

Seminar Paper
on
**Artificial Insemination in Cattle: A study on Socio-Economic Impact of
Dairy Farmers in Savar Upazila.**

Submitted To

Dr. Muhammad Abu Yusuf
MDS (Research & Consultancy)
Bangladesh Public Administration Training Center
Savar, Dhaka &
Module Coordinator
Seminar Paper Preparation & Presentation
126th ACAD Training Course.

Submitted by

MOHD. LIAQUAT ALI
ROLL- 120
126th ACAD Training Course
Bangladesh Public Administration Training Center
Savar, Dhaka.

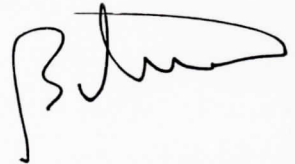


Bangladesh Public Administration Training Centre (BPATC)
Ministry Of Public Administration,
Savar, Dhaka 1343.

To whom it may concern

This is to certify that Mohd. Liaquat Ali, Deputy Secretary, Secondary and Higher Education Division, Ministry of Education bearing Roll number 120 of 126th Advanced Course on Administration and Development (ACAD) has prepared this seminar paper title on 'Artificial Insemination in cattle: A Study on Socio-Economic Impact of Dairy Farmers in Savar Upazila'. He has done this seminar under my direct supervision for the partial fulfilment of the course. He has followed all my instructions during his work.

I wish him every success.



Professor Dr. Basir Ahmed
Department of Government & Politics
Jahangirnagar University
&

Research consultant
126th Advanced Course on Administration and Development.

Acknowledgement

The author is indebted to many persons on caring out the study. At first, I would like to express my gratefulness to Mr. Md. Rakib Hossain ndc, Rector, BPATC and Secretary to the Government for his proper direction and guidance. I would like to express my deep appreciation and gratitude to Mr. Md. Zafar Iqbql ndc, Course Advisor & MDS (M&PA), Dr. Mohammed Amjed Hossain, Course Director & Director (ST&RC), Md. Atikuzzaman, Course Coordinator & Director and A.T.M Arif Hossain, Course Coordinator & Deputy Director for cooperation and accompaniment throughout the course.

I express my heartfelt thanks to Dr. Muhammad Abu Yusuf, MDS (R&C) & Module Director for his cordial cooperation to prepare the seminar paper. This effort would not have been successful had Dr. Muhammad Abu Yusuf not put in his tireless efforts and guidance in the preparation and improvement of seminar proposal. I would like to convey my sincere thanks to Dr. Mehedi Masud, Deputy Director and Md. Morshed Alom Ph.D, Senior Research Officer for their kind support and cooperation.

I express my gratitude to Professor Dr. Basir Ahmed, Department of Government & Politics, Jahangirnagar University & Research Consultant for his valuable guidelines, assistance, suggestions and advices throughout the study. He helped a lot for the preparation of the seminar paper.

I would like to convey thanks to the officers of Department of Livestock and dairy farmers of the Bhakurta Union of Savar upazila for providing very important information and data which are valuable for this seminar paper. I am also highly grateful to the authors/writers from whose Books/Writings I explored invaluable ideas and information to complete this seminar paper.

Finally, my thanks and gratitude to the officials of Bangladesh Public Administration Training Centre (BPATC) specially related to the 126th Advance Course on Administration and Development for their support during the course.

BPATC, Savar, Dhaka
22, September, 2019

Mohd. Liaquat Ali
Deputy Secretary
Secondary and Higher Education Division
(A participant of 126th ACAD)

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Artificial Insemination in Cattle: A study on Socio-Economic Impact of Dairy Farmers in Savar Upazila.

