"A STUDY OF PROFITABILITY OF SHEEP REARING IN NELLORE DISTRICT, ANDHRA PRADESH"

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE OF AGRICULTURE
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
RAJENDRANAGAR, HYDERABAD - 500 030

AUGUST, 1997

"A STUDY OF PROFITABILITY OF SHEEP REARING IN NELLORE DISTRICT, ANDHRA PRADESH"

By

J. MURALIDHARA RAO
B.Sc.(Ag)

THESIS SUBMITTED TO THE
ACHARYA N.G.RANGA AGRICULTURAL UNIVERSITY
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

MASTER OF SCIENCE IN AGRICULTURE
(AGRICULTURAL ECONOMICS)

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COLLEGE OF AGRICULTURE
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
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AUGUST, 1997

CERTIFICATE

J. MURALIDHARA RAO, has satisfactorily prosecuted the course of research and that the thesis entitled **"A STUDY OF PROFITABILITY OF SHEEP REARING IN NELLORE DISTRICT, ANDHRA PRADESH"** submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any university.

Date: 16 -08-1997

(Dr. D.S. PRASAD)
Major Advisor

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This is to certify that the thesis entitled **"A STUDY OF PROFITABILITY OF SHEEP-REARING IN NELLORE DISTRICT, ANDHRA PRADESH"** submitted in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN AGRICULTURE** of the Acharya N.G.Ranga Agricultural University, Hyderabad, is a record of bonafide research work carried out by **J.MURALIDHARA RAO**, under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee.

No part of the thesis has been submitted for any other degree or diploma. The published part has been fully acknowledged. All the assistance and help received during the course of the investigation have been duly acknowledged by the author of the thesis.

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Chairman of the Advisory Committee

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ACKNOWLEDGEMENTS

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I deem it my privilege in expressing my fidelity to an ultranous academician ***Dr. K.R. CHOWDRY,*** *Professor & Head, Department of Agricultural Economics, College of Agriculture, Rajendranagar and member of my advisory committee for his munificent acquiescence and meticulous reasoning to refine this dissertation most explicitly to reckon with set standards. Ineffable is my gratitude and sincere thanks to him for his transcendent suggestions to embellish the study.*

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Date: 16 -8-1997

(J. MURALIDHARA RAO)

DECLARATION

I, **J. MURALIDHARA RAO** hereby declare that the thesis entitled **"A STUDY OF PROFITABILITY OF SHEEP REARING IN NELLORE DISTRICT, ANDHRA PRADESH"** is a result of the original research work done by me. I further declare that the thesis or part thereof has not been published earlier elsewhere in any manner.

Date: 16 -08-1997

(J. MURALIDHARA RAO)

Author	:	**J. MURALIDHARA RAO**
Title of the thesis	:	**A STUDY OF PROFITABILITY OF SHEEP REARING IN NELLORE DISTRICT, ANDHRA PRADESH**
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Major Advisor	:	**Dr. D.S. PRASAD**
University	:	**ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY**
Year of submission	:	**1997**

ABSTRACT

The present study entitled **"A study of profitability of sheep rearing in Nellore district, Andhra Pradesh"** was undertaken to study the aspects such as sheep-rearing practices in Nellore district, to estimate costs and returns and profitability of sheep farms according to size, to assess the factors affecting sheep farming, to study the adoption of recommended technology, and to study the economics of ram-rearing and disposal.

The study was undertaken in Sydapuram and Rapur mandals of Nellore district as considerable sheep population was present in these mandals. Four villages were selected based on the sheep population from these mandals. An ultimate sample of 80 farmers, representing 29 small, 34 medium and 17 large farms, was randomly selected. The study pertains to the production period ending with the year 1996. Tabular analysis was used to estimate the costs and returns. Multiple linear regression technique was used to study the factors influencing sheep production.

The average size of the family was 8, 7 and 10 on small, medium and large farms respectively. The results also recorded that sheep farming was taken up mostly by the farmers belonging to backward community, followed by forward castes, schedule castes and scheduled tribes.

The results revealed that on an average 56 per cent of the sheep farmers were illiterate. Resource base of the farms revealed that the average of land holding increased with increase in the farm size. The average number of sheep in small, medium, large and at all-farms level was 25, 63, 121 and 61 respectively. Almost one ram was present per 43 sheep.

Nellore breed of sheep was the only breed grown in the study area. No fodder crops were grown exclusively for sheep feeding and no supplementary feeds were given to the sheep. About 40 per cent of the farmers were forced to migrate in summer due to scarcity of pastures for grazing.

The cost of production of sheep per unit decreased with increase in the farm size. Among the variable costs, the share of labour cost was the highest over any other variable costs. The percentage of fixed costs was higher occupying 83 per cent of total costs. Initial value of the sheep was the major cost of fixed costs.

The gross returns at all-farms level was Rs.1,10,582/- per flock. Value of unsold animals contributed maximum to the gross returns. The net returns per unit increased with increase in the farm size.

Total cost of production in ram-rearing worked out to be Rs.35,580/- per flock of 35 rams. The gross returns obtained were Rs.45,583/- per flock and the net returns worked out to be Rs.10,003/-. Net return per ram was Rs.286/-.

The results of functional analysis highlighted that the flock had the highest contribution in increasing the gross returns in sheep farming over any of the variables included in the function.

