# PRODUCTIVITY AND FEASIBILITY OF PIG PRODUCTION SYSTEMS IN RURAL SECTOR

By
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**THESIS**

Submitted in partial fulfilment of the requirement for the degree of

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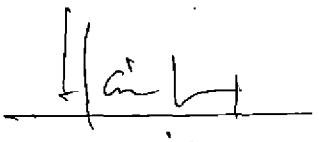
# DECLARATION

I hereby declare that this thesis entitled **"PRODUCTIVITY AND FEASIBILITY OF PIG PRODUCTION SYSTEMS IN RURAL SECTOR"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.



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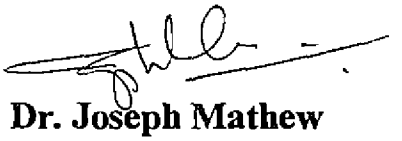
# CERTIFICATE

Certified that the thesis, entitled **"PRODUCTIVITY AND FEASIBILITY OF PIG PRODUCTION SYSTEMS IN RURAL SECTOR"** is a record of research work done independently by **Dr. S. Harikumar** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.



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*To My Father*

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# *Introduction*

# 1. INTRODUCTION

Pigs are considered to be the supreme amongst meat producing livestock. The high prolificacy, fast growth rate, short gestation period and ability to thrive well on unconventional feedstuff are the merits of pigs. In a country like India, where only 30.77per cent of the requirement of the animal protein is available, pigs can play a major role in filling up the deficiency of animal protein. In this context, pork industry is having a bright future in India.

Pig farming is primarily a smallholder concern in the tropics. The population of pigs in India is 15.41 million (F.A.O., 1997). In India pig production is not much advanced as that of the dairy sector.

The situation of pig farming in Kerala is not much different from that of India. It is estimated that there are about 1.5 lakhs of pigs in Kerala, of which more than 90per cent are concentrated in rural areas (Quinquennial report on livestock census, 1997).

Nowadays, the pig production in the rural sector is in the path of progress. The development of pig production in rural sector will not only fills up the gap between requirement and availability of food, but also a boost to the economy of the rural community. For this, the details of existing conditions of the pig farmers and the details about pig farming systems are required. Factors that influence pig farming like socio-economic status of the pig farmers, their physical and manpower potentials, problems and prospects should be known. Unfortunately information in this regard is scarce and scanty.

Majority of the pig farmers followed unconventional feeding consisted of organic wastes of animal and plant origin. Though this practice is found cost effective, not much information is available on the performance and productivity of pigs in this feeding system. The economic feasibility of this production system is also a matter of concern. A comparative study between the performance of pigs in organized farms and rural sector would be beneficial to compare the performance of pigs in rural sector. The problems and the prospects of pig farming in rural sector is also an area of interest.

A system approach considering various resources like land, agriculture, animals, human *etc.* is highly essential for the integrated development of the farmers and the improvement of overall productivity of the production systems in the rural sector. Researches in this line are very limited and hence information in this aspect are very little. Integration of the existing pig production systems will help for effective exploitation of resources available in the rural sector, thereby beneficially contributing to the environmental makeup.

In this context the present study was undertaken with the following objectives.

1. To assess the productivity and feasibility of pig production systems in rural sector.

2. To identify the problems and prospects of pig production in rural areas.

3. To compare the production performance of pigs under organized farm and field conditions.

# *Review of Literature*

# 2. REVIEW OF LITERATURE

## 2. Pig production in Rural Sector

### 2.1. Rural scenario

In South East and East Asian countries 80 to 95per cent of the farms belong to small farm categories (Devendra, 1993).

The pig population in Kerala is 142784; out of this 97.45 per cent are concentrated in the rural areas (Quinquennial report on livestock census, 1997).

In a study conducted among pig farmers in Enugu State of Nigeria showed that husbands performed major tasks like initiation, planning and organizing of pig production within households headed by males (Agwu, 1999).

Taneja (1998) observed that in the rural areas of Haryana around 73 per cent of household depend on livestock farming for supplementary income and about 19 per cent of the total income earned by a household is from piggery.

Saadullah and Saad (2000) reported that the pig production system in tropical countries are characterized by small number of animals with no or

minimum inputs, low outputs and periodic mortality. Typically the litter size is small with each household containing 5 to 6 pigs.

## 2.2. Socio-economic and educational status of pig farmers

In a study conducted by Chylek *et al.* (1996) among women running livestock farms together with their husbands in Eastern and Western Provinces of Poland, revealed that 51.1 per cent had full secondary, 30.8 per cent elementary and 6.7 per cent higher education.

Pig farming was a part time occupation of 73.33 per cent of pig farmers in peri-urban settings of Zaria, Northern Nigeria (Duru *et al.*, 1999). They also observed that Muslims did not take up this occupation. Pig farmers considered pig rearing as a source of security on crop failure and complement their salaries. About 73 per cent of the pig farmers were civil servants, students or traders.

Panday and Ram Kumar (1999) indicated that education and family income of pig owners had positive effect on the adoption of improved pig rearing practices. They found that pig farmers who have educational level beyond VII standard and large herd size of more than 10 pigs utilized veterinary facilities more efficiently.

## 2.3. Pigs

Ravindran *et al.* (1995) reported that the herd size ranged from 14 to 55, with average herd strength of 36 in smallholder pig farms in Sri Lanka. All

animals were of exotic type, consisting primarily of Large White, Landrace and crossbreds.

The average farm size of pig farms in North Taiwan was 902 pigs (Hsieh-ChiaHui, 1997). Most farmers bought weaned pigs directly from other farms and sold them after 10.5 months.

The average number of pigs per farm in Slovenia was 4.4. There were 1012 pig farmers with at least 20 breeding sows or 80 fatteners (Salehar *et al.*, 1997).

According to Zhang-XiaoHui and Zhang (1998) in China the common farmer households raised 2-5 pigs and the specialized pig raising farmers had 719.3pigsper household.

In a study conducted among pig farmers in Zaria, Northern Nigeria, Duru *et al.*, (1999) noticed that 85.0per cent of them purchased their foundation stock from other farms in the locality, 10per cent inherited and 5 per cent got their stock as gifts. Mainly 60per cent of the stock were Large White, 8per cent Landrace, 10per cent Hampshire and 22per cent of their various crosses. The mean herd size of sows was $2.92 \pm 0.21$ and of boars was $1.4 \pm 0.19$.

Rohilla *et al.*, (2000) pointed out that small and marginal farmers of North East Hill region of India mostly raised local pigs, while well-organized farms produced exotic breeds.

## 2.4. Feeding practices

Sebastian, (1972) suggested that conventional feed like tapioca starch waste could be incorporated in the swine ration up to 15per cent by replacing maize without affecting the performance of pigs.

Dried tapioca chips can be safely and profitably incorporated in practical swine ration at a level of 40per cent in place of conventional cereal grain like maize (Sasikala Devi, 1981).

Miller and De Boer (1988) recommended that a maximum of 4 to 5per cent meat and bone meal, 0 to 2per cent feather meal, 2.5per cent blood meal and 0 to 2.5per cent poultry by product meal can be included in the ration of sows and finisher pigs above 50kg and in the case of grower pigs 2.5 to 5per cent, 0 to 1per cent, 0per cent and 0 to 2.5per cent respectively.

The most promising alternative to cereal grains for intensive feeding of pigs in the tropics are organic waste from urban households, restaurants and canteens, cassava roots and its byproducts (Devendra, 1992), sugarcane molasses, whole fruit and byproducts of African oil palm (Rodriguez and Preston, 1995).

Heavy weaners on high plane diet were most efficient in feed conversion efficiency, economy and attainment of puberty at younger stage (Lalnuntluangi, 1993). He also found that heavy weaners were more economical for replacement stock than light weaners.

According to Ravindran *et al.,* (1995) some form of swill feeding was practiced in over 80per cent of the smallholder pig farms in Sri Lanka. About 55per cent of the farmers cooked the swill prior to feeding and most of the farmers practiced *ad libitum* feeding of combination of energy–type bulky feeds swill and variable amounts of protein type feeds.

Fanimo and Tewe, (1996) suggested that chicken-offal meal with DM 88.2per cent, CP 60per cent, EE 8.46per cent, CF 6.11per cent, NFE 11.03per cent and ME 2900kcal per kg can be effectively utilized in the ration of weaner piglets.

The cassava and its byproducts from starch processing and sugarcane juice and/or molasses can replace cereals in the diets of growing pigs (Le-Duc-Ngoan *et al.*, 1996).

Based on the trials conducted on pig feeding in China Li-Tiejian *et al.,* (1996) reported that poultry wastes (droppings, offal), silage, agricultural byproducts and green feed could be incorporated in pig feed. They showed that 60per cent fermented chicken droppings combined with basal feed for pig finishing saved feed cost.

Myer *et al.,* (1996) suggested that dehydration of food residuals has the potential to produce a nutritious feedstuff for swine while offering a viable solid waste disposal option. The average composition of dehydrated food

residues was 11.4per cent moisture, 15per cent crude protein, 13.8per cent crude fat, 10.4per cent crude fibre and 5.8per cent ash.

Rivas *et al.*, (1996) assessed Dehydrated Edible Restaurant Waste (DERW) as a feedstuff for swine by determining the nutrient composition and digestibility. The chemical composition of DERW was 92.1per cent dry matter, 22.4per cent crude protein, 23.2per cent crude fat, 2.3per cent crude fibre and 5.4per cent ash.

Hsieh-ChiaHui *et al.*, (1997) reported that in North Taiwan pigs were fed primarily on kitchen waste when body weight reached about 28kg, after 41kg of body weight they were fed only kitchen waste to the market weight of about 135 kg.

Poultry offal silage could be used to replace up to 300g per kg DM in commercial grower diet without affecting performance or health of the pigs (Lallo *et al.*, 1997).

The availability of cheap local feed resources and low fixed costs are the positive factors for pig production (Loc *et al.*, 1997). They found that cassava root which is the cheapest feed is the most under-utilized feed resource for pigs in central Vietnam.

Mishra *et al.* (1997) recommended scavenging system of rearing of local pigs with supplementation of 300 to 500g concentrates to save 40 per cent of the concentrate feed with no loss of body weight.

The proximate composition of the garbage/kitchen waste estimated by Ravi and Krishna Reddy, (1997) was 78.92, 9.68, 3.13, 6.96, 76.36 and 3.87per cent for moisture, CP, CF, EE, NFE and total ash, respectively. They recorded average daily fresh garbage consumption of 2.98kg up to six months of age and average daily gain of 114g. The feed conversion efficiency was 5.49kg.

In a comparative study of grain and garbage feeding of pigs Sharma *et al.,* (1997) observed that feed costs were lower for garbage fed group though the labour costs and pig mortality were higher.

Duru *et al.,* (1999) identified feed as the major single item in the cost of production. They observed that 28.3per cent of the farmers fed offal alone to their pigs, 20per cent fed offal and kitchen waste, 40per cent fed offal, kitchen waste and vegetable and the rest 11.7per cent used offal and brewers residue for feeding their pigs.

Protein from unsalted dried fish when replaced by silk worm pupae by 50per cent and 100per cent level, a cumulative average daily gain of 510.1 and 495.7g respectively, obtained in Large white Yorkshire pigs (Ramamurthi, 1999).

## 2.6. Housing

Pathiraja *et al.,* (1986) observed that most pig farmers preferred locally available materials for housing to save cost of production.

In a study related to the floor space requirements of pigs, Leena, (1992) observed no significant difference in the performance of pigs having floor space as per ISI specifications and where the floor space reduced to the extent of 50per cent.

Joseph Mathew, (1997) suggested that environmental enrichments were found to be beneficial for most of the traits such as body weight, daily weight gain, feed conversion efficiency, conception rate, live litter size at birth, litter weight at weaning and average weaning weight.

Ramesh, (1998) observed that reproductive performance of pigs maintained under sprinkler and range system was found to be better than the pigs maintained under conventional system. But the range system may not be practical and economically feasible always when compared to sprinkler system.

In a study conducted among pig farmers in peri-urban settings of Zaria, in Northern Nigeria, Duru *et al.,* (1999) observed that 65per cent of them used mud houses for pig production.

In a comparative study between the conventional housing systems and deep litter systems of pigs, Weghe *et al.,* (1999) found no significant difference between growth performance and other characteristics. Pigs in deep litter system spent a large portion of time manipulating parts of the pen, but in fully slatted pens pigs spent more time manipulating the other pigs and had significantly higher injury scores.

Jain and Bajpai, (2000) noted that *kachcha* or paddy husk flooring may be preferred over cement concrete or paddy straw flooring for raising piglets as it resulted in significantly faster growth, lowest incidence of mange and minimum hoof abnormalities with higher feed efficiency.

**2.7. Breeding**

Joseph Mathew (1992) recommended that a switch over to high plane of feeding from 84$^{th}$ days of gestation to weaning was most efficient with respect to litter output, economy and post-weaning conception.

Most of the sows maintained in small pig farms in Haryana farrowed twice with average litter size ranged 6.5 to 7.0 and in medium and in large farms it was two and 6.6 to 8.5, respectively (Rajiv Jain and Pandey, 1998).

Duru *et al.,* (1999) observed that 31.67per cent of the pig farmers in Zaria, in Northern Nigeria did not keep boar/boars for breeding.

In most of the tropical countries farmers employ natural mating because of inaccessible artificial insemination facilities (Saadullah and Saad, 2000). Farmers usually selected breeding gilts from their own piglets or to a least extent bought them from neighbours instead of buying from commercial or government farms since these were cheaper and convenient.

**2.8. Health**

Srinongkote *et al.,* (1992) observed that the post weaning diarrhoea was the main problem for pig production in small farms in the tropical countries. Massango *et al.,* (1997) reported that the survival rate of piglets was 33per cent in smallholdings of Mozambique.

Only 48per cent of producers reported parasitic problems in their pig farms in Saskatchevan, Canada Wagner and Polley, (1997). Majority of farmers (62per cent) used a planned treatment programme. Faecal testing and slaughter checks were used less commonly and primarily in larger farms.

Helminthiasis, skin diseases and tick infestation were the common disease problems noticed by the pig farmers in Northern Nigeria. Almost 91per cent of the farmers dewormed their herd twice a year, while 9per cent dewormed thrice. Only 10per cent used antiseptics, while remaining 90per cent did not, because they could not afford costly antiseptics (Duru *et al.*, 1999).

Jain and Bajpai, (2000) reported that incidence of diarrhoea was lowest 30per cent on cement flooring and was highest in *kachcha* or paddy straw flooring. Hoof abnormalities like cracks (60per cent) and deformities (20per cent) were noticed on cement flooring. The incidence of infestation of mange was 100per cent on cement concrete flooring followed by 40per cent on paddy straw and paddy husk floor system but no incidence in k*achcha* flooring system.

## 2.9. Marketing

Pathiraja *et al.,* (1986) quoted the mean prices for live pigs were Rs.38.84 ± 5.02, Rs.2048 ± 99.5 and Rs.1351.35 ± 40.48 for piglets, sows and boars respectively.

In Slovenia there were good possibilities for sale of either weaners for fattening, fatteners for slaughter or heavier fatteners for sale for home consumption (Salehar *et al.*, 1997)

Duru *et al.*, (1999) reported that booming market for pigs and pig products in the villages of Northern Nigeria. Farmers followed sale of pigs on live weight to local butchers.

## 2.10. Constraints

Poor marketing conditions, housing, poor know-how on breeding and management and health services were the major problems associated with pig production in Enugu State of Nigeria (Agwu, 1999).

The major constraints in pig productions in peri-urban settings of Northern Nigeria were poor feeds, lack of capital and management skill, improper record keeping, lack of land and religious aversion to pigs (Duru *et al.*, 1999).

Saadullah and Saad, (2000) reported that in urban piggery environmental constraints are the main problem in tropical countries.

In non-concentration areas of Netherlands expansion of pig farms were not allowed due to limitations in land use planning, mainly due to presence of housing (43per cent) and nature conservation goals (28per cent) (Vlieger *et al.*, 2001).

## 2.11. Performance of pigs on conventional feeding

Saseendran, (1979) compared the exotic pigs with indigenous pigs reared in University Pig Farm, Mannuthy and recorded a feed efficiency of 4.26, dressing percentage of 72.17 and back fat thickness 2.03cm and loin eye area 25.25cm$^2$ in exotic pigs and were much superior to indigenous pigs.

Prabhakar, (1984) recorded a live weight of 78.43 ± 7.08, dressing percentage of 33.34 ± 1.40, carcass weight of 57.57 ± 5.89kg, back fat thickness of 2.96 ± 0.29cm in Large White Yorkshire pigs reared intensively.

Carcass length and loin eye area were higher in gilts than those of barrows, while the average back fat thickness was less in gilts than barrows indicating that carcasses obtained from gilts tended to produce lean carcasses when compared to barrows (Ramaswami *et al.*, 1984).

Bhadoria, (1996) found that dressing percentage of Large White Yorkshire pigs ranged from 61.58 to 73.38 and ham weight from 20.95 to 26.04kg.

In Large White Yorkshire pigs maintained in semi-intensive system in villages in Bihar recorded an average body weight of 18.20 ± 0.79kg at six months of age (Singh *et al.*, 1996).

In a carcass study conducted in three breed crossbred pigs by Kawano *et al.* (1997) revealed that pigs fed with 74.5per cent total digestible nutrients and 12per cent digestible crude protein slaughtered at 120kg live weight had a higher carcass yield than those slaughtered at 110kg weight.

