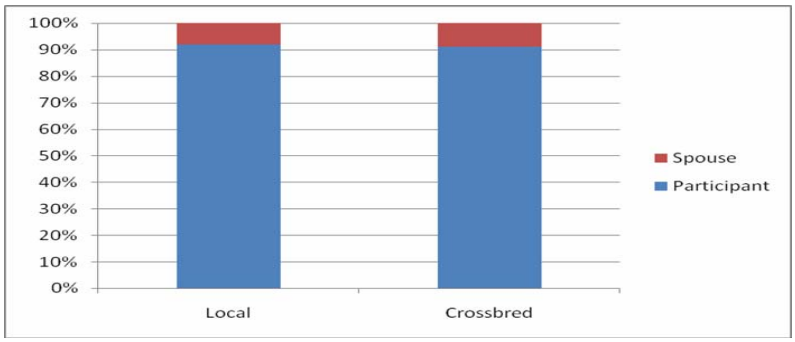
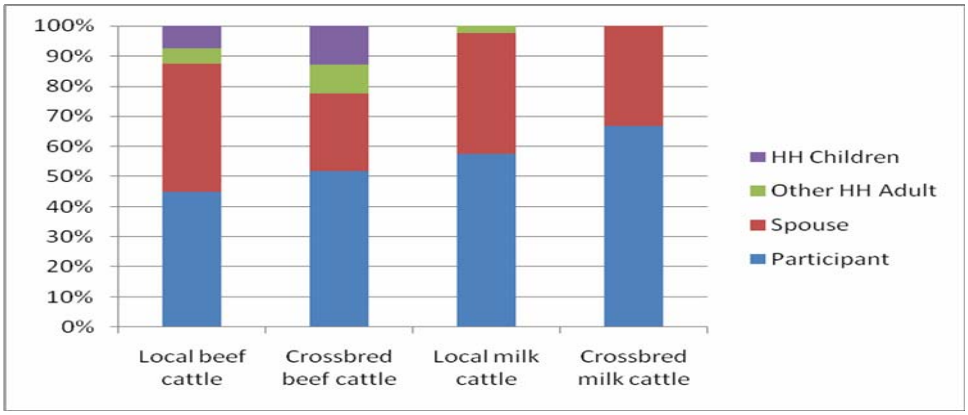


Figure 10: Responsibility for milking cattle: crossbred versus local cattle



It is clear that the task of collecting grass is more evenly distributed amongst household members, regardless of the type of cattle owned, although there is no clear difference between local and crossbred animals. The proportion of households in which the female participant is responsible for collecting grass increases from 45% in the case of local beef cattle through to 66.7% in the case of crossbred milk cattle. The spouse is responsible for collecting grass in between 25% and 40% of households, depending on strata, whilst other household adults and household children also play a role in a minority of households.

Figure 11: Responsibility for collecting grass for cattle: crossbred versus local cattle



4.4.2 Opportunity Cost of these Labour Inputs

In order to get an idea of the opportunity costs involved in cattle rearing, respondents were asked what those primarily responsible for each task would be doing if they did not have to undertake it. No clear patterns are evident in terms of a distinction between crossbred and local cattle.

Table 10: Opportunity costs associated with labour inputs to crossbred versus local cattle

		What would they be doing (%)?			If paid labour, monthly income (Tk. cash or in-
		Idle	**Paid Labour**	**Unpaid labour**	
Beef Cattle	**Local (45)**	84%	2.5%	13.5	295.0
	Crossbred (40)	58.7%	10%	23.8%	214.2
Milk Cattle	**Local (40)**	70%	12.5%	17.5%	167.6
	Crossbred (42)	67%	5%	28%	108.0

[21] Only includes respondents who stated that they would be earning an income

The majority of those looking after cattle stated that they would be 'idle' in the absence of having to care for cattle. In reality, it is highly unlikely that these household members would in fact be 'idle'; the fact that these figures are high points more to an undervaluing of the nature of unpaid domestic work than a lack of opportunity cost associated with cattle rearing.