Lambing frequency in an year was once and the number of lambs obtained per lambing was one. Lambing percentage was 79 at all farms level. The percentage of mortality was more in the case of small farms.

Most of the farmers lagged behind in adopting the recommended practices, especially feeding the sheep with concentrates, timely vaccination, regular deworming, deticking and flushing.

The following are the important policy measures emerged out of the study.

1. Supplementary or stall feeding of the sheep in lean periods.

2. The grass lands in the area must be improved with the introduction of suitable legumes and grass species.

3. Reorientation of sheep production, with scientific management practices.

4. Strengthening of existing veterinary and extension network.

5. Formation of sheep cooperatives for the benefit of the farmers.

6. Regulation of sheep marketing through organised markets.

INTRODUCTION

CHAPTER I

INTRODUCTION

Sheep rearing is an important activity in the rural economy of our country. Nearly six million people in the country are partially or fully dependent on income from sheep and wool related activities and around two thirds of them are located in rural areas. Sheep with its multi - facet utility as a producer of meat, wool, skin, manure and milk to some extent with an added advantage of survival in low vegetation areas has been providing employment and livelihood to the rural poor.

In India about 76 percent of the population lives in rural areas. According to one official estimate 36 percent of the Indian population lives below the poverty line drawn in 1994-95[1]. Of the total rural population around 67 percent lives below the poverty line as per 1987-88[2] estimates. As a result of the growing population and stagnant net sown area the pressure on land has been increasing through the years. The prospects of providing irrigation facilities to the drought prone areas in the near future are bleak. In such a situation, sheep-rearing may help in providing employment opportunities and may even alleviate poverty of the rural poor. Sheep in India are mainly reared under extensive system and maintained on natural vegetation like common grazing lands, waste lands and uncultivated fallow lands.

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1. *Parthasarathy G and K A Nirmala (1997) Lakdawala estimate of poverty and targeted PDS - Injustice to A.P. Economic and Political Weekly Vol XXXII No.16: 815-816.*

2. *Rath, Nilakantha (1996) Poverty in India Revisited. Indian Journal of Agricultural Economics Vol 51 Nos 1&2: p 101.*

1.1 SHEEP POPULATION IN INDIA AND ANDHRA PRADESH

Sheep population of the world is estimated at 1138.4 million heads. India possesses 45 million sheep constituting about 3.9 per cent of the world population[3]. Sheep holdings of the country should be measured in relation to human population since stocks are maintained to meet human requirements, such as meat, wool etc. The availability of sheep per 1000 human population worked out to 22,528 for New Zealand, 7,879 for Uruguay, 7,671 for Australia, 1,083 for Argentina, 1.022 for South Africa and only 69 for India[4]. It is, thus, obvious that the availability of sheep in India in relation to given human population is much lower as compared to that of many sheep holding countries. It was also observed that the availability of sheep per 1,000 human population has been steadily declining during the last 30 years.

Andhra Pradesh with 7.76 million sheep, constituting about 17 per cent of India's sheep population claims second rank in the country. Sheep population in Andhra Pradesh has increased from 6.8 million in 1987 to 7.7 million in 1993[5].

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3. *F.A.O (1992) Production Year Book. Food and Agriculture Organization of the United Nations, Rome.*

4. *Report of All India Survey on Raw Hides and Skins, 1987 Central Leather Research Institute, Adayar, Madras.*

5. *A report on Livestock Census of Andhra Pradesh, 1993. Directorate of Economics and Statistics, Hyderabad.*

1.2 CONTRIBUTION TO ECONOMY

According to 1988 statistics in India, 1,53,000 tonnes of meat, 48,000 tonnes of skin and 470 lakh kgs of wool from sheep were obtained. Andhra Pradesh state produced about 29,081 tonnes of meat, 2,959 tonnes of skins and 1,730 tonnes of wool during 1993-94. In terms of value, sheep contributed about Rs.144.15 crores worth of meat, Rs.23.17 crores worth of skins and Rs.6.79 crores worth of wool to the economy of Andhra Pradesh[5] .

1.3 THE ISSUES

Although the country occupies commendable place in sheep population in the world, it produces only 2.2 per cent of total meat production (Panda, 1987)[6] and 1.1 per cent of the total wool (Chaudhary, 1987)[7]. To meet both domestic and export requirements for carpets and hosieries, about 18 to 20 million kg of wool is being imported annually. Further, the gap between supply and demand for meat has been increasing. The escalation of prices of meat all over the country indicates that the demand is far outstripping the supply. Of the average per capita requirement of 51 grams of animal protein, in our

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6. *Panda P C Prospects of mutton and chevon production in India. In Proceedings of the National Seminar on Small Ruminants Production, Avikanagar, India. January 5-7, 1987.*

7. *Chaudhary A L. Breeding sheep for carpet wool production. In Proceedings of the National Seminar on Sheep and Goat Production and Utilization. Jaipur. India, 1981. Edited by A K Basuthakur and R M Acharya, pp 97-104.*

country, only 6 grams is available from meat. Out of the average per capita requirement of meat of 11 kgs, only 2.35 Kg had been met in the year 1990-91 and in the state only 1.7 Kg of it has been met. Another important issue to be considered is the low level of productivity of Indian sheep. The body weight of an adult sheep ranges between 30 kg and 40 kg. The average sheep carcass weight is 9 kg in India as against the world average of 15 kg. The average yield of wool per sheep in India comes to about 1.0 kg per annum as compared to 5 kg of wool per sheep in advanced countries. The lower productivity of sheep in India is quite alarming.

