

TRIBAL WOMENS INVOLVEMENT WITH PIG FARMING IN BANGLADESH: AN EVIDENCE OF MOULVIBAZAR DISTRICT

R. Khanum^{1*}, M.S.A. Mahadi¹ and M.S. Islam²

¹Department of Agricultural Economics and Policy, Sylhet Agricultural University, Bangladesh

²Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

ABSTRACT

The study examined the profitability and factors affecting farm income from pig farming in Moulvibazar district of Bangladesh. A multistage sampling technique was followed to select 70 tribal women entrepreneurs involved with pig farming. Primary data were collected through structured questionnaire and analyzed using descriptive statistics, independent sample t-test, benefit-cost analysis, and linear regression model. Average age of pig entrepreneurs was 39.47 years which indicates that they are young and agile. About 71% of Garo entrepreneurs had experience for pig farming. The cost and return analysis showed that in one year, the gross margin was Tk. 56743.70, while the benefit-cost ratio (BCR) was 1.19 indicating that the enterprise is profitable. Regression analysis revealed that three variables namely farm size, age of the respondent and experience of pig farming are significant factors affecting farm income. Thus, it was recommended that tribal women should be encouraged to practice pig farming to overcome their low income and unemployment situation.

Keywords: Pig farming, entrepreneur, tribal women, profitability.

INTRODUCTION

Small scale home based pig farming is an important livelihood source for pig farmers. In 2017, there were approximately 769.05 million pigs worldwide, where China has been produced about 51.85 million metric tons (USDA, 2018). Pig production has also been seen as a source of protein. Their fast growth rate which is only slightly exceeded by the best, carefully managed broilers, their proliferation which is unsurpassed by that of any other animal species except the birds, their very good efficiency of feed utilization which brings better returns per units of inputs than most animals and quality of their meat which is both tender and more nutritive in

*Corresponding author email: payelsgvc@yahoo.com

terms of the contents of protein and the B-vitamins than those of other animals (Ogunniyi and Omoteso, 2011). Despite these attributes, pig production in Bangladesh has remained low due to Muslim population who constitute the majority of most areas of the country. But it is one of the most important livestock for the cobbler, sweeper, Christian, nomadic people and tribal community of the country who keep them for their livelihood and animal protein and also to maintain their social value. The killing of pigs is important to celebrate their main occasion of communally such as cremation, marriage and initiation rites. In addition, a pig farm contributes in many ways by providing high value of animal protein and additional income. Dietze (2011) stated that pigs provide income for women, strengthening their role in families as well as in local communities. It often requires high investment and can easily be raised within home yard areas. Pig farming increases easily household income and nutritional status of women and children. It is not an easy task of farming but also takes a lot of time for rearing. It needs to have a large area with a lot of grass and soil. It is therefore, pig production is very significant and may favour profitable for their religious belief.

Although it is difficult to get the exact number of pigs population in Bangladesh, but they become an enjoyable business and increasing day by day in tribal areas (Hossain et al., 2012). Regarding this, Patr et al. (2014) reported that the tribal population of North-Eastern region rear pigs as integral part of their livelihood, the majority of pig enterprises belong to lower income groups, and have small and medium land holding capacity because of zero to minimum inputs involvement and low remuneration. Due to unemployment, inadequate nutrition and poverty, scarcity of cultivable land in the tribal society (Hossain, 2002), pig farming is getting importance in tribal regions for improving their economic status. It is relatively easy and profitable farm to reduce poverty also. In study areas, some tribal communities are rearing pigs by receiving financial and technical support from local non-government organization (NGOs). Thus the pig farming continues to be primitive scavenging in nature because they are raised by tribal women who are educationally, economically and socially most backward.