Singh *et al.* (1997) observed that in Large White Yorkshire pigs slaughter weight, carcass length, hot carcass weight, back fat thickness, loin

eye area and ham weight were 114.31 ± 1.01 kg, 87.32 ± 0.40 cm, 83.85 ± 0.88 kg, 30.45 ± 0.57mm, 28.23 ± 0.65cm$^2$ and 22.79 ± 0.25kg, respectively.

In Large White pigs the body weight, carcass weight, dressing percentage, carcass length, loin eye area, back fat thickness and ham weight were 90.17 ± 0.99kg, 65.31 ± 0.87kg, 72.42 ± 0.56, 78.46 ± 0.45cm, 26.33 ± 0.55cm$^2$, 26.56 ± 0.53mm and 15.47 ± 0.23 kg, respectively when slaughtered at 131 to 491 days (Singh *et al.*, 1998).

Jha *et al.*, (1999) observed that pigs reared on concentrates had mean values for live weight, hot carcass weight, dressing percentage, back fat thickness, loin eye area and ham weight of 90.83kg, 66.44kg, 70.76per cent, 25.55mm, 28.38cm$^2$ and 18.16kg, respectively.

Mili *et al.*, (1999) studied the effect of slaughter weight on carcass measurements of Hampshire barrows. All the pigs were fed with *ad libitum* grower ration (18 to 20per cent CP) up to 35kg body weight and with finisher ration (15 to 16per cent CP) till slaughtered. They found that Hampshire barrows weighing 70kg rendered the lowest carcass length (68.50cm) and back fat thickness (2.04cm), while barrows of 100kg registered maximum carcass length (70.10cm) and back fat thickness (3.50cm). Loin eye area was smallest (28.18cm$^2$) in 70kg group and largest (32.85cm$^2$) in 100kg group.

The growth rate of pigs reared by smallholder farmers in two areas of Philippines was 5.7kg per month and 5.5kg per month, respectively (More *et al.*, 1999).

When pigs from one to seven generation bred in a closed system, Sheiko, (1999) noticed an increase of 5.9per cent, 1.9per cent and 12.5per cent in average daily gain, carcass length and loin eye area and a reduction of 5.7per cent in back fat thickness.

Singh *et al.*, (1999) observed a average daily gain of 283.96 ± 6.14 in Large White Yorkshire pigs fed on concentrates during the period from eight to twenty weeks of age.

In Large White Yorkshire pigs fed on standard concentrate ration, Hati *et al.* (2000) recorded weight of liver as 1.12 ± 0.06kg, lungs 0.71 ± 0.05kg, heart 0.19 ± 0.09kg and kidney 0.21 ± 0.02kg.

The Large White Yorkshire pigs of North East Hill region of India obtained a slaughter weight of 54.75 ± 1070kg, growth rate 335.45 ± 7.45g per day, hot carcass weight 35.58 ± 0.87kg, dressing percentage 65.00 ± 0.58 and back fat thickness 2.28 ± 0.06cm (Rohilla *et al.*, 2000).

Suraj (2000) recorded body weight of Large White Yorkshire pigs at eight months of age as 78.44kg, body length as 86.78cm, body girth as 97.37cm and height as 60.97cm. The average mean daily weight gain was 420

± 63g on concentrate ration and daily feed intake was 1.316 ± 0.17kg. The feed conversion efficiency was 3.821 ± 0.21.

**2.12. Performance of pigs on unconventional feeding**

Prabhakar, (1984) recorded a dressing percentage of 70.39 ± 1.15, loin eye area of 16.56 ± 4.89cm$^2$ and back fat thickness 3.10 ± 0.63cm in indigenous pigs reared traditionally on food wastes and scavenging.

Shyam Mohan (1991) observed that carcass characteristics like dressing percentage, carcass length, back fat thickness, loin eye area and weight of ham were adversely affected by the inclusion of prawn waste in the ration as partial or complete replacement of unsalted dried fish.

Fanimo and Tewe (1996) observed an average daily weight gain of 287g in Large White Yorkshire pigs when fishmeal was replaced with chicken offal meal.

Loc *et al.* (1996) reported that the mean daily gain in LW **X** Mong Cai pigs under traditional feeding system was lower, 202 and 230g in two villages of Central Vietnam, but was significantly increased to 363 and 366g by giving protein supplement.

The carcass weight, loin eye area, percentage lean and back fat thickness were higher in pigs fed on complete feed than swill fed group

(Chen-YieShiung *et al.*, 1997). It was found that unsaturated fatty acid content was higher in swill fed pork.

Mishra *et al.*, (1997) reported that in local piglets raised up to 24 weeks of age after weaning showed the average daily gain of 169.87 ± 9.51g in females and 149.11 ± 21.75g in males under scavenging system.

An average daily weight gain of 114g was estimated with a feed conversion of 5.49kg on *ad libitum* feeding of dry garbage and 26.05kg on fresh garbage basis in Large White Yorkshire pigs (Ravi and Krishna Reddy, 1997).

Somanadha Sarma and Subba Reddy, (1997) studied carcass characteristics of Large White Yorkshire pigs reared on garbage in Andhra Pradesh. The characters studied included dressing percentage, proportion of ham, undercut and bacon over dressed weight and the estimates were found to be 71.44 to 73.05per cent, 17.53 to 18.81per cent, 0.82 to 0.94per cent and 10.12 to 12.03per cent, respectively.

Jha *et al.*, (1999) obtained carcass length 63.06 ± 1.11cm, dressing percentage with head 70.41 ± 0.11per cent, back fat thickness 19.28 ± 0.68mm, loin eye area 15.31±0.68cm$^2$ in pigs reared on kitchen waste and grazing.

## 2.13. Economics

Feed cost formed the major component in pig production (Selvakumar *et al.*, 1993). They accounted 72.25per cent in small units with sows less than six and 79.58per cent in large units with sows more than six. They also observed that return per Rupee of investment was Rs. 1.17 for small unit and Rs. 1.38 for large unit.

Ravi and Krishna Reddy, (1997) reported that compared to balanced ration, cost per kg of gain in crossbred Large White Yorkshire pigs can be reduced by 40per cent on garbage feeding.

The total economic cost was negatively correlated and net return positively correlated with the farm size (Sharma *et al.*, 1997). The average net return for large herds (more than 75 sows) was higher than for small (less than 25 sows) and medium herds (25 to 75 sows).

Rajiv Jain and Pandey, (1998) found that in different systems of feeding pattern, the net return per pig under exclusively hotel waste feeding category was the highest in medium and large size farms.

The cost of production of one kg live weight in Khasi local, Hampshire and upgrading pigs as Rs.61.75, Rs.35.75 and Rs.35.75 respectively (Bujarbaruah and Rohilla, 2000).

Rearing pigs entirely on concentrate feed was uneconomical, but the integration of fish and vegetable to the pig production could improve the productivity of such systems with the improvement in overall economic efficiency (Suraj, 2000).

# *Materials and Methods*

# 3. MATERIALS AND METHODS

The research work to analyze the productivity and feasibility of pig production systems in rural sector consisted of two parts. The first part was a field study in two Panchayaths to understand the existing conditions of pig production in rural sector. The productivity and feasibility of pig production system and also the problems and prospects associated with pig farming were analysed. The second part was a comparative study on the performance and productivity of Large White Yorkshire pigs in organized pig farms and pigs in farmers premises in the rural sector.

## 3.1. Field survey

The field survey was conducted in Kaiparambu and Kuzhoor Panchayaths in Thrissur district of Kerala. The geographical location of Thrissur is as follows: Longitude – 76.16"E, Latitude – 10.32"N, Altitude – 22.25 m above MSL.

The Kaiparambu Panchayath is eight kilometer away from Thrissur town towards north. Kuzhoor Panchayath is located about 50km southwest to Thrissur town.

The study was conducted from July 2000 to August 2000. Based on a well designed questionnaire (Annexure I) and personal interview information

regarding pig production systems adopted by rural farmers were gathered with the help of local bodies.

### 3.1.1. Existing conditions of pig production in rural sector

The socio-economic and educational levels of pig farmers and management practices including feeding, housing, breeding, marketing were analysed. The problems and constraints encountered by the pig farmers in pig production were also studied.

### 3.1.2. Productivity and feasibility of pig production system in rural sector

Suitable scores were given to different parameters in pig production systems to calculate the productivity and feasibility scores of the system existing in the rural sector. Higher values were assigned to factors leading to maximum performance in all aspects. Apart from pig farmers, other farmers having potential and interest in pig farming were also considered to arrive at a final productivity score of the pig production system in the given Panchayaths.

#### 3.1.2.1. Feasibility scores of sociological parameters

##### 3.1.2.1.1. Interest in pig farming

In the scoring criteria not only the potential of existing pig farmers, but also the potential of other farmers were considered. Those having interest in pig farming were given a higher score of five compared to one in the case of not interested group.

### 3.1.2.1.2. Occupational status of pig farmers

People engaged in agriculture and allied activities are more interested in pig farming compared to employed personnels. So a higher value was assigned to the agriculture community.

| Occupation | Score |
|---|---|
| Agriculture and allied activities | 2 |
| Employed personnels | 1 |

### 3.1.2.1.3. Age of pig farmers

Young pig farmers were given higher score than aged farmers. A score of three was given to pig farmers below 30 years.

| Age Group | Score |
|---|---|
| Below 30 years | 3 |
| 31 to 50 years | 2 |
| Above 50 years | 1 |

### 3.1.2.1.4. Religion of pig farmers

Generally Christian population is more engaged in pig farming followed by Hindus. So Christians were given a higher score of three, Hindus two and score one to Muslims.

| Religion | Score |
|---|---|
| Christians | 3 |
| Hindus | 2 |
| Muslims | 1 |

### 3.1.2.1.5. Economic status of pig farmers

Scoring for economic parameters was assigned as follows.

| Monthly family income | Score |
|---|---|
| Above Rs. 4,001 | 4 |
| Rs. 3,001 to 4,000 | 3 |
| Rs. 2,001 to 3,000 | 2 |
| Below Rs. 2,000 | 1 |

### 3.1.2.1.6. Educational Status of pig farmers

Level of education of the farmer has a positive correlation with the scientific management practices and also in the extent of adoption of new techniques. Since education up to matriculation is considered as the primary education, scoring was done based on the matriculation.

| Education | Score |
|---|---|
| Above matriculation | 3 |
| Matriculation | 2 |
| Below matriculation | 1 |

### 3.1.2.1.7. Time availability for pig farming

More attention can be paid in management of pigs if enough time is available. So the availability of time is an important factor.

| Duration | Score |
|---|---|
| More than 6 hours | 4 |
| 4 to 6 hours | 3 |
| 2 to 4 hours | 2 |
| Less than 2 hours | 1 |

### 3.1.2.1.8. Family size of pig farmers

Family participation will be more in a large family. So a score of three was given to family with members above eight and a lower score to family with size below five.

| Family size | Score |
|---|---|
| Above 8 | 3 |
| 5 to 8 | 2 |
| 1 to 4 | 1 |

### 3.1.2.1.9. Family participation in pig farming

Distribution of work among family members reduces the workload and make the farming easy, effortless and profitable. Score was given as follows:

| Family participation | Score |
|---|---|
| Present | 2 |
| Absent | 1 |

### 3.1.2.1.10. Land share of pig farmers

Availability of land is a critical factor in pig production. In scoring, a value of four was given to farmers having land share above one acre, keeping productivity in mind.

| Land area | Score |
|---|---|
| Above 100 cents | 4 |
| 51 to 100 cents | 3 |
| 21 to 50 cents | 2 |
| Below 20 cents | 1 |

The aggregate of scores on each parameter was taken to reach the total score of the system. The maximum score a person can score is 33 and the minimum is ten.

### 3.1.2.2. Feasibility scores of pig farming

#### 3.1.2.2.1. Type of knowledge

The level and the source of knowledge are important in management. The training gives more practical knowledge, which cannot be obtained from other sources like veterinarians, periodicals, other farmers, *etc.* The knowledge obtained from training can be practically applied more effectively than the one gathered from other sources. So in scoring criteria, knowledge from training received maximum score followed by veterinarians, periodicals and other farmers.

| Type of knowledge | Score |
|---|---|
| Training | 4 |
| Veterinarian | 3 |
| Periodicals | 2 |
| Other sources | 1 |

#### 3.1.2.2.2. Source of pigs

Pigs procured from large-scale farms perform better than those obtained from small farms or other farmers. A higher value was given to the pigs from the small-scale farms.

| Source of pigs | Score |
|---|---|
| Large farms | 3 |
| Medium farms | 2 |
| Small farms | 1 |

### 3.1.2.2.3. Breeds of pigs

The productivity of exotic pigs stands ahead of crossbred and indigenous pigs, so exotic pigs were given a higher score.

| Breeds | Score |
|---|---|
| Exotic breeds | 3 |
| Crossbreds | 2 |
| Indigenous breeds | 1 |

### 3.1.2.2.4. Feeding of pigs

In pig production swill feeding is economically feasible, compared to conventional feeding with concentrates. Higher score was assigned to swill feeding.

| Feeding | Score |
|---|---|
| Swill feeding | 2 |
| Concentrate | 1 |

### 3.1.2.2.5. Housing of pigs

A permanent shelter for housing pigs is essential for efficient management of pigs. So higher value was assigned to permanent structure and lower value to temporary one.

| Housing | Score |
|---|---|
| Permanent | 2 |
| Temporary | 1 |

### 3.1.2.2.6. Marketing of pigs

Marketing of pigs as pork fetches more value than the sale of live pigs based on live body weight.

| Marketing | Score |
|---|---|
| Pork sale | 2 |
| Live weight sale | 1 |

### 3.1.2.2.7. Occurrence of diseases

Disease outbreaks lead to the reduction in overall performance and in effect result in substantial decrease in net return. Frequent occurrence of diseases scored lower score compared to lower occurrence of diseases.

| Occurrence of diseases | Score |
|---|---|
| Rare | 3 |
| Occasional | 2 |
| Frequent | 1 |

**3.1.2.2.8. Social problems in pig rearing**

Religious and environmental obstacles are common in pig rearing areas and of course, this adversely affects the prospects of the farmer. So a farmer who did not face any social opposition was given a score two and score one in the case of objections.

**3.1.2.2.9. Experience in pig farming**

Experience of the farmers in pig farming favourably influences pig production and hence a score of four was given to experience above 12 years.

| Experience | Score |
|---|---|
| Above 12 years | 4 |
| 8 to 12 years | 3 |
| 4 to 8 years | 2 |
| Below 4 years | 1 |

In this scoring pattern the maximum score a farmer can score is 25 and the minimum is nine. The aggregate of scores in each category was taken to compare the feasibility scores of production system in two Panchayaths.

### 3.2. Comparative study of pigs in organized farm and field units

A comparative study to assess the productivity and performance of Large White Yorkshire pigs in organized farm and field piggery units formed the second part of this study. The facilities of Centre for Pig Production and Research, Mannuthy, National Agricultural Technology Project (NATP) and pig farmers of Thrissur district were utilized for the study. The duration of the study extended for a period of six months from September 2000 to February 2001.

Twenty four Large White Yorkshire weaned piglets were randomly selected from Centre for Pig Production and Research, Mannuthy. They were divided into four groups of six each as uniformly as possible with respect to age, sex and body weight. All the four groups consisted of three males and three females each. Males in all the groups were castrated at the time of weaning. Each group was allotted randomly to one of the following four treatments.

**Treatment I**

Maintained in Centre for Pig Production and Research, Mannuthy under the existing feeding and management conditions prevailing in the farm.

**Treatment II**

Maintained in Centre for Pig Production and Research, Mannuthy and were fed twice daily with food wastes collected from the hostels of Veterinary College campus. Hostel food waste contained mainly boiled rice and wheat based food. Management other than feeding was similar to treatment I group.

**Treatment III**

Pigs in this treatment maintained under the feeding and management conditions prevailing in a larger farm in the field where the holding capacity is not less than 100 adult pigs at a time. The feed consisted mainly 60per cent chicken offal from slaughterhouses and 40per cent restaurant waste. Restaurant wastes contained mainly boiled rice, wheat based food, meat and fish scraps and other dried food. Twice daily feeding was practiced, with chicken offal feed in the morning and restaurant waste in the evening. Housing was a permanent structure with concrete floor and sidewalls with cement bricks.

**Treatment IV**

This group was maintained as a single unit in the field where the holding capacity is not less than 10 adult pigs at a time. Pigs were fed with 40per cent chicken waste and 60per cent restaurant waste. Once a day feeding was practiced. Housing consisted of a simple one with concrete floor and thatched roof.

Regular deworming was practiced in all the groups. On attaining eight months of age all the pigs were slaughtered at the Meat Technology Unit, College of Veterinary and animal Sciences, Mannuthy. Growth performance, carcass characteristics and economics were assessed in all the four groups.

### 3.2.1. Growth performance of pigs

#### 3.2.1.1.Monthly body weights

Body weights were measured by using a spring balance in field units and by a platform balance in farm units.

#### 3.2.1.2. Monthly calculated body weights

Body weights were calculated monthly with the help of a formula based on body measurements (Kurien Thomas and Santa E. George, 1992)

$\mathbf{W=5.16 + LG^2 / 11568}$ where,

W = Body weight of pigs in kg.

G = Body girth at the level of umbilicus in cm.

L = Length from shoulder to pin bone in cm.

#### 3.2.1.3. Monthly body measurements

Body measurements like body length, girth and height were measured monthly.