The proportions stating that would be in paid labour were minimal (between 2.5% and 12.5%) and the average monthly income that would be gained from this labour (less than Tk. 300) was considerably lower than that derived from cattle ownership (a minimum of Tk. 1,834.5 i.e. the mean net monthly financial gain associated with local beef cattle, who bring in the lowest incomes of the four strata). However, given that cattle rearing does not take up an entire working day, it is unlikely that those members who would otherwise be in paid employment are foregoing such employment altogether in favour of cattle rearing. Instead, they are likely to be experiencing an increase in time poverty by rearing cattle alongside undertaking paid employment.

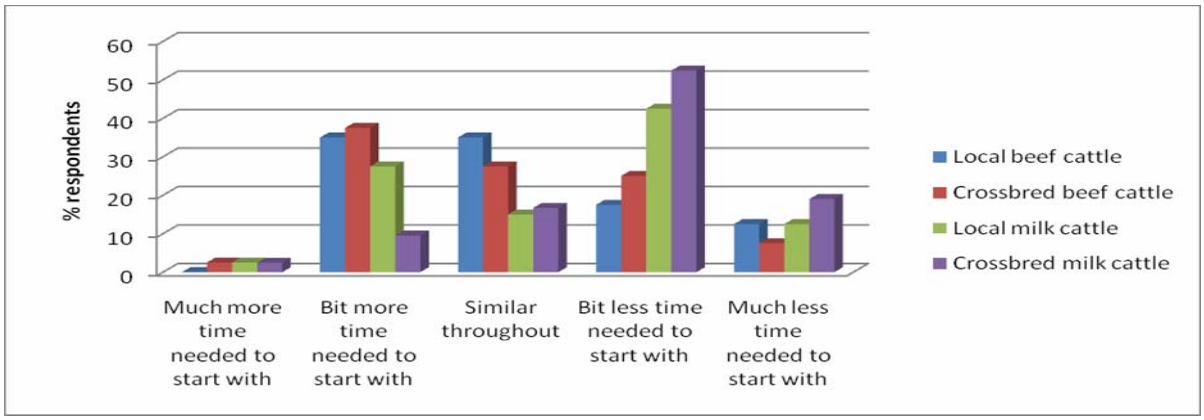
The idea that opportunity cost of owning cattle manifests itself as time poverty rather than foregone income is reinforced by the significant numbers stating that they would be undertaking unpaid labour in the absence of looking after cattle. It is unlikely that this unpaid labour is simply foregone; instead it either has to be undertaken by other household members or else looking after cattle represents an additional time burden on those who have to undertake such duties as well as maintaining their pre-cattle ownership levels of unpaid labour.

In order to determine which of these two scenarios is more common, all respondents (regardless of what they said those looking cattle would be doing in the absence of cattle ownership) were asked whether someone else had taken over their domestic duties as a result of themselves having to look after the cattle and if so, who[22]. However, 100% of respondents, regardless of what type of cattle they owned, stated that no-one else had taken over their domestic duties. Whilst this is a positive finding in that it suggests that children's education is not suffering as a result of the additional household labour required to rear cattle, it points to the overburdening of women, by adding an extra three or four hours of work per day to their already heavy workloads.

Finally, in order to ascertain whether quantitative data on labour inputs required for each type of cattle were representative of the picture over a longer space of time, or simply provided a snapshot of the current situation, respondents were asked whether required time inputs have altered since they first purchased their cattle. The results, presented below, suggest that milk cattle currently require more time to look after than at purchase (which makes sense, as owners now have to milk cattle and look after calves), whilst there is no clear trajectory for beef cattle.

Figure 12: How labour inputs required have changed over time

[22] In the result of respondents stating that children were taking on their mothers' domestic duties, a follow-up question was included in the survey, as to whether this affected children's schooling, in order to capture the incidence of this potential unintended negative impact of asset transfer.



