LIVESTOCK VALUE CHAIN IN MIZORAM: A STUDY OF PIGGERY IN AIZAWL DISTRICT

A Dissertation submitted in partial fulfillment for the award of the degree of Master of Philosophy in Economics

By

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CERTIFICATE

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DECLARATION

I, R. Lalhmangaihsangi, declare that the work done in this dissertation is the original work done by me, and the contents inside this work did not form basis of the award of any previous degree to me and the dissertation has not been submitted by me for awarding of any degree in any other University or Institution.

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LIST OF ABBREVIATIONS

AH & VETY	-	Animal Husbandry and Veterinary
APL	-	Above Poverty Line
BAHS	-	Basic Animal Husbandry Statistics
BPL	-	Below Poverty Line
CAGR	-	Compound Annual Growth Rate
DESBAPP	-	Development of Sustainable Base for Pig Production
FAO	-	Food and Agriculture Organisation
FGD	-	Focus Group Discussion
GOI	-	Government of India
ICMR	-	Indian Council of Medical Research
LWY	-	Large White Yorkshire
MIP	-	Mizoram Intodelh Project
NLUP	-	New Land Use Policy
NMPS	-	National Mission for Protein Supplement
PRA	-	Rapid Rural Appraisal
PRRS	-	Porcine Reproduction and Respiratory Syndrome
RKVY	-	RashtriyaKrishiVikasYojana
RAH	-	Rural Animal Health Centre
SGSY	-	Swarnajayanti Gram SwarozgarYojana
SF	-	Swine Fever

Chapter 1

INTRODUCTION

1.1. Introduction

Livestock are domesticated animals raised in an agricultural setting to produce commodities such as meat, eggs, milk, fur, leather and wool. Domestication of animal dates back to the beginning of human civilisation. The breeding, maintenance and slaughter of these animals known as animal husbandry is a component of modern agriculture that has been practised in many cultures since humanity's transition to farming from hunter-gatherer lifestyles. Originally, livestock were not confined by fences or enclosure, but these practices have largely shifted to intensive animal farming.So, Livestock farming can be defined as rearing of animals for earning profit and for own consumption.

Livestock value chain may be defined as a full range of activities required to bring a product (e.g. live animals, meat, milk, eggs, leather, fibre, manure) to final consumers passing through the different phases of production, processing and delivery. Value chain is the full range of activities which are needed to transport a product or service from conception, in the course of the different phases of production including a combination of physical transformation and the input of various producer or services, delivery to final consumers, as well as final disposal after use (Kaplinsky and Morris, 2001). It can also be defined as a market-focused collaboration among different stakeholders who produce and market value-added products. The key players in the value chain are the input suppliers, farmers, meat collection centers, processors and retail outlets. Each of the players in the value chain carries out various adding services.

It is stated that collaboration between government agencies, non-governmental agencies, and private agri-businesses offers the greatest potential for applying the value chain concept, with the aim of increasing income and employment through improved farming (Bamman, 2007). The approach can be applied to a wide range of situations and for different beneficiary groups, including youth and women's groups.

Livestock production continues to play a major economic and cultural role in numerous rural communities such as food supply, source of income, asset saving, source of employment, livelihood, transport, agricultural diversification and sustainable agricultural production. Majority of the World's rural poor and a significant proportion of urban poor keep Livestock and use them in a variety of ways that extant for beyond income generation (Randolph et.al, 2007).

Livestock system represents a potential pathway out of poverty for many small-holders in developing economies. In many cases, Livestock is a central component of small-holder risk management strategies (Bailey et.al,1999). Animal husbandry and dairying are vital sectors of Indian economy more particularly in the rural economy. About 20.5 million people depend upon livestock for their livelihood. Livestock provides livelihood to two-third of rural community it also provides employment to about 8.8% of the population in India.

The farmers in India maintain mixed farming system i,e a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise thereby realize the resource efficiency. India has one of the largest animal husbandry sectors in the World, having the largest livestock population of 520.6 million head (Kumar 2010).

1.2. Piggery Farming

Piggery is rated as the best meat producing animals in the World. It has a number of biological advantages over other meat producing animals owing to high prolificacy, efficient mothering ability, faster growth rate, higher feed conversion efficiency, shorter generation interval and higher dressing percentage. Scientists believe that people began taming pigs about 8000 years ago during the Stone Age. Explorers and Colonialists from Spain, England and other countries brought pigs to Netherland, South America in the early 15th Century**.** Pigs were introduced into Australia and New Zealand in the late 1700s (Piggery India Year Book, 1989).

Pig rearing is very popular amongst the tribal people of the North East India. The Government of India has been extending great help to the weaker sections of the society by arranging subsidy and loans for pig farming through various schemes. Pork is nutritionally rich and palatable human feed, containing 17% protein and 24% fats and it is a good source of energy (fats). Fats and fatty acids are essential for good health. Animal husbandry and agriculture are the main sources of income for the majority of the population in Northeast India. Among the meat producing animals, pigs occupy a unique position as pig keeping is socio-culturally intermingled with the livelihood of tribal people of the region (Das and Bujarbaruah, 2005).

1.3. Overview of Livestock Economy

1.3.1. General

Animal husbandry, Dairying and Fisheries along with Agriculture continue to be an integral part of human life since the process of Civilization started. These activities have contributed not only to the food basket and draught animal power but also by maintaining ecological balance. The Livestock sector accounted for one-

third of global agricultural gross production value. Around 1.3 billion people depend on livestock for their livelihoods, among which are 600 million poor farmers. Rural households in African countries such as Niger, Madagascar, Malawi and Tanzania depend heavily on livestock, with 44-79 percent of rural households are keeping livestock in 2013.

Exports of livestock products are concentrated in fewer than ten countries and regions, in particular Australia and New Zealand (dairy and sheep), the EU (dairy and pork), United State of America (beef, poultry, pork and dairy products) and Brazil (beef and poultry). India is currently the country that exports the largest volumes of beef. Livestock farming system are crucial to contributing to the livelihood of almost 2 billion people half of whom are poor and to global food security.

Global meat production has increased rapidly over the past 50 years. At the global level the dominant livestock types are poultry, cattle (which includes beef and buffalo meat), pig and sheep and goat to a lesser extent. Although production of all major meat types have been increasing in absolute terms, in relative terms the share of global meat types have changed significantly over the last 50 years. According to the record of Food and Agriculture Organisation (FAO), the worldwide meat production has been increasing significantly from 70.92 Million tonnes in 1961 to 315.14 Million tonnes in 2013. In 1961, Poultry meat accounted for only 12% of global meat production, by 2013 its share has approximately tripled to around 35%. Excluding poultry, pig meat is the largest meat production and its share has remained around 35-40%.

Since 1961, global pigmeat production has grown 4-5 fold to 112 million tonnes in 2013. China dominates global output. Increase in Chinese pig meat

production have been rapid, growing around 35 fold from 1.5 million tonnes in 1961 to 54 million tonnes in 2013. The other major producers include the United States, Germany, Spain and Brazil. Despite falling behind the ruminants in the pecking order, largely due to religious and cultural restrictions on pork consumption, pig business plays a Central role among urban and peri-urban farmers in many developing countries. (Kugonza et al 2015).

1.3.2. Indian Scenario

Livestock farming plays an important role for the socio-economic development of rural households in India. Animal husbandry, dairying, fisheries sectors have played prominent role in Indian economy. Traditional, cultural and religious beliefs have also contributed in the continuance of these activities. They further play a significant role in generating gainful employment in the rural sector, particularly among the landless, small and marginal farmers and women, besides providing cheap and nutritious food to millions of people.

Among agriculture produce, meat occupies a significant place as about 70-80% of Indian population is non- vegetarian. The growth of livestock sector was much faster than crop between 1981 and 2006, livestock sector grew at rate of 3.9% annually traditions and culture influence meat consumption to a great extent in India. India is having a good potential for meat production because of large livestock population. In India the largest meat producer species is poultry followed by bovines and sheep.

As per the 19th Livestock Census 2012 (GOI 2014) India's livestock sector is one of the largest in the World with a holding of 11.6% of World livestock population which consists buffaloes (57.83%), Cattle (15.06%), sheep(7.14%),

goats(17.93), Camel(2.18), equine(1.3%), Pigs (1.2%%), Chicken (4.72%) and ducks (1.94%). Table 1.1 shows detailed livestock population during the first livestock Census after Independence 1951, 18th Livestock Census(2007) and 19th Livestock Census (2012).

Table 1.1: Livestock population(million no.s) as per 1951,2007,2012, Livestock Census in India.

Sl. No	Livestock	1951	2007	2012
1	Crossbreed Cattle	-	33.06	39.73
2	Indigenous Cattle	-	166.02	151.2
	Total Cattle	***155.3***	***199.08***	***190.9***
3	Buffaloes	43.4	105.34	108.7
4	Yaks	-	0.883	0.077
5	Mithuns	-	0.26	0.29
	Total Bovines	***198.7***	***304.42***	***299.98***
6	Sheep	39.1	71.56	65.07
7	Goats	47.2	140.54	135.17
8	Pigs	4.4	11.13	10.29
9	Horses&Ponies	1.5	0.61	0.62
10	Mules	0.06	0.14	0.20
11	Donkeys	1.3	0.44	0.32
12	Camels	0.6	0.52	0.40
	Total livestock	**292.8**	**529.7**	**512**
13	**Total Poultry**	**73.5**	**648.83**	**729.21**

Source: BAHS (GOI) 2014.

Livestock production and agriculture are intrinsically linked, each dependent on the other and both crucial for overall food security. The production of livestock products were continuously increases over the year except wool production that was declined. The demand of livestock products according to low income growth will be high for milk, beef and buffalo meat and chicken in rural areas, whereas the demand of mutton and goat meat and eggs will be high in urban areas. The export of poultry products was highest in 2011-2012, export of buffalo meat, sheep and goat meat was increases over the year and it was highest in 2012-13 (1107506.24 million tonnes and 16046.91 million tonnes) respectively. (Savita et al., 2017). Table 1.2 presents the

trends on the production of different livestock products in India.

Table 1.2: **Major livestock production in India (in Million Units)**

Year	Milk(MT)	Eggs(No.)	Wool(Kg)	Meat (MT)
2006-07	102.6	50663	45.1	2.3
2007-08	107.9	53583	43.9	4.0
2008-09	112.2	55562	42.8	4.3
2009-10	116.4	60267	43.1	4.6
2010-11	121.8	63024	43.0	4.8
2011-12	127.9	66449	44.7	5.5
2012-13	132.4	69731	46.1	5.9
2013-14	137.7	73438	47.9	6.2
2014-15	146.3	78484	48.1	6.7
2015-16	155.5	82929	43.6	7

Source: Department of Animal Husbandry, Dairying and Fisheries.

1.3.3. Mizoram

Livestock play a very important part in the economic development of Mizoram. Main domesticated animals among the Mizo are pig, cattle, goat, mithun, buffalo, dog and cat. It was used as a medium of exchange in the past and still occupies a place of social prestige and economic strength among the rural people. Among the livestock farming, pig is the most important and largest domestic animal species among the Mizos. Table 1.3 presents the general status of livestock population in different Livestock Censuses in Mizoram.

Table 1.3:Livestock Population In Mizoram in Different Livestock Censuses (in 000)

Species	**1982**	**1987**	**1992**	**1997**	**2003**	**2007**	**2012**
Cattle	**48.6**	**50.4**	**95.8**	**33.3**	**35.6**	**34.9**	**38.3**
Buffaloes	4.3	5.6	6.5	5.4	5.7	5.8	5
Goats	27.5	17	22.7	16	17	15.7	3.3
Pigs	**77.1**	**81.5**	**112**	**168.2**	**217.2**	**266.9**	**266.6**
Horses	1.4	2.3	2.5	2	2	1.4	0.7
Dogs	18.4	18.9	19.4	33.8	37	35.3	46.8
Mithun	1.2	1.4	0.9	2.6	1.7	1.9	3.3
Sheep	0.9	0.5	1.2	0.7	1.1	1	0.6
Total Livestock	**179.5**	**177.6**	**261.1**	**261.9**	**317.3**	**362.9**	**364.7**
Poultry	**686.9**	**831.8**	**1072.6**	**1294.5**	**1107.9**	**1261.5**	**1253.1**

Source: Directorate of Animal Husbandry& Veterinary, Govt. of Mizoram(2012)

Table 1.3 shows that the total number of livestock animals in Mizoram has increased from 179500 in 1982 to 364700 in 2012, while poultry population has increased by almost 2 times during this period. It is clearly seen from this Table that Piggery occupy dominant position in the livestock economy in Mizoram as the number of pigs has accounted for more than 73% of the total livestock animal in Mizoram.

1.4.Statement of the problem

Domestication of animals is part of the Mizo life traditionally and contemporarily, and pig and chicken are the most commonly chosen livestock animals. With economic development and increasing urbanisation, the need for undertaking animal rearing in a commercial scale was realised. As such, livestock farming has become one of the important livelihood sources in Mizoram. Since recently, large number of families has started to undertake livestock farming for commercial purposes and as their family's main livelihood activity. It has become the main alternative (or additional) income source among the population, especially for farmers and poor families.

In spite of its livelihood significance, people do not have the practice of keeping records about the various activities and expenditure on the rearing of livestock animal in most of the cases. So they are easily misled by the returns from sale of their animals or its products without clear understanding of the cost they had incurred in the farming activities and fail to understand clearly the actual cost-benefit conditions. Further, people in Mizoram take pig rearing as additional (or subsidiary) livelihood in most of the cases without having clear knowledge on the profitability of

the farming keeping in view the material and human labour incurred in its farming activities. Thus, there has to be research inputs on the aspects of cost of farming, marketing, profits, etc. to enable better understanding of the economy of piggery farming.

1.5. Significance of the study

About 60% of the total workers in Mizoram are engaged in Agriculture and Allied Sector, while livestock play a very important part in their livelihood security by providing income for family sustenance. So, there is strong tendency among the farming population in rural areas to undertake livestock farming (piggery in particular) to generate more income in addition to their normal cultivation. At the same time, livestock rearing is a sensitive farming activity which demands active and regular attendance and managerial skill from the owners. The farming system involves buying of young animals (piglets, chicks, etc.) for replacement of the matured ones when they are sold, feeding the animals, prevention of animals from diseases, construction and maintenance of animal houses, equipment, etc. All these activities demand substantial amount of expenditures which has to be incurred regularly. Therefore, the success of livestock farming not only depends on the commitment and hard work of a farmer, but also on their levels of management skills.

An individual who intends to undertake livestock farming has to know about the requirements of initial capital for construction of animal sheds, expenditure requirements for intermediary activities, and the marketing chain. So, a study of its value chain would be of great help for the success of livestock farming. Further, out of the total meat production of 10595.29 Metric Tonnes, pigs accounted for more

than half (56.81%) during 2013-14 (Economic Survey, 2014-15). So, the study of piggery value chain would be a good indicator of the livestock sector value chain in Mizoram.

Piggery has become an additional income source for the rural areas. There is a great potential for pig production but hardly any attempt has been made to record systematically and analyse the pig rearing system followed by the farmers. Therefore, this study was motivated by the need to contribute to knowledge about the nature of Piggery production function and the significance of income generated on the family income. It is expected that this study would be very beneficial for pig farmers as well as for the general public.