### 3.2.1.4. Average daily weight gain of pigs

Average daily weight gain of pigs were calculated by the following formula (Brody, 1945)

$$W = W_2 - W_1 / T_2 - T_1$$ where,

$W$ = Weight gain (kg)

$W_1$ = Initial body weight (kg)

$W_2$ = Final body weight (kg)

$T_1$ = Initial time unit

$T_2$ = Final time unit

### 3.2.1.5. Average daily feed intake

Average daily feed intake was calculated by considering the feed consumed and the number of days fed in both fresh weight and dry matter basis.

### 3.2.1.6. Feed conversion efficiency of pigs

Feed conversion efficiency of pigs in the four treatments was worked out on dry matter basis of feed.

### 3.2.1.7. Proximate analysis of feed samples

Representative samples from all types of feed *viz.* restaurant waste, hostel waste, concentrate ration and chicken offal were analyzed for proximate principles (A.O.A.C, 1984).

### 3.2.2. Carcass characteristics of pigs

Important carcass characteristics of Large White Yorkshire pigs in the four treatments were measured.

### 3.2.2.1. Slaughter weight of pigs

Slaughter weight of pigs at eighth months of age was measured.

### 3.2.2.2. Dressing percentage

Live body weight at slaughter, carcass weight and individual organ weights were recorded and dressing percentage was calculated.

### 3.2.2.3. Carcass length

Carcass length was measured as the straight-line distance from the anterior edge of the first rib to the pubic symphysis from the shackled carcass (Krider and Carroll, 1971).

### 3.2.2.4. Loin eye area

Loin eye area was calculated by drawing the outline of *longissimus dorsi* muscle between the tenth and eleventh rib (Krider and Carroll, 1971).

### 3.2.2.5. Back fat thickness

Back fat thickness was calculated as the mean of the fat thickness at the first rib, last rib and the last lumbar vertebrae (Krider and Carroll, 1971).

### 3.2.2.6. Meat bone ratio

Ratio between deboned meat and bone was measured to calculate the meat bone ratio (Krider and Carroll, 1971).

### 3.2.2.7. Weight of offals

Weight of offals like heart, kidney, lungs, stomach and intestine, liver and spleen were recorded separately.

### 3.2.3. Statistical analysis

Data collected were analyzed statistically as per Snedecor and Cochran (1994).

### 3.2.4. Formula to calculate body weight from body measurements

A formula was derived to calculate the body weight from the body length and girth. Body length and girth of the pigs in the study were utilized for the same.

### 3.2.5. Economics

Cost of production per kilogram live body weight of pigs and economics in all the four treatment groups were worked out.

# *Results*

# 4. RESULTS

The results obtained during the study of productivity and feasibility of pig production systems in the rural sector are furnished in Tables 1 to 47 and Figures 1 to 7 below.

## 4.1. Existing conditions of pig production in rural sector

A random field survey was conducted in two Panchayaths of Thrissur district of Kerala, *viz.* Kaiparambu and Kuzhoor. Details about the sociological status of the pig farmers and the management practices existing in the rural sector are furnished hereunder.

From the survey it was observed that out of the 103 respondents, 11.65per cent were pig farmers, 35.92per cent were people interested in pig farming and the rest were not interested in pig farming in Kaiparambu Panchayath. In Kuzhoor Panchayath, out of the 80 respondents interviewed ten per cent were pig farmers, 53.75per cent were people interested in pig farming and the rest (36.25per cent) were not interested in pig farming.

### 4.1.1. Sociological status of pig farmers

#### 4.1.1.1. Age group of pig farmers

Table 1. Age group of pig farmers (in per cent)

| Age | Kaiparambu | Kuzhoor |
|---|---|---|
| Below 30 years | 16.67 | 25.00 |
| 31 to 50 years | 33.33 | 62.50 |
| Above 50 years | 50.00 | 12.50 |

Age wise distribution of pig farmers is given in Table. 1. It showed that majority of the pig farmers in both Panchayaths were above 30 years. The farmers aged below 30 years were 16.67per cent in Kaiparambu and 25per cent in Kuzhoor Panchayath.

#### 4.1.1. 2. Religion of pig farmers

Table 2. Religion of pig farmers (in per cent)

| Religion | Kaiparambu | Kuzhoor |
|---|---|---|
| Hindus | 8.33 | 12.50 |
| Christians | 91.67 | 87.50 |
| Muslims | - | - |

Religion wise distribution of pig farmers in the two Panchayaths is given in Table 2. It was observed that majority of the pig farmers were Christians. Non- Muslim participation in pig farming was evident in both the Panchayaths.

### 4.1.1.3. Occupation of pig farmers

Table 3. Occupation of pig farmers (in per cent)

| Occupation | Kaiparambu | Kuzhoor |
|---|---|---|
| Agriculture and allied activities | 33.33 | 100 |
| Employed personnels | 66.67 | – |

In Kuzhoor all the pig farmers were engaged in agriculture or allied activities, whereas in Kaiparambu there were only 33.33 per cent farmers (Table 3).

### 4.1.1.4. Educational status of pig farmers

Table 4. Educational status of pig farmers (in per cent)

| Educational status | Kaiparambu | Kuzhoor |
|---|---|---|
| Above matriculation | 25.00 | 12.50 |
| Matriculation | 58.33 | 50.00 |
| Below matriculation | 16.67 | 37.50 |

Educational level of pig farmers in both Panchayaths was high. It was observed that 83.33per cent of the pig farmers in Kaiparambu and 62.5per cent in Kuzhoor were having educational status of matriculation or above (Table 4).

#### 4.1.1.5. Economic status of pig farmers

Table 5. Average family income of pig farmers (in per cent)

| Average monthly income (Rs) | Kaiparambu | Kuzhoor |
|---|---|---|
| Above Rs 4,001 | - | - |
| Rs 3,001 to 4,000 | 16.67 | 12.50 |
| Rs 2,001 to 3,000 | 50.00 | 37.50 |
| Below Rs 2,000 | 33.33 | 50.00 |

In both the Panchayaths, the average monthly income of family did not exceed Rs. 4,000 (Table 5). Majority was having income between Rs. 2,001 and 3,000 in Kaiparambu and below Rs 2,000 in Kuzhoor Panchayath.

#### 4.1.1.6. Family size of pig farmers

Table 6. Family size of pig farmers (in per cent)

| Family members | Kaiparambu | Kuzhoor |
|---|---|---|
| 1 to 4 | 83.33 | 62.50 |
| 5 to 8 | 16.67 | 25.00 |
| Above 8 | - | 12.50 |

The size of the family of pig farmers is given in Table 6. In both Panchayaths family size was small. In Kaiparambu 83.33percent of the pig farmers and 62.5per cent in Kuzhoor were having a family size of less than five members.

#### 4.1.1.7. Land share of pig farmers

Table 7. Land share of pig farmers (in per cent)

| Area of land | Kaiparambu | Kuzhoor |
|---|---|---|
| Above 100 cents | 50.00 | 62.50 |
| 51 to 100 cents | 16.67 | 37.50 |
| 21 to 50 cents | 25.00 | - |
| Below 20 cents | 8.33 | - |

Distribution of land share among the pig farmers in the two Panchayaths is shown in Table 7. It was noticed that majority of the pig farmers had land share above 100 cents in both Panchayaths. In Kaiparambu farmers having land holding below 20 cents were 8.33per cent only and in Kuzhoor nobody was registered with land share less than 50 cents.

### 4.1.2. Type of animals

#### 4.1.2.1. Pigs

#### 4.1.2.1.1. Breeds of pigs

Table 8. Breeds of pigs (in per cent)

| Breed | Kaiparambu | Kuzhoor |
|---|---|---|
| Exotic pigs | 83.33 | 100.00 |
| Indigenous | 16.67 | - |

Presence of indigenous pigs was noticed only in Kaiparambu Panchayath with 16.67per cent share. The rest were exotic breeds like Large White Yorkshire in both the areas (Table 8).

### 2.1.2. Source of pigs

Table 9. Source of pigs (in per cent)

| Source | Kaiparambu | Kuzhoor |
|---|---|---|
| Large farm | 68.75 | 87.50 |
| Medium farm | 31.25 | 12.50 |
| Small farm | - | - |

Majority of the pig farmers in both the Panchayaths preferred to purchase pigs from large farms. None has procured pigs from small farms (Table 9).

### 4.1.2.3. Herd strength

Table 10. Herd strength of pigs (in per cent)

| Size of herd | Kaiparambu | Kuzhoor |
|---|---|---|
| Below 10 | 50.00 | 75.00 |
| 11-50 | 50.00 | 25.00 |
| Above 50 | - | - |

It is evident from the Table 10. that majority of the pig farmers were marginal farmers with herd strength below ten.

### 4.1.2.2. Domestic animals other than pigs

Table 11. Details of other domestic animals (in per cent)

| Animals | Kaiparambu | Kuzhoor |
|---|---|---|
| Cattle | 50.00 | 37.50 |
| Buffalo | 8.33 | - |
| Goat | 16.67 | 12.50 |
| Poultry | 58.33 | 87.50 |

Other than pigs, farmers preferred cattle and poultry as domestic animals in these Panchayaths (Table 11). Buffaloes got the least preference and only 8.33per cent of the pig farmers in Kaiparambu Panchayath reared buffalo.

### 4.1.3. Reasons for pig farming

Table 12. Reasons for pig farming (in per cent)

| Reasons | Kaiparambu | Kuzhoor |
|---|---|---|
| Main source of income | - | - |
| For extra income | 83.33 | 75.00 |
| To utilize organic wastes | 33.33 | 75.00 |
| To utilize spare time | 16.67 | 25.00 |

In both Panchayaths farmers found pig rearing as a source of extra income and as a way to dispose the organic wastes by converting them to pig feed. In Kaiparambu 16.67per cent of the pig farmers and 25per cent in

Kuzhoor considered pig rearing as a way to utilize the spare time available (Table 12).

### 4.1.4. Management practices

#### 4.1.4.1. Feeding of pigs

##### 4.1.4.1.1. Type of feeding

Table 13 indicates the type of feeding followed by pig farmers in Kaiparambu and Kuzhoor Panchayaths. Common feedstuff included kitchen/ restaurant wastes, slaughterhouse wastes and agricultural wastes. Majority of the pig farmers (66.67per cent in Kaiparambu and 87.5per cent in Kuzhoor Panchayaths) preferred a combination of slaughterhouse and kitchen/restaurant wastes to feed their pigs. Only 8.33per cent used concentrate feed along with other feed in Kaiparambu.

Table 13. Type of feeding (in per cent)

| Type of feed | Kaiparambu | Kuzhoor |
|---|---|---|
| Concentrate | 8.33 | - |
| Kitchen/restaurant wastes | 66.67 | 87.50 |
| Slaughter house wastes | 58.33 | 75.00 |
| Agricultural wastes | 8.33 | 25.00 |

#### 4.1.4.1.2. Distance to feed source

Table 14. Distance to the source of feed (in per cent)

| Distance | Kaiparambu | Kuzhoor |
|---|---|---|
| Above 10 km | 16.67 | - |
| 5 to 10 km | 50.00 | 37.50 |
| Below 5 km | 33.33 | 62.50 |

Majority of the pig farmers collected feed from within ten kilometer of distance in both Panchayaths (Table 14).

#### 4.1.4.2. Housing of pigs

Table 15. Type of housing (in per cent)

| Structure | Kaiparambu | Kuzhoor |
|---|---|---|
| Permanent | 66.67 | 50.00 |
| Temporary | 33.33 | 50.00 |

In both the Panchayaths the housing structure among the pig farmers is given in Table 15. In Kaiparambu 66.67per cent of the pig farmers and in Kuzhoor 50per cent had permanent housing structure for pig production.

#### 4.1.4.3. Breeding of pigs

Table 16. Purpose of rearing pigs (in per cent)

| Purpose of rearing | Kaiparambu | Kuzhoor |
|---|---|---|
| Breeding only | - | - |
| Breeding and fattening | 16.67 | 12.50 |
| Fattening only | 83.33 | 87.50 |

None of the pig farmers in these two Panchayaths reared pigs for breeding purpose alone. Majority of them preferred fattening units of pigs and very few were engaged in fattening and breeding of pigs in Kaiparambu and Kuzhoor (Table 16).

#### 4.1.4.4. Health problems in pigs

##### 4.1.4.4.1. Occurrence of diseases

Table 17. Frequency of occurrence diseases (in per cent)

| Occurrence | Kaiparambu | Kuzhoor |
|---|---|---|
| Common | - | - |
| Occasional | 66.67 | 75.00 |
| Rare | 33.33 | 25.00 |

Frequency of occurrence of diseases is shown in Table 17. In Kaiparambu 66.67per cent and in Kuzhoor 75per cent of the pig farmers noticed diseases in pigs occasionally only.

##### 4.1.4.4.2. Common disease problems in pigs

Common health problems observed among pigs in these Panchayaths were digestive disorders, skin problems, respiratory diseases and reproductive problems (Table 18). Among these, digestive disorders were predominant in two Panchayaths. Other problems like maggot wounds, piglet mortality and paralysis were also noticed.

Table 18. Common diseases in pigs (in per cent)

| Diseases | Kaiparambu | Kuzhoor |
|---|---|---|
| Digestive disorders | 75.00 | 87.50 |
| Skin problems | 8.30 | 25.00 |
| Respiratory diseases | 25.00 | 37.50 |
| Reproductive problems | 33.33 | 12.50 |
| Others | 41.67 | 37.50 |

#### 4.1.4.4.3. Distance to veterinary aid centre

Table 19. Distance to veterinary aid (in per cent)

| Distance | Kaiparambu | Kuzhoor |
|---|---|---|
| Above 10 km | - | - |
| 5-10 km | - | - |
| Below 5 km | 100 | 100 |

In both Panchayaths pig farmers could avail veterinary services within five kilometer of distance in their own Panchayaths (Table 19).

#### 4.1.4.5. Marketing of pigs

Table 20. Type of marketing of pigs (in per cent)

| Type of sale | Kaiparambu | Kuzhoor |
|---|---|---|
| Based on live weight | 75.00 | 87.50 |
| As pork | 16.67 | 12.50 |
| Sale of piglets | 8.33 | - |

Pig farmers followed the sale of pigs on live weight basis, as pork and sale of piglets. Majority were interested in sale of pigs based on live weight. Only 16.67per cent of the pig farmers in Kaiparambu and 12.5per cent in Kuzhoor were engaged on pork sale (Table 20).

#### 4.1.4.6. Labour utilization in pig farming

Table 21. Type of labour utilized (in per cent)

| Type of labour | Kaiparambu | Kuzhoor |
|---|---|---|
| Family | 83.34 | 100.00 |
| Labourers | 16.67 | - |

Only 16.67per cent of the pig farmers in Kaiparambu Panchayath engaged labourers for work and the rest depended on family members (Table 21).

#### 4.1.4.7. Knowledge level of pig farmers

##### 4.1.4.7.1. Experience in pig farming

Table 22. Duration of experience (in per cent)

| Experience | Kaiparambu | Kuzhoor |
|---|---|---|
| Above 12 years | - | - |
| 8 to 12 years | 41.67 | 12.50 |
| 4 to 8 years | 25.00 | 50.00 |
| Below 4 years | 33.33 | 37.50 |

It is evident from Table 22 that about 66.67per cent of the pig farmers in Kaiparambu Panchayath and 62.5per cent in Kuzhoor Panchayath were having experience in pig farming for 4 to 12 years. None of them have experience above 12 years in both Panchayaths.

#### 4.1.4.7.2. Training

Table 23. Training participation (in per cent)

| Training | Kaiparambu | Kuzhoor |
|---|---|---|
| Attended | 8.33 | - |
| Not attended | 91.66 | 100 |

Only 8.33per cent of the pig farmers in Kaiparambu Panchayath has attended training on pig husbandry (Table 23).

#### 4.1.4.7.3. Training requirement

Table 24. Training requirements of pig farmers (in per cent)

| Subject | Kaiparambu | Kuzhoor |
|---|---|---|
| Selection of pigs | 58.33 | 37.50 |
| Feeding | 83.33 | 75.00 |
| Breeding | 75.00 | 87.50 |
| Disease control | 41.60 | 75.00 |
| Meat processing | 16.67 | 75.00 |
| Others | 16.67 | 37.50 |

The interest of the pig farmers to get training on various aspects of pig production is shown in Table 24. In the case of selection of piglets 58.33per

cent in Kaiparambu and 37.5per cent in Kuzhoor has shown interest. Majority of the pig farmers were interested to get training on feeding and breeding aspects in pig farming. Disease control and meat processing were other areas of interest.

#### 4.1.4.8. Adoption level of scientific management practices

Percentage of pig farmers in Kaiparambu and Kuzhoor Panchayaths following scientific management practices in pig farming is shown in Table 25. A good majority of the pig farmers in both Panchayaths followed regular deworming, proper cleaning, proper disposal of wastes and timely treatment, but a very few were practicing preventive measures like vaccinations and iron injections.

Table 25. Scientific management practices (in per cent)

| Practices | Kaiparambu | Kuzhoor |
|---|---|---|
| Regular deworming | 83.33 | 87.50 |
| Vaccination | 8.33 | 12.50 |
| Proper cleaning | 91.66 | 100.00 |
| Proper waste disposal | 91.66 | 100.00 |
| Iron injection | 16.67 | 25.00 |
| Timely treatment | 75.00 | 87.50 |

### 4.1.4.9. Constraints

#### 4.1.4.9.1. Constraints in pig farming

Table 26. Common constraints in pig farming (in per cent)

| Constraints | Kaiparambu | Kuzhoor |
|---|---|---|
| Financial | 41.66 | 62.50 |
| Social | 25.00 | 12.50 |
| Availability of piglets | 33.33 | 25.00 |
| Marketing | - | - |

The major problems encountered by the pig farmers in Kaiparambu and Kuzhoor Panchayaths were financial, social and the shortage in the availability of piglets. In both Panchayaths none of the farmers found marketing of pigs as a problem (Table 26)

#### 4.1.4.9.2. Problems associated with pig rearing

Table 27. Common problems in pig rearing (in per cent)

| Problems | Kaiparambu | Kuzhoor |
|---|---|---|
| Environmental | 25.00 | 12.50 |
| Religious | - | - |
| Health | 16.67 | 12.50 |

Only a few pig farmers faced issues like environmental and health problems. Religious sentiments did not affect the pig farming in the Panchayaths (Table 27).