1.4 NEED AND SCOPE FOR SHEEP DEVELOPMENT

The issue of development of sheep farming for better living conditions of the vast masses of rural people particularly weaker sections assumes greater national importance in the present context. Immediate measures for improving the yield of sheep in terms of meat, wool and skin are needed to be taken. Good scope for sheep development exists in the country as natural resources such as land including grazing areas and manpower are available. Efficient utilization of not only the natural resources and man-power but also the scarce capital for purchase of stocks, housing, veterinary services is called for. It obviously involves adoption of technology and better management practices.

1.5 THE PROBLEM STATEMENT

In view of its economic importance, the need and urgency for developing the sheep farming in the country is well recognized. The sheep farming can be developed on a sound footing only when it is made profit-oriented rather than a way of life. Profits can be enhanced through improvement in the productivity levels. Presently, the sheep production in terms of mutton, wool and skins is low due to a variety of factors, however, adoption of modern technology and improved management practices shall help in realizing the higher productivity and larger profits. First of all, it becomes essential to identify the problems and constraints in sheep farming, particularly in the adoption of technology and management practices. Free grazing and human labour are the only twin resources utilized in sheep farming. It is only in recent times that the farmers started using the modern inputs, such as, veterinary medicines, balanced feed, etc.

As farmers are becoming cost conscious, it is also necessary to investigate into the cost-return relationship to help them gauge the production and profitable levels of the enterprise and also to understand the nature of costs inorder to make resource use adjustments.

To investigate the above issues a micro level field study was conducted in Nellore district. The study would help the research workers, extension agencies and policy makers in playing their role effectively and in making sheep farming an economically viable and profitable proposition.

1.6 OBJECTIVES OF THE STUDY

The specific objectives of the study are:

1. to study the sheep-rearing practices in Nellore district
2. to estimate costs and returns and profitability of sheep farms according to size
3. to assess the factors affecting sheep farming
4. to study the adoption of recommended technology
5. to study the economics of ram-rearing and disposal.

1.7 STRUCTURE OF THE THESIS

The study is presented in six chapters.

I.	Introduction	: The importance of the study, problem statement and objectives are covered.
II.	Review of Literature	: The available and relevant literature is thoroughly reviewed.
III.	Materials and methods	: The methods and materials encompassing sampling, data collection, analytical tools, concepts and terms are explained
IV.	Agro-Economic Features	: The Agro-Economic features of the study area are presented.
V.	Results and Discussion	: The results and discussion covering the important aspects such as, costs and returns, employment, management practices are presented.
VI.	Summary and Conclusions	: Summary and Conclusions and Policy measures are presented.

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REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

The available literature on economic aspects of sheep farming and releated issues is reviewed in this chapter. Keeping in line with the objectives of the study, the review of literature has been presented under different sub-heads as follows:

Studies on: 1. Sheep farming (costs and returns), and 2. Investment, feeding and management.

1. SHEEP FARMING (COSTS AND RETURNS)

Potts (1953) recommended that a flock of 60 or more ewes would be more economical. Further, he felt that from an ewe gross annual return of $10 to $30 could be obtained in USA depending upon the lambs and fleece produced.

Gundert (1962) reported, from a study of management conditions of karakul farms in the southern districts of South West Africa, that the cost of inputs totalled Rs.98.64 per year per sheep. He further reported that about 52 per cent of the total cost was towards salaries and wages, 15 per cent for transport and equipment, 10 per cent each for fodder and buying animals and 13 per cent for miscellaneous items. The net income was only 19 per cent of gross income.

Jooste (1964) from a study in the eastern Karoo in South Africa reported that the average expenditure per 100 sheep farm as Rs.18,384/- and the net income as Rs.22,635/-.

Dutche (1965) revealed from a study in East Scotland that the average cost per head per 57 lots studied, was Rs.35.40 leaving an average profit of Rs.7.38 for each animal fattened.

Jackson (1965) reported from a study in the United Kingdom that on an average gross return per ewe was Rs.73.75.

Raut and Sathe (1968) estimated that cost of production of mutton was Rs.1.11 per kg from Nellore sheep with an average flock size of 50 sheep. They hinted that increase in the size of the flock would reduce the cost of production.

Acharya and Saxena (1972) in their socio-economic survey in Rajasthan found an average income from a flock of 100 breedable ewes with attendant rams to be Rs.3,881/- per year from Chokla and Rs.5,642/- from Nali breeds of sheep.

Gangwar and George (1973) worked out the cost and returns of 30 to 50 units in comparison to flocks of 100 sheep. The profit per sheep in the first case was found to be Rs.4.27 and in the later case Rs.10.23.

Chowdhary (1974) stated that in India, the income from sale of wool constituted only 11 to 16 per cent of total earnings from the flock, whereas, in other countries it was of the order of 30 to 40 per cent. He also estimated the return from an ewe to be Rs.5.80 per year.

Raut and Nadkarni (1974) reported that the average annual cost of maintenance of sheep in migratory flocks was Rs.7.78 in first year and

Rs.5.42 per sheep in the second year and their variation was attributed to flock size. Their results showed variation in cost, particularly on labour, according to the size of flock. They further reported that the cost was appreciably less for large in stationary flocks and the average cost of maintenance of a sheep was Rs.21.56 and Rs.31.49 in the first and second year respectively, with labour charges accounting for a major component of expenditure.