1.6. Objectives of the Study

The main objectives of the study are as follows:

- To study the nature of piggery and socio-economic conditions of the farmers.
- To examine the basic farming conditions of piggery in Aizawl district Mizoram.
- To study the cost structure of piggery farming and its disaggregation to various activities like equipment, feeds, etc.
- To study the income generated from piggery farming and examine sustainability of income.
- To examine the nature of piggery production function and the significance of income generated on the family income.
- To identify various problems faced by the farmers with respect to production activities and marketing.

1.7. Hypotheses

The following hypotheses are tested in this study.

- Piggery farming has significantly increased income of the farmers.
- There is an increasing return to scale in the production of piggery farming.

1.8.Scopeand Coverage of the study

Though the study considers the value chain of the entire livestock sector in the State, the piggery value chain is selected as a case so as to make it more in-depth analysis. Accordingly, the entire analysis of the study is basically based on the piggery farming. In fact, piggery has constituted more than 73% of the total livestock population, covering only piggery value chain is considered representative of the entire livestock farming in Mizoram. It may be noted that different studies have used four interrelated concepts, namely piggery, piggery farming, pig rearing, and pig farming, in the analysis of piggery value chain. This study also used the concepts of pig rearing and piggery farming interchangeably to mean pig farming (or pig rearing).

It is understood that value chain analysis of any product has to consider the aspects of different process which contributes in the value addition of the products starting from seeds, farming activities, harvests, and consumption, this study has given more focus on revenue value chain analysis (i.e. inputs, costs, returns and profitability). Thus, the study perceived piggery value chain as analysis of input structure, cost of production, income generation and its sustainability, study of the nature of production (production function, scale, etc.), and marketing conditions (channels, rate structure, etc.).

The coverage of the study is extended to Aizawl district of Mizoram. As this district has been the largest contribution of piggery population and the largest producer of pork among the districts of Mizoram, selection of this district is expected to be a good representation of the entire state. This study covered different locations in rural and urban within the district. Due to their similarities in respect to farming practices, inputs, marketing, and prices, no separate analysis was presented in the two areas. In fact, most farmers in urban locations are also undertaking piggery farming at the outskirt of the towns and city.

1.9. Methodology

1.9.1. Data Source: The study is based on both Primary as well as Secondary data. Secondary data are collected from various sources like Official publications of the State Government Departments like various volume of Economic Survey of Mizoram, Livestock Census, various publications of AH&Vety department and Trade and Commerce Department, individual researchers, journals etc. Required information from unpublished records of the government departments and individual papers, Books, journal articles etc. are also collected to study the nature of livestock farming at the global level and in India.

Primary data are collected by conducting Sample Survey in Aizawl district using Stratified random sampling method. As the main objectives of this study is to study the piggery value chain rather than estimation of the total volume of production, it is considered more appropriate to cover small number of piggery farmers and collect data in a more intensive manner. Firstly, the study selected

Aizawl district as the study area as Aizawl is the leading producer of pigmeat among the 8 districts in Mizoram. Secondly, Rural and Urban areas are considered as the Strata, and two villages and one urban area were randomly selected from each Stratum. So, the study selected Thingsulthliah, Muallungthu and Aizawl. Thirdly, from each selected study areas the list of households engaging in piggery activities was prepared and adopted as sampling frame of the study. Required number of sample was selected randomly from these sampling frames. In view of this requirement, a sample of 30 households was interviewed in this study. The unit level data were collected using Semi-structured Interview Schedule (SSI) administered intensively by the researcher.

1.9.2. Analytical tools: The data obtained from Primary and Secondary sources were analysed in accordance with the objectives of this study. To examine the existing patterns and trends, the study primarily adopted simple descriptive statistical tools like percentage, mean, standard deviation, etc. To test the first hypothesis simple method t-test was adopted, while benefit-cost conditions were also analysed to examine the profitability and sustainability of the piggery farming. Further, simple log-linear regression model was also estimated to study the nature of production function in piggery farming. In addition, suitable charts or diagrams are also prepared to supplement the elaboration and interpretation of the field data.

1.10. Scheme of Chapterisation

This study is organised in five chapters as follows:

Chapter-1: Introduction. It presents an introduction to the subject matter, general

overview of livestock production, significance and scope of the study, objectives and hypotheses of the study and methodology adopted in the study.

Chapter-2: Review of Literature. This chapter gives a review of related literature and previous studies relevant for the present study.

Chapter-3:General Conditions of Piggery and Production in Mizoram. It gives the overview of Piggery farming in Mizoram i,e. its population and production, and Government initiatives for Piggery development.

Chapter-4.Analysis of the Cost, Revenue and Market. This chapter presents a statistical analysis of Primary and secondary data collected. It gives socio-economic profiles of pig farmers, analysis of Cost structure, income, profit in Piggery and its marketing channels.

Chapter-5.Summary of findings and conclusions. This chapter summarized the main findings of the study and concludes with recommendations for further development.

Chapter 2

LITERATURE REVIEW

2.1. Introduction

To have better understanding on the nature and dimensions of piggery value chain undertaken in this research work, several empirical studies have been evaluated and reviewed. These literatures are expected to throw light on the significance of this study. Despite our best effort to collect as many studies specifically undertaken on piggery value chain, it is hard to find adequate number of studies on this issue. Given this problem, attempt is also made in this chapter to give review of literature on the value chain of other livestock activities like dairy, cattle, poultry, goat, etc. as they can be considered best proxy to the piggery farming. Accordingly, this chapter is broadly divided into two: literature on piggery value chain; and other livestock activities.

2.2. Studies on Piggery Value Chain

Levy et al. (2014) studied the challenges and opportunities of smallholder pig production and marketing in Western Kenya. The overall goal of this thesis was to evaluate the organization and efficiency of local pork marketing and the challenges of butchers and farmers in rural and peri-urban settings of Western Kenya. The specific objectives of this study were: to examine the competiveness, efficiency and profitability of pig butchers, to describe the components of training workshops intended to enhance butcher's business skills, knowledge of pork safety and to evaluate the economic potential of semi-intensive pig rearing in the local pork marketing chains of Western Kenya. A cross sectional, observational study was

conducted in 50 pig butchers to collect their demographic information, challenges, operating practices and costs. Factors associated with pig prices, pork prices, marketing and operating costs, profit and marketing margins were determined using mixed and generalized linear models. A unique algorithm that emulates least-cost pig feeding was developed to assess the impact of season, average daily gain, opportunity cost of farm grown feed and butcher price variation on farmer's maximum revenue and profit potential when pigs are sold to butchers.

The study found that butchers were Central in coordinating activities required to connect pig farmers to pork consumers. Capital constraints, government license fee andpig prices were common challenges to butchers.The butchers business profit margins ranging from 5% to 10%. Marketing margins ranged from 27% to 41% for 45 and 22 kg pigs respectively. It also observed that butcher education was positively associated with pork prices charged to consumers and butcher profit.

Munzhelele (2015) studied on 'Evaluation of the production systems and constraints of smallholder Pig farming in three agro-ecological zones of Mpumalanga province, South Africa attempted to identify factors that influence production positively or negatively and impact of climatic condition on the small scale pig production systems in the various agro-ecological zones.The study was conducted in Mpumalanga of South Africa in three agro-ecological zones namely, the Highveld, the Lowveld and the Midveld. The study followed mixed methods approach, using qualitative and quantitative data. In total, 220 randomly selected smallholder pig farmers were interviewed some hypotheses were tested by descriptive and correlation analyses. Association between agricultural training, government assistance and thirteen herd and farmer- related variables were analysed using multivariable logistic regression model. A pairwise correlation was used where necessary and output were generated to associate certain variables and preferred

methods including markets, market determinants, treatment methods for sick pigs, feed preference, body conditions of the sows and age at weaving.

The study indicated that smallholder pig farming was predominated by males (64%), age group 51 years and above (54%), black Africans (98.6%) and approximately three-quarters of the smallholder farmers were classified as being poor to just below average. The majority of respondents had no prior pig husbandry training while few had received assistance from Department of Agriculture. The study also found out that low quality of breeds, diseases, lack of knowledge are the problems faced by pig farmers in the study areas. Poor quality of pigs produced in smallholder pig farms result in low returns of profits. It also revealed that change in climatic condition affects the production system of pig in the study areas as pigs respond to temperature changes due to their lack of skin pigment and sweat glands. The association study showed that the receipt of agricultural assistance from Government and training positively influence the farm inputs and outputs, so the government should explore how identified inputs can be distributed to farmers within the province and perhaps nationally.

Ngarava (2016) studied the effectiveness of Commodity pricing along the pork value chain in Zimbabwe a case of Masholand Central province. The main objective of this study was to give a reflection of the pricing strategies, articulate the organizational attitudes; feelings and behaviour regarding these strategies and how they all influence value creation within agribusinesses in the Zimbabwean pork industry. The research sought to determine influence of marketing in value creation, establish influence of price in marketing mix, ascertain pricing strategies, determine influence of attitudes, feelings and behaviours and measure pricing efficiency. Utilising interview-administered-questionnaires, the study sought responses from strata of producers, abattoirs and retailers in Mashonaland Central Province of

Zimbabwe totalling a sample size of 226 respondents.

It utilised a cross sectional survey research design and quantitative research methods. The study utilised correlation analysis, ANOVA analysis, MANOVA analysis, multiple regression analysis and marketing margin analysis in establishing correlations, mean differences, influences and efficiencies in pricing.The study found out that marketing is not an influential value creating activity within the pork industry at $P<0.05$. Price was also not the most influencing marketing mix component within the industry. The most significant feeling was of being indifferent to a price change as it is offset by changes in units sold. Attitudes of industry players disregarding pricing mechanism as long as it covers costs of production as well as substitute products determining prices were significant in influencing pricing objectives. Pricing within the industry was inefficient. The study recommends leveraging on the most influential industry value creating activity,which is production and processing, to take advantage of the myopic pricing objectives, lack of discount policy and avoiding substitutes. Evading the low profit to cost ratio in the industry through utilising price flexibility policies and vertical integrating were also recommended.

Nabikyu et al. (2016) conducted a study to determine the drivers of profitability in pig farming in Wakiso district, Uganda. One hundred pig farms were sampled in a random and purposive procedure and data were collected using a standard pre-tested questionnaire. The study was conducted among pig farmers in Wakiso district in sub-countries of Busukuma(n=30), Gombe (n=20),Nangabo(n=25). Nangabo and Kera are peri-urban while Busukuma and Gombe are rural. A stratified survey design was used with stratification done at district, sub-county and parish administrative levels. The production parameters analysed were family size, production system, herd size, veterinary inputs, and

availability of veterinary extension services. The marketing aspects analysed included availability of market for pigs, satisfaction on level of pig sales and willingness of farmers to invest proceeds from pig sales into expanding the business.

The study observed that pig enterprise was found profitable even with the low investments. The major factors that influenced profitability among pig farmers were the number of pigs sold, budgeting and amount of land under pig farming. Market for the pigs is readily available making it easy to make sales and usually no making costs are incurred.However, sales are also low due to small stocks. Pigs are mainly fed on Maize brain, vegetation and kitchen refuse in the study areas.The study also found out that major health challenges faced by pig farmers include worms, fever, skin disease and diarrhoea.It suggests major factors affecting profitability of pig rearing are marketing of pig, availability of extension services like management practices and availability of veterinary services.

Shadap (2016) studied on the purposes, problems and prospects of Piggery development in West Jaintia Hills district of Meghalaya, India. The research work was carried out in West Jaintia Hills, district of Meghalaya. Laskein block and Thadlaskein block were selected for the study area. The respondents were divided into beneficiaries and non-beneficiaries of government Grant/aid/subsidy. From beneficiaries and non-beneficiaries 5 respondents from 5 clusters of villages were selected randomly. This comprised of 50 beneficiaries and 50 non-beneficiaries total of 100 sample size. Data were collected through a pre-tested dependable and valid objective interview schedule. Major statistical tools used were mean, standard deviation, frequency distribution, percentage, range, correlation, regression and t-test.

The study revealed that recycling waste food, having additional income, mark of insurance, better profit in short time and primary income were identified as the

major purposes of pig rearing problems of concentrate feed, medicines and vaccines. Input supply, economic problem, lack of transportation facilities, accessibility to market, absence of cooperatives and bank linkages were the major constraints perceived by the respondents. The study indicated that interdisciplinary approaches could do well with farming, marketing, linkage convergence and other related issues.

Perey (2017) conducted a study on determinants of sustainability of backyard pig farming in the Philippines. The purpose of this study was to investigate the factors that determine the sustainability of backyard pig raising in the Philippines. Descriptive research method with survey and use of Secondary sources was used. The respondents were 60 backyard pig farmers, 26 of them had sustainable and 34 had non-sustainable backyard pig farming. They were interviewed with structured questionnaire; the municipality of Siniloan in the province of Laguna was the study area. Statistical tools like mean, Standard Deviation were used in comparing the group of farmers with sustainable and non-sustainable backyard pig farming. Two sample t-statistics was used to test for significant differences between the two groups characteristics. Binary logistic regression analysis was used to identify the significant factors that in combination determine the sustainability of backyard pig farming. Empirical data were collected from 60 farmers, among the farmer respondents, less than majority (43.33%) were able to sustain production. The results of a logistic regression model showed that family income, farmer's organizational affiliation whether the farmer is a contract or an independent producer, access to credit and exposure to extension services have significant influence on the decision of farmers on whether to continue or stop backyard pig farming. On the other hand, age, educational attainment, number of household size, access to bank credit, access to market and complaints by neighbours were not significant factors that determine the farmers decision to engage continuously in pig farming. Prospective businessmen,

extortionists and policy maker can consider these factors in Planning and designing a sustainable pig production for smallholder farmers in Philippines.

2.3. Studies on Other Livestock

Igbinnosa et al. (2011) studied on opportunity for value chain development by improving beef processing practices in rural Tanzania. The study tried to find out the causes of underdevelopment in beef processing in rural areas in Tanzania and lack of value chain in backyard slaughtering business. Secondary and empirical data were adopted for data collection. Empirical data were collected through interview of meat processors, butchers, traders and animal producers in 12 villages in three regions (Manyara, Dodoma, Morogoro) in Central Tanzania. A visual problem appraisal was carried out on the supply chain of backyard butcher's using value chain concept. Estimate cost and profit margins (gross margins and profit margins) of backyard butchers were also calculated to gauge profitability of backyard slaughtering practices remain underdeveloped due to some factors like inadequate supply of cattle for slaughtering, inadequate slaughtering and storage facilities, ineffective enforcement of rules, very little value addition, inadequate market development and local consumer's inability to pay for value addition. The study also revealed that actors in the chain do not share information and do not trust each other. Inefficiencies resulted in very high costs of doing business and high prices for consumers. The rural butchers had very low gross margins which is a disincentive to improve. Therefore, the study identified that currently local consumers cannot pay for value addition on beef and this is the reason of non-operation of value chain approach in the study area.

Gondwe (2004) stated that it is essential to generate appropriate technology which is acceptable socially, environmentally and economically viable to address the problem of poultry in production and marketing, and to improve marketing linkage and livelihood of rural households. The main advantages of chicken value chain study are defining the needs and nature of customers and their ability and desire to buy, scanning the business environment, gathering needed information for decision-making, reducing risk, helping in production and monitoring and controlling marketing activities.