### 4.1.4.10. Sources of financial assistance

Table 28. Sources of financial assistance for pig farming (in per cent)

| Source | Kaiparambu | Kuzhoor |
|---|---|---|
| Government agencies | 33.33 | 12.50 |
| Banks | 8.33 | 25.00 |
| Private firms | - | 12.50 |
| Self investment | 58.33 | 50.00 |

Almost 50per cent of the pig farmers in both the Panchayaths depended primarily on their own investment to put up the piggery units. The rest relied on government agencies, banks and private firms for the initial expenditure (Table 28).

### 4.1.4.11. Interest in developmental activities

Table 29. Areas of interest for development (in per cent)

| Activities | Kaiparambu | Kuzhoor |
|---|---|---|
| Integrated farming | 50.00 | 87.50 |
| Co-operative setup | 33.33 | 100.00 |
| Meat processing | 8.33 | 50.00 |
| Biogas plant installation | 33.33 | 75.00 |
| Expansion of existing unit | 83.33 | 87.50 |

The percentage of pig farmers in both Panchayaths interested in developmental activities in pig farming is given in Table 29. Majority of them

were interested in integrated farming, installation of biogas plant, pig farming in co-operative setup and the expansion of the existing units.

### 4.2. Feasibility of Pig Production in Rural Sector

The feasibility of pig production system in rural sector was assessed by calculating feasibility scores of each factor that influences the production favourably. Maximum score was given to the factors, which favour the economic and effective pig farming in rural sector.

#### 4.2.1. Feasibility Scores on Sociological Parameters

Table 30. Feasibility Scores on Sociological Parameters

| Parameters | Kaiparambu | | Kuzhoor | |
|---|---|---|---|---|
| | Pig farmers | Interested people | Pig farmers | Interested people |
| Interest | 60 | 175 | 40 | 215 |
| Occupation | 16 | 60 | 16 | 75 |
| Age | 20 | 58 | 17 | 85 |
| Religion | 35 | 89 | 23 | 128 |
| Economic status | 22 | 93 | 13 | 89 |
| Educational status | 25 | 97 | 14 | 73 |
| Time availability | 34 | 73 | 22 | 125 |
| Family size | 22 | 48 | 15 | 84 |
| Family participation | 14 | 32 | 12 | 40 |
| Land share | 37 | 83 | 29 | 100 |
| Total score | 285 | 808 | 201 | 1014 |
| Score per person | 21.25 | 23.09 | 25.12 | 23.81 |

It was observed that the aggregate feasibility scores of pig farmers on sociological parameters were 285 and 201 for Kaiparambu and Kuzhoor Panchayaths, respectively. People who are interested in rearing pigs scored 808 and 1014 in respective Panchayaths (Table 30).

Table 31. Feasibility Scores on Sociological Parameters (in per cent)

| Score range | Kaiparambu | | Kuzhoor | |
|---|---|---|---|---|
| | Pig farmers | Interested farmers | Pig farmers | Interested farmers |
| 10-20 | - | 17.14 | - | 4.65 |
| 21-25 | 75 | 77.14 | 62.5 | 81.39 |
| 26-30 | 25 | 5.72 | 37.5 | 13.95 |
| 31-33 | - | - | - | - |

The feasibility scores on sociological parameters of pig farmers and those interested in pig farming in Kaiparambu and Kuzhoor Panchayaths are shown in Table 31. The aggregate of the scores were taken to calculate the total score of a farmer. The maximum score one can achieve was 33 and the minimum 10. It was found that majority of the pig farmers in both Panchayaths were having the feasibility score between 21 and 30. People who have interest in pig farming were also scored between 21 and 30 in both Kaiparambu and Kuzhoor Panchayath.

### 4.2.2. Feasibility scores of Pig farmers on Pig Farming

The total feasibility scores of pig farmers in Kaiparambu and Kuzhoor Panchayaths were 227 and 153, respectively. The average score per farmer was 18.92 and 19.13 in respective Panchayaths (Table 32).

Table 32. Feasibility scores of pig farmers on pig farming

| Parameters | Kaiparambu | Kuzhoor |
|---|---|---|
| Knowledge | 20 | 14 |
| Source of pigs | 32 | 23 |
| Breeds of pigs | 32 | 24 |
| Feeding | 24 | 16 |
| Housing | 20 | 12 |
| Marketing | 25 | 17 |
| Diseases | 28 | 18 |
| Social problems | 21 | 15 |
| Experience | 25 | 14 |
| Total score | 227 | 153 |
| Score per farmer | 18.92 | 19.13 |

Table 33. Feasibility scores of Pig Farmers on Pig farming (in per cent)

| Score range | Kaiparambu | Kuzhoor |
|---|---|---|
| 9-15 | - | - |
| 16-20 | 75 | 62.5 |
| 21-25 | 25 | 37.5 |

Score range of pig farmers in Kaiparambu and Kuzhoor is given in Table 33. It was observed that majority of the pig farmers in Kaiparambu and Kuzhoor were having feasibility score between 16 and 20. The maximum score one farmer can achieve was 25 and the minimum was nine. In Kaiparambu 25 per cent of the pig farmers and 37.5per cent in Kuzhoor secured score above 20.

### 4.2.3. Feed resource potential and resource utilization efficiency

Table 34. Feed resource potential and resource utilization efficiency

| Source of feed | Kaiparambu | Kuzhoor |
|---|---|---|
| Household waste (kg) | 1210 | 1070 |
| Animal waste (kg) (slaughter house, poultry farms, etc. | 280 | 540 |
| Restaurant waste (kg) | 190 | 110 |
| Total (kg) | 1680 | 1720 |
| No. of pigs reared | 172 | 84 |
| No. of pigs that can be reared (@ 4kg waste/day) | 420 | 430 |
| Resource utilization efficiency (%) | 40.95 | 19.53 |

The feed resource potential of Kaiparambu and Kuzhoor is illustrated in Table 34. In these Panchayaths main sources of unconventional feed were household waste, restaurant waste and wastes of animal origin from slaughterhouses and poultry farms. It was estimated that about 1210 kg and 1070 kg household waste were produced daily in Kaiparambu and Kuzhoor

Panchayaths, respectively. The estimated quantity of total unconventional feed for pigs were 1680 kg and 1720 kg per day in respective Panchayaths. The existed population of pigs was 172 and 84, respectively for Kaiparambu and Kuzhoor Panchayaths. Pigs consume an average of four-kilogram swill feed daily. Based on this assumption the total quantity of feed available in these two Panchayaths can support 420 pigs in Kaiparambu and 430 pigs in Kuzhoor Panchayath. That means the resource utilization efficiency of the existing pig production system was only 40.95per cent and 19.53per cent, respectively for Kaiparambu and Kuzhoor Panchayaths.

### 4.3. Comparative study between pigs in organized farm and field units

The various observations obtained from the farm and field units of Large White Yorkshire pigs for a period of six months are furnished below.

#### 4.3.1. Body weight of pigs

The mean monthly body weights of pigs in the four different treatments are given in Table 35 and Fig 1. The body weight at eight months of age was 65.33 ± 1.90, 60.00 ± 2.79, 65.40 ± 4.55 and 73.66 ± 3.15kg, respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4). From six months of age onwards, significant difference was observed ($P<0.01$) in body weight between treatments. At eight months of age pigs in small field units recorded significantly higher body weights than the pigs in farm units (T1 and T2).

Table 35. Mean body weight of Large White Yorkshire pigs (in kg)

| **Age** (months) | **T1 (FARM)** Concentrate | **T2 (FARM)** Hostel food waste | **T3 (LFU)** CO 60% + RW 40% | **T4 (SFU)** CO 40% + RW 60% |
|---|---|---|---|---|
| 2 | 7.916 ± 0.15* | 8.16 ± 0.21 | 7.83 ± 0.10 | 7.58 ± 0.20 |
| 3 | 15.34 ± 0.47 | 17.83 ± 0.60 | 17.66 ± 0.76 | 17.83 ± 0.54 |
| 4 | 28.5 ± 0.71 | 28.83 ± 1.27 | 29.33 ± 2.15 | 29.33 ± 0.28 |
| 5 | 38.66 ± 0.91 | 37.5 ± 1.76 | 42.50 ± 3.32 | 42.00 ± 1.75 |
| 6 | 48.66 ± 1.26 $^{A}$ | 45.50 ± 2.04 $^{B}$ | 49.60 ± 3.60 | 55.00 ± 2.42 $^{AB}$ |
| 7 | 57.83 ± 1.30 $^{a}$ | 52.83 ± 2.41 $^{b}$ | 58.83 ± 3.82 | 66.16 ± 3.19 $^{ab}$ |
| 8 | 65.33 ± 1.90 $^{A}$ | 60.00 ± 2.79 $^{b}$ | 65.40 ± 4.55 | 73.66 ± 3.15 $^{Ab}$ |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