Most of the tribal women are involved in pig farming under the poverty alleviation program of direct local. For this purpose, local NGOs provide financial and training facilities on pig rearing to tribal women for meeting their basic needs. An important way of helping is to reduce their production cost, so that the prices of locally reared pig become more competitive and profitable. A few literatures (Sarma, 2014; Kabir et al., 2006; Roy and Manna, 2014) are available in home and aboard. Sarma (2014) focused on entrepreneurial activity of tribal women who improved their socioeconomic condition by using local raw materials like jute, straw, wood, and paper etc. Kabir et al. (2006) analyzes the performance and role of small entrepreneurship development in socioeconomic development of rural poor women. They found that participation of rural women to different small enterprise activities contributed significantly to increase participation in economic activities and

household decision making. Ray & Manna (2014) conducted on the issues of women entrepreneurship and empowerment from the perspective of thriving, evolving and prospering small urban India. It is therefore, clear that most of the studies were conducted on women empowerment through enterprise development and uplift their socioeconomic status, which was not presented in the present study. On the other hand, Sylhet, one part of Bangladesh is totally neglected or untouched in terms of academic research where tribal women recently have developed pig farm and benefitted. So it is needed in-depth research whether pig farming is profitable for them or not and made a difference of socioeconomic conditions from tribal women who have not involved in pig farming. If pig farming is profitable and better livelihood option for tribal women, it will be easy to take a decision for further improvement. It was also a systematic and comprehensive study which has not been conducted in Sylhet region of Bangladesh yet. This study is therefore an attempt to examine the profitability associated with pig farming in Moulvibazar district. The specific objectives of this study are: 1) to examine the socioeconomic differences between two groups of tribal women; 2) to determine profitability of pig farming; and 3) to analyze the factors affecting income from pig farming.

MATERIALS AND METHODS

Study area, sampling techniques and data collection

Moulvibazar district was purposively selected for the study considering the emerging importance of pig farming. A multistage sampling technique was used for the selection of pig producers. In the first stage, two upazila namely, Sreemangal and Kulaura were selected purposively. In the second stage, two unions from each upazila (Rajghat and Kalighat unions from Sreemangal upazila, and Kulaura and Kadirpur unions from Kulaura upazila) were selected purposively because of prominence of pig entrepreneur in the areas. After that the targeted tribal women entrepreneurs from two communities namely *Garó* and *Khasia* were randomly selected from 13 *punji* (the living place of *Garó* and *Khasia* communities) using the list of communities available in the local NGOs' sampling frame. Out of 13 *punji*, 7 *punji* were considered from Kulaura and 6 from Sreemangal upazila. The fourth stage involved the random selection of 35 pig farms from the *Garó* and another 35 pig farms from the *Khasia* communities making a total of 70 tribal women entrepreneurs using the list of pig farmers available with the local NGOs' sampling frame. Primary data were collected through structured questionnaire from the selected pig entrepreneurs. Both descriptive and analytical methods were employed in order to analyze the data.

Data analysis techniques

Descriptive statistics

Descriptive techniques have been used to illustrate current situations, describe different variables separately. These included: frequency distribution, percentage, mean, and standard deviation. Analytical techniques have been utilized to investigate

relationship between two communities of tribal women and statistical difference/association among them.

Independent t-test

It is also a parametric test where data are collected in probability sampling technique. In this study, this technique was used to determine the differences between two tribal communities 'Garó and Khasia' on the selected characteristics of tribal women entrepreneur.

Cost-benefit analysis

This was used to estimate farm net revenue for pig production. Theoretically, net revenue (NR) is total revenue (TR) less the total cost (TC) (Sarma et al., 2014):

$$NR = TR - TC$$

Total cost is the addition of the entire variable cost (VC) and fixed cost (FC) items;

$$TC = TVC + TFC$$

Total revenue is the total amount of money that an entrepreneur received from the sale of stock;

$$TR = \Sigma PQ$$

Where,

P = Price per pig, Q = Quantity of pig sold

Gross margin (GM) = TR - TVC

Net farm income (NFI) = GM - TFC

The rate of return is a performance measure used to measure the amount of return on an investment relative to the investment cost. It is given by:

Rate of Returns (ROR) = NR/TC

Gross Ratio (GR) = TC/TR

Benefit cost ratio (BCR) = TR/TC

Pig farming is profitable if it's $BCR \geq 1$ (Boardman et al., 2006). The higher the BCR the more profitable the pig production enterprise is. Depreciation was calculated using the straight line method.

Linear regression model

Following linear regression model was used to analyze the factors affecting income from pig production in the tribal areas (Miles and Shevlin, 2001).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon_i$$

Where,

Dependent variable

Y = Annual income from pig farm (Tk.)