Abstract:

This study was undertaken to evaluate the socio-economic impact of artificial insemination (AI) in two villages of Savar Upazila of Dhaka district. The important criteria for evaluation were distribution of crossbred cattle and their productivity performance, economic benefits derived from artificial insemination (AI) technology, milk consumption at household (HH) level, and livelihood improvement status in study areas. A cross-sectional survey was conducted by using a pre-tested and pre-designed questionnaire and face-to-face interview technique. A stratified-purposive sampling technique was applied to select 22 small-scale dairy farmers from two study areas. The data so generated were arranged in tabular form and were analyzed as per the objectives of the study. Simple statistical tools along with one way ANOVA were applied to examine the validity of the findings. Evidence showed that milk productions were significantly increased about 123 percent during eight years through intervention of AI technology ($p < 0.05$). The results also showed that the per capita milk consumption in farm HH level was significantly increased during eight years (150 ml Vs 290 ml). All the major parameters for socio-economic status assessment like economic benefits, children's schooling intensity, HH health status and household savings were found positive impact, which were the secondary influence derived from artificial insemination technology. The empirical evidence showed that the national demand for milk production and to attain the goal for poverty alleviation can meet up by rearing and improving the productivity of crossbred dairy cattle through intervention of artificial insemination technology in rural areas. The demand for the AI services has been increasing but the existing efficiency rate of AI is needed to increase especially in rural areas. From this study, it is recommended that farmers' needs should be translated in a way that they get access to their required services in a satisfactory manner.

Key words: Artificial insemination, Milk production, Per capita milk consumption, Livelihood improvement.

Introduction and literature review:

The economic backbone of Bangladesh is based on agriculture where livestock is one of the major components of agriculture (crop, livestock, fisheries and forestry). Agriculture Sector plays an important role in economic development in Bangladesh. This Sector contributes around 17% of the Gross Domestic Product and provides employment for around 48% of the total labor force of the country (Economic Review-2017). There are about 28.712 million households in the country. The number of Agriculture farm households has been recorded at 14.72 million, which account for 51.33% of total households. 50% of total households rear livestock and poultry

(Report of the Household-based Survey 2009, BBS). Among the SAARC countries, the number of Cattle population of Bangladesh rank 2nd and 7th among the Asian countries. The contribution of the livestock sub sector in GDP at constant prices is projected at 1.47 per cent in the financial year 2018-19. The growth of this sub sector was 3.47 percent in the same fiscal year (Yearly report, DLS 2018 and Bangladesh Economic Review 2018-19). Livestock development is considered as a vital step to enhance the rural economy as well as to build a meritorious and healthy nation by ensuring the animal protein security.

To meet the rising demand for animal protein from animal origin as well as nutrition security at household level the famers need to enhance their productivity efficiency. One of the major challenges of the farm animal production is the low productive indigenous cattle with poor feed conversion efficiency (Jabbar et al 2005; Khaleque et al. 2012). Moreover, lack of proper breed up gradation, proper breeding policy and feed scarcity, disease prevalence are also the hindrance for productivity (Bari 2008; Khan et al. 2009).

To overcome the barrier of productivity enhancement, artificial insemination (AI) has been chosen as the best assisted reproductive biotechnology tool to boost up the production of highly genetically meritorious breeding stock as well as hybrid vigor. It was also reported that artificial insemination services is the most suited technology for better milk and meat production as well as rural socio-economic upliftment of Bangladesh (Uddin et al. 2010).

In Bangladesh the production capacity of local cattle is very low, which can be increased to a great extent for enabling the sector to play an important role in national economy. Artificial insemination of cattle through production of liquid semen started here from sixties. Getting positive result on breeding more improved type of cattle by adopting artificial insemination creates a great interest among the farmers. Artificial insemination was first introduced in 1959 at very limited scale, from 1974 it was started to practice at the farmers level (Shamsuddin et al. 1987; Alam and Ghosh