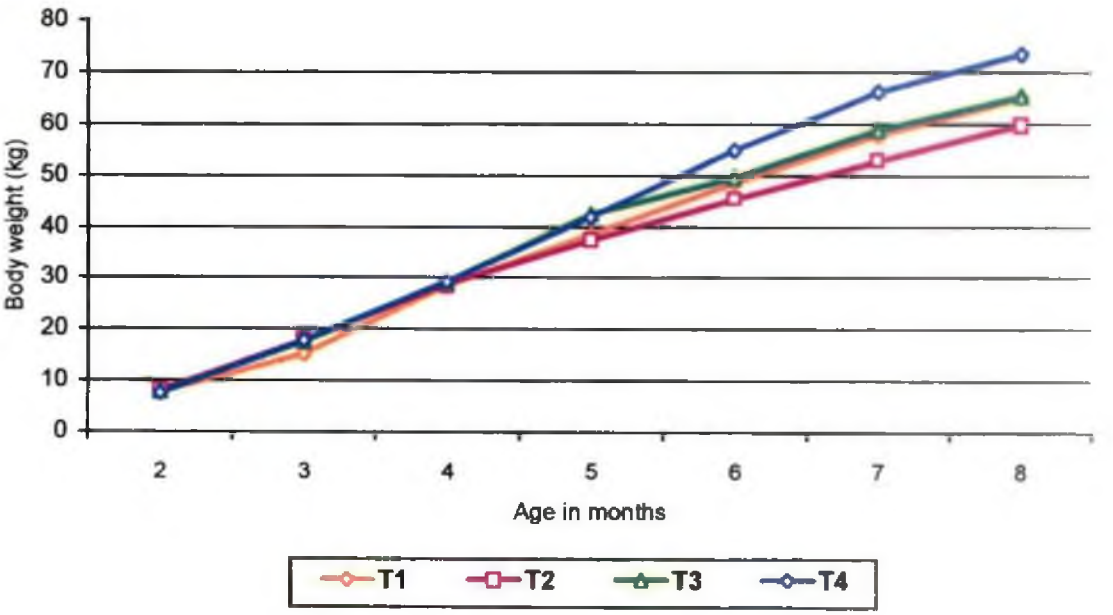


**Fig. 1. Mean monthly body weight of pigs in four treatment groups**

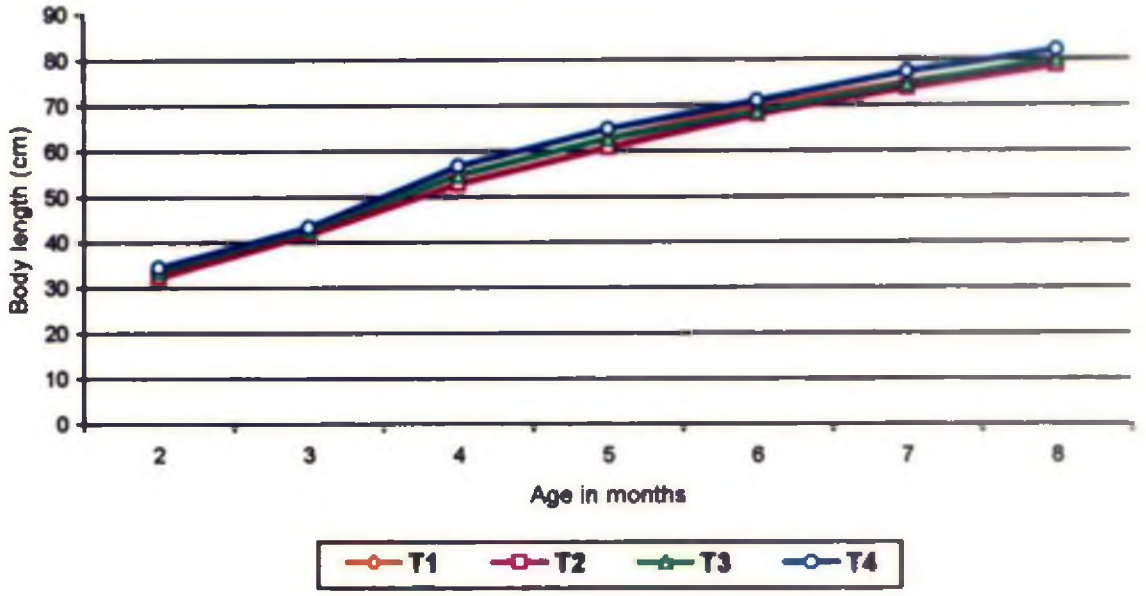


**Fig. 2. Mean monthly body length of pigs in four treatment groups**

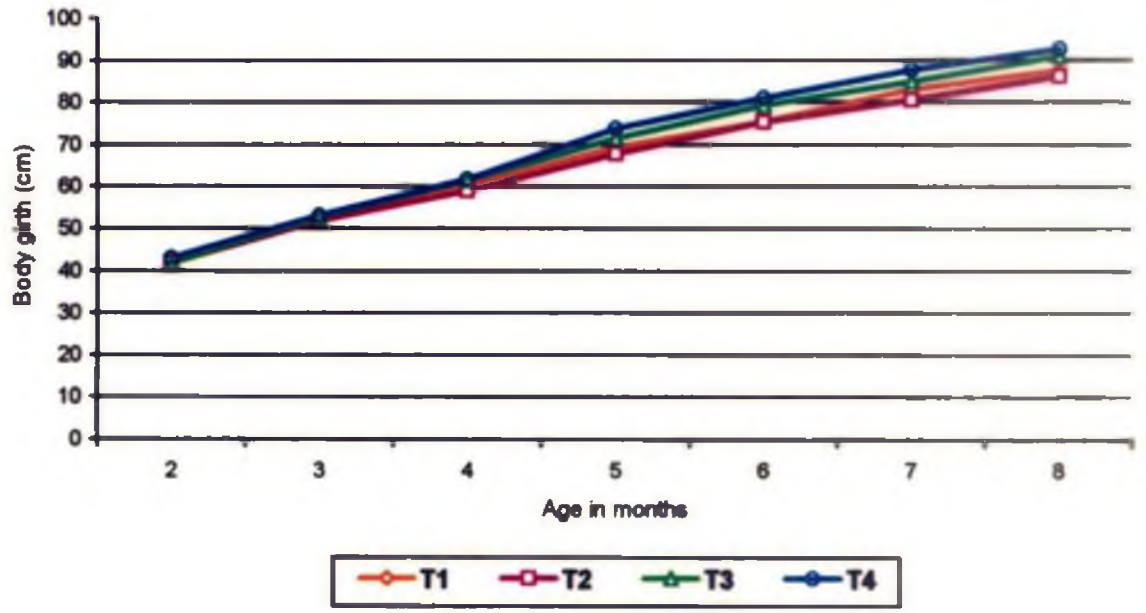


**Fig. 3. Mean monthly body girth of pigs in four treatment groups**

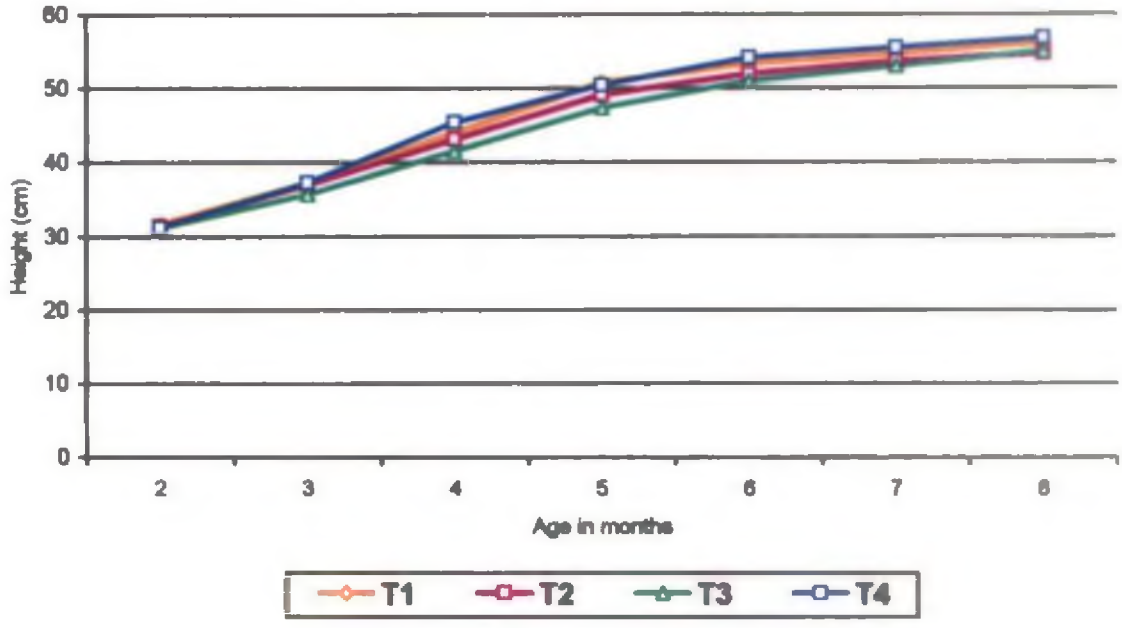


**Fig. 4. Mean monthly body height of pigs in four treatment groups**

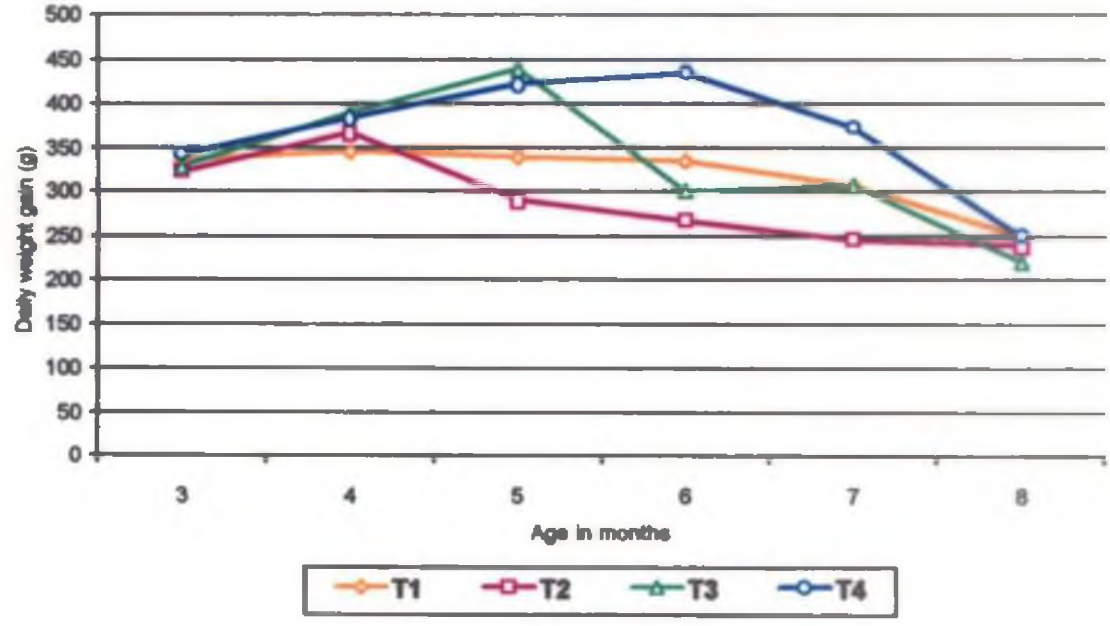


**Fig. 5. Average daily weight gain of pigs four treatment groups**

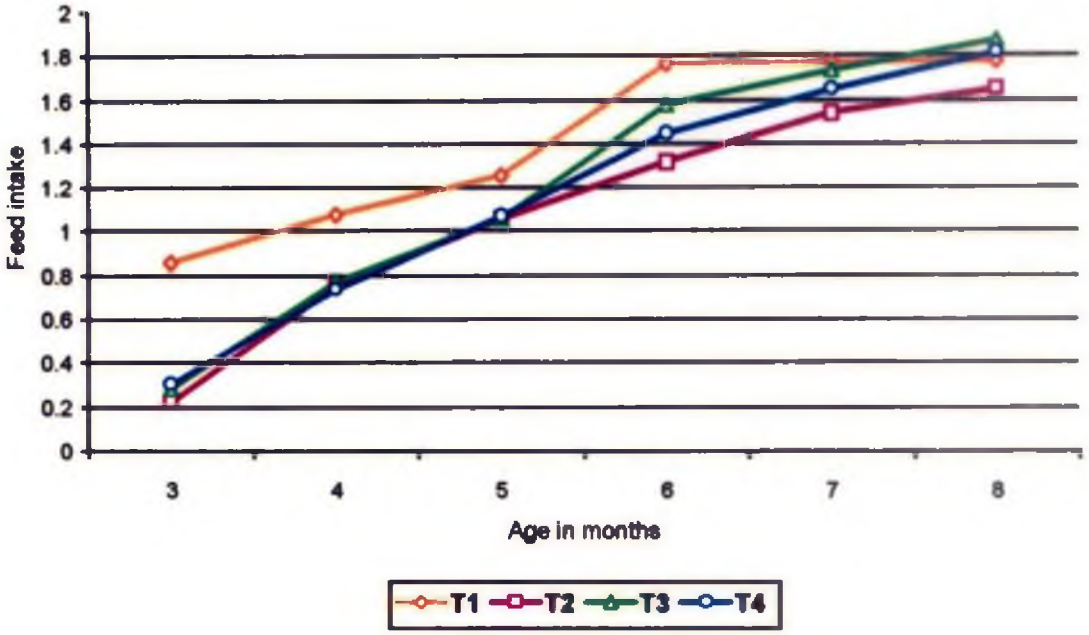


**Fig 6. Average daily feed intake of pigs in four treatment groups**

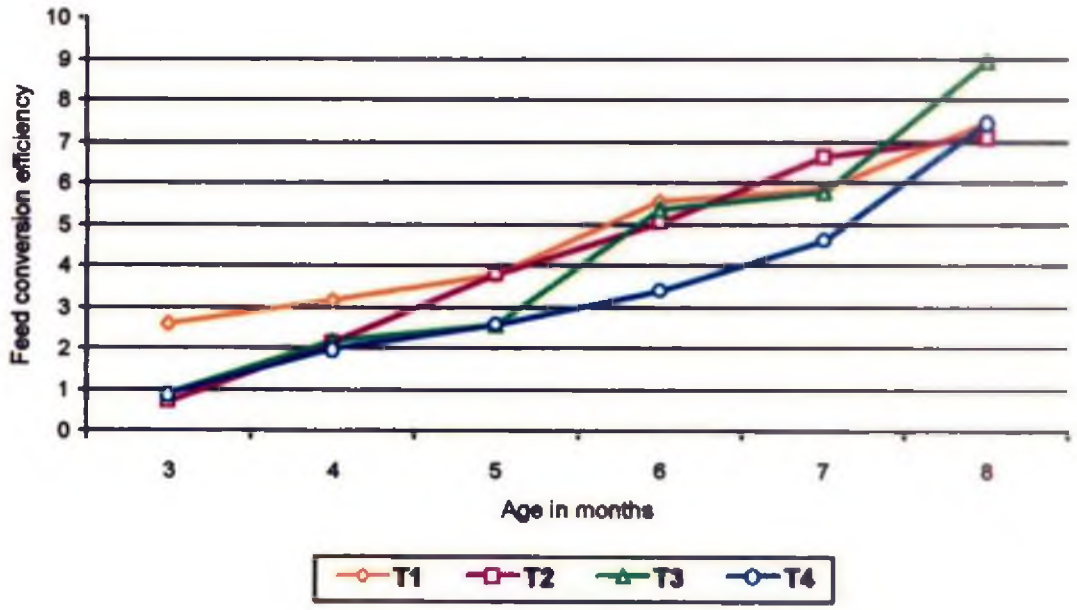


**Fig. 7. Feed conversion efficiency of pigs in four treatment groups**

### 4.3.2. Calculated body weight of pigs

Table 36. Mean calculated body weight of Large White Yorkshire pigs (in kg)

| Age (months) | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| 2 | 10.49 ± 0.28 | 10.12 ± 0.12 | 10.26 ± 0.24 | 10.69 ± 0.29 |
| 3 | 15.31 ± 0.43 | 14.95 ± 0.72 | 15.25 ± 0.60 | 15.78 ± 0.49 |
| 4 | 22.32 ± 0.29 | 21.11 ± 0.79 $^{A}$ | 23.13 ± 1.04 | 23.69 ± 0.96 $^{A}$ |
| 5 | 31.24 ± 0.98 $^{A}$ | 29.51 ± 1.66 $^{B}$ | 33.12 ± 2.18 | 35.79 ± 1.29 $^{AB}$ |
| 6 | 41.08 ± 1.69 | 38.78 ± 2.25 $^{A}$ | 42.77 ± 3.63 | 45.47 ± 1.18 $^{A}$ |
| 7 | 49.81 ± 1.66 $^{A}$ | 46.66 ± 2.38 $^{b}$ | 52.01 ± 4.15 | 56.64 ± 1.84 $^{Ab}$ |
| 8 | 57.76 ± 1.86 $^{A}$ | 55.57 ± 2.55 $^{B}$ | 62.54 ± 4.85 | 65.94 ± 2.24 $^{AB}$ |

* S.E **LFU**- Large Field Unit **SFU**-Small Field Unit **CO**-Chicken Offal **RW**- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper casein arrow are significantly different at P<0.05

The mean monthly body weight of pigs calculated by using the formula is given in Table 36. The mean body weight at eight months of age was 57.76 ± 1.86, 55.57 ± 2.55, 62.54 ± 4.85 and 65.94 ± 2.24 kg, respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4). In all the four groups the calculated body weights were less than the actual body weights after three months of age.

Pigs in T4 group put up significantly higher (P<0.05) body weight than the pigs in farm units.

### 4.3.3. Body length of pigs

The mean monthly body length of pigs in the four treatments is given in Table 37. The mean body length at eight months of age was 79.33 ± 0.49, 78.33 ± 1.33, 79.80 ± 1.28 and 82.00 ± 0.96, respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4). The final body length was more in T4 followed by T3, T1 and T2. A significant increase (P<0.05) in body length of the pigs in small field unit was observed.

Table 37. Mean body length of Large White Yorkshire pigs (in cm)

| Age (months) | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 60% + RW 40% |
|---|---|---|---|---|
| 2 | 32.83 ± 0.47* | 32.33 ± 0.66 | 33.66 ± 0.61 | 34.71 ± 0.61 |
| 3 | 42.83 ± 0.30 | 41.83 ± 1.07 | 42.66 ± 0.74 | 43.33 ± 0.42 |
| 4 | 54.83 ± 0.65 | 52.83 ± 1.66 | 54.66 ± 0.84 | 56.66 ± 0.88 |
| 5 | 62.66 ± 0.71 | 60.66 ± 1.78 | 62.66 ± 0.76 | 64.83 ± 1.01 |
| 6 | 70.16 ± 0.74 | 68.00 ± 1.96 | 68.60 ± 0.92 | 71.00 ± 0.63 |
| 7 | 74.83 ± 0.70 $^{A}$ | 73.66 ± 1.68 | 74.60 ± 1.32 | 77.33 ± 0.80 $^{A}$ |
| 8 | 79.33 ± 0.49 $^{A}$ | 78.33 ± 1.33 $^{B}$ | 79.80 ± 1.28 | 82.00 ± 0.96 $^{AB}$ |

* S.E **LFU**- Large Field Unit **SFU**-Small Field Unit **CO**-Chicken Offal **RW**- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

### 4.3.4. Body girth of pigs

Table 38. Mean body girth of Large White Yorkshire pigs (in cm)

| Age (months) | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 60% + RW 40% |
|---|---|---|---|---|
| 2 | 42.83 ± 0.47* | 42.00 ± 0.70 | 41.83 ± 0.70 | 43.00 ± 0.81 |
| 3 | 52.33 ± 1.17 | 51.83 ± 1.49 | 52.50 ± 1.47 | 53.16 ± 0.81 |
| 4 | 60.16 ± 0.30 | 59.00 ± 0.63 | 61.50 ± 1.33 | 61.83 ± 1.10 |
| 5 | 69.33 ± 1.25 $^{A}$ | 67.83 ± 1.57 $^{b}$ | 71.50 ± 2.43 | 73.83 ± 1.01 $^{Ab}$ |
| 6 | 75.33 ± 1.56 $^{a}$ | 75.33 ± 1.60 $^{B}$ | 79.20 ± 3.84 | 81.00 ± 0.85 $^{aB}$ |
| 7 | 83.00 ± 1.31 $^{A}$ | 80.50 ± 1.54 $^{b}$ | 84.80 ± 3.07 | 87.66 ± 1.14 $^{Ab}$ |
| 8 | 87.50 ± 1.33 $^{A}$ | 86.00 ± 1.59 $^{b}$ | 90.80 ± 3.26 | 92.50 ± 1.23 $^{Ab}$ |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

The mean monthly body girth of pigs in the four treatments is shown in Table 38 and Fig 3. Pigs in small field unit (T4) recorded significantly higher (P<0.01) body girth than the pigs fed on hostel food waste in farm (T2) and pigs reared on concentrates (P<0.05).

### 4.3.5. Body height of pigs

Significant difference in body height was observed in fourth and fifth months of age and thereafter no significant difference was noticed between

treatments (Table 39 and Fig 4). At eight months of age the body height of pigs were 56.16 ± 0.30, 54.66 ± 0.98, 55.00 ± 1.14 and 56.83 ± 0.70cm respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4).

Table 39. Mean body height of Large White Yorkshire pigs (in cm)

| Age (months) | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| 2 | 31.66 ± 0.21* | 31.33 ± 0.55 | 31.16 ± 0.74 | 31.16 ± 0.71 |
| 3 | 37.33 ± 0.42 | 37.00 ± 0.73 | 35.66 ± 0.76 | 37.33 ± 0.21 |
| 4 | 44.00 ± 0.63 $^{A}$ | 43.16 ± 0.90 | 41.50 ± 0.71 $^{Ac}$ | 45.50 ± 0.56 $^{c}$ |
| 5 | 50.83 ± 0.40 $^{A}$ | 49.16 ± 1.24 | 47.33 ± 1.11 $^{AC}$ | 50.50 ± 0.56 $^{C}$ |
| 6 | 53.33 ± 0.33 | 52.00 ± 1.21 | 51.00 ± 1.51 | 54.16 ± 0.54 |
| 7 | 54.66 ± 0.21 | 53.66 ± 1.14 | 53.00 ± 1.22 | 55.50 ± 0.67 |
| 8 | 56.16 ± 0.30 | 54.66 ± 0.98 | 55.00 ± 1.14 | 56.83 ± 0.70 |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in arrow are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

### 4.3.6. Average daily weight gain of pigs

The average daily weight of pigs in the four treatments is given Table 40 and Fig 5. Pigs in small field unit (T4) recorded a maximum mean average daily weight gain of 367.13 ± 16.64 and pigs fed on hostel food waste in the

farm (T2) recorded a minimum of 287.96 ± 15.23g. Significant difference in average daily weight gain was noticed from fifth month onwards, but not observed in eight month. Significantly higher mean average daily weight gain was observed in T4 group than pigs in farm units (T1 and T2).

Table 40. Average daily gain of Large White Yorkshire pigs (in g)

| Age (months) | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| 3 | 336.11 ± 14.54 | 322.22 ± 15.90 | 327.78 ± 23.04 | 341.67 ± 15.96 |
| 4 | 344.44 ± 11.11 | 366.67 ± 33.33 | 388.89 ± 47.66 | 383.33 ± 28.22 |
| 5 | 338.89 ± 20.03 $^{B}$ | 288.89 ± 0.49$^{AaB}$ | 438.89 ± 45.87 $^{A}$ | 422.22 ± 18.59$^{a}$ |
| 6 | 333.33 ± 32.20 $^{A}$ | 266.67 ± 14.90 $^{a}$ | 300.00 ± 21.08 $^{b}$ | 433.33 ± 4.34$^{Aab}$ |
| 7 | 305.56 ± 10.24 | 244.44 ± 22.22 $^{a}$ | 306.67 ± 22.11 | 372.22 ± 29.08 $^{a}$ |
| 8 | 250.00 ± 23.95 | 238.89 ± 18.08 | 220.00 ± 29.94 | 250.00 ± 18.76 |
| **Mean** | 318.98 ± 11.09 $^{A}$ | 287.96 ± 15.23 $^{b}$ | 320.00 ± 24.68 | 367.13 ± 16.64$^{A b}$ |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

### 4.3.7. Daily feed intake of pigs

The feed intake of pigs in the four treatments is shown in Table 41 and Fig.6. On fresh weight basis, the maximum consumption of 4.792 ± 0.97kg was in pigs reared in small farm unit (T4) and the minimum of 1.576 ± 0.19kg in pigs fed on concentrate in farm (T1). Significant difference was noticed

between treatments on fresh weight basis but on dry matter basis there was no significant difference between treatments.