Time dynamics associated with cattle rearing have been briefly examined here through the perspective of ascertaining whether is a difference between time required to rear crossbred and local cattle. However they are clearly complex and would benefit from more in-depth study, ideally through Focus Group Discussions, which would allow detailed exploration of the extent to which asset transfer has an unintended negative impact in terms of increasing time poverty.

4.5 Morbidity and Mortality

Respondents were asked (i) whether their cattle had been sick in the last year, and if so, (ii) how many times, and (iii) for how many days each time. They were also asked to rate the severity of sickness for each incidence, using a 1-5 scale, with 5 being the most serious.

The results are presented in Table 11 below. Slightly higher proportions of crossbred cattle owners reported their animals getting sick in comparison to their local counterparts (7% for beef cattle and 10% for local cattle). Figures for frequency of sickness reveal sharper distinctions between crossbred and local animals: for both milk and beef cattle, crossbred animals get sick twice as many times a year as their local counterparts. Furthermore, frequency of sickness is higher amongst milk cattle than beef cattle, except when comparing local milk cattle with crossbred beef cattle, in which case the figure for the latter is very slightly higher (0.02 days). Finally, there is no difference in the average severity of sickness experienced by crossbred and local milk cattle, whilst in the case of beef cattle, sickness faced by local animals tends to be more severe.

Table 11: Incidence, frequency and severity of sickness of crossbred versus local cattle

	% of cattle who got sick in last year	Mean no. of times per year	Mean number of days per year	Mean severity of sickness (scale of 1-5)[25]

[23] includes all animals, not just those who got sick

24 Only include those animals who got sick

25 See previous footnote

Beef Cattle	**Local (45)**	18%	0.18	8.4	2.5
	Crossbred (40)	25%	0.35	9.2	1.9
Milk[26] Cattle	**Local (40)**	30%	0.33	8.25	2.4
	Crossbred (42)	40%	0.64	7.47	2.4

To see if there were any qualitative differences between the morbidity of crossbred versus local animals, respondents were asked to report the type of sickness for each incidence of sickness identified above, respondents were also asked to report the type of sickness and cattle were also subject to a brief physical examination by enumerators to see if they displayed any current symptoms of sickness. Furthermore, to get an indication of the relative mortality rates of crossbred and local cattle, respondents were asked to report the deaths of any cattle they had owned in the last five years, along with the cause of death and whether the animal was a crossbred or local cattle. However, none of the findings were very revealing. Data on types of sickness for each of the incidences referred to above showed no clear differences between different types of cattle, whilst so few cattle showed current symptoms of disease and reported death rates were so low across all four strata that no analysis could be made of either of these indicators. .

This is due to the small sample size, which was calculated on the basis of the key indicator of this survey (i.e. the size required to show a significant difference in the overall profitability of local versus crossbred cattle), rather than individual indicators. Under CLP2, crossbred/local status will be recorded in ATP participants' passbooks, Livestock Services Providers' treatment records and mortality records. This will enable the calculation of relative morbidity and mortality rates and will provide comparative qualitative data from a much wider sample of cattle than that used in this study.

4.6 Adherence to the Ideal Management Regime for Crossbred Cattle

Owners of cross bred cattle were asked several questions related to the management of their cattle to determine whether they were complying with the ideal management regime for crossbred cattle, as outlined in the training they received. The findings, presented in Table 12, show that the majority of crossbred owners are following the ideal management regime for their cattle, but less so for calves, except in the case of feeding them milk. . This is likely to be because (i) milk is more easily available to feed to calves than alternatives to straw or grass (and the former is also free, whilst the latter cost money), and (ii) whilst the CLP provides voucher support for deworming cattle, this is not true in the case of calves.

[26] This is aggregated data for milk cattle and their calves; no attempt was made to disaggregate as respondents were asked about incidence and frequency of sickness within the last year, but both crossbred and local calves were less than 3 months old on average, which would bias the results.