Lundy et.al (2004) stated that a market chain is used to describe the numerous links that connect all the actors and transactions involved in the movement of agricultural goods from farm to the consumer. Supporting these activities are services that enable the chain to operate. Agricultural goods and products flow up the chain and money flows down the chain. The efficiency of the market chain is generally a factor of how well information flows among these actors. Given the many challenges of the market place, it is vital to suggest that a practical starting point in developing a marketing strategy is to assist chain actors to visualize their market chain from beginning to end. Market chains operate most efficiently when they are supported by dedicated business organizations, both formal and informal, which participate in enabling produce to flow from the farm gate to the final consumer.

Shiferaw et al. (2006) identify value chain problems such as roads and high transportation costs due to the remoteness of the farms from the markets, poor communication systems that hampers access to market information and limit development of the markets. Smallholder farmers are also poorly served by traders and crops prices vary by season, falling during the time of harvest and increasing when the supply declines. Finally, there is low local effective demand for agricultural

products.

Zeberga (2010) analysed the poultry marketing chain in Dale and Alaba 'Special' Woredas of Southern nations nationalities and people regional State, Ethiopia. The specific objectives includes analysis of the structure, conduct and performance of poultry marketing system, production and marketing support services of extension, input supply, cost structure and profitability of village poultry keeping were also analysed. It assessed constraints and opportunities of production and marketing of poultry as well. To address the aforementioned objectives descriptive statistics and econometric models were employed. Primary data and Secondary data sources were used. Primary data was collected from farmers, traders and other market participants involved in production and marketing of poultry subsector. The information includes the overall socio-economic characteristics of farmers and traders involved in this business and structured questionnaire design for this study. The study showed that production and trading of live birds and eggs are profitable in smallholders production system due to its low and abundant input requirements than alternative business activities.

Bakengesa (2011) conducted a study on analysis of performance of smallholder dairy goat farmers' cooperatives in Mpwapwa district, Tanzania. The main objective was to give recommendations towards improving of the dairy goat cooperatives performances and dairy goat value chain in Mpwapwa district. The research examined the current status of the dairy goat cooperatives and the interventions for improving their performances when looking to the production, marketing and internal organisations. Number of 30 smallholder dairy goat farmers in 3 dairy goat cooperatives (10 farmers per cooperative) 2 representatives from each cooperative, 3 dairy goat farmers, 2 milk traders and the district Statistician Officers were interviewed, focus group discussion in each cooperative was able to be used to

increased reliability of the result.The study indicated that all three dairy goat cooperatives played a great role in providing services to members like ease to inputs pesticides, fertilizers etc. It contributed positively to the member's economic enterprise development. It found out that dairy goat cooperatives faced challenges like insufficient entrepreneurship skills, inadequate trainings to both management staff and members and others. The study also revealed that there should be deliberately effort for dairy goat cooperatives management and members to be equipped with training on cooperated operations and product value addition. In order for the improvement of dairy and goat value chain there should be sufficient collaboration among stakeholders in the sub sector which will help in harmonizing activities eliminate duplication and harness the ensuring synergies.

Kumar et al. (2011) has synthesized experiences of various authors on value chains of livestock products presented during 18th Annual Conference of Agricultural Economics Research Association on ' Value chains of Agricultural commodities and their role in food security and poverty Alleviation' held in Hyderabad. It highlights broader perspective of value addition in Indian dairy sector and potential of value addition in milk through manufacturing of different types of dairy products.

A comparative analysis of costs on milk procurement, processing, manufacturing and marketing of dairy products in cooperative and private dairy plants in Tamil Nadu revealed that procurement cost of the co-operative dairy societies was higher than private milk collection centres. However, co-operative dairy plant was more efficient, standardized milk, full cream milk and ghee. Success of dairy value chain through Self Help Groups is evident from Madhya Pradesh State. Farmers could get higher returns on developing value chain through Self Help Groups.

Hangara et al. (2012) conducted a study to examine the efficiency and constraints in the management of the cattle supply chain from farmer to processor as well as access to market information by communal farmers in the Omeheke region of Namibia. The study was carried out in four communal areas of Omaheke region namely, Epukiro, Otjinene, Otjombinde and Aminius. The study adopted Rapid Rural Appraisal (RRA) techniques, including a questionnaire which was administered through purposive Sampling to 100 communal farmers and 8 key informants of farmers associations and farmer's cooperatives, an auctioneer and a beef processor involved in cattle marketing in Omaheke region. The respondents were chosen for a particular purpose on the basis of their involvement in cattle marketing and that they were 'typical' of a group or representative of diverse perspective on the issue. It was found that the farmers were not aware of the quality criteria used by buyers when determining prices for cattle classes and grades. The constraints facing the communal cattle farmers include low prices offered for cattle, buyers arriving late or not at all, slow payment processes and buyers running out of cash, whereas those found to be facing auctioneers and buyers operating in communal areas included the buying of poor-quality cattle and low numbers of cattle being offered for sale. Lack of essential and safe facilities at market outlets was identified as a constraint by cattle farmers, auctioneers and buyers. The study recommends strengthening the capacity of farmer's association interms of human and financial resources, the training of communal cattle farmers in managerial and marketing practices and the provision of essential facilities at market outlets.

Kadigi et al. (2013) studied value chain of indigenous cattle and beef products in Mwanza region, Tanzania, market access, linkages and opportunities for upgrading. This study applied the results of participatory market analysis and questionnaire surveys to map the value chain and assessed profitability in each node.

The study was conducted in two districts i,eIlemela and Magu, data collection was done with reconnaissance survey and identification of stakeholders followed by a value chain workshop which was attended by total 40 participants representing different actors including livestock keepers, beef cattle fatteners and traders, input suppliers, researchers and local government officials. Veterinary officers and meat inspectors. Various field participatory rural appraisal (PRA) protocols were adopted to gather general information about the conduct and performance of the value chain. Actor specific information was gathered during the household interviews using structured interviews. Data collected were analysed using both qualitative and quantitative methods. The study found out that the value chain was generally operating inefficiently. Cattle producers received lower prices and profit margins. Vertical integration of livestock farmers, beef processors and traders was limited. The study revealed that profit margins at the producer level suggest that returns are greater if cattle are kept for short periods.

Bwalya (2014) studied on an analysis of the value chain for indigenous chicken in Zambia's Lusaka and Central provinces of Zambia. The main objective of this study was to map and analyse the value chain for the study areas. It also analysed the value added and the associated costs in the chain. Both secondary and primary data were collected. Primary data was collected from smallholder farmers in Chibombo and Mumbwa districts as well as wholesalers, retailers, processors and final consumers from Lusaka districts. Multistage Sampling was used in selecting the farming Households. In total the Sample comprised of 315 Households of which 161 were drawn from Chibombo and 154 from Mumbwa. Total consumer sample size was 297 households; from the closest market selected minimum of 3 retailers were interviewed and 30 restaurants were also interviewed. The study findings showed that although almost all (99%) of the smallholder households keep indigenous

poultry, production and productivity is very low leading to low and unplanned sales. Low production is due to high mortality of indigenous chickens mainly as a result of limited producer knowledge of methods of disease prevention and breeding practices. However, the absence of processors along the value chain means that chicken are sold live in open market. The study further suggested that although the value chain shows positive gross margins for all players along the chain there is need to address the various constraints to improve the operation of the chain and to improve incomes for the value chain actors.

International Livestock Research Institute (2014) provides an overview of the findings of an assessment of livestock production, feed availability, feeding system and an appraisal of the feed value chain in Diga district, Ethiopia. It describes the core functions, major actors, activities and constraints associated with the feed value chains in the study areas. The field survey was conducted in 2013 and information was gathered from feed producers, feed traders and consumers through focus group discussions, a structured questionnaire, key informant interviews and direct observations. The report found out that cattle are the dominant livestock species reared and natural pasture and crop residues constitute the major feed resources available in the study site includes seasonal shortages in supply of inputs, unreliable power supply, lack of awareness on input quality, high cost of the by-products and the overall lack of capacity to initiate feed related interventions.

Moulton et al. (2015) studied on the potential for improving smallholder's livelihoods in Zanzibar, a case study of local value chain of goat meat. The overall objective of the study is to understand through the case study how local farmers can improve their livelihood. To find out the objective the study examined farmer's potential access to the tourist market and women's position in goat farming in Zanzibar. A value chain approach inspired by Kaplinsky and Morris is used to

analyse the opportunities and constraints in the value chain of goat meat. Both qualitative and quantitative methods were used to collect the necessary data. A survey of 117 farmers was conducted in Zanzibar and further qualitative data was collected by a field visit in the study area. The findings showed that women play important roles in dairy goat farming in Zanzibar. Women have ownership of the goats and receive income from goat products. The study confirms that women spend substantially more time on household chores than men. This has implications for women's participation in upgrading strategies in the value chain. The study indicated that hotels are reluctant to source meat from local suppliers because of inconsistent supply and poor overall quality. Findings from the study of the proposed value chain showed that the lack of facilitators to oversee and ensure the transaction between local farmers and hotel and restaurant owners is a major bottleneck. The study however suggested that dairy goats have the potential to play a significant role in the islands long term sustainable development.The study revealed that the main reason farmers keep dairy goat is to raise household income. Ninety-nine percent of the farmers said it was a strong reason or main reason they chose to keep dairy goats. The findings from the survey suggest that farmers do have an interest in keeping more goat to raise household income.

Meshack et al (2015) conducted a study to analyse beef cattle value chains so as to identify potential areas for intervention in order to improve livestock keeper's access to market in Longido and Monduli districts in Tanzania. The study aimed to evaluate profit obtained by different actors along the chain, to determine the marketing efficiency in various beef cattle marketing chain segments and to identify the challenges faced by various actors in the beef cattle value chain in the study area. The study was a cross-sectional design, data were collected from 191 beef cattle value chains actors using individuals and key informant interviews. It indicated that

there were a number of actors i,e livestock keepers, middlemen, traders, butchers, hotels and final consumers. It further revealed that the butchers who purchased live cattle from Primary and Secondary market received the highest Gross margin of 198500 Tshs/head of cattle weighting 200kg. The study findings showed that educational level and accesses to veterinary services were significant at $P<0.01$ while experience and access to market information were significant at $P<0.05$. Marketing efficiency decreases as the marketing costs or margins of intermediaries in the marketing channels increases and vice-versa. It found out that marketing challenges hinderthe development of sustainable and profitable value chain. It recommended provision of appropriate education and training improving access and availability of market information for establishing a sustainable value chain in the study area.

Tarekegn et al. (2016) analysed Sheep value chain in Kafazone, Southern Ethiopia. The main objective of this study was to identify major marketing routes, value chain actors and distribution of costs and margin of sheep value chain. It utilised Participatory Rural Appraisal (PRA) tools, Focus Group Discussion (FGD) key informant interviews and visual observations to collect Primary data. A total of 120 farmers were interviewed, the study identified that introduction of value adding management practices and marketing linkage is the most important aspect of enhancing the livelihood and source of income for smallholder farmers in the zone. Smallholder farmers are the main suppliers of the animal and sale at anytime when immediate income is required. Six major sheep marketing channel are identified in the area are as follows: sheep purchased by big traders; sheep purchased by small traders; sheep slaughtered at Hotels and butcheries; purchased by Individual consumers; purchased by other cooperatives for breed improvement purposes; and purchased by other farmers for breeding purposes.

2.4. Concluding Note

Most of the studies considered in this chapter adopted cross sectional survey farmers for data collection, while schedule questionnaires, interview, focused group discussion and observation methods are the main tools of data collection. Meanwhile, with the exception of few studies (Ngarava, 2016; etc.), most of these studies adopted descriptive statistics like mean, percentage, etc. as main tools of data analysis.

The focus areas of these studies can be broadly divided into two, namely production process (Munzhelele, 2015; Nabiky et el., 2016; Perey, 2017), and marketing margins and profitability (Levy et al., 2014; Nagarava, 2016; Igbinnosu et al., 2011; Zeberga, 2010; etc.). The main focus is more on the latter, i.e. study of market value chain. The study of backyard pig farming undertaken by Perey (2017) and small holder piggery farming done by Munzhelele (2015) are found notable in view of the field situation of this study where piggery farming is undertaken mostly as subsidiary livelihood activity with a holding of one or two pigs in most of the cases.

Chapter 3

GENERAL CONDITIONS OF PIGGERY AND PRODUCTION IN MIZORAM

3.1. Introduction

Livestock farming has been one of the important livelihood activities of the people in Mizoram since very long time. However, it is mostly undertaken in small scale as additional livelihood activities, rather than undertaking in commercial scale. The main domesticated animals are pig, cattle, poultry, goat, buffalo, mithun, dog, and cat. Pig and poultry are the most common animals reared by the households in and around their house. It is a common practice of families to keep one or two pigs, provided they have enough space for it, in the vicinity of their house and feed them with household food wastes without incurring additional expenditure. They would sell it once they mature and the income earned as a result of it are normally used for buying household durable assets like televisions, refrigerators, etc. Attempt is made in this chapter to present an overview of the livestock situation and status of pig farming in Mizoram using secondary data obtained from different sources.

3.2. Trends in Livestock Population

Table 3.1 presents the general status of livestock population in Mizoram as per the record of different Livestock Census. It is observed from this table that the major livestock animals in Mizoram are pigs, indigenous cattle, and dogs, while there are also buffaloes, horses, mithun and sheep but their population are comparatively low. In addition to livestock animal, the State has large number of poultry over the years. The total poultry population (hen) has increased substantially from 686.9 thousands in 1982 to 1253.1 thousands in 2012, of which the improved variety has

shown significantly higher increase during this period.

Table 3.1: Trends of Livestock Population In Mizoram in Different Livestock Censuses (in 000)

Species	1982	1987	1992	1997	2003	2007	2012
Cattle (Crossbred)	3	5.3	11	7.5	8.8	10.7	12.8
Cattle (indigenous)	45.6	45.1	84.8	25.8	26.8	24.2	25.5
Cattle (Total)	**48.6**	**50.4**	**95.8**	**33.3**	**35.6**	**34.9**	**38.3**
Buffaloes	4.3	5.6	6.5	5.4	5.7	5.8	5
Goats	27.5	17	22.7	16	17	15.7	3.3
Pigs	**77.1**	**81.5**	**112**	**168.2**	**217.2**	**266.9**	**266.6**
Horses	1.4	2.3	2.5	2	2	1.4	0.7
Dogs	18.4	18.9	19.4	33.8	37	35.3	46.8
Mithun	1.2	1.4	0.9	2.6	1.7	1.9	3.3
Sheep	0.9	0.5	1.2	0.7	1.1	1	0.6
Total Livestock	**179.5**	**177.6**	**261.1**	**261.9**	**317.3**	**362.9**	**364.7**
Poultry (Desi)	602.5	684.9	878.2	1083.4	779.9	879.4	770.7
Poultry (Improved)	84.4	146.9	194.4	211.1	328	382.1	482.4
Poultry (Total)	**686.9**	**831.8**	**1072.6**	**1294.5**	**1107.9**	**1261.5**	**1253.1**

Source: Directorate of Animal Husbandry& Veterinary, Govt. of Mizoram(2012)

The total livestock population has increased consistently from 179500 in 1982 to 261100 in 1997 to 364700 in 2012. At the same time, pig population has also increased consistently from 77100 in 1982 to 217200 in 2003 to 266600 in 2012, while dogs are also increasing during this period. The number of cattle has shown declining trend from 48600 in 1982 to 38300 in 2012 due to the substantial reduction in the number of indigenous cattle (hill cattle). Similarly, there was also substantial reduction in the population of horses and goats during this period. Meanwhile, the number of buffaloes, mithun and sheep did not show clear trend during this period.