Table 41. Daily feed intake (fresh weight (FW) and dry matter (DM) basis, in kg)

| Age (months) | T1 (FARM) Concentrate | | T2 (FARM) Hostel food waste | | T3 (LFU) CO 60% + RW 40% | | T4 (SFU) CO 40% + RW 60% | |
|---|---|---|---|---|---|---|---|---|
| | **FW** | **DM** | **FW** | **DM** | **FW** | **DM** | **FW** | **DM** |
| 3 | 0.970 | 0.863 | 0.890 | 0.225 | 1.080 | 0.283 | 1.250 | 0.305 |
| 4 | 1.110 | 1.077 | 2.980 | 0.754 | 3.010 | 0.775 | 3.000 | 0.736 |
| 5 | 1.410 | 1.255 | 4.180 | 1.058 | 4.080 | 1.056 | 4.330 | 1.072 |
| 6 | 1.980 | 1.762 | 5.200 | 1.316 | 6.010 | 1.578 | 5.920 | 1.448 |
| 7 | 1.990 | 1.770 | 6.100 | 1.544 | 6.590 | 1.735 | 6.670 | 1.647 |
| 8 | 2.000 | 1.779 | 6.500 | 1.645 | 7.270 | 1.869 | 7.580 | 1.815 |
| **Mean** | 1.576 ± 0.19$^{AbC}$ | 1.417 ± 0.16 | 4.308 ± 0.86$^{A}$ | 1.090 ± 0.21 | 4.073 ± 0.97$^{C}$ | 1.216 ± 0.25 | 4.792 ± 0.97 | 1.170 ± 0.23$^{b}$ |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

### 4.3.8. Feed conversion efficiency of pigs

Feed conversion efficiency was the highest (3.221 ± 0.15) in pigs reared on 40per cent chicken offal and 60per cent restaurant waste (T4) with and lowest (4.469 ± 0.16) in pigs fed on concentrate (T1). Feed conversion efficiency of T4 was significantly higher (P<0.01) than T1 group of pigs (Table 42 and Fig 7).

Table 42. Feed conversion efficiency (dry matter basis)

| Age (months) | T1(FARM) Concentrate | T2(FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| 3 | 2.580 ± 0.10 | 0.706 ± 0.03 | 0.883 ± 0.06 | 0.902 ± 0.04 |
| 4 | 3.144 ± 0.10 | 2.141 ± 0.19 | 2.155 ± 0.27 | 1.970 ± 0.13 |
| 5 | 3.773 ± 0.24 | 3.776 ± 0.33 | 2.577 ± 0.33 | 2.565 ± 0.12 |
| 6 | 5.551 ± 0.56 | 5.013 ± 0.28 | 5.358 ± 0.34 | 3.391 ± 0.18 |
| 7 | 5.826 ± 0.20 | 6.614 ± 0.66 | 5.788 ± 0.46 | 4.583 ± 0.41 |
| 8 | 7.437± 0.67 | 7.112 ± 0.61 | 8.936 ± 0.98 | 7.443 ± 0.50 |
| **Mean** | 4.469 ± 0.16 [a] | 3.850 ± 0.25 | 3.894 ± 0.31 | 3.221 ± 0.15 [a] |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

### 4.3.9. Proximate analysis of feed samples

Results obtained in the proximate analysis of feed samples are given in Table 43. Concentrate feed recorded a moisture content of 11.01 ± 0.32per cent and crude protein 17.85 ± 0.22per cent, on dry matter basis. Although, the moisture content of chicken offal was 70.79 ± 1.14per cent crude protein content was highest 35.63 ± 2.77 per cent on dry matter basis. Restaurant waste and hostel food waste recorded almost similar values for moisture and crude

protein. Ether extract recorded maximum in chicken offal and minimum in concentrate feed.

Table 43. Results of proximate analysis of feed samples (dry matter basis)

| Proximate principles | Concentrate | Chicken offal | Restaurant waste | Hostel food waste |
|---|---|---|---|---|
| Moisture | 11.01 ± 0.32 | 70.79 ± 1.14 | 78.79 ± 0.61 | 74.69 ± 1.57 |
| Crude protein | 17.85 ± 0.22 | 35.63 ± 2.77 | 10.95 ± 0.47 | 9.9 ± 0.46 |
| Crude fibre | 8.16 ± 0.44 | 8.61 ± 2.80 | 4.69 ± 0.57 | 4.92 ± 0.67 |
| Ether extract | 8.16 ± 0.47 | 30.9 ± 2.31 | 20.49 ± 1.38 | 18.34 ± 1.57 |
| Ash | 10.12 ± 0.18 | 7.05 ± 0.7 | 10.3 ± 0.86 | 6.08 ± 0.52 |
| NFE | 55.70 ± 1.01 | 15.67 ± 1.81 | 53.58 ± 2.06 | 60.75 ± 1.24 |
| Acid ins. ash | 4.19 ± 0.25 | 2.74 ± 0.35 | 0.91 ± 0.15 | 0.91 ± 0.09 |

### 4.3.10. Carcass characteristics of pigs

The back fat thickness for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4) was 28 ± 0.22, 28.1± 0.2, 37.6 ± 0.22 and 32.7 ± 0.03mm, respectively. Pigs from T3 group recorded significantly higher ($P<0.05$) back fat thickness than that of pigs from farm units.

Table 44. Carcass characteristics of Large White Yorkshire pigs

| Characters | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| Slaughter weight (kg) | 65.33 ± 1.74 $^{A}$ | 60.0 ± 2.79 $^{b}$ | 65.4 ± 4.07 | 73.66 ± 3.15$^{Ab}$ |
| Carcass length (cm) | 63.2 ± 0.2 $^{A}$ | 63.0 ± 0.77 $^{B}$ | 61.5 ± 0.95 $^{C}$ | 65. ± 0.83 $^{ABC}$ |
| Back fat thickness (mm) | 28.00 ± 0.22 $^{A}$ | 28.10 ± 0.20 $^{B}$ | 37.60 ± 0.22 $^{AB}$ | 32.70 ± 0.03 |
| Loin eye area ($cm^2$) | 19.36 ± 2.20 $^{A}$ | 15.85 ± 1.13 | 13.49 ± 0.91 $^{Ab}$ | 17.67 ± 0.80 $^{b}$ |
| Hot carcass weight (kg) | 47.66 ± 1.64 $^{A}$ | 44.16 ± 2.4 $^{b}$ | 49.0 ± 3.69 | 55.66 ± 2.49$^{Ab}$ |
| Dressing percentage | 72.89 ± 0.48 $^{a}$ | 73.45 ± 0.77 $^{B}$ | 74.48 ± 0.99 | 75.52 ± 0.41$^{aB}$ |
| Hot deboned meat (%) | 59.80 ± 1.13 $^{a}$ | 61.39 ± 1.60 | 62.61 ± 2.34 | 64.49 ± 0.64 $^{a}$ |
| Meat bone ratio | 4.06 ± 0.11 $^{AC}$ | 3.53 ± 0.19 $^{ABc}$ | 4.31 ± 0.29 $^{B}$ | 4.40 ± 0.03 $^{Cc}$ |

* S.E LFU- Large Field Unit SFU-Small Field Unit CO-Chicken Offal RW- Restaurant Waste
Figures having same superscript in lower case in a row are significantly different at P<0.01
Figures having same superscript in upper case in a row are significantly different at P<0.05

The maximum loin eye area of 19.36 ± 2.2$cm^2$ was recorded in pigs reared on concentrate (T1) followed by pigs in T4, T2 and T3 treatments with 17.67 ± 0.80, 15.85 ± 1.13 and 13.49 ± 0.91$cm^2$, respectively. The area of loin eye muscle of pigs reared in small field unit on 40 per cent chicken offal and 60 per cent restaurant waste was significantly higher (P<0.01) than that of pigs fed on 60 per cent chicken offal and 40 per cent restaurant waste (T3) and loin eye

area of pigs fed on concentrates (T1) was significantly higher ($P<0.05$) than that of pigs in T3 group.

Pigs from T4 group recorded a maximum hot carcass weight of 55.66 ± 2.49kg which was significantly higher than that of pigs reared on hostel food waste ($P<0.01$) and pigs fed on concentrate in farm ($P<0.05$).

A significantly higher dressing percentage was recorded in pigs from small field unit (T4) compared to that of pigs from farm units (T1 and T2).

Percentage of hot deboned meat was maximum in pigs reared in small field unit and significantly higher ($P<0.01$) than pigs reared on concentrate in farm.

Significant difference in meat bone ratio was observed between different treatment groups. Pigs of T4 group obtained a maximum and pigs fed on hostel food waste obtained a minimum meat bone ratio.

The colour of the lean muscle was bluish pink and firm in consistency. The consistency of back fat thickness was also firm in all the pigs in the four treatment groups.

**4.3.11. Weight of offals of pigs**

The mean weight of offals of pigs in various treatment groups is shown in Table 45. Significant difference was obtained slaughter weight at eight months of age between treatments. In the case of heart, lungs, kidney, spleen,

and stomach and intestine, there was not much difference in weight between treatments. The weight of heart of pigs in the four treatments ranged from 0.31 to 0.38 per cent of the slaughter weight. The weight of lungs of pigs in the four treatments varied from 1.19 per cent to 1.42 per cent of the slaughter weight. In the case of liver the pigs in the small field unit (T4) recorded a maximum weight of 1.61 per cent and minimum of 1.34 per cent in pigs from T2 group.

Table 45. Weight of offal in Large White Yorkshire pigs (in per cent)

| Organs | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60%+RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| Slaughter weight (kg) | 65.33 ± 1.90* | 60.0 ± 2.79 | 65.4 ±4.55 | 73.66 ± 3.15 |
| Heart | 0.38 ± 0.02 | 0.31 ± 0.02 | 0.32 ± 0.03 | 0.32 ± 0.02 |
| Lungs | 1.27 ± 0.04 | 1.27 ± 0.03 | 1.42 ± 0.14 | 1.19 ± 0.07 |
| Liver | 1.40 ± 0.04 | 1.34 ± 0.09 | 1.57 ± 0.12 | 1.61 ± 0.07 |
| Kidney | 0.22 ± 0.01 | 0.26 ± 0.01 | 0.26 ± 0.03 | 0.24 ± 0.02 |
| Spleen | 0.17 ± 0.01 | 0.24 ± 0.02 | 0.22 ± 0.02 | 0.24 ± 0.01 |
| Stomach & intestine | 11.41 ± 0.42 | 12.28 ± 0.39 | 10.38 ± 0.80 | 10.44 ± 0.58 |
| Bone | 14.76 ± 0.44 | 17.49 ± 0.75 | 15.14 ± 0.82 | 14.66 ± 0.17 |

* S.E **LFU**- Large Field Unit **SFU**-Small Field Unit **CO**-Chicken Offal **RW**- Restaurant Waste

### 4.3.12. Formula to calculate body weight from body measurements

A formula was developed to calculate the body weight of pigs from the body length and girth. Formula was derived based on the assumption that the shape of the pig resembles a cylinder. Volume of a cylinder is $\pi r^2 h$, where r is

the radius and h is the height of the cylinder. For the pig height of the cylinder is its length and radius is proportional to the back girth (G). Hence the volume of a pig is proportional to $G^2$ L. The weight of the pig therefore can be written as:

$$W=a+b\,G^2\,L$$

Also it was observed that the correlation between W and $LG^2$ is very high from the fourth month onwards. The coefficient of correlation (r), regression equation and mean squared error (MSS) in estimation are given in Table 46.

Table 46. Coefficient of correlation, regression equation and MSS

| Month | r | Regression equation | MSS |
|---|---|---|---|
| 4 | 0.74 | $W=8.6+LG^2/10674$ | 1.47 |
| 5 | 0.88 | $W=10.55+LG^2/11509$ | 1.17 |
| 6 | 0.89 | $W=12.62+LG^2/12421$ | 1.30 |
| 7 | 0.92 | $W=14.13+LG^2/11927$ | 1.18 |
| 8 | 0.89 | $W=17.15+LG^2/13982$ | 1.82 |

### 4.4. Economics of pig production systems

The cost of production of Large White Yorkshire pigs in the four treatments is given in Table 47. The cost involvement was the highest in T1 group, which was fed on concentrate in the farm. The minimum cost was recorded in T4, which was reared on 40 per cent chicken offal and 60 per cent

restaurant waste in a small unit in the field. Except T1 all the treatment groups gained profit. The cost of production of one kg live weight was Rs 54.66, 26.07, 15.26 and 12.64 for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4), respectively.

Table 47. Cost of production of pigs in the four treatment groups (in Rupees)

| ITEMS | T1 (FARM) Concentrate | T2 (FARM) Hostel food waste | T3 (LFU) CO 60% + RW 40% | T4 (SFU) CO 40% + RW 60% |
|---|---|---|---|---|
| **CAPITAL COST** | | | | |
| Cost of housing | 45,795.42 | 45,795.42 | 7,000.00 | 4,500.00 |
| Interest on capital cost | 2,289.77 | 2,289.77 | 350.00 | 225.00 |
| **OPERATIONAL COST** | | | | |
| Cost of piglets (@ Rs 90 per kg) | 4,274.64 | 4,406.40 | 4,228.20 | 4,093.20 |
| Cost of feed | 1,2260.16 | - | - | - |
| Labour charge | 2,250.00 | 2,250.00 | 850.00 | 700.00 |
| Treatment charge | 250.00 | 250.00 | 300.00 | 350.00 |
| Freight charge | 100.00 | 190.00 | 260.00 | 220.00 |
| **RECEIPTS** | | | | |
| Sale of pigs (@ Rs. 30/ kg live weight) | 11,759.40 | 10,800.00 | 11,772.00 | 13,258.80 |
| Cost of manure | 250.00 | 100.00 | 100.00 | 100.00 |
| **COST OF PRODUCTION** | | | | |
| Cost of production | 21,424.57 | 9,386.17 | 5,988.20 | 5,588.20 |
| Cost of production (per kg live weight) | 54.66 | 26.07 | 15.26 | 12.64 |
| Profit/loss | -9,415.17 | +1,513.83 | +5,883.80 | +7,770.60 |

**LFU**- Large Field Unit **SFU**-Small Field Unit **CO**-Chicken Offal **RW**- Restaurant Waste

# *Discussion*

# 5. DISCUSSION

The results obtained in the productivity and feasibility study of pig production systems in the rural sector is discussed here.

## 5.1. Existing conditions of pig production in rural sector

From the survey it was observed that out of the 103 respondents, 11.65per cent were pig farmers, 35.92per cent were people interested in pig farming and the rest were not interested in pig farming in Kaiparambu Panchayath. In Kuzhoor Panchayath, out of the 80 respondents interviewed ten per cent were pig farmers, 53.75per cent were people interested in pig farming and the rest (36.25per cent) were not interested in pig farming.

### 5.1.1. Sociological status of pig farmers

#### 5.1.1.1. Age group of pig farmers

In both Kaiparambu and Kuzhoor Panchayaths pig farmers aged below 30 years were few, *i.e.,* 16.67per cent and 25per cent, respectively. Majority was above 50 years of age in Kaiparambu and between 31 and 50 years in Kuzhoor. This may be due to the lack of interest of youngsters in pig farming.

#### 5.1.1.2. Religion of pig farmers

Christian population dominated among pig farmers in the two Panchayaths. Non-Muslim participation was evident in both areas. This

observation is in agreement with the report of Duru *et al.*, (1999). In both Panchayaths population of Christians were more than the Hindus and Muslims put together and this reflected in the present study.

### 5.1.1.3. Occupation of pig farmers

In Kuzhoor Panchayath all the pig farmers were engaged in agriculture or allied activities, but in Kaiparambu majority, 66.67per cent was employed personnels. This situation in Kaiparambu is in accordance with the report of Duru *et al.*, (1999), who observed that 73.33per cent of the pig farmers in Northern Zaria were civil servants, students or traders. Kuzhoor Panchayath is more agriculture oriented compared to Kaiparambu. This can be the reason for the large proportion of pig farmers in Kuzhoor with agriculture background.

### 5.1.1.4. Educational status of pig farmers

Educational standard of pig farmers was higher in Kaiparambu and Kuzhoor. It was observed that only a few were having education below matriculation, *i.e.* 16.67per cent in Kaiparambu and 37.5per cent in Kuzhoor. This observation supports the report of Chylek *et al.*, (1996), and Panday and Ram Kumar, (1999). The high literacy level of people in Kerala may be the reason for the higher educational status of the pig farmers in these Panchayaths.

### 5.1.1.5. Economic status of pig farmers

In this agriculture based Panchayaths the average monthly income of family was between Rs 2001 and 4000. About 33.33per cent pig farmers in Kaiparambu and 50per cent in Kuzhoor were with monthly income below Rs 2000. This is in agreement with the observation of Panday and Ram Kumar, (1999). This finding is indicative of relatively more involvement of low income groups in pig farming in rural areas as a source of extra income.

### 5.1.1.6. Family size of pig farmers

Majority of the pig farmers in Kaiparambu and Kuzhoor Panchayaths were from small families with less than five members. In Kerala, joint family system is getting reduced and nuclear families are coming up nowadays. This may be the reason for the observation in the present study.

### 5.1.1.7. Land share of pig farmers

It was found that 50per cent pig farmers in Kaiparambu and 62.5per cent in Kuzhoor were having land holdings above 100 cents. Those having land share below 50 cents were 33.33per cent in Kaiparambu and none in Kuzhoor. The observation in the present study is in contrast to Duru *et al.*, (1998) and Vlieger *et al.*, (2001), who reported the limitation of land for pig farming in their respective study areas. Availability of land is not a limiting factor in these Panchayaths and is a favourable factor for pig production. Per

capita land holding of pig farmers in the two Panchayaths is relatively higher when the population and land availability of Kerala is concerned.

