Economic Analysis of Pig Farming under Traditional Tribal Low Input Production System in Mizoram State

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ABSTRACT

This study analyzed the economics of pig production in Mizoram state. Data were collected through interview schedule administered to eighty pig farmers in that area. The findings of the study revealed that total economic cost and net return were positively correlated with farm size. Variable costs accounted much higher chunk than fixed costs for all the categories of farms and it represent 95.23 per cent while fixed costs accounted for 4.77 per cent of the total cost of production on an average, net return/profit per day per animal was ₹ 37.07. The result of the Cobb-Douglas production function showed that there is a significant relationship between income obtained from pig farming and feed cost and number of animals while there are no significant relationship between total income and labour and veterinary costs. High cost of concentrate feed, lack of financial assistance, non availability of veterinary facilities, diseases were the problems faced by the farmers in pig rearing.

Key Words: Gross margin, Costs, Cobb-Douglas production function
JEL Classification: D24, Q12

INTRODUCTION

Pig is one of the most important livestock which plays an important role in improving the economic status of the tribal and weaker section of the society in India. Genetically pigs are superior to ruminants in converting feed to meat. Efficiency of the pigs is recorded to as twice that of ruminants (Mpofu and Makuza, 2003). The small scale pig sector has seemingly greater potential to reduce poverty (Lanada et al., 2005). Pig rearing occupies an important position in farming system as it is closely interlinked with the other agricultural operations performed by the tribal people for livelihood. Pigs can be raised for their entire lifetime in enclosure as they do not contribute to loss of grazing lands (Mpofu and Makuza, 2003).

In the north eastern region of India, pig rearing is a part of the livelihood of the tribal people and the system of pig production in the region is unique and different from the standard system (Das and Bujarbaruah, 2005). The tribal farmers of the region practice almost a zero grain pig production system. Due to remoteness and inaccessibility, the rural hill farmers of this region has evolved a self sustainable local resource based production system, in which pigs are mainly dependent on local

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vegetations, crop residues and kitchen waste (Kumaresan *et al.* 2007; Moanaro *et al.* 2011). In this feeding system, it has been claimed that local pigs proved more prolific than exotic breeds. Like other states of north eastern region, the state of Mizoram is inhabited by tribal communities which are mostly non-vegetarian and hence, the demand for per cent of the total livestock population in Mizoram, but still a wide gap exists between the demand and availability of pork mainly due to traditional production system. Families usually keep an average of 1-2 indigenous or crossbred pigs for fattening with zero to minimum inputs in terms of family labour and feeding. Although, this system has been followed generation after generation, further improvement is required to augment the productivity. Several reports highlighted that the main purpose of keeping pigs was to obtain emergency cash and/or meeting the home consumption. Thus, the present study was undertaken to examine the cost and returns and constraints in traditional pig farming for introducing any scientific intervention for further improvement in existing production system for transforming the subsistence production to a profitable enterprise.

MATERIALS AND METHODS

The study was conducted in Mizoram state. Out of the eight districts in Mizoram the three districts namely, Aizawl, Kolasib and Champhai districts were purposively selected as the pig population is relative higher in these districts comparing to the other districts of the state. From each of the three districts, two blocks were selected randomly and from each of the selected block cluster of two to three villages were selected in order to select in total 80 households. The pig farms based on herd size were categorized into three classes namely small, medium and large using cumulative square root frequency method of stratification (Singh and Mangat, 1996). Data obtained were analyzed using descriptive statistics such as frequency count, mean, percentages, profitability ratio and Cobb Douglas production function.

The primary data were collected by conventional survey method on a well-structured schedule through personal interview on various aspects of piggery enterprises from selected households for the year 2014-15. The data collected covered socio-economic characteristics, management practice, land availability and use, labour use and availability, capital, output and the problems encountered by pig farmers.

Fixed costs includes interest on fixed capital and depreciation. The interest on fixed capital was worked out at the prevailing interest rate given by the commercial bank in the study area i.e.13 per cent and depreciation on pig sty and other equipments were calculated using straight line method. The annual depreciation on pig sty was calculated at the rate of 2 per cent for *pucca* sty and 5 per cent for *kachha* sty assuming the useful life of 50 and 20 years, respectively (Rao, 1991). The depreciation of other equipments was also calculated as per the productive life of the individual equipment. Variable costs are those costs which are incurred on the variable factors of production and can be altered in the short run. It included feed cost, labour cost, veterinary and miscellaneous charges.