Table 3.2 presents the percentage composition of livestock population in Mizoram in different censuses. It is clearly observed from this table that the share of most of the livestock animals in the total has decrease substantially during 30 years after 1982. Meanwhile, the share of pig in the total livestock population has shown substantial increase from 42.95% in 1982 to a high of 73.1% in 2012. It can, thus, be

concluded that piggery has become the most progressive livestock farming in Mizoram and has become the driver of the livestock sector in the state.

Table 3.2: Percentage Shares of Different Livestock Animals in Mizoram

Percent

Species	1982	1987	1992	1997	2003	2007	2012
Cattle (Crossbred)	1.67	2.98	4.21	2.86	2.77	2.95	3.51
Cattle (indigenous)	25.40	25.39	32.48	9.85	8.45	6.67	6.99
Cattle (Total)	27.08	28.38	36.69	12.71	11.22	9.62	10.50
Buffaloes	2.40	3.15	2.49	2.06	1.80	1.60	1.37
Goats	15.32	9.57	8.69	6.11	5.36	4.33	0.90
Pigs	42.95	45.89	42.90	64.22	68.45	73.55	73.10
Horses	0.78	1.30	0.96	0.76	0.63	0.39	0.19
Dogs	10.25	10.64	7.43	12.91	11.66	9.73	12.83
Mithun	0.67	0.79	0.34	0.99	0.54	0.52	0.90
Sheep	0.50	0.28	0.46	0.27	0.35	0.28	0.16
Total	100	100	100	100	100	100	100

Source: Directorate of Animal Husbandry& Veterinary, Govt. of Mizoram(2012)

3.3. Livestock Production

Table 3.3 presents the annual livestock production as per the record of the Animal Husbandry & Veterinary (AH&Vety) Department since 2005-06. There was ups and down in the production of animal products, namely milk, egg and meat, over the years due to a number of factors. Despite the short term increase and decrease in the production, the overall averages for these years indicate an increasing production year after year. The total milk production has increased from 15098 MT in 2005-06 to 25019 MT in 2017-18 with a compound annual growth rate (CAGR) of 4.8%, and egg also slightly increased from 426 lakhs (No) to 410 lakhs with CAGR 0.1%, while meat production increased significantly from 9239 MT to 15683 MT during this period with a CAGR of 4.8%.

Table 3.3: Annual Livestock Production in Mizoram

YEAR	Milk (MT)		Egg (in lakh No.)		Meat (MT)	
	Production	Change (%)	Production	Change (%)	Production	Change (%)
2005-06	15098	--	326	--	9239	--
2006-07	15304	1.4	348	6.7	8761	-5.2
2007-08	15690	2.5	402	15.5	9430	7.6
2008-09	16007	2.0	411	2.2	10244	8.6
2009-10	10022	-37.4	371	-9.7	8784	-14.3
2010-11	10831	8.1	388	4.6	9700	10.4
2011-12	13942	28.7	350	-9.8	13158	35.6
2012-13	13639	-2.2	351	0.51	12076	-8.22
2013-14	15305	12.2	362	3.22	12189	1.26
2014-15	20495	33.9	377	4.14	12525	2.76
2015-16	21997	7.3	391	3.23	13592	7.88
2016-17	24159	9.8	408	4.33	14787	8.79
2017-18	25019	3.6	410	0.46	15683	6.06
CAGR (%)	--	4.8	--	0.9	--	4.9

Source: Directorate of Animal Husbandry & Veterinary, Govt. of Mizoram (2018)

In respect of the milk production,only the productive animal such as Crossbred Cows and indigenous Cows were taken into account for estimation of annual production of milk as milking of goat and a buffalo are very rare and is negligible in Mizoram. The production of milk has increased during the period of 2013-2015. The per capita availability of milk per day was estimated to 36.57 gms only as against the recommendation made by the Indian Council of Medical Research (ICMR) that an individual needs 240 gms of milk per day for keeping his/her health in good condition.This shows that there is great necessity for increasing milk production in Mizoram.

To estimate annual production ofegg, the population of hen, improved and desi were taken into account. The population of duck is very low in Mizoram and is negligible. The production of eggs in Mizoram has shown an increasing trends, but the percentage increase rate is declining from 2013-2014. During the year 2017-2018, the total production of eggs was worked out to 410 (lakhs nos) which shows an

increase of only 0.46% (408 lakhs nos) over the previous year. The per capita availability of eggs per year for Mizoram was estimated to 31.61 numbers per year which is well below the ICMR recommendation of 180 eggs per year for maintenance of good health.

The main sources of meat in Mizoram are cattle, buffaloes, mithun, goats and pigs. During the year 2017-2018, the total meat production was 15683 tonnes as against 14787 in the previous year of 2016-17 percentage rate increase was 6.06%. The per capita availability of meat per year for Mizoram was estimated to 10.634 kg per. As the per capita availability of meat in Mizoram it is below the ICMR recommended quantity 12.41 kg/head per year, there is scope to increase meat production even to meet local demand.

3.4. General Profile of Piggery

Among the Livestock farming enterprises, pig farming plays a significant role in improving the Socio-Economic status of sizeable sections of weaker and tribal population. In the last few decades, pig farming has assumed great importance in meeting the protein demand. Piggery rearing occupies a unique place in Mizoram since it is Socio-Culturally intermingled with the livelihood of tribal people of the State. Pigs are reared by almost every family in Mizoram as a backyard venture. The backyard production of pigs in the State is characterized by low input and traditional management system suited to the local condition (Rahman, 2007). As noted earlier, pigs constitute the largest group in the livestock population in Mizoram.

The major variety of pigs, breed, nature and their origin as given by the state AH&Vety Department may be presented as follows:

a) **Large white Yorkshire(Purebred)** : It is a native breed of U.K imported to India from U.K, New Zealand and Australia. It is a large in size with a long and slightly dished face. Body is covered with fine white hairs,free from curls. Skin is pink in colour and free from wrinkles with long and moderately fine coat. Ears are thin, long and slightly inclined forward and fringed with fine hair. Neck is long and full to the shoulders with deep and wide chest, shoulders are not too wide. Tail is set high, pattern are strong and straight with clean feet. It has the capacity to thrive well under different climatic conditions that is why it is extensively use for crossbreeding and breed upgadation.

b) **Hampshire (purebred)**: This breed has been developed in USA and is now one of the World's most important breeds. The Hampshire is a black Hog with a white band around the body at the shoulder including the front legs and feet. The head, tail, legs and back are black. The ears are erect and the face is longer and straighter compared to other breeds. Hampshire sows are very prolific have extra longevity and make good mothers. They have been used extensively in crossbreeding because of their good Carcass-quality popular for their lean,meaty carcasses. Sows give birth to a large litter of 10 piglets with 1kg birth weight, but some sows have been known to have litters of up to 16 piglets.

c) **Large White Yorkshire Cross**: These breeds are frequently crossed with local variety to generate a composite breed called improved breeds that are considered an upgradation form with a good blend of superior exotic germ plasm. LWY crosses have good mothering ability and good prolificacy with average litter size of 7 numbers which increases following subsequent

farrowing. LWY boar semen have been used extensively for Artificial Insemination purpose in the State.

d) **Hampshire Cross Local**: They are black in colour with the typical white belt covering the shoulder portion including the forelimbs extending till the pastern. It is most preferred by the locals are very popular in the State. Average litter size at first farrowing is 6 nos which increase in the range of 7-12 during subsequent farrowing.

e) **Large Black Colour Crossed**: It is a very common breed in Mizoram which is believed to be brought by local farmers through the porous border of the State. It is preferred by the local due to its colour, good litter size, and good mothering ability.

f) **ZoVawk (Indigenous Breed**): This is a small size breed found in Mizoram. They are predominantly black in colour with potbellied appearance. The mature body weight ranges between 40-50 kg and litter size about 5-8 numbers. These pigs are mainly raised in backyard and semi-intensive systems. They have good mothering ability, early maturity, tolerance and resistance to parasites and diseases and low nutrient requirement. There is a gradual decrease in the population of ZoVawk/ Mizo local due to heightened interest of farmers towards fast growing pigs so conservation of this breeds with proper strategy is gravely important.

To give better picture on the existing stock of pig breed Table 3.4 presents the compositions of pig population by crossbred and indigenous according to the livestock census 2012.

Table 3.4: Composition of Pigs Variety in Mizoram

	No. of Pigs			Percentage of Pigs		
District	Crossbred	Indigenous	Total	Crossbred	Indigenous	Total
Mamit	22251	4022	26273	84.69	15.31	100
Kolasib	20614	2855	23469	87.84	12.16	100
Aizawl	78039	8440	86479	90.24	9.76	100
Champhai	32181	5608	37789	85.16	14.84	100
Serchhip	11761	300	12061	97.51	2.49	100
Lunglei	26097	5444	31541	82.74	17.26	100
Lawngtlai	17704	11326	29030	60.99	39.01	100
Saiha	18765	1239	20004	93.81	6.19	100
Total	227412	39234	266646	85.29	14.71	100

Source: Directorate of Animal Husbandry & Veterinary, Govt of Mizoram

It is clearly seen from Table 3.4 that people reared crossbred in most of the cases. With the exception of the southern district of Lawngtlai where 39% of the pigs are indigenous, crossbred accounted from more than 80% of the total pig population in all other districts of Mizoram. It can be concluded that the farmers preferred crossbred pig in place of the indigenous one throughout the state.

3.5. Production of Pork in Mizoram

Pork is the most popular and preferred meat in Mizoram as there is no taboo for pork eating amongst tribal people, and its production shows an increasing trend in Mizoram. The trend of pork production is presented in Figure 3.1 and Table 3.5. The total production has increased from 6320 MT in 2005-06 to 7894 MT in 2008-09, but declined to 4545 MT in 2010-11 and again increased to 7368 MT in 2016-17. The overall annual compound growth rate (CARG) turned out to be 0.99%. It may be noted that the pig farmers are frequented by the outbreak of Porcine Reproduction and Respiratory Syndrome (PRRS) from time to time, since 2008-09. This is clearly reflected in the reduction in pork production the sequent years.

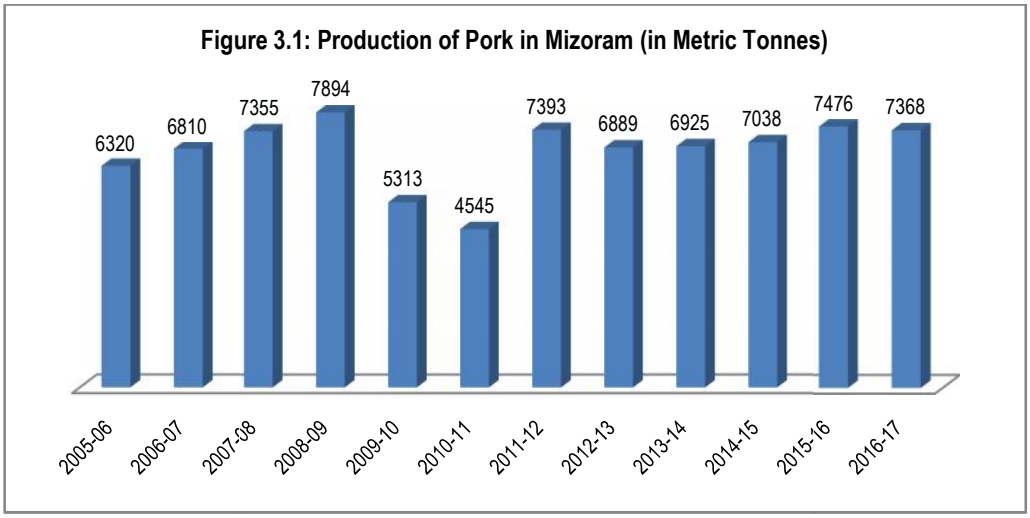
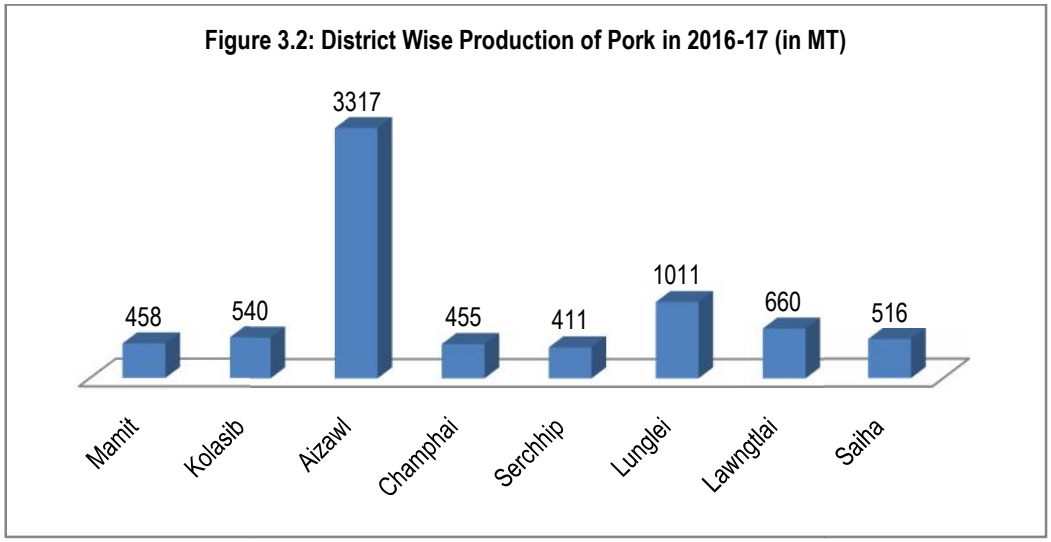


Table 3.5: Trend of Pork Production in Mizoram (in Metric Tonnes)

Year	Pork	Total Meat	% Share of Pork
2005-06	6320	9239	68.41
2006-07	6810	8761	77.73
2007-08	7355	9,430	78.00
2008-09	7894	10,244	77.06
2009-10	5313	8784	60.48
2010-11	4545	9700	46.86
2011-12	7393	13158	56.19
2012-13	6889	12076	57.05
2013-14	6925	12189	56.81
2014-15	7038	12525	56.19
2015-16	7476	13592	55.00
2016-17	7368	14787	49.83
CAGR (%)	0.99	4.9	

Source: Directorate of Animal Husbandry & Veterinary

The statistics shows that pork is the major meat production in Mizoram. It contributed the largest share to the total livestock meat production. During the period from 2007-2009 almost 80% of meat production was derived from pig meat. Pork contributed almost 60% from the year 2011- 2016 to the total meat production. The production of pig meat decreased in 2016-17 but still constituted almost 50% of the total meat production. The district wise pork production in the year 2016-17 is presented in Figure 3.2.



Pork is produced by all the 8 districts in Mizoram, among these 8 districts, Aizawl is the leading producer of pig meat in Mizoram. Aizawl district is the largest producer of pork producing 3317 (in tonnes) followed by Lunglei district which produced 1011 (in tonnes) and Lawngtlai producing 660 (in tonnes). Serchhip district is the smallest pork producing district by producing only 455 (in tonnes). In view of the total population and extent of urbanisation, Aizawl district appears to be the main consumer and producer of pork in Mizoram.