### 5.1.2. Type of animals

#### 5.1.2.1. Pigs

##### 5.1.2.1.1. Breeds of pigs

Exotic breeds like Large White Yorkshire were common in both Panchayaths. Presence of indigenous and crossbred pigs was negligible. This observation is in agreement with the report of Ravindran *et al.*, (1995), but in contrast to the observation of Rohilla *et al.*, (2000), who reported that small and marginal farmers of North East hill region of India raised local breeds. This is probably due to the fact that, exotic breeds have better growth rate, carcass characteristics and are economically viable compared to indigenous ones. Proximity of reputed pig farms of Kerala Agricultural University, Animal Husbandry Department and Kerala Livestock Development Board is also a major factor for this high proportion of exotic breeds of pigs in and around Thrissur.

##### 5.1.2.1.2. Source of pigs

Large pig farms were the major source of pigs for pig farmers in Kaiparambu and Kuzhoor Panchayath. This is in agreement with the report of Duru *et al.*, (1999). Pigs procured from large farms have better qualities than those from small farms. Since large farms of Kerala Agricultural University,

Animal Husbandry Department and Kerala Livestock Development Board are nearby, pig farmers preferred them for quality pigs and piglets.

#### 5.1.2.1.3. Herd strength of pigs

Majority of the pig farmers in Kaiparambu and Kuzhoor Panchayaths were marginal pig farmers with herd strength below ten. This observation is in accordance with the reports of Salehar *et al.,* (1997) and Zhang XiaoHui and Zhang, (1998). The herd strength reported by Ravindran *et al.,* (1995) and Hsieh ChiaHui *et al.*, (1997) is in contrast to the observations in the present study. The low herd strength of pigs was due to the fact that, in Kerala large scale pig production in commercial sector is still in the cradle stage.

### 5.1.2.2. Domestic animals other than pigs

Other than pigs, cattle and poultry dominated among domestic animals. 50per cent of the pig farmers in Kaiparambu and 37.5per cent in Kuzhoor possessed cattle, poultry owners were 58.33per cent and 87.5per cent, respectively. Goat rearing was not so popular among pig farmers and only 8.33per cent in Kaiparambu were having buffaloes. In Kerala among the livestock, cattle formed the largest share of 60.90per cent, goats 33.36per cent, buffaloes 2.96per cent and other livestock 2.79per cent. The observations on the distribution of domestic animals from the two Panchayaths are quite similar to that of the present state scenario.

### 5.1.3. Reasons for pig farming

A good majority of the pig farmers in Kaiparambu and Kuzhoor Panchayaths found pig farming as source of extra income and as suitable method for utilizing organic wastes effectively. The observation in the present study is in agreement with Taneja, (1998) who reported that pig farming as a source of extra income.

### 5.1.4. Management practices

#### 5.1.4.1. Feeding of pigs

##### 5.1.4.1.1. Type of feeding

Majority of the pig farmers irrespective of Panchayaths depended on swill feeding. A combination of kitchen/restaurant waste and slaughterhouse wastes was mainly used. The observations of Ravindran *et al.* (1995), Fanimo and Tewe (1996) and Sharma *et al.* (1997) agree with the observation in the present study. The low cost and easy availability of the swill feed makes it the suitable unconventional feed for feeding pigs in rural sector since feeding based on commercial feed is not economically feasible. Besides this feeding pigs with organic wastes can reduce environmental pollution to a substantial level.

##### 5.1.4.1.2. Distance to feed source

Majority of the pig farmers in both Panchayaths collected pig feed from restaurants, slaughterhouses and households with in ten kilometer of

distance. Here the cost involved in the transportation of feed is less, so the cost of production can be cut down marginally.

#### 5.1.4.2. Housing

In Kaiparambu, 33.33per cent of the pig farmers and 50per cent in Kuzhoor had only temporary housing for pigs. Duru *et al.* (1999) observed that 55per cent of the pig farmers in Northern Nigeria used mud houses. Construction cost of housing is very high, so in economic point of view, low cost housing structures are most suited for pig production in rural sector.

#### 5.1.4.3. Breeding of pigs

It was observed that none of the pig farmers in the two Panchayaths reared their pigs for breeding alone. But 16.67per cent of the pig farmers in Kaiparambu and 12.5per cent in Kuzhoor reared pigs for fattening and breeding and the rest for fattening only. In contrast to this Duru *et al.*, (1999) reported that 31.67per cent of the pig farmers in Northern Nigeria did not keep boars for breeding. Probably the extra care and management and high mortality rate of piglets may be the reasons for lack of interest in pig breeding.

#### 5.1.4.4. Health problems

##### 5.1.4.4.1. Occurrence of diseases

The frequency of occurrence of diseases in pigs observed by the farmers was less. Occasional diseases were noticed by 66.67per cent and 75

per cent of the pig farmers in Kaiparambu and Kuzhoor, respectively. Relatively better management practices, proximity of veterinary service and maintenance of hygiene can be the reasons for the low frequency of diseases among pigs.

**5.1.4.4.2. Common diseases of pigs**

Digestive disorders were the most common disease condition encountered by the pig farmers in both Panchayaths. Respiratory and reproductive problems were also noticed among pigs. Only 8.33per cent of pig farmers in Kaiparambu and 25per cent in Kuzhoor reported skin problems in pigs. In Kaiparambu 41.67per cent and in Kuzhoor 37.5per cent complained about other conditions like parasitic problems, piglet mortality and maggot wounds. These observations agree with the reports of Srinongkote *et al.*, (1992), Wagner and Polley, (1997) and Duru *et al.*, (1999). Feeding pigs with degraded swill feed can be the probable reason for the high frequency of digestive disorders. This can be prevented by steam cooking of the feed prior to feeding.

**5.1.4.4.3. Distance to veterinary aid centre**

All the pig farmers could avail veterinary services within five kilometer in their own Panchayath itself. In Kerala, veterinary dispensaries and hospitals are available in each Panchayaths, hence veterinary service is not a limiting factor for pig rearing in the two Panchayaths.

### 5.1.4.5. Marketing of pigs

None of the pig farmers in Kaiparambu and Kuzhoor found marketing as a problem. In contradictory to this, Agwu, (1999) reported poor marketing conditions in pig farmers in Northern Zaria. Majority of the population in Kerala are non-vegetarians, so marketing of meat and meat products is not a problem in Kerala. It was observed that 75per cent of the pig farmers in Kaiparambu and 87.5per cent in Kuzhoor followed the sale of pigs on live weight basis, because the labour involvement and the investment required were less compared to the sale of pigs as pork. This observation is in agreement with the report of Duru *et al.*, (1999). Sale of pigs as value added products fetch more profit so that should be encouraged in rural areas.

### 5.1.4.6. Labour utilization

Utilization of family input in farming activities was evident in both Panchayaths. Only 16.67per cent in Kaiparambu relied on labourers from outside the family. Family participation reduces the labour cost and makes the farming easy, profitable and suitable for rural sector.

### 5.1.4.7. Knowledge level of pig farmers

#### 5.1.4.7.1. Experience in pig farming

It was observed that 41.67per cent of pig farmers in Kaiparambu and 12.5per cent in Kuzhoor were having experience between eight to twelve years.

#### 5.1.4.7.2. Training

Only 8.33per cent of the pig farmers in Kaiparambu alone have got training on pig husbandry. In Kuzhoor nobody has got an opportunity to attend training in pig husbandry. Lack of sufficient extension activities related to pig farming in this area may be the reason for this. So pig farmers are not much exposed to modern practices in pig farming.

#### 5.1.4.7.3. Training requirement

Pig farmers in Kaiparambu and Kuzhoor Panchayaths have shown interest to obtain training. Selection of pigs, breeding, feeding, disease control, meat processing were the major topics of interest. In Kaiparambu, 83.33per cent of pig farmers and 75per cent in Kuzhoor were interested to get information on feeding. Probably the higher level of education may be the motivation for gathering knowledge and to improve the husbandry practices in pig farming.

### 5.1.4.8. Adoption level of scientific management practices

Percentage of pig farmers following scientific practices in pig farming was high in both Panchayaths. Regular deworming, maintenance of hygiene, proper disposal of wastes, timely treatment was practiced over 75per cent of the pig farmers in Kaiparambu and Kuzhoor. But farmers following preventive measures like vaccination, iron injection were lower in both Panchayaths. This is in accordance with the report of Duru *et al.*, (1999), who

reported that 91per cent of the pig farmers in Northern Nigeria dewormed their herd twice a year but in contrast to the case of cleaning and manure disposal. Pig farmers are nowadays aware about the importance of hygienic and economic pig production, but preventive measures in pig farming are not much popularized among them in rural areas.

### 5.1.4.9. Constraints

#### 5.1.4.9.1. Constraint in pig farming

In Kaiparambu and Kuzhoor Panchayaths the major problem faced by the pig farmers were financial, social and the shortage in the availability of piglets. None of the farmers found marketing of pigs as a problem and this is in contrast to the report of Agwu, (1999).

#### 5.1.4.9.2. Problems associated with pig rearing

The common problem encountered by pig farmers in the two Panchayaths were environmental and health problems. This observation is in agreement with the report of Saadullah and Saad, (2000). Pig rearing close to human settlements results in objections.

### 5.1.4.10. Sources of financial assistance

Majority of the pig farmers in the two Panchayaths depended on their own investment to setup the piggery units. The rest relied on government

agencies, banks and private firms for the initial expenditure. Financial burden is the major obstacle in pig farming in rural sector.

#### 5.1.4.11. Interest in developmental activities

In both Kaiparambu and Kuzhoor, a good majority of the pig farmers were interested in developmental activities in pig farming. In Kaiparambu, 50per cent of the pig farmers and 85.5per cent in Kuzhoor were interested in integrated farming and all the farmers in Kuzhoor Panchayath shown interest in pig farming on co-operative setup. The reason for this is an already existing co-operative network among poultry farmers in that area. About 33.33per cent of pig farmers in Kaiparambu and 75per cent in Kuzhoor were interested in biogas plant installation, 83.33per cent of them in Kaiparambu and 87.5per cent in Kuzhoor were interested in expansion of the existing piggery units. Integrated farming centered on pigs, now gaining attention among pig farmers and this can be a reason for the interest of pig farmers in integrated farming.

### 5.2. Feasibility of pig production in rural sector

#### 5.2.1. Feasibility scores on sociological parameters

In both Kaiparambu and Kuzhoor Panchayaths, pig farmers and people interested in pig farming scored high for sociological factors favouring pig production in rural sector. The average score per farmers was 21.25 in Kaiparambu and 25.12 in Kuzhoor. In Kaiparambu, 75per cent of the pig farmers and 62.5per cent in Kuzhoor scored between 21 and 25 against the

maximum score of 33 and minimum 10. People interested in pig farming also scored well. The high level of existing sociological status of pig farmers and the people interested in pig farming indicates a high feasibility of pig production in rural sector.

### 5.2.2. Feasibility score of pig farmers in pig farming

The total feasibility score on pig farming was 227 and 153 for Kaiparambu and Kuzhoor, respectively. In Kaiparambu 75per cent of the pig farmers and in Kuzhoor 62.5per cent scored between 16 and 20, when the maximum score was 25 and minimum 9. The standard of existing pig farming practices is high in both Panchayaths and this resulted in the higher feasibility scores.

This also indicates that the high feasibility for pig production in the two Panchayaths with respect to the sociological status of the pig farmers, people interested in pig farming and existing practices in pig farming.

### 5.2.3. Feed resource potential and feed utilization efficiency in rural sector

It was estimated that about 1680kg of organic wastes including household waste, restaurant waste and waste of animal origin from slaughterhouses and poultry farms produced daily in Kaiparambu and 1720kg in Kuzhoor Panchayath. The existed pig population was 172 and 84, respectively for Kaiparambu and Kuzhoor. Pigs consume approximately four

kilogram of organic wastes per day. Based on this assumption, the possible number of pigs that can be reared in the two Panchayaths are 420 in Kaiparambu and 430 in Kuzhoor. This indicates that only 40.95per cent of the available resource in Kaiparambu and 19.53per cent in Kuzhoor are utilized currently. So by effective utilization of the resource potential, the number of pigs that can be reared can be increased to many folds.

## 5.3. Comparative study between pigs reared in organized farm and field units

### 5.3.1. Body weight of pigs

The body weight of pigs at eight months of age in the four treatments were 65.33 ± 1.9, 60 ± 2.79, 65.4 ± 4.55 and 73.66 ± 3.15kg, respectively for pigs fed on concentrate ration (T1), hostel food waste (T2), pigs in large field unit reared on 60per cent chicken offal and 40per cent restaurant waste (T3) and pigs fed on 40per cent chicken offal and 60per cent restaurant waste (T4). Pigs in the T4 group gained significantly higher ($P<0.01$) body weight at eight months of age compared to T1 group of pigs and T2 group of pigs ($P<0.05$). Rohilla *et al.*, (2000) reported a body weight of 54.75 ± 1.7kg in Large White Yorkshire pigs at eight months of age, which is lower than the present observation in T1 group. In contrast to this Prabhakar, (1984) and Singh *et al.*, (1997) reported higher body weights. The pigs fed on chicken offal and restaurant waste gained more body weight due to relatively higher protein

content of 35.63 ± 2.77per cent and ether extract of 30.9 ± 2.31per cent. Pigs reared on hostel food waste recorded the minimum body weight due to lower content of animal protein in hostel food waste.

### 5.3.2. Calculated body weight of pigs

The body weights of pigs were calculated by a formula based on body length and girth. In all the groups calculated body weight were less than the actual body weights after three months of age. Calculated body weight at eight months of age was found to be lower than the actual body weight by a reduction of 11.58per cent in pigs fed on concentrate (T1), 7.4per cent in pigs reared on hostel food waste, 4.38per cent in pigs reared in large field unit (T3) and 10.48per cent in pigs reared in small field unit (T4). The formula used is based on body length and girth only. This can be the reason for the reduction in calculated body weights compared to the actual weights.

### 5.3.3. Body length of pigs

Among the four treatments a maximum body length of 82 ± 0.96cm was recorded in pigs reared in small field unit (T4) and a minimum of 78.33 ± 1.33 cm in pigs reared on hostel food waste (T2). The body length at eight months of age was significantly higher ($P<0.05$) in pigs in small field unit (T4), compared to that of the pigs in farm units. The result obtained in pigs reared on concentrate (T1) was lower than that reported by Suraj, (2000). The

body length is proportional to body weight so, a maximum body length is recorded in group having a maximum body weight.

### 5.3.4. Body girth of pigs

In the case of body girth also, pigs reared in small field unit (T4) recorded a maximum value of 92.5 ± 1.23cm. The lowest body girth of 86.0 ± 1.59cm was observed in pigs fed on hostel food waste (T2). The body girth of pigs in T4 group was significantly larger ($P<0.01$) than that of pigs fed on hostel food waste (T2) and concentrate (T1). Body girth was proportional to the body weight so, pigs in T4 group with highest body weight recorded a maximum body girth.

### 5.3.6. Average daily weight gain of pigs

The average daily weight gain was significantly higher in pigs fed on 40per cent chicken offal and 60per cent restaurant waste, than that of pigs reared in the farm (T1 and T2). Suraj, (2000) recorded a mean average daily gain of 420 ± 63g and Rohilla *et al.*, (2000) reported 335.45 ± 17.45g which were higher than the values obtained in concentrate fed pigs in the present study. Ravi and Krishna Reddy, (1997) obtained average daily weight gain of 114g in indigenous pigs, which was much lower than the values obtained in pigs reared on unconventional feed. Singh *et al.*, (1999) observed average daily weight gain of 283.96 ± 6.14g and Fanimo and Tewe, (1996) reported 287g, which were lower than the observations in the present study. In all the

groups the average daily gain was the lowest at eight months of age and this may be due to the reduced growth rate in adult pigs.

### 5.3.7. Daily feed intake of pigs

Gradual increase in the daily feed intake was noticed in the four treatment groups. The T4 group of pigs reared on 40per cent chicken offal and 60per cent restaurant waste consumed a maximum feed at the rate of 4.792 ± 0.97kg per day on fresh weight basis and a minimum of 1.576 ± 0.19kg in pigs reared on concentrate (T1). On dry matter basis no significant difference was noticed. The value obtained in T1 group of pigs was lower than that reported by Suraj, (2000). The average daily feed intake noticed in unconventional feeding was in contrast to the report of Ravi and Krishna Reddy, (1997). In the present study unconventional feed used consisted of chicken offal, restaurant waste and hostel food waste. The composition of the feed changed daily and the dry matter content was 25 to 30per cent only, hence they have to consume more feed on fresh weight basis to meet the dry matter requirement.

### 5.3.8. Feed conversion efficiency of pigs

The mean of feed conversion efficiency of T4 group of pigs fed on 40per cent chicken offal and 60per cent restaurant waste was a maximum of 3.221 ± 0.15 on dry matter basis and a minimum of 4.469 ± 0.10 in concentrate fed pigs (T1). The feed efficiency of pigs in T1 group was lower

than that reported by Suraj, (2000). The results obtained in unconventional feeding in the present study were in contrast to the observations of Ravi and Krishna Reddy, (1997). The unconventional fed in this study consisted of mainly chicken offal, restaurant waste and hostel food waste. The crude protein and ether extract content of chicken offal was higher than that of concentrate feed. In restaurant waste and hostel food waste the NFE content was higher. This can be the reason for higher feed conversion efficiency of pigs fed on unconventional feed compared to concentrate fed group.