1988). The extension as well as familiarization of AI service was introduced by the Department of Livestock Services from the year of 1975 (Ali 2003). According to its efficiency, simplicity, economy and success, the concept of AI industry become familiar throughout the country (Vishwanath 2003). Therefore, since 1975, a lot of initiatives were taken to facilitate and spread out of artificial insemination activities at farmer's door step, by introducing high quality frozen semen of Friesian and Shahiwal breed. Initially, the AI coverage was very low, it was only 15-20% since the starting of new millennium. However, it was spread throughout the country from the 1st decade of this century by strong govt. initiative. Under the Department of Livestock Services (DLS) along with some NGOs, 23 district artificial insemination centre and 4500 AI points, the artificial insemination services are provided to the farmers. Thus, extended AI activities resulted acute acceleration in producing a good number of crossbred high yielding cattle in the country. Consequently, milk and meat production up rises sharply. The total milk and meat production is 99.23 and 75.14 lakh MT in FY 2018-19, respectively, whereas, it was only 21.4 and 10.6 lakh MT respectively in FY 2004-05 (Yearly report, DLS 2018 and Bangladesh Economic Review 2018-19). It showed that milk and meat production increases several times during the 15 years. Breed up gradation through artificial insemination is the major factor behind this significant improvement. However, this characteristic also immensely associated with the socio-economic status of the farmers as well as economy of the country. Hence, this study is a modest effort to assess the milk production as well as socio-economic impact of dairy farmers in Savar upazilla.

Problem statement:

In consultation with the artificial insemination workers, who are the key implementers of the programme, and the primary stakeholders i.e. the beneficiaries a blend of feedback was found in terms of technology transfer and its ultimate results about the AI technology. The major challenges are the violation of bilateral deal of the government, improper recording, discriminatory price between DLS and other NGOs, and quality of calves to some extent. The policy demand of the artificial insemination

workers comprise of improving semen quality especially blood level, supplying different varieties of bull semen, ensuring adequate artificial insemination materials, increasing acceptability rate of repeat case, reducing price of semen to farmers, and reducing overlapping of the artificial insemination workers in a given area.

The beneficiaries are mainly smallholders having 2-5 cattle and involved in agricultural occupation. The beneficiaries seek different varieties of bull semen depending on prevailing market demand for those products. For instance, demand for Holstein Frisian bull semen is high in Sirajganj and Pabna as milk pockets of Bangladesh whereas demand for Sahiwal and Brahma bull semen is high in Kushtia and Narsingdi where beef fattening is a popular business. Another important problem is production of inbred offspring, which is the ominous sign of this industry in terms of low productivity. The household consumption of animal protein in rural areas, marketing of produced goods and income utilization of the respective farmers is another crucial concern.

Research objectives:

The objectives of this study is stated below-

- i) To evaluate the changes in milk Production in the selected area.
- ii) To investigate the socio-economic improvement of farmer in the selected area.

Research questions:

The following research questions are drawn to assess the validity in the selected study area:

- i) What are the current farming activities of selected area?
- ii) Is milk Production increase in selected area and is per capita milk consumption increased at farmer's level?
- iii) Is there any improvement of livelihood status of farmer's profile?

Rationale of the study:

The artificial insemination has been the most successful tool used for improvement the productivity of cattle in Bangladesh. According to the data of DLS and MoFL, milk and meat production has been increasing tremendously especially from the starting of this decade (Figure 1).

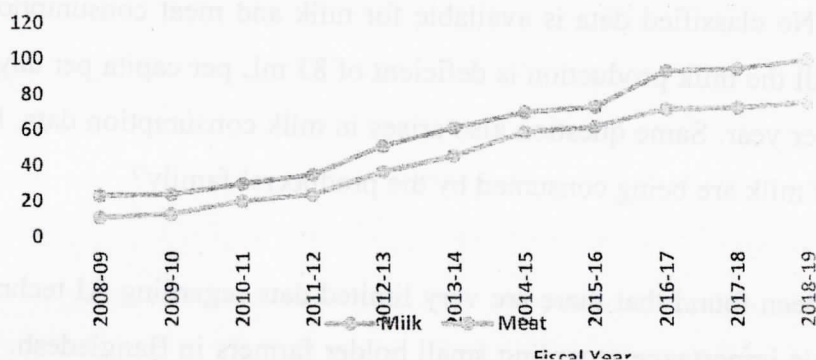


Figure 1. Trends of milk and meat production in Bangladesh.