Mittu *et al.* (1975) in their bench mark survey conducted in Rajasthan identified that an average income of Rs.620/- per annum from a flock of 72 sheep consisting of ewes, rams and lambs.
Dwivedi and Jain (1977) in their survey work reported an estimated income of Rs.720/- per year from a flock of 100 ewes in Rajasthan.

Dwivedi and Mathur (1977) in their socio-economic survey on sheep farming, estimated a total income per year from a flock of 100 ewes, attendant rams as Rs.1045/- and Rs.1422/- during 1975 and 1977, respectively from crosses of Malpura, Marwari and Jaisalmari and on an average Rs.7201/- from the sale of wool from 100 sheep per year.

Srivastava and Saxena (1977) worked out a net monthly income of Rs.246.66 to 268.20 from a sheep unit consisting of 50 adult sheep besides gaining a flock of 74 sheep of the value of about Rs.6,880/- as personal property at the end of fifth year after repaying the loan and interest.

Dwivedi *et al.* (1978) in their bench mark survey in Malpura sub-division of Tonk district in Rajasthan had estimated the total income per year from sale of wool, lamb and manure etc. From a flock of 100 Malpura ewes with attendant ram and follows to be Rs.5666/- of

which wool alone accounted for Rs.2171/- and manure for Rs.500/-. They estimated the net income per annum per 100 sheep to be Rs.1519.15 i.e., Rs.15.20 per sheep per year.

Achutakumar (1980) estimated from a sheep unit consisting of 20 Nellore ewes and one ram, a net surplus of Rs.140/-, Rs.200/-, Rs.350/-, Rs.770/- in the first, second, third and fourth years respectively for small farmers whereas for marginal farmers and agricultural labourers the net surplus of Rs.160/-, Rs.140/-, Rs.160/- and Rs.1120/- during first, second, third and fourth years respectively.

Kistopanidis *et al.* (1980) concluded from a study in Greece that the gross returns per sheep in farms upto 100 number was Rs.239.93 against the production costs of Rs.222.90.

Mudaliar (1980) estimated a net profit of Rs.6,250/- per annum from a sheep unit of 100 ewes and 3 rams, with a total non-recurring investment of Rs.25,000/- with a bank interest at the rate of 10 per cent.

Reddy and Reddy (1981) reported that total cost of rearing a lamb from birth to slaughter at 6 months age ranged from Rs.79.35 to Rs.102.50. They also reported that if the flock is looked after by himself or one of his family members an additional income of Rs.1,200/- can be obtained. They further revealed from their study conducted at AICRP on Sheep for Mutton, Palamaner (Andhra Pradesh) that the total cost of 100 ewe and 3 ram unit as Rs.5,641/- and the gross income as Rs.8,796/- per annum.

Sahani *et al.* (1981) estimated a total net saving of Rs.4000/- per

year from 100 adult black faced Marvari sheep and their progeny. They mentioned that using a family member for grazing the sheep would enhance the annual income about Rs.1,500/-.

Singh and Singh (1981) estimated the net cost of rearing an ewe to produce a lamb to be Rs.9.70

An evaluation report (1982) from Nalgonda district in Andhra Pradesh revealed that the total costs were Rs.1000/- and Rs.807/- in one ram, 25 ewe unit and one ram 20 ewe unit respectively (Anonymous, 1982). The respective gross incomes were Rs. 3,490/- and Rs. 3.074/-, with per sheep gross income being higher for 1 + 20 units as compared to 1 + 25 units.

Das(1982) revealed a possible net income of Rs.2000/- or more for a year from farms having 40 females and 1 male stock. He concluded that sheep farming in the rural areas resulted in upliftment of economic status and increased employment among the educated rural youth.

Kantha Raju (1982) stated that with 45 per cent dressing, each animal yielded 7 kg of dressed meat fetching Rs.126/- at the rate of Rs.18/- per kg of mutton and the other products contributing to Rs.17/.

Swain *et al.* (1982) in a study in the semi arid regions at Rajasthan studied flocks of 30 Malpura sheep maintained on face range grazing in highly degraded land. The sheep gave a net income of Rs.145.45 per year per sheep.

Kapoor (1983) reported from a study in Gujarat that the gross income from a flock of 56 was Rs.4.980/- of which 48 per cent has

come from milk, 30 per cent by sale of ram lambs and the rest 22 per cent from manure disposal and miscellaneous sources. He further reported that the average income from sheep was Rs.8.92.

Sharma and Pandey (1983) reported from a study in Haryana that the total costs per sheep in three categories of flocks such as small (40), medium (62) and large (99) were Rs. 205.89, Rs.157.31, Rs.114.86 and the corresponding returns of Rs.94.85, Rs.86.68 and Rs.90.81 respectively.

Sudarshan (1984) in his study estimated the expenditure and income (excluding working capital) for 100 sheep flock with two rams as Rs.19,078.25 and Rs.18,843.75 respectively. Income on every Rs.100/- investment worked out to Rs.52.60.

Balakrishna *et al.* (1985) worked out the economics for farms having small (21 and below), medium (22 to 50) and large (above 50) sheep farms. The survey indicated that annual returns for small size flock was Rs.1,515.09, Rs.4,314.50 for medium and Rs.8,375.28 for large sized flock. They concluded that maintenance of a flock consisting more than 21 sheep was comparatively more profitable.