Independent variables:

X_1 = Age of the respondent (years);

X_2 = Family size (number);

X_3 = Educational level of the respondent (year of school);

X_4 = Farm size (number of pig);

X_5 = Experience of pig farming (number of years);

X_6 = Pig feed (quantity);

β_0 = Intercept;

β_1 to β_6 = Regression coefficients of the independent variable; and

ϵ = Disturbance term or error term.

RESULTS AND DISCUSSION

Socioeconomic characteristics differences between Two Tribal Women Entrepreneur

Socioeconomic differences of the sample pig entrepreneurs were presented in table 1. It is evident from the table that most (60 and 54 percent) of *Garos* and *Khasias* entrepreneurs in the study area were within the age group of 35-44 years, 6 and 37% of years were above 44 years of age respectively. The mean age was 39.47 years. This implies that most of the tribal women entrepreneur were young and agile and therefore, able to cope up with the stressful nature of pig production. The result of t-test (4.41) also shows that *Garos* entrepreneurs were significantly ahead compared to *Khasias*. Durno and Stuart (2005) stated that the risk bearing abilities and innovativeness of a farmer, the mental capacity to cope with the daily challenges and demands of farming business decreases with advancing age.

Table 1. Socioeconomic characteristics of tribal women entrepreneurs (n=70)

Variables	<i>Garos</i>	<i>Khasias</i>	Mean	Standard Deviation	t-test
	Frequency	Frequency			
Age					
<35 years	12 (34)	3 (9)	39.47	5.65	4.41***
35 to 44 years	21 (60)	19 (54)			
45 and above years	2 (6)	13 (37)			
Educational level					
Illiterate	3 (9)	5 (14)	5.13	2.60	0.32
Primary (1-5)	17 (48)	17 (49)			
Secondary (6-10)	15 (43)	13 (37)			
Family size			4.96	1.42	0.42

Variables	<i>Garó</i>	<i>Khasia</i>	Mean	Standard Deviation	t-test
	Frequency	Frequency			
Small family (up to 3)	3 (9)	8 (23)			
Medium family (4 to 6)	27 (77)	20 (57)			
Large family (7 and above)	5 (14)	7 (20)			
Farm size					
11 to 20 pigs	28 (80)	30 (86)	18.81	2.09	0.06
21 to 30 pigs	7 (20)	5 (14)			
Experience of pig farming					
1 to 5 years	10 (29)	17 (49)	6.13	1.69	1.64**
6 to 10 years	25 (71)	18 (51)			
Training on pig rearing					
No	12 (34)	14 (40)			0.49
Yes	23(66)	21 (60)			
Sources of fund					
Personal savings	9 (26)	10 (29)			
Friend/relatives	3 (9)	3 (11)			0.36
Bank loan	4 (11)	4 (8)			
Local NGOs	19 (54)	18 (51)			
Farm income (annual)					
< 25 thousand	2 (6)	0	30479.57	1984.45	0.78
25 to 30 thousand	12 (34)	12 (34)			
>30 thousand	21 (60)	23 (66)			

Source: Field survey, 2015

Note: Figures within the parentheses indicate percentage of total

Garó and *Khasia* entrepreneurs' literacy level reveals that only 9 and 14 percent, respectively had no formal education whereas the remaining 91 and 86 percent had formal education ranging from primary to secondary education. The result of mean and standard deviation of educational level were 5.13 and 2.60 for pig entrepreneurs respectively. Ajieh and Okwuolu (2015) also reported that majority of the pig farmers in Delta state are literates. In the study, the result of t-test (0.32) implies that the educational level of pig entrepreneurs had insignificant impact on their capacity to exploit latent opportunities and adaptation of improved technologies.

The distribution of pig entrepreneurs by size of their household shows that a larger percentage (77 and 57 percent) had between 4 to 6 members, 9 and 23 percent, respectively had a small family and the remaining 14 and 20 percent had a large

family respectively. The number of family members ranged from 3 to 8 within an average of 4.96 and 1.42. The national average size in Bangladesh is 4.5 (BBS, 2014) which was relatively lower compared to the average size of the study areas. The average farm size of 18.81 pigs implies that pig production in the study areas is on small scale level and had insignificant impact on pig production. Table 1 shows that 71 and 51 percent of *Garo* and *Khasia* entrepreneurs had between 6 to 10 years pig rearing experience, while 29 and 49 percent, respectively had only 1 to 5 years of experience. The mean pig rearing experience in the study areas was 6.13 and significant (1.64) which suggests that *Garo* entrepreneurs had considerable years of pig production experience than *Khasia* entrepreneurs. Table 1 also shows that 66 and 60 percent of *Garo* and *Khasia* entrepreneurs have received training on pig production by government agencies and local NGOs about pig production whereas 34 and 40 percent respectively have not. The implication of this is that the trained entrepreneurs will be better equipped and perform better than those without training.