Though, the AI technology was started from 1975, the coverage of AI expanded (approximately 45%) through some strongly motivated govt. projects. As well as, it takes 2-3 generations to get the high productive offspring from low productive native cattle. Moreover, the total semen production throughout the country is more than 55 lakhs doses per year, which is increasing day by day. Out of this production, DLS produced about 44 lakhs of semen straws, which is almost double compared to the production 15 years back. Accordingly, the total number of AI services reached up to 50 lakhs. Only DLS has performed 41 lakhs of AI in 2018-19 FY (Figure 2). But, the total calves' production is still poor, as only about 17 lakhs (32%) calves were produced through AI in the previous year.

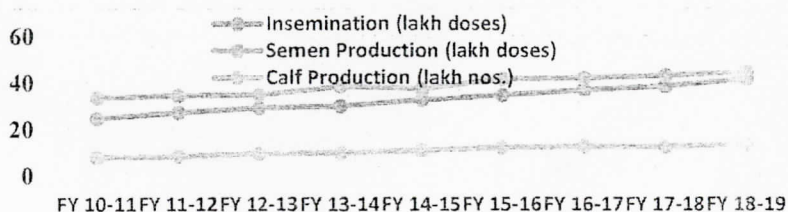


Figure 2. Trends of AI, semen production and calf production through DLS.

On an average 250 mL of milk/day/head and 120 gm of meat/day/head is required to meet the nutritional demand from animal origin. Now, the availability of milk and meat/head/day is 165 mL and 124 gm, respectively. It represents that meat is surplus for the country, though it is questionable that whether the meat consumption is properly distributed among the people or it shows high value due to the consumption in rich areas. No classified data is available for milk and meat consumption. On the other hand, still the milk production is deficient of 83 mL per capita per day, which is 53 lakh MT per year. Same question also arises in milk consumption data, how much proportions of milk are being consumed by the producers' family?

It has been found that there are very limited data regarding AI technology and socio-economic importance regarding small holder farmers in Bangladesh. Therefore, in this study, according to above discussions, an attempt will be made to quantify the productivity especially achievement in milk production in the study area. Additionally, the socio-economic profile, consumption of animal nutrition and income generation status will also be assessed in selected places. It seems that the finding of this study will help to take decisions by the govt. for further improvement, recording, monitoring, regulations and other developmental activities regarding AI technology for building healthy nations.

Conceptual framework:

Artificial insemination (AI) is the process of collecting sperm cells from a male animal and manually depositing them into the reproductive tract of a female. Artificial insemination is commonly used instead of natural mating in many species of animals because of the many benefits it can reap. Dairy farmers care for cows that supply milk and oversee the harvesting of their milk. Some dairy farmers own their cow herds, as well as the land that the farm is on.

Although research is done on various elements and aspects of artificial insemination practices in dairy farms for the milk production, the following factors (variables) seems to more pertinent in connection to influencing respectively.