Feed cost includes the value of green fodder, kitchen waste, and concentrate given to the animals per day was taken into consideration.

Since the pig farmers did not hire any labour in the study area, only family labour

cost was determined on the basis of the prevailing existing wage rate in the area after necessary conversion of the labour units into standard unit irrespective of age and sex as suggested by Khumbhare *et al.* (1983) i.e. 3 females equivalent to 2 males and 2 children equivalent to 1 male.

Per day expenditure on veterinary charges like the charges for natural services and treatment of the animals was worked out on the basis of annual expenditure on these items. The annual repairs of pig sty, electricity charge, water charge etc. were also calculated per farm per day for different households.

Gross cost was obtained by adding all the cost components including fixed and variable costs.

Gross Cost = Total Variable Cost + Total Fixed Cost

Net cost was worked out by deducting the imputed income earned through pig feces from the gross cost.

Net Cost = Gross Cost - Value of feces

Gross returns were obtained by adding the income obtained from selling of pork and piglet after multiplying the quantity sold with their respective prevailing market prices.

Net returns were calculated by subtracting net cost from gross returns.

Net Returns = Gross Returns – Total Cost Benefit-Cost (BC) Ratio was used to test the economic worthiness of the investment in pig farming as

BC Ratio = Total Benefits/ Total Costs

The BC Ratio of more than 1 indicates the economic viability of the investment.

Returns to scale were obtained by adding the elasticities of production of the input variables. It indicates the increasing/ decreasing/constant intensity of input used in pig farming.

Resource Productivities in Pig Farming

To analyze the resource productivities of different farms for improving the economic conditions of the farmers and to measure the contribution of specific factor in combination with other factors which were responsible for the change in the level of output, multiple regression analysis was used. The Cobb- Douglas production function was fitted to the data. The empirical specification of the model was:

$$Y = \beta_0 X_i^{\beta_i} \varepsilon_i$$

In logarithms, the equation was:

$$\log Y = \log \beta_0 + \sum_{i=1}^{4} \beta_i \log X_i + \log \varepsilon_i$$

Where,

Y	=	Income from pig farming
β	=	Intercept of the function
X_1	=	Quantity of feed consumed
X_2	=	Labour employed
X_3	=	Veterinary charges
X_4	=	Number of animals
ε	=	Error term

Constraints in Pig Farming

The Garrett Ranking technique was used to study the opinions of the farmers regarding the constraints in pig farming (Garrett and Woodworth, 1969). The per cent position of each rank was found out by the following equation.

$$\text{Per cent position} = \frac{100 \, (R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Rank given for the ith items by the jth individual, and

N_j = Number of items ranked by the jth individual.

RESULTS AND DISCUSSION

The socio-economic characteristics of the sample farmers as well as the total economic costs and returns of sample herds

were compared by the size of the farm. The herd size was categorized into three categories i.e. small (1-2 animals), medium (3-4 animals) and large (>5 animals).

Socio-Economic Characteristics of Households

The result of selected personal factors of the respondents is presented in Table 1. Pig farming in Mizoram is characterized by small herds. Of the 80 pig farmers, 53.75 per cent had on average two animals, 30 per cent has on an average three animals and large farms which accounted for 16.25 per cent of the total farm has six animals on average. The mean age of farmers was 50 years and 65 per cent of farmers were below this age. The implication of this was that young people were engaged more in pig farming business than older people and hence represent a high percentage of pig farmers in the area. The table also shows that the females were involved more than males in piggery enterprise in the study area. The literacy level of the respondents was very high. Only 1.25 per cent of the respondents were illiterate and 63.75 per cent of the respondents had attained at least middle school level education. The respondents had 11 years of experience in pig farming which implied that the sample of respondents were well established in their pig production activities on an average, majority of the pig farmers in the study area were having three to six members in their family.