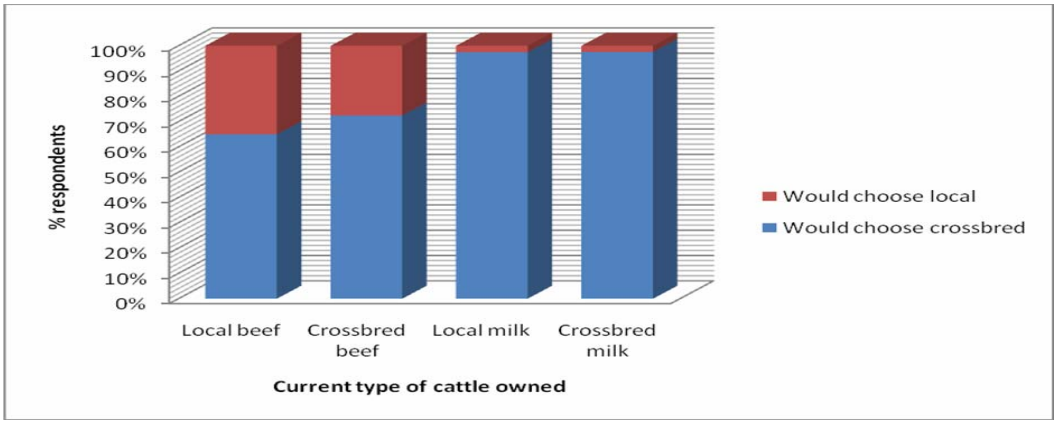
Table 12: % of crossbred owners who followed various aspects of the ideal management regime for crossbred cattle

	Calves dewormed at 21 days-1 month?	Calves dewormed at 3 months?	Cattle dewormed at regular 6 month intervals thereafter?	Calves not fed straw/grass before 2 months?	Calves fed 1-3 litres of milk per day up to age of 4 months?	Cattle fed at least 5kg of fodder per day?
Beef Cattle	n/a	n/a	100	n/a	n/a	92.6
Milk Cattle	64.3	76.2	100	31.0	100	100

4.7 Preferences for Crossbred versus Local Cattle

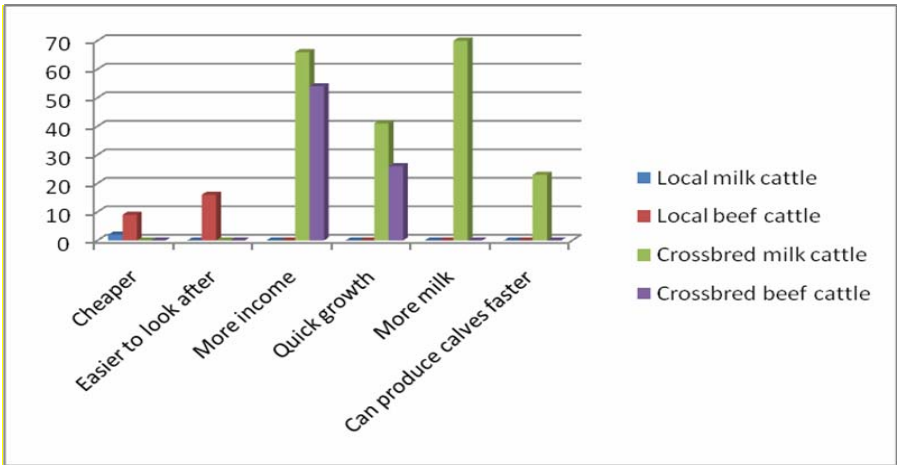
Respondents were asked whether they would choose a crossbred or local cattle if they were to purchase another cattle. Crossbred cattle were preferred by owners across the four strata. Almost 100% of milk cattle owners, whether they currently owned local or crossbred animals, said they would choose a crossbred if they were to purchase another cattle. However, relatively smaller proportions of beef cattle owners indicated a preference for cross bred animals (65% of local beef owners and 72.5% of crossbred beef owners).