Furthermore, source of funding of pig production in the study areas revealed that most (54 and 51 percent) of *Garo* and *Khasia* entrepreneurs finance their business from local NGOs, 26 and 29 percent source of their capital from personal savings, while 9 and 11 percent from friends and relatives respectively. This study disagrees with Ogunniyi and Omoteso (2011) who found that the source of capital of livestock farmers was either from friends and relatives or from their personal savings. Table 1 further show that the farm income ranged from Tk. 24000 to Tk. 33380 with the mean and coefficient of variance was Tk. 30479.57 and 6.51 percent, respectively. Based on annual income of farm, entrepreneurs are classified into three categories, namely 'low income (Tk.<25 thousand), 'medium income (25 – 30 thousand), and high income (Tk.>30 thousand) respectively. The majority of tribal women entrepreneur belonged to the medium to high classes (34 to 66 percent) respectively.

Average annual costs and returns of pig farming

Table 2 presented detail information on the cost, returns and profitability of pig farming in the study areas. The annual average total cost of production as shown in table 2 was Tk. 277875.48 per pig. On an average, the annual total cost was estimated at Tk. 273857.30 and Tk. 281893.66 per pig for *Garo* and *Khasia* operated farms respectively.

Table 2. Annual average cost and returns of pig farming (Tk. /pig)

Cost/Return	<i>Garo</i> entrepreneurs	<i>Khasia</i> entrepreneurs	All entrepreneurs
	Amount (Tk.)	Amount (Tk.)	Amount (Tk.)
Total Revenue (TR)	330687	328260	329473.5
Variable cost			
Cost of stocking	29078.42 (10.62)	25965.23 (9.21)	27521.83 (9.90)
Feed	200869.6 (73.35)	213828.4 (75.85)	207349 (74.62)
Labour	27387.83 (10.00)	26785.21 (9.50)	27086.52 (9.75)
Veterinary expense	2434.78 (0.89)	2300.67 (0.82)	2367.72 (0.85)
Transportation	6572.65 (2.40)	5847.73 (2.07)	6210.19 (2.23)
Other cost	2252.17 (0.82)	2136.89 (0.76)	2194.53 (0.79)
Total Variable Cost (TVC)	268595.45 (98.08)	276864.1 (98.22)	272729.8 (98.15)
Fixed cost			
Depreciation	1057.45(0.39)	1132.17(0.40)	1094.81(0.39)
Interest on loan	4204.40(1.54)	3897.39(1.38)	4050.89(1.46)
Total Fixed Cost (TFC)	5261.85(1.92)	5029.56(1.78)	5145.71(1.85)
Total Cost (TFC+TVC)	273857.30	281893.66	277875.48
GM = TR – TVC	62091.55	51395.90	56743.70
NFI = GM – TFC	56829.70	46366.34	51597.99
NR = TR – TC	56829.70	46366.34	51597.99
ROR = NR/TC	0.21	0.16	0.19
BCR = TR/TC	1.21	1.16	1.19
Gross Ratio = TC/TR	0.83	0.86	0.84

Source: Field survey, 2015

Note: Figures within the parentheses indicate percentage of total

The respective annual average variable costs and fixed costs were calculated at Tk. 272729.8 and Tk. 5145.7 per pig respectively. The major cost items of pig farming included were feed cost, cost of stocking, labour cost, veterinary expenses, and transportation cost etc. Table 2 shows that the average feed cost is the highest about 74.62 percent of total, whereas *Garo* and *Khasia* managed farms contributed about 73.35 and 75.85 percent of total respectively.