Ranveer Singh *et al.* (1986) reported that the gross income from sheep rearing included value of lambs survived and of wool produced. Nearly 52 per cent of the total income from sheep rearing was accounted for by the value of lambs survived. The balance of 48 per cent accounted for by the value of wool produced. The total average cost of rearing of a sheep was calculated to be Rs.89.38 per annum. This figure was observed to be higher among large sized flock owners. The average annual gross returns per sheep worked out to Rs.128.45

which were found to be higher among medium sized flocks. It was observed that the net returns over variable costs per sheep were higher among medium sized sheep flocks than others.

Joshi (1987) reported that a shepherd needed about Rs.7000/- to purchase a sheep unit (30 ewes and one ram). He needed about Rs.1000/- for the development of pasture for a sheep unit annually and about Rs.200 for the purchase of shearing equipment. In this way, he needed about Rs.7,200/- as fixed capital and about Rs.1000/- as working capital.

Raju *et al.* (1987) in their study observed that the sheep and goat rearing which were also covered under IRDP helped to increase the productive asset value of the beneficiaries by 38.33 per cent and 22.13 per cent leading to an incremental return of 119.81 and 194.88 per cent respectively.

Dastagiri *et al.* (1988) worked out the net income for 20 ewes and one ram as Rs.2,977.34, Rs.3,596.38 and Rs.9,695.00 for small, medium and large farms respectively, resulting in a benefit cost ratio of 0.29, 0.37 and 0.39 respectively. They concluded that higher labour units were devoted to sheep rearing instead of making improvements in feeding schedules, housing and management for obtaining higher returns.

Chauhan *et al.* (1989) revealed that the number of sheep kept per household varied from 32 to 700 and the income generated from this enterprise ranged between Rs.6,716/- and Rs.218.69 per household accounting for 43 to 73, 80 per cent of household income from small, medium and large groups. The sale of sheep and wool were significant sources of income.

Chauhan and Moorti (1991) reported, from a study of Gaddi tribe in Himachal Pradesh, that among the farm sources sheep contributed the highest income forming 43.30 per cent, 72.90 per cent, 80.07 per cent and 66.81 per cent on small, medium, large and all farms, respectively. This indicating that, as the farm size increases the income per farm also increases proportionately which can be attributed to the fact that, the cost of rearing sheep decreases for larger herd.

Dastagiri and Rao (1991) in their study revealed that the total fixed cost for 20 + 1 sheep unit was Rs.8,593.44 accounting for 87.72 per cent of the total sheep maintenance cost whereas the total operational cost accounted for only Rs.1,202.56 (12.28%). The gross returns obtained were about 13,186.17 and net returns being Rs.3,390.17.

Chauhan and Sharma (1992) reported that the share of income from sheep enterprise in the total net income ranged from 72.6 per cent on small farms to 93.5 per cent on large farms and the higher percentage of income on large farms was due to economies of scale. They observed an increasing trend regarding farm business income and family labour income with the increase in the farm size. They further reported that the percentage returns on capital investment on sheep enterprise on an average was Rs.13.54 as against Rs.11.1 on crops and sheep taken together, indicating that the sheep enterprise was more profitable than crop enterprise.

Nilkantha Rath (1992) estimated that the total cost of grazing, feed and fodder for the flock as Rs.2,350 in the first year and Rs.2,575 in each of the subsequent years. He further estimated that the gross total earnings as Rs.2,914/- in the first year and Rs.5,394/- in

each succeeding year or Rs.140/- in the first year and Rs.270/- in each succeeding year, per ewe. He reported that the net income from the flock was Rs.550/- in the first year and Rs.2,825/- in each of the subsequent years. The income per ewe per year was Rs.27.5 in the first year and Rs.141/- subsequently.

Padmanaban (1992) reported that 73 per cent of farmers rear a Macheri cross breed and that on an average, farmers tend 19.2 ewes and 1.39 rams. He further reported that the income from sheep per farm amounted to Rs.2,699/- of which 78 per cent was derived from sale of sheep.

Rawat *et al.* (1993) revealed that the annual net returns of different categories of sheep farmers i.e., marginal farmers, small farmers and other farmers were Rs.8,570/-, Rs.13,386/- and Rs.51,378/- respectively. The net returns from agriculture and livestock were Rs.7,599/- and Rs.5,799/- respectively and total cost Rs.13,398/-. The rearing cost of sheep, goat and bovines was Rs.71/-, Rs.57/- and Rs.422/- per animal whereas gross returns of the order of Rs.115/-, Rs.124/-, and Rs.720/- respectively. The annual net returns from a flock of 71 sheep, 17 goats and 5 bovines were Rs.3,165/-, Rs.1,142/- and Rs.1,491/- respectively. The highest benefit cost ratio i.e., 1:2.38 has been observed in case of small farmers category with optimum livestock configuration of 60 sheep, 24 goats and 4 bovines for land holding size of 1 - 2 ha.

Padmanaban (1994) in his study estimated that the average maintenance cost per a farm maintaining 20 sheep was Rs.1,954.43 and average income realised per farm amounted to Rs.2,700/- and the

annual average income per sheep was Rs.222.23. He reported that there is a great scope for sheep farming through better utilization of resources.

Prasanna (1994) in her study revealed that the total costs incurred on sheep farming were Rs.19,825/- and returns obtained were Rs.31,015/- and net returns being Rs.11,190/-. The benefit cost ratio observed was 0.56.