Policy and investment activities

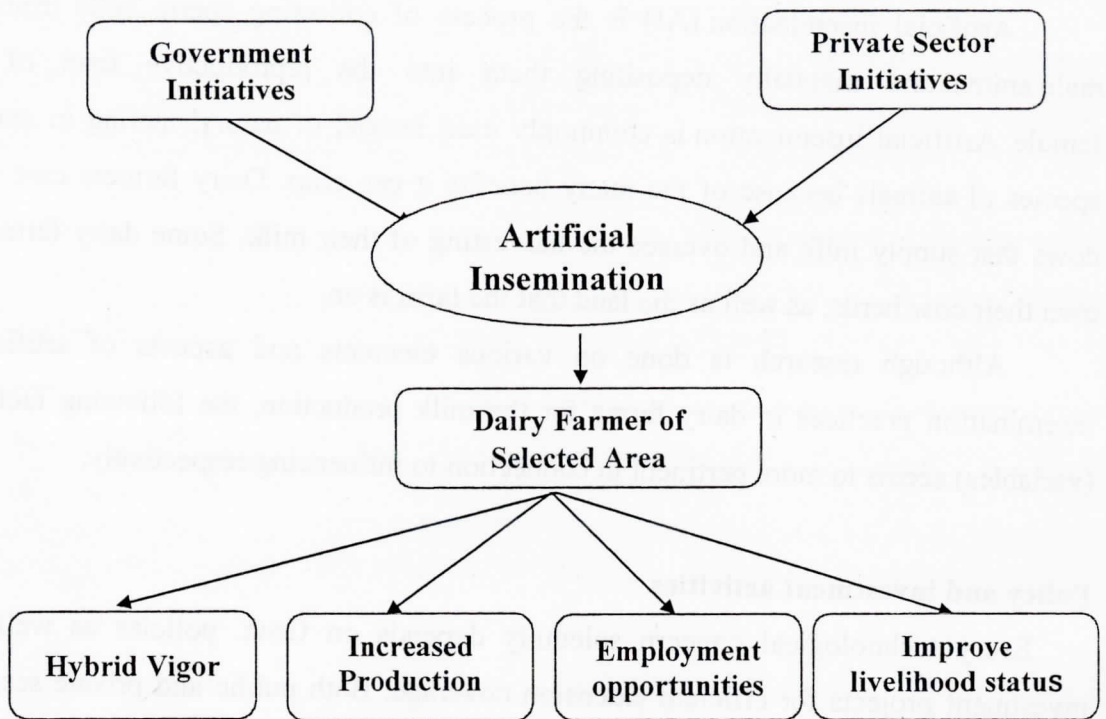
Every technological concern solemnly depends on Govt. policies as well as investment projects for efficient extension coverage. Both public and private sectors labor and efforts play a key role to facilitate the new introduction. Artificial insemination technologies has brought out through Govt. decisions, in some instance practiced by NGOs, an important factor for improving dairy farming of Bangladesh.

Productivity concerns

Majority of the dairy farmers are very much dependent on local breeds of cattle. The milk productivity is also affected due to their low genetic makeup. Artificial insemination can uplift the genetic merit and thus hybrid vigor that increases milk productivity dramatically, which is the most important concern in dairy sector.

Household status and livelihood concerns

Majority of the dairy farmers of the country are marginal and keeping small herd in the farm. The income generated from this farm is very much interrelated with the respective household's status, livelihood, health, nutrition, and education, poverty abject and socio-economic patterns. Artificial insemination has also the same impact on smallholders' dairy farms, which should be assessed by surveying the households as well as accumulating and analyzing the secondary data.



Source: Deign by Author.

Methodology:

A research/ Seminar Paper based on appropriate information/data. It is better to collect data from primary source. But due to time constraints, only 22 household were selected for in this study. This Seminar Paper has been largely depend on Secondary Sources of data i.e. concerned books, journals, reports, articles, websites etc.

Selection of study area:

The study was conducted in two villages (Mushurikhala and Khaghuria) of Bhakurta union at Savar upazila in Dhaka district. The villages were selected on the basis of following characteristics:

- Villages have nearby artificial insemination point/sub-centre.
- Farmers have been practicing artificial insemination technique for a few years.
- Easy communication to collect data.

Selection of sample household:

The data necessary for the analysis, were collected both from primary and secondary sources. The primary data were collected from a sample survey. At first 22 household of 2 villages of Bhakurta union at Savar upazila were selected, than data were collected and categorized. Secondary data was gathered from Department of Livestock service, farmgate, Dhaka and Upazila Livestock Office, Savar, Dhaka. Secondary data also collected form the published book/folder/catalogue.

Preparation of the survey schedule:

Before preparing the final questionnaire, a draft questionnaire was prepared. It was pre-rested in the study areas by interviewing a few artificial insemination technology adopters. The draft questionnaire was improved, rearranged and modified in the light of the practical experiences gathered in the pre-test. The final questionnaire was developed in logical sequence so that the artificial insemination adopters could answer systematically.