Tribal women entrepreneur usually used the wastage of consumed food as feed for pig. The supplementary feed were also used and purchased at market price. In the study, the value of home supplied and purchased feeds were considered according to the market price. They used mixed vegetables, rice, and green grass etc. as feed for pig. The annual average feed cost was estimated at Tk. 207349 per pig. Labour cost shared about 10 percent of total costs respectively for both *Garo* and *Khasia* managed farms. Veterinary expense is an important cost item for pig rearing when

diseases occur frequently but in reality it happened scarcely. The annual average veterinary cost of pig farming was estimated at Tk. 2368 per pig which shared about 1 percent of total costs. On the other hand, transportation used for selling and buying pigs etc. Table 2 also shows that the annual average miscellaneous cost include electricity bill, contact with buyer etc. of pig farm was calculated at Tk. 2194 per pig in which *Garo* entrepreneur shared higher than *Khasia*. Fixed cost included depreciation cost of housing and interest on loan which shares only 1.92 and 1.78 percent for *Garo* and *Khasia* operated farms respectively. The annual average total fixed cost was Tk. 5146 per pig which was lower than variable cost.

The annual average total revenue was Tk. 329474 per pig while *Garo* entrepreneur received higher than *Khasia*. Table 2 shows that the annual average gross margin was Tk. 56744 per pig, where *Garo* and *Khasia* managed pig farms were at Tk. 62092 and Tk. 51396 respectively. The annual net farm income was Tk. 51598 per pig. The rate of return on investment in the study area was 0.19 which implies that every Tk. 1 invested in the pig business yielded Tk.19 per pig as profit. The benefit cost ratio (BCR) of 1.19 shows that pig production is a profitable business in the study area since it is greater than one. The gross ratio of 0.84 implies that Tk. 84 is spent for every one Taka gained in the business. Result indicated that *Garo* entrepreneur were comparatively more benefited than *Khasia* for pig farming. Thus pig farming is a profitable venture in the study areas as indicated by the various profitability ratio techniques employed in the analysis. Several fields based studies on pig farming have been reported in many South East Asian countries like India (Kumaresan et al., 2007, 2009, Nath et al., 2013), China (Riedal et al., 2012), and Lao People's Democratic Republic (Phengsavanh et al., 2011) indicating general household information, farm characteristics, performances of the pigs, pig health status, marketing system, constraints and opportunities for development. Tylor and Roese (2006) also reported that piggery was a profitable business which provided employment and return on investment, as Hu et al. (2004) studied that higher earnings from pig farming keeps the market attractive even for small producers, but recently Anower et al. (2017) identified that pig production is an additional income source of household. In the present study, an attempt has been taken to analyze whether pig farming is profitable for tribal women or not. The profitable farm might be encouraging business activities for tribal women to develop an entrepreneur which was done in Sylhet region of Bangladesh for the first time.

Factors affecting farm income from pig production

The result of linear regression analysis examined the characteristics of pig entrepreneurs and its impact on farm income of pig production. Different variables were expected to influence pig rearing, these are age of entrepreneurs, educational level, family size, experience of pig farming, farm size based on number of pigs, and pig feed. Durbin-Watson (2.199) test was used to detect to autocorrelation. The result revealed that there is no autocorrelation problem. A variance inflation factor (VIF)

detects multicollinearity in regression analysis. It estimates how much the variance of a regression coefficient is inflated due to multicollinearity in the model and range from 1 upwards. The numerical value for VIF indicated (in decimal form) what percentage of the variance (i.e. the standard error squared) is inflated for each coefficient. In the study, a VIF of 1.2 shows that the variance of educational level of pig entrepreneurs is 90 percent

Table 3. Regression results of factors affecting of farm income of pig farming

Independent variables	Coefficient	t-test	P-value	VIF
Constant	10.02	102.17	0.000	
Age of the entrepreneurs	0.002	1.13	0.262	1.13
Family size	-0.003	-0.65	0.518	1.01
Experience of pig farming	0.01	2.24**	0.029	1.05
Farm size	0.014	3.73***	0.000	1.15
Educational level of pig entrepreneurs	0.006	1.90*	0.061	1.20
Pig feed used	-0.037	-3.39***	0.001	1.11

Source: Field survey, 2015

Note: Dependent variable: Annual income from pig farming; *, **, and *** indicates the significance level of 10, 5 and 1 percent respectively.