Rawat *et al.* (1994) revealed that 94.3 per cent sheep farmers were illiterate. The classification of sheep farmers according to their caste group revealed that 8.5 per cent belonged to SC, whereas 91.5 per cent belonged to other caste groups. The average gross income per farmer was Rs.10,415/-. The percentage contribution from sale of wool was 34.05 and sale of aninals was 12.23. The percentage contribution from sale of agricultural produce was 17.62 whereas live-stock contributed 82.38 per cent to the total income of sheep farmers.

Deoghare and Bhattacharya (1995) reported that the capital invest-ment per sheep per year was highest on small farms (Rs.772.09), followed by marginal farms (Rs.763.17) and landless sheep keepers (Rs.733.36). They also reported that the margin of profit on small farms was much higher than of landless sheep keepers and marginal farms. They further reported that the overall return over cost A (paid out expenses and depreciation) was Rs.4,146.62, over cost B (cost A + interest on fixed capital) was Rs.3,203.20 and over cost C (Cost B + imputed value of family labour) was Rs.907.25.

Sinha and Deoghare (1996) reported that the cost of production per kg of mutton over cost C (commercial cost of production) in

winter under intensive and semi-intensive systems was Rs.33.71 and Rs.32.26 whereas in spring it was Rs.33.28 and Rs.29.82 respectively. Thus the cost of mutton production was comparatively low in spring born lambs under semi-intensive system. He suggested that the sheep expertise should invariably be encouraged for broiler lamb production under semi-intensive system for the maximum economic gain to the sheep entrepreneur.

2. INVESTMENT, FEEDING AND MANAGEMENT

Potts (1953) suggested that the farmer should select his ewe flock and rams with special emphasis on their ability to produce lambs that grow fast and reach market weight from 3 to 5 months with high degree of finish. He observed that sheep could be made to yield practically the same net returns on the value of land as cattle and swine if well cared for and kept on land reasonably well adopted for sheep raising.

Kamlade and Kamlade (1955) stated that lambs would make 75 per cent of their mature weight when they attain one year of age. Of this, 50 per cent of growth would take place during the first 3 months, 25 per cent in the next 3 months and the remaining 25 per cent in the next 6 months.

Dehoves and Williams (1957) recommended a flock of 20 to 60 ewes and 1 pure breed ram for a beginner. They warned that shepherd must realise that more the number of sheep on any one farm, the greater the parasitic problem.

Khot (1957) reported that an average flock size of 50 to 60 sheep would provide a better standard of living to a shepherd than an agricultural labourer in India.

Adams and Copper Smith (1963) opined that a farm flock should consist of 40 ewes and in order to maintain (for breeding) 40 sheep one ram was considered sufficient. Further, they considered that a flock of 100 to 300 ewes makes a more efficient unit and a flock of 500 to 1000 ewes would make a major livestock enterprise.

Mudaliar (1965) stated that flushing increased lambing percentage but the effect of flushing decreased as far as weight gain was concerned on the age of the ewe advanced; but there was increased tendency for twinning.

Singh and Moore (1968) mentioned that migration of sheep was very popular in North Indian plains where the flock owners migrate with large flocks to Himalayan region during summer and autumn.

Acharya and Patnayak (1972) felt that although sheep can thrive well on forages alone than any other kind of livestock, the forages available for sheep under natural conditions did not provide sufficient nutrients required and very little attention was paid to develop improved pastures or to improve the available waste lands and grazing areas in the country. They have mentioned that in a survey conducted in Gujarat 15 per cent of deaths among sheep was due to parasitic gastro-enteritis and suggested that under field conditions exotic inheritance could be introduced upto the level of 50 per cent without any serious problems of disease susceptibility and mortality.

Mudaliar (1972) stated that vaccinating the flock against enterotoxaemia was not only the most effective means of protecting the sheep but it also increased the weight gains in lambs.

Mudaliar (1972) stated that flushing increased about 17 to 18 per cent in lamb production.

Gangwar and George (1973) mentioned that sheep can live on uncultivated waste land, their feed requirement was not rigid as they feed on many types of weeds.

Singh *et al.* (1973) opined that, economics of sheep rearing was mainly dependent on attainment of maximum lamb weight in minimum time.

Suryaprasad *et al.* (1973) mentioned that castrated lambs gained less body weight than the lambs which were not castrated.

Goodwin (1974) suggested cross-breeding in commer-cial sheep farms which in his opinion enhances prolificacy and encourages early maturity through hybrid vigour.

Mudaliar *et al.* (1974) indicated that Bellary, Bikaneri and their cross-bred ewes were capable of breeding and lambing throughout the year and suggested to restrict the breeding if lambing was not desired during a certain part of the year. Lambs born during summer months is a loss, which is a known fact.

Mudaliar *et al.* (1974) found that sex ratio of lambs in Nellore, Mandya, Bellary crosses, Bellary and Bikaneri breeds were 49.09: 50.01, 50.36 : 48.44, 45.83 : 54.17, 52.22 : 47.78 and 48.71: 51.29 as males and females respectively.

Taneja (1974) observed that Indian sheep farmers are poorer than the poorest in agriculture community and the average flock size of sheep vary from 35 to 100 sheep. He also stated that the sheep farmers are mostly illiterates and not familiar with modern developments in the sheep farming. He felt that their socoi-economic condition should be improved as a social need.