3.6. Government Initiatives for Piggery Development

Piggery is the most popular livestock farming activity of the people in Mizoram; almost every household rears at least two pigs. To increase the availability of meat and pork, the Government of Mizoram has implemented several schemes and programmes. One of the most popular schemes being implemented by the government was Development of Sustainable Base for pig production (DESBAPP) under which model piggery village each was set up in three districts i e, Aizawl, Champhai and Lunglei . The Government of Mizoram is also encouraging piggery as an alternative source of livelihood for the Jhum cultivators in particular. Under New Land Use Policy (NLUP), Mizoram Intodelhna Project (MIP), and other State and

Centrally sponsored Schemes implemented by District Rural Development Agencies like Swarnajayanti Gram SwarozgarYojana (SGSY) and Special SGRY, the government is encouraging piggery as an alternative source of livelihood under which supply of good quality pigs are supplied to the farmers.

The Animal husbandry and Veterinary (AH &Vety) department, Government of Mizoram plays an important role for piggery development. It aim at ensuring sustainable growth of livestock sector by enhancing livestock productivity for attaining nutritional security, economic prosperity, employment generation. The department provides veterinary care, improving genetic resources, better management of feed and fodder and providing improved mechanism for collection, processing and management of livestock products. Table 3.6 presents the basic infrastructure provided by the Department for piggery development in different districts of the state.

The department has 10 pig breeding farms 2 farm each in Kolasib, Aizawl,Lunglei and Serchhip districts. 1farm in Champhai andLawngtlai districts.One piggery village in three disticts i.e., Aizawl district, Champhai district and Lunglei district.

Table 3.6: District wise Veterinary Institutions and Infrastuctures in Mizoram

District	Hospital	Dispensary	Rural animal health Centre (RAH)	Artificial insemination centre
Mamit	-	3	12	-
Kolasib	1	4	6	8
Aizawl	1	6	30	16
Champhai	1	7	13	10
Serchhip	-	4	7	6
Lunglei	1	6	26	13
Lawngtlai	-	2	2	3
Saiha	1	3	7	2
Total	5	35	103	58

Source: Directorate of Animal Husbandry &Veterinary, Government of Mizoram.

3.6.1. Mizoram Pig Breeding Policy

The Government of Mizoram through Department of Animal husbandry& Veterinary develop a pig breeding policy known as 'Mizoram Pig Breeding Policy' in aiming at improving the genetic of the existing swine population of the State in the interest of the pig rearing farmers economic sustainability. The major objectives of the Mizoram Pig Breeding Policy are as follows:

a) Zovawk, indigenous pig breed of Mizoram, where no crossbreeding shall be applied, the germ plasm of this breed shall be established and preserved.
b) Prized animals should be collected from farmers field/State farm to the Nucleus herb.
c) Pedigreed animals need to be propagated only to interested farmers who want to rear indigenous germplasm. However, Govt. should ensure necessary incentive to these farmers. For this, rate of piglet and pork of Zovawk pigs may be fixed at higher values as compared to other pork by the Government.

d) Import of germ plasm of large White Yorkshire, Landrace and Hampshire from sources which are free from Scheduled Diseases.
e) Import of Live animals may be considered at regular intervals at a first primary strategy with import of Semen as a secondary option, in improving and upgrading Herd Quality.
f) Cross breeding may be propagated through selective breeds of Large White Yorkshire, Hampshire and Landrace.
g) Artificial insemination should be delivered through Private inseminator who has taken training courses conducted by the Department.

The Mizoram pig Breeding Policy aim at improving pig production system under changing climatic scenario by improved scientific method of production. It will also target at improving socio-economically weak communities including women folk in terms of sustainable livelihood security. It is also expected to meet the current demand supply gap of pork in the State and opening new entrepreneurship and export of pork and pork products. The current breeding policy should be reviewed after a minimum of period of every five years.

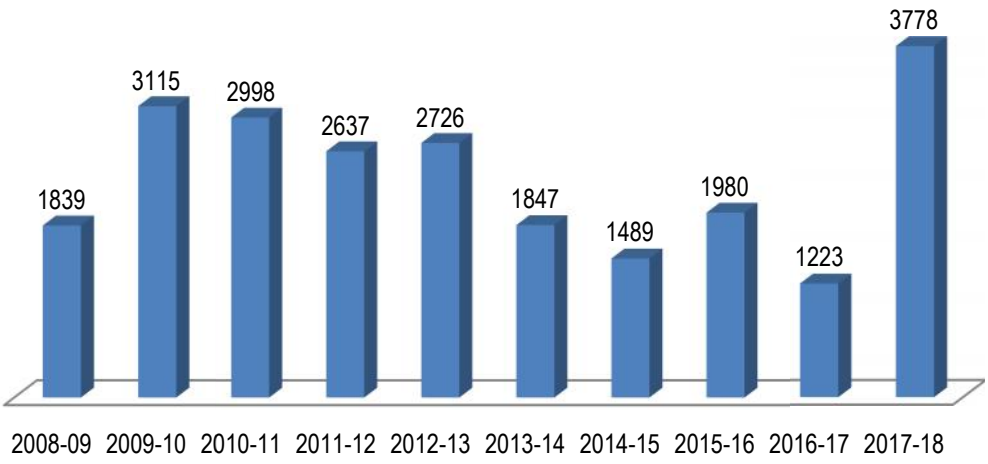
In view of the objectives of the Pig Breeding Policy, the AH &Vety Department currently operates 10 pig farms in different places as follows: (1) Regional Pig Breeding farm, Selesih; (2) Mega seed farm, Selesih; (3) Pig multiplication farm,Thingdawl; (4) Pig demonstration farm, Kolasib; (5) Base Pig farm,Lunglei; (6) Pig Breeding farm,Mampui; (7) Piggery farm,Thenzawl; (8) Piggery farm,Mamit; (9) Pig Breeding farm,Hnahthial; and (10) Zovawkfarm,Lunglei

These farms are initially for demonstration but then continued to maintain as breeding farm for product of high yielding variety of pig for the farmers. With the Government of India policy for conservation of indigenous variety which are in the

verse of extinction, the department established one pig farm for conservation of indigenous pig which is classified as 'MizoVawk'. The objective of the farm is to improve variety of piglet for further reproduction of meat through farmers intervention.

The Breeding Programmewas carried out with a mechanism initially applied with natural service. With the advancement in the technology the Artificial Insemination is being carried on since 1997. The practice of Artificial Insemination is found successful like other advance countries. Presently, the department established the Artificial Insemination centres at Aizawl,Lunglei.Kolasib,Champhai and Serchhip. The service of these centres is operated 24 hours on need basis. Figure 3.3 presents the number of pigs which are given artificial insemination by the AH &Vety Department since 2008-09.

Figure 3.3: The Number of Pigs given Artificial Insemination (Nos)



The number of artificial insemination done in pig has been increasing and there is a significant increase in 2017-18 that artificial insemination in pig was increase from 1223 in 2016-2017 to 3778 in 2017-2018.

The regional Boar Semen Station was established in the year 2013 under RKVY(NMPS) located at AH&Vety farm complex Selesih, Aizawl and start functioning in the year 2014. The Station is mainly used for production of quality liquid Boar semen for artificial insemination and dissemination of quality germ plasm to the pig farmer within the State of Mizoram. It is also served as a training centre for pig Artificial Insemination Technicians of AH&Vety department Government of Mizoram.

3.6.2. Feed Development

Feed development is another crucial area undertaken by the AH &Vety Department for the development piggery farming activities in Mizoram. It established two animal feed mixing plants, one at Selesih and Tanhril in the vicinity of Aizawl city where different varieties of ingredients are compounded to manufacture different types of livestock and poultry feed.

Quality feed materials for pig are produce in Tanhril Animal Husbandry&Veterinary Plant. The department prepare quality pig feed by adding different protein which are essential for pigs in their different stages of growth for starter, Grower and Finisher. The department sell out to the local wholesaler at a wholesale price at the rate of Rs.30/kg for starter, Rs.27/kg for Grower and Rs.24/kg for Finisher.The department produce the quality feed for Starter and Grower as per the demand of the farmers. Due to unavailability of the time series on the production of feeds in these two plants, it is decided here to present the monthly production in the year 2017. The result is presented in Table 3.7. It is expected that the production being observed in 2017 is a good representation of other years as well.

Table 3.7: Production of Pig Feed by AH &Vety Department - 2017 (in Kg.)

Month	Starter Ration	Grower Ration	Finisher Ration	Total
January	3000	4000	28000	35000
February	200	500	36500	37200
March	200	500	31000	31700
April	---	---	25500	25500
May	---	---	23000	23000
June	---	7000	19000	26000
July	1000	1000	22500	24500
August	1300	---	54000	55300
September	1500	---	17500	19000
October	1000	500	41000	42500
November	1500	---	38000	39500
December	1800	2000	42000	45800
Total	11500	15500	378000	405000

Source: Directorate of AH &Vety, Government of Mizoram

It is observed from Table 3.7 that the total annual production of different types of animal feeds by the AH &Vety Department is 405 MT, of which the production of finisher ration is highest at 378 MT which shows continuous production throughout the year. The total production of starter ration was 11.5 MT and there was no production during April-June, while there was no production of grower ration which has total annual production of 15.5 MT in five months.

3.6.3. Disease Control

Occurrence of diseases causes heavy economic losses in terms of livestock health and production.Advances in animal health are expected to play a major role in the progress of livestock industry. In order to enhance Pig production in Mizoram the Government aim to control and eradicate important diseases. The last few years have seen general reduction in the burden of Livestock diseases, except PRRs as a result of more effective drugs and vaccines and improvements in diagnostic technologies

and Government Services.Veterinary health cover is provided through a network of veterinary Hospitals, Dispensaries and Rural Animal Health care Centres (RAH). The department provides the following services at Hospitals and Dispensaries:

a) Treatment of sick animals of both large and small including major and minor surgery.
b) Immunization against contagious and infectious diseases
c) Artificial Insemination in cattle and pig.
d) Consultation, Meat Inspection, Dispensing.
e) Post-mortem investigation.

Services provided by Animal Husbandry& Veterinary Department at Rural Animal Health Centre (RAH) are:

a) Treatment of sick animal both large and small.
b) Vaccination against contagious diseases of livestock and poultry.
c) Surgical operation like Castration and Overcatomy and minor injury etc.
d) Dispensing and first aid to ailing Animals.

Inorder to prevent and control any disease outbreak within the State, Disease Investigation Wing was set up to investigate, Surveyed, study the aetiology, mode of occurrence of diseases. This wing gave instruction to field Officer and Staff to combat the prevailing diseases and to take the measure for its prevention and control. This Wing renders the following services: (1) Examination of Blood, Stool, Urine etc.; (2) Parasites and Bacterial examination; (3). Antibiotic Sensitivity tests; (4) Post- Mortem examination; and (5) Procurement and distribution of medicine Vaccines, Instruments and appliances is also taken up by this Wing.

Pig diseases like Swine flu fever and Porcine Reproductive and Respiratory Syndrome (PRRS) are the most common in Mizoram. The outbreak of Swine fever disease had affected almost all the 8 districts of the State in recent years, it was

mainly concentrated in Aizawl District, Serchhip District and Champhai district. The Veterinary Department provides a Swine fever vaccinations to prevent these disease. According to the report of Dr.Hmarkunga, Joint Director, Mizoram Animal husbandry& Veterinary Department over 2600 pigs and piglets have been infected with PRRS and Swine fever (SF) in different parts of the State and over 80 Villages have also been affected by the two diseases in 2018. Table 3.8 presents the latest position of vaccination of pigs in different districts of the state.

Table 3.8: No. of Pigs Vaccinated by Swine Fever Disease

District	2016-2017	2017-2018	Progress (%)
Aizawl	4208	11805	180.5
Lunglei	951	2314	143.3
Saiha	236	1455	516.5
Champhai	2756	15030	445.4
Kolasib	1998	3505	75.4
Serchhip	1825	4949	171.2
Mamit	303	1948	542.9
Lawngtlai	114	1415	1141.2
Total	**12391**	**42421**	**242.4**

Source: Directorate of Animal Husbandry & Veterinary, Govt. of Mizoram

Due to the outbreak of PRRS and SF diseases in Mizoram the number of SF vaccination undertaken by the VetyDepartment showed a significant increase from 12391 in 2016- 2017 to 42421 in 2017-2018. Provision of SF vaccination is highest in Champhai District (15030) followed by Aizawl District (9010) and Serchhip District (4949).

As of now, there is no medicine to cure PRRS, and the pigs were treated with vitamins to ensure that other diseases did not aggravate the illness. As there are no vaccines available for the PRRS diseases, drugs to prevent Secondary bacterial infections were administered to the affected swine. Rapid Response Team was sent to different places in 2018 to combat the PRRS. The Team was tasked to investigate

the PRRS infected pigs, testing of blood and provides vaccination to prevent the widespread of this disease. In addition, the Government of Mizoram issued an order banning import of pigs and piglets from outside the State especially from Myanmar, the order also prohibited inter-village or district transportation of pigs. The Government also asked all pig farmers to immediately bury their dead pigs and warned against selling ailing pigs in the Market.

3.6.4. Marketing

The marketing channel is the route through which the product moves from the producer to the consumer. Marketing channels affects the marketing efficiency to a great extent. There are two types of marketing channels: Organized channel involves participation of Government institution or cooperative federation. The basic motive of the organization is to see that the consumer price doesn't fluctuate violently. The unorganized channel means participation of private traders who have profit making motives.

In Mizoram pig farmers sell their pigs to local consumers or traders, pig market is unorganized. In Mizoram generally farmers sell pigs when it reach minimum one year of age. They sell on live weight basis to the trader or the farmer himself slaughter.Pork retailing market in rural market is through informal system with least concern for hygienic measures. There is inadequate infrastructure and pork is sold in open air. There is need to effective supervision and training on scientific methods of slaughter and handling of pork and slaughter house as food safety measures.

The Government of Mizoram has 7 marketing infrastructures in Aizawl, Champhai and Kolasib.Pork& Poultry Processing Plant, Zemabawk started its production activities from the year 2009-2010. Within a short period of time, the

products such as Smoked Pork, Sausage etc have gained popularity in the local market. For production of clean and healthy meat, new Rural Slaughter House is constructed with an estimate cost of Rs 387.24 lakhs at Brigade Field, Bawngkawn, with possible slaughtering work load of 20 nos. of large animal weekdays and 70-80 nos. of animals at weekend.

3.7. Conclusions

The foregoing analysis clearly revealed that piggery has become the most important livestock activity in Mizoram. The number pigs has grown significantly and accounted for more than 70% of the total livestock population, while it contributes around half of the total meat production. Thus, it can be concluded that piggery is one of the most important livelihood activities of the people in Mizoram, and its success and failure would significantly impact income generation among the farm population.

The farmers had tendency of substituting indigenous pig by crossbred provided through the various initiatives of the state AH &Vety Department. Presently, crossbred accounted for more than 80% of the total pig population in Mizoram. This Department has taken significant effort to ensure availability of the facility and personnel for the application of artificial insemination under its Breeding Policy. In addition, the department has also produced substantial quantity of pig feed which can have forward and backward linkage to the agriculture and allied sector of the economy. The procurement of raw material for production of pig feed within the state can open market opportunity for agriculture produces like maize, vegetables, etc. (backward linkage), while it can have positive impact on production meat, i.e. pork, (forward linkage).