Methods and Period of data collection:

Direct interview method was followed to collect data from the respondents. The sample survey was conducted at August/2019. All the required information's were carried out from selected 22 household of mushurikhala and khaghuria villages of Saver upazila.

Analytical techniques:

After completion the survey, data were arranged in the Microsoft Excel sheet and analyzed as per the objectives of the study. Simple statistical tools such as, mean, average, percentage etc. were applied to examine the validity of findings. Data of year wise cattle head, milk production and per capita milk consumption were analyzed using one-way ANOVA followed by Duncan's test (IBM SPSS Statistics, version 22). Values of $p < 0.05$ were considered statistically significant.

Data Analysis/Findings:

Two villages namely mushurikhala and khaghuria of Savar upazila of Dhaka district were purposively selected as the study area. The purpose was to determine the status of dairy farming activities, artificial insemination adoptions and its' impact on milk productions as well as impact of HH livelihood through AI technology.

Farming activities of selected area:

The results of the field survey on the Household characteristics are presented in Table 1. It appears only 4.55 percent dairy based household reported as business is their main income generating occupation, while 95.45 percent stated that dairy farming is their main occupation. Out of them 68.18 percent stated agriculture is their 2nd income generating option.

Table 1. The Household (HH) characteristics in the study areas

Sl No.	Item	Present study
1	Total number of HH	22
2	Average number of persons per HH	6.14
3	Main income generating activity (%)	
	a. Dairy farming	95.45
	b. Business	4.55
4	Secondary income generating activity (%)	
	a. Agriculture	68.18
	b. Business	18.18
	c. Both agriculture and business	13.64

The results of farming activities and cattle distribution stated at Table 2. It shows that average number of cattle were increased to 7.409 at 2018 from 4.363 at 2011. Though it was not statistically significant. At present, averagely 3.59 nos. (About 50 percent of total cattle population) of milking cows are producing milk in the study areas, while the average number of calves are 3.82. A 68.18 percent of farmers stated that the green grass is available in good condition, while 31.82 percent

reported it fair. It is obtained that due to artificial insemination of cattle; number of cattle has increased at farmer's level. Calves born through artificial insemination are high in genetic quality.

Table 2. The farming activities in the study areas

SI No.	Item	Present study
1	Average number of cattle per HH	
	a. in 2011	4.364
	b. in 2014	5.455
	c. in 2018-19	7.409
2	Average number of milking cows per HH	3.59
3	Average number of calves per HH	3.82
4	Availability of green grass (%)	
	a. Good	68.18
	b. Fair	31.82

An artificial insemination activity is interesting to note that that 100 percent of the farm practiced artificial insemination for breed up gradation in the study areas (Table 3. Shows). Also 100 percent artificial insemination service practiced through the government workers. Average number of service for per conception is 2.23; a little bit lower than the national average which is 2.60. The results of artificial insemination performance on the basis of satisfaction of farmers are 68.18 percent satisfactory, 18.18 percent moderate and 13.64 percent unsatisfactory.

Table 3. The artificial insemination activities in study areas

SI No.	Item	Present study
1	Percentage of AI practice in farm	100
2	AI service provider (%)	
	a. Government	100
	b. NGOs	0.00
3	Average number of service per conception	2.23

SI No.	Item	Present study
4	Performance of AI services (%)	
	a. Satisfactory	68.18
	b. Unsatisfactory	13.64
	c. Moderate	18.18

Milk Production performance:

The productivity of dairy cattle was measured in terms of milk yield and lactation period. The reproductive performance was measured in terms of the fecundity rate of the dairy cows. The results indicate that average milk production in farm level is 30.64 liter (Table 4). There is a clear difference on milk production stat between local and crossbred cows (2.82 lt Vs 9.25 lt). It revealed the major impact of AI in dairy industry. Average lactation period is slightly higher for crossbred cows 280.45 days than the local cows 263.45 days. The results also show that the per capita consumption of milk is significantly increased during eight years (150 ml Vs 290 ml).