Total Economic Cost and Net Return

Total economic cost was positively correlated with farm size ($r = 0.396$, $P<0.01$). The association between net return and farm size was also positive ($r = 0.704$, $P<0.01$). However, the relationship between farm profitability (as measured by net return) and farm size does not imply that all smaller herds were unprofitable. A

TABLE 1: SOCIO-ECONOMIC PROFILE OF SAMPLE HOUSEHOLDS IN MIZORAM, 2014-15

Particulars	Small	Medium	Large	Overall
No. of farms (%)	43 (53.75)	24 (30.00)	13 (16.25)	80 (100)
Herd size	1.63	3.16	5.85	2.78
Age (years)	50.88	48.58	50.23	50.09
Gender				
Male	17 (39.53)	10 (41.67)	5 (38.46)	32 (40)
Female	26 (60.47)	14 (58.33)	8 (61.54)	48 (60)
Education				
Illiterate	0 (0.00)	1 (4.17)	0(0.00)	1 (1.25)
Read & write	5 (11.63)	2 (8.33)	0(0.00)	7 (8.75)
Primary school	11 (25.58)	6 (25)	4 (30.77)	21 (26.25)
Middle school	13 (30.23)	12 (50)	5 (38.46)	30 (37.50)
High school	14 (32.56)	3 (12.50)	4 (30.77)	21 (26.25)
Mean years of experience	11	13	12	11
Family size				
>3	2 (4.65)	2 (8.33)	0(0.00)	4 (5.00)
3-6	20 (46.51)	13 (54.17)	5 (38.46)	38 (47.5)
6-9	19 (44.19)	8 (33.33)	7 (53.85)	34 (42.5)
>9	2 (4.65)	1 (4.17)	1 (7.69)	4 (5.00)

Note: Figures in parentheses are percentages to their respective totals.

sizable proportion of smaller herds had the same level of total economic cost and net return as several larger herds. The poorer average performance on smaller herds was attributed to wide variability in their costs and returns.

Costs and Returns Structure

Table 2 shows that the average total cost of production incurred by the respondents were ₹ 42.95 per animal per day for the overall farm. Among the various categories of farm, the daily cost incurred in pig production was highest for large farm, followed by medium and small farms. The total cost comprises the variable and fixed costs. From the table, variable cost represents 95.23 per cent while fixed costs accounted for 4.77 per cent of the total cost of production for the overall farm. Variable costs accounted much higher chunk than fixed costs in all the categories of farms. Labour cost was the dominant component

TABLE 2: AVERAGE MAINTENANCE COST OF PIG REARING ON DIFFERENT SIZE CATEGORIES OF PIG UNITS IN MIZORAM, 2014-15

(₹/animal/day)

Particulars	Small	Medium	Large	Overall
A. Variable Costs				
i. Cost of feed	13.60	17.30	19.98	15.66
	(33.85)	(39.26)	(39.74)	(36.46)
ii. Cost of labour	24.12	24.44	27.16	24.71
	(60.03)	(55.46)	(54.02)	(57.53)
iii. Veterinary charges	0.26	0.50	0.66	0.39
	(0.65)	(1.13)	(1.31)	(0.91)
iv. Miscellaneous charges	0.09	0.17	0.22	0.13
	(0.22)	(0.39)	(0.44)	(0.30
Total Variable Cost (TVC)	38.06	42.13	48.03	40.90
	(94.72)	(95.60)	(95.53)	(95.23)
B. Fixed Costs				
i. Depreciation	1.09	1.02	1.13	1.08
	(2.71)	(2.31)	(2.25)	(2.51)
ii. Interest on fixed capital	1.04	0.91	1.13	0.98
	(2.59)	(2.06)	(2.25)	(2.28)
Total Fixed Cost (TFC)	2.13	1.94	2.25	2.05
	(5.30)	(4.40)	(4.47)	(4.77)
C. Gross Cost (TVC+TFC)	40.18	44.07	50.28	42.95
	(100)	(100)	(100)	(100)
D. Net Cost	40.18	44.07	50.28	42.95
E. Returns				
Sale of pork	59.37	91.12	103.51	76.07
Sale of piglet	3.60	5.59	2.11	3.96
Gross Returns	62.97	96.71	105.61	80.02
F. Net Return/farm	22.79	52.65	55.33	37.07
Benefit-Cost ratio	1.56	2.19	2.10	1.86

Note: Figures in the parentheses are percentages to gross cost.

in the total economic cost on all farms (57.53% for overall farm) followed by feed cost (36.46% for overall farm) while other variables like depreciation, interest on fixed capital and veterinary and miscellaneous charges shared only negligible portion in the total cost of pig production.