It is also observed that meat (pork) production in the state has increased substantially over time, and all the produced are sold within the state. An interview of the officials during the field work suggest that the local production of pork meat is not sufficient to meet even the local demand, thereby necessitating import from the neighbouring states, and countries of Myanmar and Bangladesh. Consequently, the pig farmers practically do not have problems in marketing of their produces in the local market even if there is no efficient market channel. To ensure food safety of the pork consumers, the AH &Vety department recently established some basic infrastructure for meat marketing like slaughter house, processing infrastructure, cold storage, etc. in some places of Mizoram.

Despite the active effort shown by the AH &Vety Department, Government of Mizoram, for disease control, the pig farmers are frequented by outbreak of diseases from time to time causing huge loss to them. The most common diseases known in Mizoram are PRRS and Swine Fever which originated from the South East. As noted above, the state has to import substantial quantity from neighbouring countries through informal route as it share porous borders with Myanmar and Bangladesh. Consequently, disease control has become the serious challenge to protect the interest of the pig farmers. Thus, it is necessary to show concrete effort to increase production within the state which will have dual impact on increasing farmers income as well as disease control to some extent.

Chapter 4

ANALYSIS OF THE COST, REVENUE AND MARKET

4.1. Introduction

Pig keeping is important in Eastern States of the country and particularly for the tribal communities (Rangnekar, 2006).Pig rearing is a traditional occupation adhering to theMizosociety since past beyond memory. It is still in practice today and almost every household are keeping pigs as backyard farming provided that they have space and capital for it. Thus, there is good potential for piggery development in Mizoram. Pig farming in Mizoram may be divided into two - backyard pig farming and commercial farming. The former is most popular in rural areas where people rear small number of pigs in and around their house as additional income source. At the same time, due to the increasing urbanisation which led to more meat demand, some families have started piggery farming on a commercial scale by keeping relatively larger number of pigs in their farm. This is mostly found in the vicinity of towns and city, but only a limited number of families are found undertaking piggery farming on commercial scale.

In fact, pork is the most favourite meat item of the people of Mizoram right from their ancestors who had used it even for religious purposes and community feast. Its demand tended to increase substantially in pace with the population growth and economic development. As per Livestock Census in 2012, out of the total meat production(including poultry products) pork accounted for the highest quantity with 56.19% followed by beef with a share of 25.57% and chicken accounted for 16.73% of the total meat production. The local demand itself clearly justify the fact that pig farming is one of the lucrative sources of income which can be undertaken by the

families in addition to their normal agricultural practice. Thus, pigs are mostly valued as a form of savings for the farmers,from where the farmer can tap in times of cash shortage and emergency needs. (Ikanni and Dafwang, 1995;Muys et al. 2004)

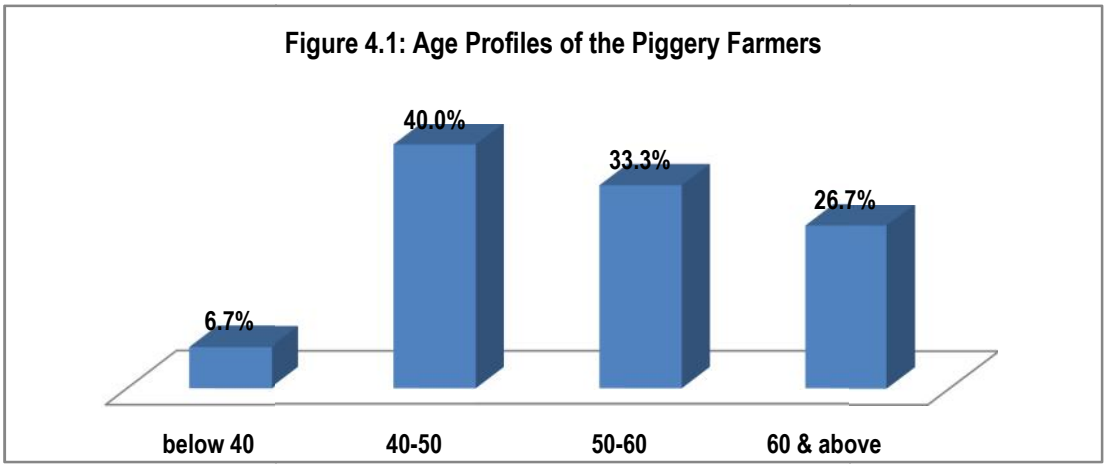
Attempt is made in this chapter to examine the conditions of production chain (initial cost, labour inputs, feeds, etc.) what we called input value chain, production and income from piggery farming, and marketing conditions for the production. To throw more light on the farming condition, this study also examined the socio-economic conditions of the farmers and the basic farming conditions. All the analyses undertaken in this chapter are purely based on the primary data collected from the sampled respondents.

4.2. Socio-Economic Profile

The status of the households who are involve in pig rearing and the person in each family who took responsibility or ownership of the activity was taken as pig farmer. It is observed that pig rearing has been an important secondary occupation in the study area where women took more piggery activities like feeding, food preparation, collection, etc. Among the sample farm households, women took responsibility for 60% of the cases, while 40% for male because men are actively engaged in some other primary occupation. Further, the average family size is 4.5 which range 2 and 9.

Figure 4.1 presents the age profiles of the piggery farmers in the study area, i.e. Aizawl district of Mizoram. It is observed that 40% of the respondents fall in the age group of 40-50 years, 33.3% in the age group of 50-60 years, 26.7% in the age group of 60 and above, only 6.7% respondent fall in the age group of below 40 years.

Thus, those who actively involved piggery activities are above 40 years of age in most of the cases, while the participation of youth members in the age group of 18-35 years is extremely low.



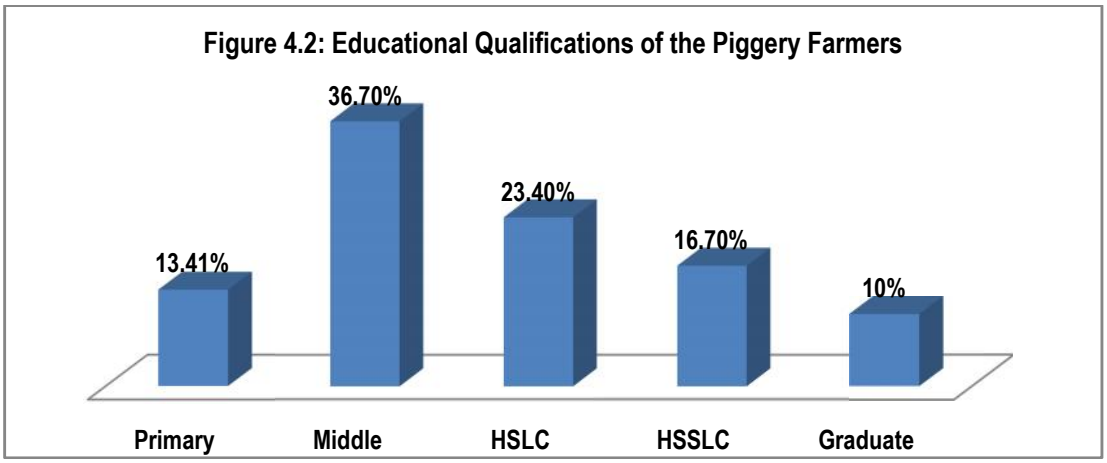
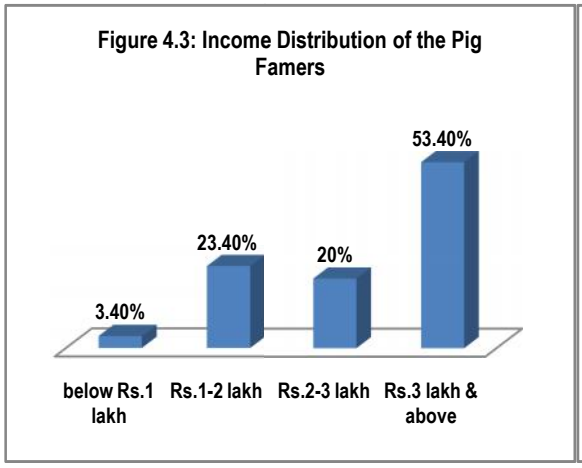


Figure 4.2 presents the educational levels of the piggery farmers. It is observed that all the sample pig farmers had attended formal education and are able to read and write. Largest number which is 36.70% of pig farmers had Middle level education, only 10% of pig farmers were graduated. The survey results in general indicated that pig farmers were literate suggesting that with good extension and training programme they can improve the conditions of pig farming to be more profitable.

Figure 4.3 presents the income distribution of the sample farmers in the study areas. The respondent farmers are having wide income distance due differences in main occupation, while the scale of piggery farming has also contributed to substantial differences in income. It is observed that the average annual income of the households turned out to be Rs. 3.4 lakh with a high standard deviation of Rs.2.5 lakhs. It is observed from Figure 4.3 that more than 53% of the farmers have annual income more than Rs.3 lakh, while only 3.40% are having income below Rs. 1 lakh per annum. Keeping in view the average family size of 4.5 persons, the average per capita income of more than half of the farmers (53.40%) is more than Rs.5000 per month. Thus, one may conclude that majority of the piggery farmers are having considerably higher income, and can be safely assumed to be due to additional income earned from pig rearing.



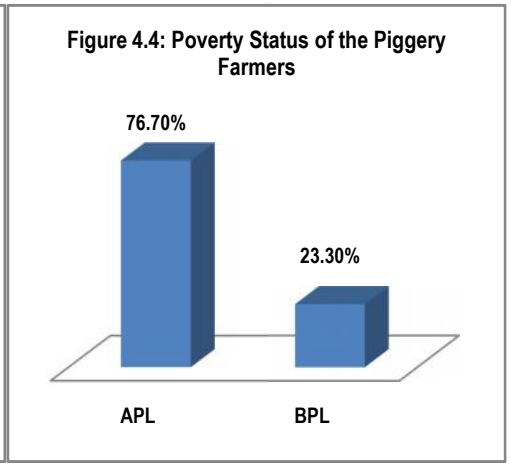


Figure 4.4 presents the poverty status of the family as per the latest BPL Census in 2016. It is found that majority (76.70%) of the pig farmers in the study areas are in Above Poverty Line (APL), while only 23.30% are in the Below Poverty Line (BPL).

4.3. General Profiles of Piggery Farming

To present the basic farming conditions of piggery in the study area, the status of the farmers in respect of several parameters like experience of household, animal house, number and size of pig reared, duration before sale, etc. are examined and presented in this section.

The study found out that all the pig farmers in the study areas had experience in pig farming. It is observed from Figure 4.5 that majority of the farmers (63.33%) have undertaken pig rearing for more than 7 years, while another 36.67% are having less than 7 years of farming experience. Farmers who started pig farming during the period of 2000-2010 is 40%, 23.3% of the farmers started pig farming before 2000 and having an experience of about 18 years in pig rearing while 36.67% of farmers had started farming after 2010 having an experience of around 5 years. Thus, it may be concluded that most of the farmers in the study areas have been engaged in pig rearing for a number of years.

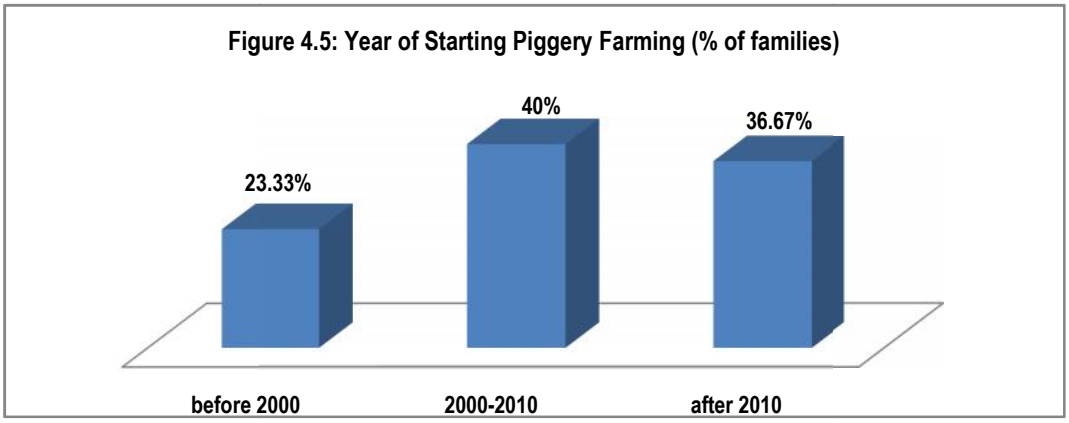


Table 4.1 presents the basic status of the piggery farming in the study area. Each family keep 2 pigs on average with a standard deviation of 1.34 and the

maximum number is 6 pigs. This clearly revealed that the nature of piggery farming in Mizoram where piggery is undertaken in small scale, rather than large scale. In spite of the huge local demand for pork meat in Mizoram, the farming practice is still in a small scale and most farmers could not leverage the potential of large scale farming.

Table 4.1: Basic Farming Conditions of Piggery

No	Particulars	Average	Std. Dev.	Min.	Max.
1	No. of Pigs reared by the households	2.07	1.34	1	6
2	Area of Pigsty (in Square Feet)	43.9	31.5	16	140
3	Distance of the Pigsty form House (M)	9.4	5.56	4	34
4	Harvest Size of the Pig (Inches)	47.53	2.75	40	52
5	Farming Duration before sale (no. of months)	11.28	1.5	7	14

Source: Computed

The study also observed that all farmers constructed separate house for their pig (we called it Pigsty) in and around their residential house. The average area of Pigsty is estimated to be 43.9 square feet with a maximum size of 140 sq. ft. It is constructed near the house with an average distance from the residential house of 9.4 metres. Thus, we may also call the current farming as backyard small scale farming system. Further it was observed that supply of water dependent on rain or nearby streams and almost all the farmers never face shortage of water for maintenance of pigs.

The size of live pig is normally measured in inches from which the farmers estimated the weight in Kg. Table 4.1 shows that the average size of the pigs at the time of sale is 47.53 inches, which is roughly equivalent to 80-90kgs. The feeding period (i.e. from tender stage to maturity) is estimated to be 11.28 months. Thus, the piggery farmers could sale the pig at least once in a year.

4.2. Piggery Production

To examine the production levels of the pigs in the study areas, the selected sample households were asked about the number of pigs and piglets they sold during last one year from the date of interview. The result is presented in Table 4.2. It is to be noted that out of the 30 sample households, one household did not have any record of production during the reference period (last one year). So, the performances of only 29 households are presented in this Table. Of the 29 households who sold their pigs last year, 5 households reported to have sold an average number of 18 piglets in addition to sale of full grown pig.