Taneja (1974) observed that almost 70 per cent of the sheep farmers in the plains were nomads and they followed the fixed annual cycle of migration from winter camps to summer pasture. To improve this system he suggested to study and map the seasonal movement of migratory types of shepherds and locate the extension centres along the routes of migration to provide all veterinary aid and propagation of improved germplasm through artificial insemination techniques and exchange the indigenous rams with half-bred rams. He also felt that cross-breeding was advisable for hybrid improvement of wool and mutton production, both qualitatively and quantitatively and suggested to provide cross-bred rams to the sheep farmers free of cost at subsidised rates.

Mudaliar and Rao (1976) observed that Bellary ewes could go upto 7th lambing even though the percentage of lambing was very small; whereas, Bikaneri, Nellore and Mandya ewes had only 5 lambings.

Sastry and Thomas (1976) mentioned that sheep and goats were raised almost entirely on roughages and as such the cost of production was lower than that of poultry and pigs. They further mentioned that indigenous breeds of sheep and goats could subsist under the most adverse circum-stances on scanty feeding as a result their productivity

was also very low compared to exotic breeds. They have observed that grazing lands in India were over grazed and generally were in a poor condition and felt that very little attention was paid to develop the pastures.

Dwivedi and Jain (1977) observed that in Rajasthan, most of the flocks were normally penned in open fields away from the houses and no shelter was provided to sheep.

Dwivedi and Mathur (1977) in a bench mark socio-economic survey on sheep farming with Malpura breed of sheep of Rajasthan state observed that the sheep farmers in the area are very poor, living in Katcha houses. They revealed that most of them possessed less than 15 acres of dry land and about 83% of the flock owners possessed less than 100 sheep. The average flock size in their survey was 61 sheep.

Jalihal (1977) mentioned that sheep normally attained full growth when they were about 2 years old and in India ewes were mated at about 9 to 14 months of age, and he felt that one ram could be used for 30 to 40 ewes and a lamb crop generally comprised of equal number of male and female lambs.

Singh and Moore (1978) mentioned that generally in India a flock owner maintains 50 to 60 sheep as a minimum economic unit and in the case of farmers having sheep farming as subsidiary occupation the flock size is as low as 20 to 30 sheep. They also stated that the major portion of monetary income comes from mutton. He further stated that price per kg paid for slaughter sheep would depend largely

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upon the value of dressed animal and young ones whereas, well finished lambs would fetch higher price per kg than old sheep. They have observed that the quality and quantity of mutton was judged by feeling the rump, loins, legs and shoulder.

Venkateswarlu *et al.* (1978) reported that the pasture was fully required in lean period. Further pasture, supplementary feeds were proportioned to the body weights of the sheep. Thus a linear relationship seemed to exist between body weight and feed requirements of the sheep. The supplementary feeding would not be necessary from July to October except in days with heavy rains.

Basuthakur and Kalla (1979) mentioned that lamb mortality vary widely with year and season and the mortality in exotic lambs maintained at different parts of India varied from 7 to 47 per cent. Imperfect mothering of lamb was mentioned on the most important cause of mortality.

Mittal (1979) stated that grazing of sheep was one of the major problems in Western Rajasthan as no grazing facilities are available from January to June except few bushes and shrubs in common grazing fields. The period from October to December was stated to be the best season for grazing. Further, he observed that sheep farmers migrate towards East in the month of December every year and return back in June and July.

Atchuta Kumar (1980) stated that normal life span of sheep is 8 to 10 years and at the age of 7 to 8 years they are considered to be old and unfit for further breeding.

Narayanaswamy and Yadav (1980) reported that the incidence of heavy mortality among lambs as one of the major sources of economic loss. Lesser the loss among young ones the greater will be the improvement and return from the flock. Factors cited with flock mortality included sex of lamb, age of lamb at death, month of birth and birth weight of lamb. They also reported that the mortality rate was higher in males than in female lambs.

Raman and Venkata Subramanaiah (1980) reported that the assessment of age would be beneficial for purchase of sheep at the time of installing a sheep farm unit, for cutting the old animals and for age grouping of animals. They also considered it for disposal of the animal.

Sharma (1981) recorded that about 22 per cent flocks migrated to distances upto 20 km during lean periods from April to June in Rajasthan and the average flock size was 48 sheep.

Das (1982) reported that improved pastures with rationally managed indigenous species of sheep could help in raising early marketable lambs even in low rainfall areas in India. When green pastures are in abundance, necessity of supplementary feeding is least and the cost is lower in achieving higher animal body weight gains ensuring early market.

Kantha Raju (1982) reported that to protect sheep against predators and heavy rains, a floor space of 10-12 square feet for each adult and 8 sq.ft. to young ones is required. He further reported that one thatched shed of 40' x 40' with sufficient yard space in the compound would be sufficient. He felt that sheep getting 8 hours of good

grazing would not require feeding of concentrates and one shepherd would be sufficient to look after 100 ewes and their young ones.

Sharma *et al.* (1983) observed that maximum number of deaths in sheep were due to gastro-enteritis including parasitic causes (25/65 in sheep and 9/28 in goats) parasitic gastro-enteritis was more in sheep (23.07%) than goat (10.71%). This could be possible because sheep were fed mainly on grasses. Therefore the chances of picking up the infection were more as compared to goats being mainly browsers.