Figure 13: Preferences for crossbred versus local cattle



Respondents were also asked to give reasons for their preferences, with multiple responses allowed. For beef cattle, 'more income' comprised two-thirds of responses, whilst the remaining third of respondents cited 'quick growth'. Whilst 'more milk' was the most popular reason for preferring crossbred milk cattle, 'more income' was also a strong response, whilst the other reasons cited were 'quick growth' and 'can produce calves faster'.

Figure 14: Reasons for crossbred/local preference



5. Conclusion

This study has demonstrated that crossbred milk and beef cattle are twice as profitable as their local counterparts. For milk cattle, this is a result of both higher nominal monthly increases in asset values (for both cattle and calves) and higher net monthly cash incomes (at the household level). For beef cattle, greater profitability derives solely from higher asset values increases.

Milk cattle, whether crossbred or local, bring in significantly more money from milk sales than they cost to rear. Furthermore, crossbred cows generate around Tk. 2,000 more in monthly milk sales than local cows, as a result of producing double the volume of milk, which more than outweighs the Tk. 150 per month more they incur to rear on average.

However, beef cattle actually generate negative net monthly cash incomes. The small gross incomes they provide from dung sales (less than Tk. 60 per month) are insufficient to meet monthly feeding and veterinary costs. These costs are around Tk. 100 more in the case of crossbred beef cattle than local beef cattle, whilst they bring in only Tk. 15 more per month from dung sales, meaning their owners are losing more money on a monthly basis. Although this fact is countered by crossbred cattle's higher monthly increases in asset value, meaning they are more profitable overall, profits are tied up until the sale of the cattle. Thus the additional monthly costs to rear crossbred beef cattle are more difficult for their owners to absorb in comparison with

crossbred milk cattle owners and represent an additional investment. Whilst CLP provides asset maintenance stipends to ATP participants during the first six months of ownership to help with feeding costs and vouchers to pay for veterinary services, it is important to monitor carefully whether crossbred beef cattle owners sell their assets in periods of financial distress;

Hard data demonstrating greater profitability of crossbred cattle are reinforced by respondent preference. Preference for crossbreds is particularly strong amongst milk cattle owners, with close to 100% stating that they would choose a crossbred animal if they were to purchase another cattle. The lower incidence of crossbred preference amongst beef cattle owners is likely to reflect the difficulties in absorbing the additional costs crossbred beef cattle incur in comparison with local beef cattle.

The fear that crossbred cattle take more time to rear and thus their ownership adds to the already heavy time burdens of female participants is unfounded. The extra time expended is minimal, and in any case approximately cancelled out by time savings from reduced need to collect fuel as a result of higher dung production. However the dynamics of opportunity costs associated with cattle rearing are complex and would benefit from further investigation, preferably of a qualitative nature.

Incidence and frequency of sickness is slightly higher amongst crossbred cattle. However, findings on severity of sickness reveal a lack of distinction between crossbred and local animals, and data on types of sickness and mortality are essentially inconclusive. Indeed, whilst morbidity and mortality are important issues to consider when assessing profitability, a clear picture could not be ascertained due to the small sample size, which was calculated based on the requirement of the key indicator (i.e. relative overall profitability of crossbred versus local cattle) rather than the needs of individual indicators. However, the fact that crossbred/local status will be recorded in participant passbooks, cattle deaths records and Livestock Services Provider (LSP) treatment records of under CLP2 means reliable comparisons of mortality and morbidity will be possible in the future.

Crossbred owners are generally adhering to the additional deworming and feeding requirements for crossbred cattle, although less so in the case of calves. Thus it would be fruitful to investigate the reasons behind this non-adherence and formulate suitable responses. For example, in the case of deworming, this may be providing vouchers for the deworming of calves, in addition to those provided for cattle.

The study findings also highlight two further points for consideration:

- The reduced value of investment capital provided to the first cohort of ATP participants under CLP2 may have implications for the affordability of crossbred animals – this issue should be investigated by the Livelihoods Unit;

- It is important to record weight at purchase for all cattle, as without this data growth rates cannot be calculated.

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