Table 4.2: Annual Piggery Production (during last 1 year)

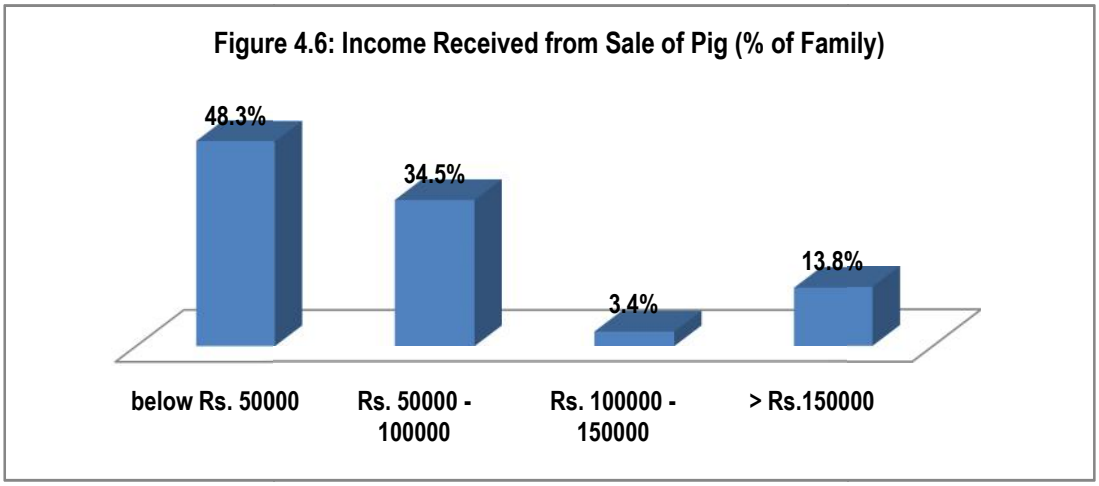
Particulars	No. of Families	Average	Std. Dev.	Min.	Max.
Sale of Pig (Nos.)	29	2	0.769	1	3
Income from Sale of Pig (Rs)	29	49897	30354	19000	114000
Sale of Piglets (Nos.)	5	18	14.893	11	45
Income from Piglets (Rs)	5	92000	74464.8	55000	225000

Source: Computed

In clear support to the number of current pigs, the average number of pig sold by the farmers is 2 per year. As per the rough estimation of the respondents, a pig is sold when it attained 47.5 cm which would be around 85-100 kg. The number of sale range are in the range of 1 to 3, which revealed the scale of piggery farming limited to 3 pigs in most of the cases in the study areas. There may be a number of reasons for the small scale pig farming. Tatwangire (2013) argued that keeping few pigs maybe a result of farmers lacking capital to invest into the business, lack of space for expansion or lack of feeds. It was observed in the study that 16.7% of pig farmers keep Sow with an average litter size at birth was 18.6 and farmers follow the practice

of sow farrowing twice in a year.

It is observed from Table 4.2 that the average income from sale of pig (full grown) turned out to be Rs.49897 with a standard deviation of Rs.30354, while the average annual household income from piglets is much higher at Rs.92000. It may be argued that there productivity is higher in piglet production. The distribution of household income from piggery farming is presented in Figure 4.6. The study highlighted that nearly half of the farmers (48.3%) earned income below Rs. 50000 in a year from selling pig, and 34.5% of farmers earned between Rs. 50000-100000 in a year only 3.4% earned between Rs. 100000-150000 from pigs and 13.8% of pig farmers earned more than Rs. 150000.



4.3. Analysis of Cost Structure

The farmers have to bear expenditure on piggery farming which may be broadly classified into two – fixed cost and variable cost. The fixed cost consist of expenditure that has to be incurred at the initial period for construction of pig shed, purchase of tools and equipment, and other expenditure for creation of assets. As they are used for creation of durable assets, they can be used for relatively longer period and farmers do not need to incur expenditure on such items, except for repair and maintenance. At the same time, variable cost includes feeds, hiring of labour, medicines, etc. As the farmers have to purchase piglets in a regular interval for replacement of the one sold once grown, the purchase of piglets is also counted as variable cost. Since variable cost are recurring (that is to be incurred in a regular interval) in nature, it is also called here as recurring expenditure.

It is very critical to value the cost of family labour used on piggery farming in an objective manner. This is basically due to the subsidiary nature of the farming activity in which some member of the family do the task of feeding, food preparation, etc. in their spare time without disturbing their normal duty on their main occupation. At the same time, all the farmers interviewed in the study said that they had not engaged hired labour during the reference period. Given this condition, it is not clear whether to book the family labour on the cost of production as it can also be counted as subsidiary employment that for some members of the family in addition to their normal work. It is decided to exclude the cost of family labour in the cost of production in this study.

However, it is considered necessary to value the family mandays used on various farming activities for better understanding of the cost structure of piggery farming. It is called in this study as *imputed labour cost*. Another challenge is

valuation of the family labour as only part of the day is devoted on it. Thus, the respondents were asked to recall the hours that need to be used for piggery farming everyday which is further converted into the whole day. Given the fact that the time used for piggery is additional in nature, it cannot be valued at par with the prevailing wage rate. So, it is valued at half of the prevailing wage rate of Rs.300 per day, and accordingly, the family manday devoted on piggery farming is imputed at Rs.150 per day.

Table 4.3 present the detailed breakup of fixed cost and variable cost of piggery farming in the study areas. To ensure uniformity in presentation of data among the farmers with differing farming scale, only the unit cost is presented, i.e. expenditure per unit (pig).

Table 4.3: Estimated Average Running Cost of Piggery Farming till Sale (Rs. per Pig)

SN.	Expenditure Heads	Average	Std. Dev.	Percent
A. Initial Farming Expenditure (Fixed Cost)				
1	Construction of Shed (Pigsty)	5347.6	2740.4	71.4
2	Tools &Equipment	2147.2	693.7	28.6
	Total	*7494.8*	*3051.2*	*100*
B. Running Expenditure (Variable Cost)				
1	Piglets	4353.6	1507.4	32.7
2	Food	8230.10	4089.02	61.8
3	Medicines	729.72	534.12	5.5
	Total	*13313.42*	*3995.26*	*100*
C. Imputed FamilyLabour Cost		**4882.10**	**1640.28**	**100**

Source: Computed from Field Data, 2018

It is observed from Table 4.3 that construction of pig house (pigsty) have accounted from 71.4% of the total fixed expenditure (capital expenditure) which amounted to Rs.5247.6 per pig with wide variation as indicated by the magnitude of

standard deviation. Meanwhile, expenditure on tools and equipment, mainly iron vessel for boiling feeds, plastic or empty mustard oil tin (modified form) or cut piece of woods or bamboos,tyres for feeding through, etc. amounted to Rs.2147 per pig which accounted for 28.6% of the total fixed cost of farming, i.e. Rs.7495 per pig.

The major heads of variable expenditure (running expenses) are purchase of piglets, food and medicines. It is observed from Table 4.3 that the highest amount of Rs.8230 per pig is spent on food expenditure (purchase of pig feed) which accounted for more than 61% of the total variable expenditure. This is followed by cost of piglets which is Rs.4353 per pig on average and accounted for 32.7% of the total variable expenditure. It may be noted that the cost of one piglet is Rs.5000 in all the villages. However, as those who are rearing their own piglet and who purchase from relatives at a rate below the market price are included in the estimation, the average cost of piglet is found to be well below the market price. The estimated standard deviation also justifies this situation. Meanwhile, only Rs.729.72 is spent on purchase of medicines including vaccines which accounted for 5.5% of the total variable expenditure. At the same time, the imputed family labour cost is estimated to be Rs.4882 per pig.

Including the fixed cost, i.e. all expenditure on creation of durable assets for piggery farming, and imputed labour cost, the total production cost of pig is estimated to be Rs.25690 per pig. The percentage breakup of the total cost in these major heads of expenditure is presented in Figure 4.7. It is observed that the variable cost (operating expenses) accounted for more than half of the total expenditure, and it would be more than 70% if imputed cost is included. Thus, one can concludes that the major portion of the cost of production of piggery farming is on the variable cost, and consequently, the variable cost virtually becomes the main determinants of cost

and income under the piggery farming.

Figure 4.7: Percentage Breakup of Production Cost

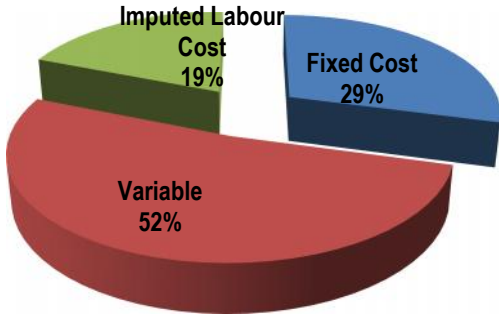


Table 4.4 presents further details of the variable cost of piggery production in the study area. Variable costs are specific to each household and are vary with the farming scale and have direct bearing on the levels of production. The average expenditure on food in the study areas was 8230.10. It is the major cost item for pig farming. Majority of pig farmers incurred highest expenditure on buying of Pigfeed which accounted for 48% of the total food expenditure, followed by rice (33%) and other food expenditure like cereals, egg, etc. (19.1%).

It is found that all the farmers spend less amount of money on buying medicines and vitamins. The average cost incurred on medicines and vaccination was only Rs 729.7 out of this 54% is spent of purchase of vitamins, while 45.9% was on medicines and vaccinations. The expenditure on vaccines and other medicine is surprisingly low in view the frequent outbreak of diseases like PRRS, Swine Fever, etc. in the State.

Table 4.4: Detailed Breakup of Variable Cost of Piggery Farming (Rs./Pig)

SN	Expenditure Heads	Average	Std. Dev.	Percent
1	**Purchase of Piglets**	**4353.6**	**1507.4**	**100.0**
2	**Expenditure on Food**	**8230.10**	**4089.02**	**100.0**
	Rice	2713.4	1644.2	33.0
	Pigfeed (company product)	3947.2	2694.5	48.0
	Others (dal, egg, etc)	1569.5	1266.7	19.1
3	**Medicines & Vaccinations**	**729.72**	**534.12**	**100.0**
	Vitamins	395.0	402.0	54.1
	Medicines & Vaccinations	334.7	342.1	45.9
4	**Imputed Labour Cost**	**4882.10**	**1640.28**	**100.0**
	Feeding of Pigs	2173.4	1042.9	44.5
	Food Collection & Preparation	2345.6	1204.7	48.0
	Other (caring of cubs, etc.)	363.1	955.9	7.4
	Total Expenditure	**18196**		

Source: Computed from Field Data, 2018

The main activities undertaken by the family members in the piggery farming are food collection, preparation, feeding, and other (caring of cubs, repair, etc.). It is observed from Table 4.4 that collection and preparation of food has accounted for the largest family manpower (48%) followed by feeding (44.5%), while other activities constituted 7.4% of the family labour used on it.

4.4. Analysis of Income

Table 4.5 presents the summary details of the estimation of production and income from piggery farming. As already discussed, the sample households sold an average number of 2 well grown pigs during the reference period, while 5 families sold average number of 18 piglets. The average size at the time of sale was 47.53 inch with estimated weight of 90 kg. The total average household income from sale of pigs is estimated to be Rs.49900, and those 5 families who sold piglets earned Rs.92000 in a year. Thus, the gross average income of all sample farmers from the piggery farming is estimated at Rs.65759 in a year with standard deviation of Rs.58253 implicating with degree of variation on income levels. At the same time, income per unit of pig is estimated at Rs.24837.

Table 4.5: Details of Production and Income from Piggery

No	Particulars	Families	Average	Std. Dev.
1	Pig Production (No. of Pigs/HH)	29	2	0.8
2	Harvest Size of Pig (Inch/Pig)	29	47.53	2.751
3	Estimated Quantity of Sale (Kg/HH)	29	190	106.11
4	Income from Pig Sale (Rs/HH)	29	49900	30354.3
5	Piglet Production (No/Household)	5	18	14.9
6	Average Income from Piglet (Rs/HH)	5	92000	74464.8
7	Total Piggery Income (Rs/HH)	29	65759	58253.5
8	Total Income Per Unit (per Pig in Rs)	29	24837	9594.4

Source: Computed from Field Data

Table 4.6 presents the various costs of piggery farming as percentage of total income. To ensure uniformity this table also presented the unit level data on cost and income. It is observed from Table 4.6 that the fixed cost incurred at the initial farming stage was more than 30% of the total profit, while the variable cost (running

or operating expenditure) is estimated to be 53.6% of the total income from sale of pig. At the same time, the imputed cost of family manpower accounted for around 20% of the total income per unit. The amount being Rs.4882 may also be interpreted as the income obtained from subsidiary employment generated by the piggery farming.

Table 4.6: Various Farming Expenditure as Percentage of Income per Unit (Rs. per Pig)

Sl. No	Expenditure Heads	Average Value (Rs)	Cost as % of Income
A. Initial Farming Expenditure (Fixed Cost)			
1	Construction of Shed (Pigsty)	5347.6	21.5
2	Tools & Equipment	2147.2	8.6
	Total Initial Expenditure	*7494.8*	*30.2*
B. Running Expenditure (Recurring)			
1	Piglets	4353.6	17.5
2	Food	8230.10	33.1
3	Medicines & Vaccinations	729.72	2.9
	Total Running Expenditure	*13313.42*	*53.6*
C. Imputed Family Labour Cost (Rs)		4882.10	19.7
D. Total Income (per Pig in Rs.)		24837	100

Source: Computed from Field Data, 2018

4.5. Profit Analysis

Having the conditions of cost and income being analysed, it is an interest to examine the sustainability of the piggery farming in the study areas. Study of the Benefit – Cost (B-C) conditions has been found appropriate for the analysis of the profitability as well as the sustainability of piggery farming. The capital expenditure incurred for creation of assets at the start of the farming includes construction of pig house, tools and equipment, etc. It was observed during the field work that these assets could last for at least 10 years with minor repair and maintenance. Accordingly, the expenditure on fixed capital formation may be excluded in the

study of benefit-cost situation.

Another consideration that has to be attended in the analysis is the imputed family labour cost. The field work observed that all the farmers interviewed reported that pig farming is undertaken as subsidiary livelihood activities (or additional income source) in addition to their normal occupation. In such a situation, only some members of the family do the farming activities as per their convenience without disturbing their day to day normal duty. Accordingly, this study considered the family labour used on piggery as subsidiary employment. Thus, the imputed cost of family labour on piggery farming is excluded in the benefit-cost ratio (B-C) ratio analysis. Consequently, this study adopted the difference between income from sale of pigs and variable cost (cost) and income, i.e. net income, called benefit in the analysis. The result is presented in Table 4.7.

Table 4.7: Estimated Benefit (Profit) - Cost Ratio of Piggery Farming Per Unit

Sl. No	Expenditure Heads	Average Value (Rs)	Cost as % of Income
A	**Total Variable Cost (Cost)**	13313	*53.6*
1	Piglets	4354	*17.5*
2	Food	8230	*33.1*
3	Medicines & Vaccinations	730	*2.9*
B	**Total Income (per Pig)**	24837	100
C	**Net Income Per Pig (Benefit)**	**11524**	**---**
D	**Benefit-Cost Ratio (%)**	**86.56**	**---**

Source: Calculated from Field Data

It is observed from Table 4.7 that the estimated net benefit turned out to be Rs.11524 per pig. Taking into consideration, the average number of pigs held by the farmers (i.e. 2), the piggery farmers are earning Rs.23048 net income annually. The piggery farming being subsidiary activity, it can be argued that they are earning this much of additional income every year. The estimated Benefit-Cost Ratio (B-C Ratio) indicates the net income from piggery is estimated to be 86.56% of the total variable

cost. Moreover, the net income could still be around 20% of aggregate expenditure (fixed and variable) even by inclusion of the fixed cost, which has to be incurred in the first year only. It can, thus, be concluded that the profit (net income) clearly justifies the expenditure for its continuance. Therefore, piggery farming may be considered as sustainable livelihood activity in the study areas.