Table 4. Production performance and milk consumption pattern in the study areas

SI No.	Item	Present study
1	Average daily milk production per farm (lt)	30.64
2	Average daily milk production per local cow (lt)	2.82
3	Average daily milk production per crossbred cow (lt)	9.25
4	Average lactation period of local cow (days)	263.64
5	Average lactation period of crossbred cow (days)	280.45
6	Average milk production per farm per year	
	a. in 2011	3798.86
	b. in 2014	5640.91
	c. in 2018-19	8508.41
7	Average milk production increased introducing AI (%)	123.97
8	Per capita average milk consumption per day (ml)	

Sl No.	Item	Present study
	a. in 2011	150
	b. in 2014	210
	c. in 2018-19	290

The field survey results (Table 5) represent that the milk production per farm per year is significantly higher in 2018 than the year of 2011, 8508.40 and 3798.86 liters, respectively ($p < 0.05$). From the time period of 2011 to 2018, the results shows that the number of cattle increase non-significantly. Hence, the milk production increased about 123 percent for the given time period. It seems the enhancement of milk production is the result of introducing of AI up to small scale dairy farms. It is clearly determined that after two generations of cattle, productivity sharply increased. The AI was done the trick by improving genetic merit for certain economical traits.

Table 5. Year wise data for cattle head, milk production and milk consumption in the research areas

Sl No.	Year	No. of cattle per farm	Milk production per farm per year (lt)	Per capita milk consumption (ml)
1	2011	4.363 ^a	3798.86 ^a	147.13 ^a
2	2014	5.454 ^a	5368.18 ^{ab}	211.27 ^a
3	2018-19	7.409 ^a	8508.40 ^b	289.36 ^b

Values with different superscripts within the same column are significantly different ($P < 0.05$).

A similar result is found in Savar upazila as the milk production increased 130 percent during the past 8 years (Table 6). Also the total number of dairy farm is increased in Savar upazila from 392 to 620 during the given time period. Interestingly, during 8 years the number of AI service increased only 15 percent but the milk production increased more than 1.3 times. Because, intervention of AI technology increases cows productivity geometrically generation by generation. After each generation, AI brought the sharp changes in dairy productions.

Table 6. Dairy statistics of Savar upazila.

Sl No.	Item	Savar Upazilla
1	Total number of cattle	
	a. in 2011	86000
	b. in 2014	128000
	c. in 2018	182400
2	Total milk production (MT)	
	a. in 2011	3150
	b. in 2014	3661
	c. in 2018-19	7250
3	Average milk production increased during 8 years (%)	130.16
4	Total number of Dairy farm	
	a. in 2008	392
	b. in 2013	424
	c. in 2018	620
5	Total number of AI per year (nos.)	
	a. in 2011	24261
	b. in 2014	26009
	c. in 2018	28015

Source: Upazila livestock office, Savar, Dhaka.

Impact on livelihood improvement of Dairy Farmers:

The cost of rearing dairy cattle is calculated on the basis of feeding cost, veterinary and other expenses. In Savar upazila, cattle are generally fed with greed fodder, dry fodder and straw, which are self-produced. The purchase inputs are mainly oil cakes, minerals, concentrates, molasses and veterinary medicine. It can be observed from the table 7 that the total average cost per farm per year is BDT 3.6 lakh that is 0.5 lakh per animal per year. Whereas, the income from dairy farming is calculated in terms of milk production along with the value of offspring. The results represent that the total average income for per farm per year is 5.25 lakh. It is undoubtedly shows that the net

profit per farm per year is 1.65 lakh, which means the benefit cost ratio is quite healthy as 1.46.

Table 7. Socio economic status in research areas

Sl No.	Item	Present study
1	Average income from dairy farming per year (BDT)	525023.18
2	Average cost for dairy farming per year (BDT)	360022.73
3	Average Profit per year (BDT)	165000.45
4	Status of schooling after introducing AI (%)	
	a. Upgraded	77.27
	b. No change	22.73
5	Status of HH savings after introducing AI (%)	
	a. Increased	81.82
	b. No change	18.18
6	Health status after introducing AI (%)	
	a. Improved	72.73
	b. Not sure	27.27

The field survey also revealed few secondary or economic effects on HH that AI technology brought positive impact on not only the profit margin but also the socio-economic status. Results indicate that after introducing AI technology, they think the status of schooling in research areas upgraded by 77 percent. A huge impact on HH savings is also observed in survey areas, which is accounted as 81 percent. Only 18 percent think that they are not sure about the change in savings. Similarly, 72 percent HH think the health status was improved during past 8-10 years.