Among the six factors affecting farm income of pig farming, four variables (educational level, farm size, experience of pig farming and used pig feed) were found significant. The coefficient of farm size is positive and significant at 1 percent, means that 1 percent in the number of pigs will increase output level by 0.014 percent (Table 3). The experience of pig farming has a positive effect on farm income and is statistically significant at 5% probability level. The result suggests that as entrepreneurs have high pig farming experience the number of pig increased through its effect on farm income. The result also explained that every one year of experience in pig farming leads to increase farm income by Tk. 0.01 per day per pig. This result is plausible and suggests that farm income of the pig farm in the study areas is more responsive to a number of pig. Furthermore, this result illustrates that farm income per year increases in responses to the increases in a number of pig.

Table 3 also shows that farm income in the study areas increases with increases in the entrepreneurs' level of education. This implies that pig entrepreneurs who are educated achieved higher level of income than the uneducated ones. Finding agrees with Umeh et al. (2015) who explained that education is important for achieving effective utilization of inputs in pig production in Nigeria. The coefficient of pig feed is negative but significant at 1percent probability level. The result of feed used (0.037) confirms the importance of concentrates in pig production. This implies that farm income declines with increases feed suggesting.

CONCLUSION

The study was conducted to measure the profitability and factors affecting on farm income of pig in Moulvibazar district of Bangladesh. The study revealed that majority of tribal women entrepreneurs were middle aged and earned significantly from pig farm. It gives them year round work with extra income. The calculated net profit and the benefit-cost ratio (BCR) indicated that it is a profitable business for tribal women. Econometric result also indicate that number of pigs, experience and educational level of entrepreneurs significantly associated with farm income. This also implies that it is profitable and worth venturing as a source of year round income. It plays a vital role in creation of employment opportunities in tribal areas, animal protein supply, increasing income and standard of living, although there are room for improvement.

Based on findings of the study, adequate training programme on pig production can be organized for pig entrepreneurs in the stud areas. Pig entrepreneurs should also be organized into formidable groups such as cooperative society to enjoy the marketing of pigs and purchasing inputs such as feeds, drugs and vaccines. If need based remedial measures could be taken, then pig farming would be a viable in commercial enterprise which in turn would play a vital role to overcome the problems of low income and unemployment situation of tribal women. Therefore, the government may provide necessary assistance on how to get access in receiving credit in order to increase their capital base to expand their scale of production.

ACKNOWLEDGEMENT

This paper is derived from the PhD dissertation of first author as “Impact of Entrepreneurship Development on Improving Livelihood of Tribal Women in Sylhet Region of Bangladesh”. The authors are grateful to all who directly and indirectly involved in the execution of the field work.

REFERENCES

- Ajeh, P.C., and Okwuolu, U. (2015). Constraints and Strategies for Enhancing Pig Production in Delta State, Nigeria. *Global Journal of Science Frontier Research: Agriculture and Veterinary*, 15, 46-52.
- Anower, A.K.M.M., Ahmed, M., Rahman, M.M., Hasan, A., Islam, M.A., and Rahman, L. (2017). Hygienic Farming System Improved Pig-Rearers Livelihood Status in South-West Region of Bangladesh. *International Journal of Avian & Wildlife Biology*, 2(4), 1-8.
- BBS.(2014). *Household survey*, Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People’s Republic of Bangladesh, Dhaka.
- Boardman, A., Greenberg, D., Vining, A., and Weimer, D. (2006). *Cost Benefit Analysis: Concepts and Practice*, Prentice Hall, 1996, 3rd Edn.
- Dietze, K. (2011). *Pigs for Prosperity Diversification Booklet*, Italy: 1-67.