Since the farmers did not utilize the by-products of pig, the net cost was equal to the gross cost. The per day average gross return was highest for large farm (₹ 105.61/animal) followed by medium farm (₹ 96.71/animal) and small farm (₹ 62.97/animal). The average net return per animal was ₹ 37.07 for the overall farm. Among the various categories of farms, the average net return per animal was highest for large farm (₹ 55.33) followed by medium and small farms. Benefit-cost ratio (BCR) was greater than one for all the categories indicating that pig production was a profitable business in the study area.

Resource Productivities of Pig Farms

The coefficient of multiple determination (R^2) imply that 69.78 per cent of total variation in the income obtained from pig farming was explained by the explanatory variable while the remaining 30.22 per cent not explained was attributed to other variables not included in the model. All the explanatory variables had positive signs indicating that the variables were positively related to the income generated from pig farming. The result shows that variables like feed cost and number of animals were statistically significant at 5 per cent level of significance (X_1 and X_4) while labour cost (X_2) and veterinary expenses (X_3) were not found significant. The result further implies that an increase in investment on feed and more number of pig will likely bring an increase in farm income. The regression co-efficients constitute the respective elasticities of production in Cobb-Douglas production function. The total sum of regression coefficients was 1.6992 (Table 3). This was found to be greater than unity, indicating increasing returns to scale. Hence, the farmers can be said to operate in stage 1 (irrational stage) of production. The implication of this is that the enterprises in

TABLE 3: PRODUCTION ELASTICITY AND RETURNS TO SCALE IN PIG REARING IN MIZORAM, 2014-15

Variable	Regression coefficient	t-value
Constant	5.2179	1.8795
	(2.880)	
Feed (X_1)	1.1078*	2.0265
	(0.547)	
Labour (X_2)	0.2734	1.1787
	(0.186)	
Veterinary charges (X_3)	0.1108	0.2384
	(0.465)	
Number of animals (X_4)	0.2073*	2.7300
	(0.076)	
R^2 (%)	69.78	
Returns to scale	1.6992	

Note: Figures in parentheses are standard errors.
* Significant at 5 per cent level of significance.

TABLE 4: CONSTRAINTS TO HIGHER RETURNS IN PIG REARING IN MIZORAM, 2014-15

Particulars	Per cent position	Rank
High cost of concentrate feed	51.88	1
Lack of financial assistance	44.35	2
Unavailability of veterinary facility	34.86	3
Unavailability of feed	31.81	4
Unavailability of labour	30.56	5
Disease	28.41	6

the study area were not yet operating at optimum scale of production. Hence, there is need for improvement such as better equipment and using more variable inputs to boost production.

Constraints to Higher Returns in Pig Farming

The result of the study also reveals the problem encountered by the respondents. Among the various problems stated by the pig farmers in the study area, high cost of concentrate feed rank was the most serious problem as it ranked first with 51.88 per cent position (Table 4). Lack of financial assistance is a huge problem hindering large-scale production of pigs in the study area. Similarly, unavailability of veterinary facility, feed and labour were another important constraints faced by the pig farmers. Also, the farmers faced the problem of disease and high infant mortality. This result corroborates with the findings of Patr *et al.* (2014) who found that high cost of concentrate as the most serious problem (81.08 %) in pig farming in Nagaland which was followed by non availability of proper veterinary health care (72.97 %) and high cost of initial inputs and lack of quality piglet (60.36 %).

CONCLUSION

To boost pig production in the study area, there was a need to provide a production incentive package for the swine farmers at all production levels. Credits could be extended to them in form of purchase inputs such as drugs and feed rather than in cash as this will encourage the use of the credit facilities or the intended purpose rather than their use on social satisfaction. Also, the schemes that will directly reduce costs and increase output should be adopted. The farmers should endeavor to re-invest a greater percentage of their profit into activities that will lead to the expansion of their herd size. Research work should be geared towards discovering the least cost combination of feed that will yield the same nutrients equivalent to the pigs' conventional diet. The income obtained from piggery enterprise could be increased by increasing the quantity of feed consumed, rearing more number of animals, employing more labour and using better equipment.

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