**5.3.9. Proximate analysis of feed**

The moisture content of all the feed other than concentrate varied between 70 and 78per cent. Concentrate ration was having moisture 11.01 ± 0.32per cent, crude protein 17.85 ± 0.22per cent, crude fibre 8.16 ± 0.44per cent, ether extract 8.16 ± 0.47per cent, ash 10.12 ± 0.18per cent and NFE 55.70 ± 1.01per cent. Chicken waste recorded highest crude protein content of 35.63 ± 2.77per cent, but restaurant waste and hostel food waste recorded 10.95 ± 0.47 and 9.90 ± 0.46, respectively. Crude fibre content of chicken waste was 8.61 ± 2.80 and 4.69 ± 0.57 and 4.92 ± 0.67per cent, respectively for restaurant and hostel waste. The composition of restaurant and hostel waste was found similar to that reported by Ravi and Krishna Reddy, (1997). Fanimo and Tewe, (1996) recorded crude protein content of 60.08per cent in chicken offal meal, which is higher than the value obtained in the present study. Chicken waste mainly consisted of alimentary tract and skin excluding

feathers. Subcutaneous fat can be the reason for the high ether extract content. Chicken waste and restaurant waste can effectively replace commercial feed in pig feeding.

### 5.3.10. Carcass characteristics of pigs

The slaughter weight of pigs in small field unit (T4) was significantly higher ($P<0.01$) than that of pigs fed on hostel food waste (T2) and pigs fed on concentrate (T1) ($P<0.05$).

Carcass length of pigs in small field unit (T4) was significantly higher ($P<0.05$) than other pigs. The carcass length of pigs fed on concentrate (T1) was found lower than that reported by Singh *et al.*, (1997) and Singh *et al.*, (1998) but higher than the carcass length reported by Mili *et al.*, (1999). Carcass length is proportional to body length, so pigs with a maximum body length (T4) measured a maximum carcass length of $65 \pm 0.83$cm.

The back fat thickness of pigs reared on 60per cent chicken offal and 40per cent restaurant waste was significantly higher ($P<0.05$) than that of pigs reared on concentrate ration (T1) and pigs fed on hostel food waste (T2). Saseendran, (1979), Rohilla *et al.*, (2000) reported a lower back fat thickness in exotic pigs reared on concentrate feed. This is in contrast to the results of T1 in the present study. The reports of Singh *et al.*, (1998), Jha *et al.*, (1999) are in accordance with the observation of T1. The back fat thickness obtained by Prabhakar, (1984) was slightly higher than the result obtained for T1. On

unconventional feeding Prabhakar, (1984) recorded a back fat thickness of 3.10 ± 0.63cm in indigenous pigs which is similar to the value obtained for T4, but lower than T3. The value recorded by Jha *et al.*, (1999) is lower than the present study. The pigs of T3 and T4 groups recorded relatively higher back fat thickness due to the consumption of chicken waste. The higher level of fat content and metabolisable energy of the chicken offal may be reason for the increased fat synthesis in pigs from the field units.

In the present study loin eye area recorded was 19.36 ± 2.20, 15.85 ± 1.13, 13.49 ± 0.91 and 17.67 ± 0.80cm$^2$ for T1, T2, T3 and T4 respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4). Pigs reared in farm on concentrate ration recorded significantly higher loin eye area than pigs in T1 and T3 groups. Saseendran (1979) obtained a loin eye area of 25.25cm$^2$ in exotic pigs, Singh *et al.* (1979) reported loin eye area of 28.23 ± 0.64cm$^2$ in Large white Yorkshire pigs, Singh *et al.* (1998) observed 26.33 ± 0.55cm$^2$ in conventional type of feeding. These values were higher than the T1 group in the present study. In unconventional type of feeding, Prabhakar, (1984) obtained loin eye area of 16.56 ± 4.89cm$^2$ in indigenous pigs, Jha *et al.*, (1999) measured loin eye area of 15.31 ± 0.68cm$^2$. These observations are in agreement with the results obtained in the present study. Pigs fed on chicken offal and restaurant waste recorded a minimum loin eye area due to relatively high back fat thickness. The higher level of fat content and metabolisable

energy of the chicken offal and the higher NFE content of restaurant waste may be the reasons for this.

Hot carcass weight recorded was maximum in T4, 55.66 ± 2.49kg and the minimum 44.16 ± 2.4kg for T2 group of pigs. Significant difference at $P<0.01$ was noticed between pigs of T2 and T4. T1 and T2 were significantly different at $P<0.01$. The carcass weight of T1 was lower than that reported by Prabhakar, (1984), Jha *et al.*, (1999) and Singh *et al*, (1999), but higher than that of Rohilla *et al.*, (2000). The comparison of T1 with T3 and T4 agrees with the findings of Chen YieShiung *et al.*, (1997) who reported that carcass weight of pigs fed on complete feed was higher than swill fed group.

A maximum dressing percentage of 75.52 ± 0.41 was recorded in pigs in small field unit (T4) with and a minimum of 72.89 ± 0.48 in pigs fed on concentrate ration (T1). Pigs in T4 group recorded significantly higher ($P<0.01$) dressing percentage than that of pigs in T1 and that pigs fed on hostel food waste (T2) ($P<0.05$). Dressing percentage of pigs in T1 group is in agreement with that of Saseendran, (1979), Bhadoria, (1996), Singh *et al.*, (1998) and Jha *et al.*, (1999). Pigs reared on unconventional feed had a dressing percentage of 73.34 ± 1.40 (Prabhakar, (1984), 71.44 to 73.05per cent (Somanadha Sarma and Subba Reddy, (1997) and 70.41 ± 0.11 (Jha *et al.*, (1999), and these observations are found to be lower than the results obtained in pigs fed on unconventional feed. Low dressing percentage in T1 group was due to low carcass yield compared to other treatments.

Hot deboned meat was 59.80 ± 1.13, 61.39 ± 1.60, 62.61 ± 2.34 and 64.49 ± 0.64per cent of the slaughter weight in pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4), respectively. Pigs in small field unit (T4) had significantly higher ($P<0.01$) hot deboned meat than pigs in T1 group.

The meat bone ratio of pigs of four treatments are 4.06 ± 0.11, 3.53 ± 0.19, 4.31 ± 0.29 and 4.40 ± 0.03 for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units (T3) and small field units (T4), respectively. Significant differences were noticed between treatments in meat bone ratio.

The colour of the lean muscle was bluish pink and firm in consistency. The consistency of back fat thickness was also firm in all the pigs in the four treatments.

**5.3.11. Weight of offals**

The pigs reared in small field unit (T4) recorded a maximum slaughter weight of 73.66 ± 3.15kg and pigs fed on hostel food waste (T2) gained a minimum of 60.00 ± 2.79 kg. Weight of heart, lungs, liver, kidney and spleen of pigs did not vary considerably between treatments. The higher weight of stomach and intestine may be due to improper fasting before slaughter. Weight of bone of pigs was maximum when reared on hostel food waste and minimum in pigs reared in small field unit.

### 5.3.12. Formula to calculate body weight from body length and girth

It was found that length and girth has a very high correlation between body weights. So body length and girth was taken to derive the formula to calculate body weight from body measurements.

### 4.4. Economics of pig production systems

The cost of production was the highest, Rs 21,424.57 in pigs fed on concentrate in farm (T1) and the lowest, Rs 5588.20 in pigs reared in small field unit on 40per cent chicken offal and 60per cent restaurant waste (T4). Cost of production of one kg live weight was Rs 54.66, 26.07, 15.26 and 12.64, respectively for pigs fed on concentrate ration in farm (T1), hostel food waste in farm (T2), pigs in large field units fed on 60per cent chicken offal and 40per cent restaurant waste (T3) and in small field units fed on 40per cent chicken offal and 60per cent restaurant waste (T4). This observation is in agreement with the report of Ravi and Krishna Reddy, (1997), but in contrast to the report of Rajiv Jain and Panday, (1998). Pigs maintained on concentrate ration recorded a loss of Rs 9,415.17, but unconventional feeding was found profitable. This is due to the fact that a considerable amount of money was required for t housing in the farm and along with this cost of feed was also a contributing factor. But in contrary to this, pig farms in field invested very less in housing and feeding of pigs.

# *Summary*


# 6. SUMMARY

The productivity and feasibility of pig production systems were studied in rural sector of Kerala. The study on feasibility of pig production and problems and prospects associated with pig farming was conducted in Kaiparambu and Kuzhoor Panchayaths in Thrissur district of Kerala. The performance of Large White Yorkshire pigs in organized farms and field units was studied. Four groups of six Large White Yorkshire weaned piglets each were selected and allotted to one of the following four treatments. Pigs in T1 group were reared on standard concentrate ration in the organized farm, T2 group of pigs were fed on hostel food waste in the organized farm, T3 group maintained in large field unit on unconventional feed consisted of 60% chicken offal and 40% restaurant waste and the T4 group of pigs were maintained on small field unit on 40% chicken offal and 60% restaurant waste for a period of six months. On attaining eight months of age, all the pigs were slaughtered and growth performance and carcass characteristics were analysed.

It was observed that in both Panchayaths the socio-economic and educational status of the pig farmers were higher. The major occupations of the pig farmers were agriculture and allied activities. Exotic pigs purchased from large farms were the main stock of majority of the pig farmers in both Panchayaths. The feeding and housing followed were cost effective and suited well for the rural sector. Health problems were only occasional and digestive disorders were predominant.

Social problems and other constraints encountered by the pig farmers were found to be minimum in both Panchayaths. Pig farmers followed scientific practices to a certain extent and were interested in developmental activities of their piggery units.

It was observed that a high feasibility for pig production in both Panchayaths with respect to the sociological parameters of pig farmers and pig farming practices existed. Majority of the pig farmers scored a high feasibility score on factors influencing pig production favourably. The resource utilization efficiency of the existing pig production was only 40.95per cent and 19.53per cent, respectively in Kaiparambu and Kuzhoor Panchayaths.

In the comparative study on the performance of Large White Yorkshire pigs, it was observed that pigs in the field units performed better than those kept in organized farm in the case of body weight gain. The slaughter weight at eight months of age was 65.33 ± 1.74, 60.0 ± 2.79, 65.4 ± 4.07 and 73.66 ± 3.15 kg, respectively for pigs fed on concentrate, hostel food waste, 60per cent chicken offal and 40per cent restaurant waste and 40per cent chicken offal and 60per cent restaurant waste. A significantly higher body weight was recorded in T4 group of pigs than T2 ($P<0.01$) and T1 ($P<0.05$) groups of pigs. Body weight was also calculated using a formula based on body measurements. Pigs in the small field unit fed on 40per cent chicken offal and 60per cent restaurant waste recorded maximum body measurements followed by T3, T1 and T2 groups, respectively.

The average daily weight gain was a maximum of 367.13 ± 16.64g in pigs of T4 group and was significantly higher ($P<0.01$) than that of pigs reared on

hostel food waste (287.96 ± 15.23g). The daily dry matter feed intake was almost similar in all the groups but feed efficiency of pigs fed on 40per cent chicken offal and 60per cent restaurant waste group was better than other groups.

Carcass characteristics of pigs in the four treatment groups were studied and observed that pigs fed on 40per cent chicken offal and 60per cent restaurant waste attained a dressing percentage of 75.52 ± 0.41 compared to 72.89 ± 0.48 in pigs fed on concentrate. The performance of pigs in T1 group was better than other pigs in the case of loin eye area, meat bone ratio and back fat thickness. Hot carcass weight was lowest in T2 group and highest in T4 group of pigs. Pigs in T4 group scored a maximum weight in individual visceral organs and carcass length.

The analysis of feed samples revealed that moisture content was higher in feed samples except in concentrate feed. Chicken waste recorded maximum value for crude protein content and ether extract. Nitrogen Free Extract content was higher in concentrate, chicken offal and restaurant waste.

Cost involved in feeding was negligible on unconventionally fed groups of pigs. Small farm unit in the field registered a minimum cost of production of Rs. 12.64 per kg live weight of pigs and the maximum of being Rs. 54.66 in organized farm on concentrate feeding. Cost of housing was also negligible in field units compared to that of farm units.

It was observed from the present study that a higher level of productivity and feasibility of pig production existed in the two Panchayaths studied. The

performance of pigs reared in small field unit on 40per cent chicken offal and 60per cent restaurant waste was found better than other groups of pigs.

From the present study we could conclude that suitable environment for pig production is existing in the rural sector and by exploiting the resource potentials with a scientific approach we will be able to transform the pig production in the rural sector to a viable and profitable industry.

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# PRODUCTIVITY AND FEASIBILITY OF PIG PRODUCTION SYSTEMS IN RURAL SECTOR

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## ABSTRACT OF A THESIS

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# ABSTRACT

The productivity and feasibility of pig production systems were studied in the rural sector of Kerala. The study on feasibility of pig production and problems and prospects associated with pig farming was conducted in Kaiparambu and Kuzhoor Panchayaths in Thrissur district of Kerala. The performance of Large White Yorkshire pigs in organized farms and field units was compared.

Majority of the pig farmers were having higher educational and economic status and were equipped with potential and facilities for economic pig production. The management practices were cost effective and suited well for pig production in rural sector. Problems and constraints faced by the pig farmers were minimum in two Panchayaths.

It was observed that the feasibility of the pig production was higher in two Panchayaths studied. The resource utilization efficiency of the existing pig production was only 40.95per cent and 19.53per cent, respectively in Kaiparambu and Kuzhoor Panchayaths.

In the comparative study between pigs in the organized farm and field units, the pigs reared in small field unit on 40per cent chicken offal and 60per cent restaurant waste recorded a significantly higher ($P<0.01$) slaughter weight of $73.66 \pm 3.15$kg than that of $60.00 \pm 2.79$kg in pigs reared on hostel food waste in the farm. In the case of body measurements, pigs in small field unit

group recorded maximum values. The feed efficiency (3.221 ± 0.15) was better in pigs fed on 40per cent chicken offal and 60per cent restaurant waste. The mean daily dry matter intake was a maximum of 1.417 ± 0.19g in pigs reared on concentrate ration. The average daily weight gain was highest in pigs fed on 40per cent chicken offal and 60per cent restaurant waste (367 .13 ± 16.64g) and lowest in hostel food waste fed pigs (287.96 ± 15.23g).

Pigs fed on 40per cent chicken offal and 60per cent restaurant waste were recorded a maximum value for dressing percentage (75.52 ± 0.41). Pigs fed on concentrate ration attained a maximum of 19.36 ± 2.2cm$^2$ for loin eye area and a minimum of 28.0 ± 0.22mm for back fat thickness. Meat bone ratio was the lowest in pigs fed on hostel food waste (3.53 ± 0.19). Hot carcass weight (55.66 ± 2.49kg) and carcass length (65.00 ± 0.83cm) was more in pigs fed on 40per cent chicken offal and 60per cent restaurant waste in T4 group.

In proximate analysis chicken offal was recorded a crude protein content of 35.63 ± 2.77per cent and ether extract of 30.9 ± 2.31per cent. Concentrate, restaurant waste and hostel waste were recorded a higher NFE content.

Cost of production per kilogram live weight of pigs was the highest in concentrate fed group (Rs 54.66) and the lowest in small field unit (Rs 12.64).

# *Appendix*

# Annexure I

**Questionnaire used in the survey**

1. Name :
2. Age :
3. Religion :
4. Address :

5. Panchayath :

**6. Family details**

| Sl No. | Name of members | Age | M/F | Educational qualification | Occupation |
|---|---|---|---|---|---|
| | | | | | |

**7. Average monthly family income (please tick)**

Above Rs. 4001 / Rs. 3001to 4000 / Rs. 2001 to 3000 / Below Rs.2000

**8. Land holding (please tick)**

Above 100 cents / 51 to 100 cents / 21 to 50 cents / below 20 cents

**9. Details of animals reared**

**A. Pigs (please tick)**

a. Breed : Exotic breeds / indigenous breeds
b. Herd strength : Below 10 / 11 to 50 / Above 50
c. Sources of pigs : Large farm / medium farm / small farm

**B. Other domestic animals**

Details of animals

| Sl. No. | Animals | No. | Type | Breed |
|---|---|---|---|---|
| 1 | Cattle | | | |
| 2 | Buffalo | | | |
| 3 | Goat | | | |
| 4 | Poultry | | | |
| 5 | Others | | | |

**10. Reasons for pig farming (please tick)**

Main source of income / for extra income
To utilize organic wastes / to utilize spare time

**11. Feeding (please tick)**

a. Type feeding Concentrate / kitchen, restaurant waste /
Slaughterhouse waste / agricultural waste

b. Distance to feed source : Above 10km
5 to 10km
below 5km

**12. Housing (please tick)** Permanent / temporary

**13. Breeding (please tick)** Breeding only / breeding and fattening / fattening only

**14. Health problems (please tick)**

Common / occasional / frequent

**15. Common diseases (please tick)**

Digestive disorders / skin problems

Respiratory diseases / reproductive problems / others

**16. Distance to veterinary aid centre (please tick)**

Above 10km / 5 to 10km / below 5km

**17. Marketing of pigs (please tick)**

Based on live weight / as pork / sale of piglets

**18. Labour utilization (please tick)**

Family / labourers

**19. Experience in pig farming (please tick)**

Above 12 years / 8 to 12 years

4 to 8 years / below 4 years

**20. Training (please tick)**

Attended / not attended

**21. Training requirement (please tick)**

Selection of pigs / feeding / breeding

Diseases control / meat processing / others

**22. Adoption of scientific management practices (please tick)**

Regular deworming / vaccination / proper cleaning

Proper waste disposal /iron injection / timely treatment

**23. Constraints in pig farming (please tick)**

Financial / social / availability of piglets / marketing

**24. Problems in pig rearing (please tick)**

Environmental / religious / health

**25. Sources of financial assistance (please tick)**

Government agencies / banks

Private firms / self investment

**26. Interest in developmental activities (please tick)**

Integrated farming / co-operative setup

Meat processing / biogas installation

Expansion of existing unit