Limitation:

This study was conducted in only 22 household of two villages of Savar upazila of Dhaka district under several constraints, including the limitation of time and resources. Therefore, the wider range of knowledge required for policy decisions could not be provided within the framework for policy decisions. However, the

methodology and the findings of the study may provide valuable guidance to the researchers dealing with similar problems in future.

Implications and recommendations:

Usually a socio-economic study concludes recommendation for policy guidance. The benefits of artificial insemination programme have been distributed up to rural communities. In this case a set of interrelated proposals are presented. The proposal may be considered as broad guidelines for successful operations of the AI programme.

1. An expansion of the programme is recommended to increase employment and income in rural areas. This will help to alleviate rural poverty without having any worsening effect on the rural income distribution.
2. The productivity of Crossbred cattle is better than local cattle. The advantages of crossbred cattle should be publicized, through mass media and cattle exhibitions, so that farmers are encouraged to rear crossbred cattle for dairy farming.
3. Rural AI points the key role in adoption process. More number of both public and private AI points should be established for expansion and intensification of AI programme. There should be due AI point in each agricultural block. Also, it is recommended that each and every AI workers should be trained properly provide AI service efficiently, which will decrease service per conception rate.
4. In some instances, rearing of crossbred cattle is a risky job. There was no evidence of undertaking an insurance policy in the rural areas to cover the risk associated with rearing crossbred cattle. It is essential to expand the livestock insurance programme up to the remote villages to encourage the adoption of cross-breeding technique by the farmers. The premium should be kept as low

as possible. Government may decide to provide subsidies in premium for such insurance.

5. Shortage of feed is major barrier for the success of AI programme. Therefore, non-conventional feed should be identified. Cultivation of high yielding fodder varieties (HYV) should be encouraged. Government khas land should be allotted to groups of landless and small farmers on priority basis for fodder cultivation. Some NGOs may be approached to work for extension of HYV fodder in the rural areas.
6. Quality of semen should be ensured. Regional and sub-regional stations for AI laboratory should be established.
7. Local bulls should be castrated in areas where AI points have been established.
8. Still the price of milk is poor in relation to its production cost. Thus there is a strong case for imposing restrictions on milk imports to enhance the domestic price of milk.
9. There are indications that a number of dairy type crossbred cattle are slaughtered for meat at their early age. Laws should be framed to refrain people from slaughtering and sacrificing of crossbred cattle at their growing stage.

Conclusions:

In the study an effort was made to evaluate the socio-economic impact of artificial insemination in two villages of Savar upazila. The impact of the programme was measured in terms of the proportion of cattle, increased milk production and economic benefits derived from AI programme as well as impact on household livelihoods.

A positive sampling technique was followed in this study. At first a list of 22 farms was prepared from selected two villages and data were collected by direct interview method from the respondents. The data so generated were arranged in tabular form and were analyzed as per the objectives of the study. Simple statistical tools along with one way ANOVA were applied to examine the validity of the findings.

The result of the field study showed milk production was significantly increased about 123 percent during eight years through intervention of AI technology. The results also showed that the per capita milk consumption in farm household level was significantly increased during eight years (150 ml Vs 290 ml). All the major parameters for socio-economic status assessment like economic benefits, children's schooling intensity, household health status and savings were found positive indication, which were the secondary influence derived from artificial insemination technology.

The empirical evidence showed that the national demand for milk production and to attain the goal for poverty alleviation can meet up by rearing and improving the productivity of crossbred dairy cattle through intervention of artificial insemination technology in rural areas.

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