To further examine the impact of piggery farming on the family livelihood conditions and income levels, it is considered appropriate to test the differences in the income level with and without income from piggery. For this, the following paired t-test is adopted:

$$t = \frac{\bar{d}}{s/\sqrt{n-1}} \sim t_{n-1} \qquad \text{Eq. (1)}$$

where $\bar{d} = \sum d_i/n$, and $s^2 = \frac{1}{n}\sum(x-y)^2$

$$d_i = Total\ Annual\ Income\ (x) - Total\ Income\ excl. piggery\ income\ (y)$$

The test result is presented in Table 4.8.

Table 4.8: Result of Paired T-test for difference in Income

Particulars	Mean	Std. Dev.	t-value	df	sig.
Gross Income (x)	342275.9	250677.00	6.07	28	0.000
Income excl. Piggery (y)	276517.2	228645.00			

Source: Computed from Field Data

It is observed from Table 4.8 that the annual income of the families would be substantially reduced if the income received from sale of pig is excluded. Since the t-statistic is significant at all levels, it can be concluded that there is significant increase in the income levels of the households due to the income received from piggery farming. Thus, it is concluded that piggery farming has significantly increase the income of the farmers in clear support of our study hypothesis.

It is further an academic interest to examine the condition of production by estimating suitable production function so as to generate better economic interpretation of the results. It is decided to use the double-log regression of total income (Y) on the cost of production which is broadly divided into fixed cost (X_1) and variable cost (X_2). The regression equation takes the following form:

$$\log Y = b_0 + b_1 log X_1 + b_2 log X_2 \qquad \text{Eq. (2)}$$

where$b_0$is the constant, and $b_1$and $b_2$are the coefficient of production function. The result is presented in Table 4.9.

Table 4.9: Estimated Production Function of Total Piggery Income on Variable and Fixed Cost

Variable	Coefficient	Std. Error	t-Statistic	Sig.
Constant	1.20	1.31	0.92	0.369
Total Variable Cost	0.67	0.13	5.16	0.000
Total Fixed Cost	0.30	0.19	1.58	0.127
R-squared	0.75		Adjusted R-squared	0.728
F-statistic	38.47		Prob(F-statistic)	0.000

Table 4.9 showed the variable cost is significant at all levels, while the fixed cost is not significant at 10%. Though it is not significant at 10% it is found significant at 15% level. As the highly significant F-statistic with acceptable R-square, it is considered safe to make economic interpretation on the estimated production function. First, production (total farm income) is positively related to the level of variable cost and fixed cost. The increase in variable cost is implicated in the increase in production but less than proportionately. Second, the sum of the coefficient is approximately equal to unity (0.97), the result suggest the existence of constant returns to scale as against the study hypothesis of increasing returns to scale in the piggery farming. In fact, the scale of production is very small as the average number of animal is only 2. Thus, the farmers in the study area could not achieve the

potential of economies of scale in piggery production. Consequently, the given data could not justify the study hypothesis that 'there is an increasing return to scale in the production of piggery farming'.

4.6. Market Channels

The market for peak meat (pork) in Mizoram is quite peculiar comparing with other food items. Though there is no organised market channel, the rate structure is determined in an organised manner that all the villages are having uniform rate. This is basically due to high demand-supply gaps where demand normally exceeds supply in most of the cases. The governing rate for pork is normally determined by the village authority or local council in the urban areas keeping in view the prevailing market price in the main city, i.e. Aizawl. Consequently, the rates even in the remote villages tend to converge towards the prevailing rate in the urban areas. All the respondents said that they did not face problem in marketing of their produces.

On the situation where any production can be disposed in the local market, the farmers do not have marketing problem. But they have to choose the market channel which is most convenient and considered most profitable. It is observed that 48.3% of the pig farmers practised butchering of their pigs and sell the pork directly to the consumer. At the same time, 51.7% sell directly to middlemen as it is easier than own butchering. The middlemen would quote the price of the pig, and the farmers would also give their quotation in exchange, and they would arrive at the agreement on the price on which the former expect some profit margin. Some families who slaughter their pig also prepared smoked pork (*vawksa rep*) to enable longer storage and as way of value addition. Since there is uniform rate for pork meat in different places, it is rather difficult to study the market value chain, and to estimate the price spread among the various marketing stakeholders.

4.7. Problems of the Farmers

In our attempt to assess the main problem of the piggery farmers in the study areas, they were asked to quote the most severe problem they had experienced causing substantial loss during the last five years from the date of interview. The most important problem of the piggery farmers turned out to be disease like PRRS and Swine Fever as more than 40% of the respondent said the disease is the most severe problem of the piggery farming. The losses due to the disease range from Rs.78000 to Rs.1.14 lakh. Notably, no other problem was raised by the respondent farmers with apparent reason of substantial demand-supply gap throughout the year.

4.8. Conclusions

Piggery farming is practised in Mizoram as subsidiary occupation which is undertaken as backyard farming in the vicinity of residential house by keeping small number of animal. Even those family members who are involved in its farming spent only part of their time in addition to the work they devoted on their main occupation. So, the pig farming is basically an additional source of employment for the family members.

In spite of the limited time devoted to the piggery farming, the farmers earned substantial income from the sale of pig which is normally. The income is found to be much higher among the family who produce piglets. The paired t-test for the contribution of income from piggery on the total family income significant at all levels. Thus, piggery farming has significantly increased the income levels of the farmers. This is in support of our study hypothesis No. 1 given in Chapter 1. Further,

the analysis of the benefit-cost conditions justifies the sustainability of the piggery farming in the study areas even if it is undertaken in small scale.

Given the limited number of animals kept by the households, the estimated double-log regression does not support the hypothesis of increasing returns to scale in piggery production, instead is indicate more or less constant returns to scale with respect to fixed and variable cost of production. Thus, the field data failed to justify Hypothesis No.2 of this study.

It is fortunate to see all the farmers saying no marketing problems for their produce due to the favourable demand-supply condition in all the villages. The existence of more or less uniform and stable rate of pork meat in all the areas (village and urban) led the farmers to choose the most convenient market channels rather than seeking the most profitable marketing channels. Thus, the price margins among for the different marketing agents could not be clearly ascertained as it depend purely on the skill of these agents while negotiating the price with the farmers.

The observation given in Chapter 3 regarding the animal diseases is justified in this chapter. Several farmers have experienced substantial loss due to the outbreak of two main pig diseases, PRRS and Swine Fever during last 5 years. In spite of this, the study found limited use of medicine (vaccine, vitamins, etc.) by the farmers to prevent the animal from the diseases. Therefore, control of diseases through vaccination and other measures have become the critical challenge of piggery farming in Mizoram.

Chapter 5

SUMMARY OF FINDINGS AND CONCLUSIONS

5.1. Introduction

This study has conceptualised piggery value chain study on three major aspects - the analysis of cost of production, market channel and profitability, in line with some value chain studies of agriculture and allied activities (Munzhelele, 2015; Nabiky et al., 2016; Perey, 2017; Levy et al., 2014; Nagarava, 2016; etc.). Secondary data were mostly obtained from the record of the Directorate of Animal Husbandry and Veterinary (AH&Vety), while primary data were collected through sample survey using semi-structured interview method. Some statistical tools like descriptive statistics, t-test, regression and benefit-cost ratio analysis were employed. This chapter presents the summary of findings and observations, conclusions and some recommendations proposed for piggery development in Mizoram.

5.2.Major Findings and Observations

1. Piggery has become the most important livestock activity in Mizoram. According to different livestock censuses, the total number of pig have increased significantly from 77100 in 1982 to 266600 in 2012, and has accounted for more than 70% of the total livestock population. There is a strong tendency of rearing crossbred pigs in place of indigenous variety as the farmers prefer the former due lower mortality rate than the latter. As much as 85.29% of the total pig population in 2012 was found to be crossbred variety. Production of pork has

increased from 6320 MT in 2005-06 to 7368 MT in 2016-17, while 50% of the total meat production in the State is contributed by pork.

2. The AH &Vety Department has taken several steps to ensure availability of the facility and technical personnel for adoption of Artificial Insemination. In addition, it has also produced substantial quantity of pig feed, disease control, and other piggery development activities. In spite of these efforts, the local production is insufficient to meet the local demand which necessitate import from neighbouring countries of Myanmar and Bangladesh. Import of pig from other countries has made the State vulnerable to diseases like PRRS, Swine Fever, etc. which originated from South East Asian countries. The outbreak of PRRS and Swine Fever had significantly reduced pork production in the State since 2009-10 till 2011-12, and has continued to cause problems in several villages till date.

3. Piggery farming is practised in Mizoram as Subsidiary occupation which is undertaken as backyard farming in the vicinity of residential house by keeping 2 animals on an average. It is undertaken by family members (female) in addition to main occupation and most of the respondent farmers have practised piggery farming for more than 7 years. The farmers keep their pigs in a separately constructed shed (Pigsty) in average distance of 9.4 metres from the residential houses.

4. The piggery farmers had experienced sale of 2 pigs per year on an average, which is roughly 180-200 kg. Meanwhile, there are some farmers (around 16%) produced average number of 18 piglets in addition to sale of full grown pigs and earned significantly higher amount of income from piggery production.

5. In its analysis of production value chain, this study divided the costs of production into three categories as fixed cost (initial capital expenditure for

construction of pig house, purchase of equipment, etc.), variable cost (recurring expenditure on purchase of piglet, food, medicine, etc.), and imputed labour cost (imputed value of family mandays used for food preparation, feeding, etc.). The total expenditure (inclusive of fixed cost) required for starting piggery farming is estimated to be Rs.25690 per pig, and detailed break up for different expenditure heads are 29%, 52% and 19% for fixed cost, variable cost, and imputed cost respectively.

6. Analysis on the breakup of variable cost shows that purchase of company product pig feed has accounted for the largest (48%) share in the total food expenditure followed by purchase of rice (33%). Only a limited amount of Rs.729.72 is spent on purchase of medicines which is around 4% of the total variable expenditure. It may be noted that most of the farmers visited in the study did not employ hire labour and all the works are undertaken by own family members. It is observed that food collection & preparation occupied 48% of the family manday used on piggery farming followed by feeding (44.5%).

7. The average total household income from sale of full-grown pigs is estimated to be Rs.49900 per year, and those farmers producing piglets have income of Rs.92000. The average income of all households (pigs and piglets taken together) from piggery farming is estimated at Rs.65759, which is approximately Rs.24837 per pig. While taken as percentage of total income, fixed cost turned out to be 30.2%, running cost (variable cost) accounted for 53.6% and imputed labour cost constitutes 19.7%.

8. The net income from piggery farming is estimated to be Rs.11524 per pig in a year, which would amount to a total family income of Rs.23048 every year taking into consideration the average number pigs kept by the farmers (i.e. 2).

Being subsidiary livelihood activities, this study found piggery farming as having significant contribution to the family income. In clear justification to this observation, the paired t-test is significant at all levels in support of our study hypothesis that 'Piggery farming has significantly increased the farmer's income'.

9. The estimated net income per pig of Rs.11524 is found to be 86.56% of the total variable cost (excluding imputed family labour). Moreover, the net income could still justify the profit even in the first year of farming as it is around 20% of the aggregate expenditure if fixed cost is included. The Benefit-Cost ratio of 86.56% is considered substantial enough to justify the sustainability and profitability of piggery farming as one of the livelihood options in the study areas.
10. To generate further economic interpretation on the conditions of piggery production, double-log regression is estimated which shows highly significant coefficient of variable cost with poor significance of fixed cost. As the sum of the two coefficients is approximately equal to unity, one can conclude that there is constant return to scale in piggery production as against the study hypothesis of increasing returns. Thus, the piggery farmers, who keep 2 animals on an average, could not leverage the potential of economies of scale in production.
11. A peculiar marketing system is observed for piggery products (pigs, piglets, and pork) where there is uniform rate structure in different places. This is due to wide demand-supply gap for it where demand exceeds supply in all the areas, and as such the farmers do not face problem in marketing, and they have to choose the market channel which they considered the most convenient. The farmers practically have two options in disposing their produce in the markets, namely, direct sale to middlemen and own slaughter to sell in the local market. The profit margins of both the farmer producers and middlemen depend on the agreed price

of the live pigs purely based on the skills in quantity estimation and negotiation, which may also goes against the latter in some cases.

12. The most important problem of the piggery farmers during the last 5 years was found to be the outbreak of PRRS and Swine Fever diseases. More than 40% of the respondents are reported to have experienced farming problem due to animal diseases. The losses due to the diseases range from Rs.78000 to Rs.1.14 lakh. Notably, no other problem was raised by the respondent farmers.

5.3. Conclusions

In spite of the fact that the piggery farming in Mizoram is practised mainly as subsidiary occupation in which the farmers keep only one or two animals in the vicinity of the residential houses, it has become the most important livestock activity in Mizoram. The number of pigs has grown significantly and accounted for more than 70% of the total livestock population, while it contributes around half of the total meat production (including chicken). The value chain analysis which considers inputs, cost structures, marketing conditions, benefit-cost ratio and production function clearly justifies the profitability piggery farming in view of the costs and manpower requirement in the study areas. Thus, it can be concluded that piggery has become one of the most important livelihood options of the people in Mizoram, and its success and failure would significantly impact income generation among the farming population.

The farmers have strong tendency to select crossbred variety seeds in place of indigenous pig variety due to its low rate of mortality and growth potentials. The AH &Vety Department have shown several efforts to ensure access of seeds by the farmers; development of pig feed using local resources having considerable

backward and forward linkage in the economy through input supply chain and marketing chain; provision of market infrastructure in view of the need to ensure food safety and storage; and disease control.

Despite the efforts shown by the AH &Vety Department to control diseases, the farmers are still haunted by the outbreak of PRRS and Swine Fever from time to time causing substantial loss to them. Mizoram being located in the strategic geographical location sandwich between two countries (Myanmar and Bangladesh) is prone to the outbreak of several animal diseases. This is due to the insufficiency of local production to meet local demand necessitating import from these countries.

5.4. Recommendations

Based on the observations and conclusions given above, it is decided to put forward some recommendations for development of piggery farming in the study areas. They are given as follows:

1) This study found that piggery farming is undertaken as one of the subsidiary livelihood activities by the farmers in the study areas despite proving its profitability and its significance to the family income. Moreover, local demand for pork is well above the local production, and as a result, there is no marketing problem for piggery products. Keeping these in view, it is necessary to model piggery farming as commercial venture to attract more investment. This will enable generation of income and more employment by leveraging potential economies of scale in the production.
2) To enable the poor to undertaken piggery farming in a continuous and sustainable way so as to enhance generation additional income, it is necessary to take policy intervention. Public policy intervention may be made through

supply of seeds and the provision of basic equipment. Any schemes and programme for piggery development should be accompanied by capacity building of the farmers on the skill required for farming, marketing and post-harvest activities.

3) The serious challenge for the sustainability of piggery farming in the study area is the control of diseases which spread from time to time. There should be holistic initiative on disease control measure encompassing the provision for vaccination, medicine, awareness creation among the farmers on animal health, effective demand-supply management to avoid import from other areas, etc.

4) The State is producing huge quantity of pork every year, and as such one can assume continuous flow huge quantity of supply from farmers to the final consumers. The need of the day is the provision of adequate storage infrastructure which would enable effective management of supply to cater the local demand. It is also necessary to develop the system of safe slaughtering, packing, etc. to ensure food safety to the consumers.

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