- Hossain, M.E., Chakma, S., Khatun, M.M., Hasanuzzaman, M., and Miah, M.Y. (2012). Production System of Swine in Rural Areas of Rangamati and Khagrachari Districts of Bangladesh. *Bangladesh Journal of Animal Science*, 40(1&2), 28-33.
- Hu, D., Reardon, T., Rozelle, S., Timmer, P., and Wang, H. (2004). The Emergence of Supermarkets with Chinese Characteristics: Challenges and Opportunities for China's Agricultural Development. *Development Policy Review*, 22, 557-586.
- Durno, J., Stuart, R. (2005). Gender Issues in Sustainable Agriculture in: Overholt C. (ed.) Gender Roles in Development Studies, Fox Publisher, New Delhi, India.
- Hossain, M. (2002). Promoting Rural Non-farm Economy of Bangladesh. CDO-IRRI Policy Brief No.3, Center for Policy Research, Dhaka.
- Kabir, M.S., Ali, R.N., Rahman, M.W., and Palash, M.S. (2006). Upliftment of Rural Women through Small Entrepreneurship Development in Some Selected Areas of Mymensingh District. *Journal of Bangladesh Agricultural University*, 4 (1), 157-164.
- Kumaresan, A, Bujarbrua, K.M., Pathak, K.A., Das, A., and Bardoloi, R.K. (2009). Integrated Resource-Driven Pig Production Systems in a Mountainous Area of Northeast Production Systems in Northern Lao PDR. *Tropical Animal Health and Production*, 42, 1627-1633.
- Kumaresan, A, Bujarbrua, K.M., Pathak, K.A., Chhetri, B., Das, S.K., Das, A., and Ahmed, S.K. (2007). Performance of Pigs Rared under Traditional Tribal Low-Input Production System and Chemical Composition of Non-conventional Tropical Plants Used as Pig Feed. *Livestock Science Journal*, 107, 294-298.
- Miles, J., and Shevlin, M. (2001). Applying Regression and Correlation: A Guide for Students and Researchers. London, Saga Publications.
- Nath, B.G., Pathak, P.K., Ngachan, S.V., Tripathi, A.K., Mohanty, A.K. (2013). Characterization of Smallholder Pig Production System: Productive and Reproductive Performances of Local and Crossbred Pigs in Sikkim Himalayan Region. *Tropical Animal Health Production*, 45, 1513-1518.
- Ogunniyi, L.T., and Omoteso, O.A. (2011). Economic Analysis of Swine Production in Nigeria: A Case Study of Ibadan Zone of Oyo State. *Journal of Human Ecology*, 35, 137-142.
- Patr, M.K., Begum, S., and Dek, B.C. (2014). Problems and Prospects of Traditional Pig Farming for Tribal Livelihood in Nagaland. *Indian Research of Journal Extension Education*, 14(4), 6-11.
- Phengsavanh, P., Ogle, B., Stur, W., Frankow-Lindberg, B.E., and Lindberg, J.E. (2011). Smallholder Pig Rearing Systems in Northern Lao PDR, *Asian-Australasian Journal of Animal Sciences*, 24, 867-874.
- Riedel, S., Schiborra, A., Huelsebusch, C., Huanming, M., and Schlecht, E. (2012). Opportunities and Challenges for Smallholder Pig Production Systems in a Mountainous Region of Xishuangbanna. Yunnan Province, China, *Tropical Animal Health Production*, 44(8), 1971-1980.
- Roy, D.S., and Manna, D.S. (2014). Women Entrepreneurship and Empowerment: An Analysis from the Perspective of Small Urban India. *International Journal of Research in Commerce, Economics & Management*, 4 (2), 8-12.

- Sarma, G.(2014). An Analytical Study on Entrepreneurial Activity as a tool for Socioeconomic Development of Tribal Women in BTAD Area of Assam. *IOSR Journal of Economics and Finance*, 3 (2), 49-52.
- Sarma, P.K., Raha, S.K., and Jorgensen, H. (2014).An Economic Analysis of Beef Cattle Fattening in Selected Areas of Pabna and Sirajgonj Districts. *Journal of Bangladesh Agricultural University*, 12(1), 127-134.
- Taylor, G., and Roese, G. (2006). Pork-Cost of Production: Profitable & Sustainable Primary Industries, Primefact 66, 2nd edition, www.dpi.nsw.gov.au
- Umeh, J.C., Ogbanje, C., and Adijo, M.A. (2015).Technical Efficiency Analysis of Pig Production: A Sustainable Animal Protein Augmentation for Nigerians. *Journal of Advanced Agricultural Technologies*, 2, 19-24.
- USDA. (2018).Livestock and Poultry: World Markets and Trade. United States Department of Agriculture, Foreign Agricultural Service. https://apps.fas.usda.gov/psdonline/circulars/livestock_poultry.pdf (Accessed on 12 May 2018).