Sahani and Chaudary (1984) reported that there was significant increase in body weights with increase of age. Males were heavier than females at all the stages. Lambs born out of 8 teeth age group ewes were significantly heavier than the lambs born out of 4 and 6 teeth age group ewes. This indicated that age of mother had an important contribution on the future productivity of lambs.

Prabhakaran *et al.* (1985) observed that nearly 38 per cent of the herds belonged to 21-40 size group. The reason attributed for this was that majority of farmers was given loan for this particular size of flock. Declining number of permanent labourers and diminishing size of farm holdings were the major factors identified for reduction in size of sheep herd.

Sawant and Mali (1985) reported that the local breed was successful for crossing with exotic breeds for quantity and quality of meat. The cross-breds proved a boon to the shepherds. The meat of cross bred sheep was of very high quality, tender, tasty and in good demand. Since meat obtained from cross breed was superior in quality, it was profitable to raise cross-bred sheep.

Sharma *et al.* (1994) found that the availability of rams was 2.37 per hundred ewes in two major breeding seasons. Further they reported that out of the two major lambing seasons i.e., July to October and November to February, the maximum number of lambs born were in November to February season. The lambing was around 5 per cent per annum. Out of total morbidity cases 44.52 per cent sheep suffered from sheep pox disease and highest death toll i.e., 49.27 per cent was also due to this disease in Jaipur district. In Bhilwara and Churu districts worm infection ranked first in causing morbidity and mortality.

Sharma *et al.* (1995) reported that the adopter category of farmers had better feed resources. They found that the adoption of cross breeding in sheep was associated with possession of land holding and irrigated land, provision of shelter for sheep, gross income, educational status bodies. However, they did not find any association between adoption of cross breeding in sheep and the factors like occupation of a farmer, possession of pucca/katcha house, type of family and caste.

Balakrishna *et al.* (1988) revealed that about 12 to 15 per cent of the flock owners were migrated towards South East to provide adequate grazing. They reported that the sheep were penned in the open fields and 2.43 per cent of total cost of production was spent towards housing and equipment. They found that the farmers retain the ewes for 3 to 4 lambings only and the breedable ewes in the flock constituted 69.22 per cent of total sheep. They also reported that the main cause of mortality was pneumonia and the average mortality of lambs was 3.2 per cent.

Nageswara Rao and Dastagiri (1988) found that the higher returns obtained in respect of non-loan farms compared to loan farms was mainly due to maintaining better animals and adopting efficient management practices which reduced mortality and increased high lambing rates.

Chauhan *et al.* (1993) reported that the average number of sheep kept on small and large farms was worked out to 26.76 and 78.92 respectively. The average wool yield per sheep per annum on small and large farms was estimated to 1.028 kg and 1.117 kg respectively. The average per farm gross income was worked out to Rs.4008.97.

Naidu (1993) reported that 92.33 per cent of Nellore lambings occured during the period from September to February while in case of Deccani sheep breed 89.87 per cent of lambings took place during the period from August to end of February. In both the breeds maximum lambing took place in the month of November indicating the peak breeding season in the month of June.

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MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

The present study has been conducted in Nellore district of Andhra Pradesh as it is famous for its Nellore breed of sheep and ranks second in sheep population in the South Coastal districts. This chapter presents an idea about the sampling procedure, analytical tools employed and the concepts and terms used in this investigation under the following sub-heads.

3.1 Sampling procedure

3.2 Collection of data

3.3 Method of evaluation

3.4 Tools of analysis

3.5 Concepts and terms used in the study, and

3.6 Limitations of the study

3.1 SAMPLING PROCEDURE

Three stage sampling design was employed in the present study. The Nellore district was purposively selected for its importance in sheep rearing in Andhra Pradesh. Two mandals with the highest number of sheep rearing units in the district were purposively selected. All the villages in each mandal were arranged in descending order of sheep population and top two villages from each mandal were selected making the total number of villages to four. All the sheep farmers in the selected villages were categorised into three groups viz., small, medium and large. An ultimate sample of 80 sheep rearing units representing small, medium and large groups were randomly selected from the universe.

3.1.1 Selection of the District

The Nellore district was purposively selected for conducting this study for the following reasons. Firstly, it is famous for its Nellore breed of sheep. Secondly, it ranked second in the South coastal districts of Andhra Pradesh in terms of population. Thirdly, area under hills and grazing lands is highest in this district among coastal districts of Andhra Pradesh. Finally, there is a greater marketing potential for sheep and sheep products in the district and adjoining districts of Tamil Nadu.

3.1.2 Selection of Mandals

All mandals in Nellore district were arranged in descending order of sheep population and top two mandals were purposively selected. Accordingly, two mandals, viz., Sydapuram and Rapur, representing highest sheep population were selected.

3.1.3 Selection of Villages

All the villages in the selected mandals along with their sheep population were arranged in descending order and the first two villages in each mandal with the highest sheep population were purposively selected for a detailed investigation. The number of villages studied was four.

3.1.4 Selection of Sheep Rearing Units

A complete list of farmers along with the sheep population particulars in all the selected villages was obtained from the livestock records of Sydapuram and Rapur mandals. All the farmers from four selected villages were arranged in ascending order on the basis of the

number of sheep maintained. Then the farmers were devided into three categories viz., (1) small (below 40 sheep), (2) medium (41 to 80 sheep) and (3) large (81 sheep and above). From the categories so made, 29 farmers from small 34 farmers from medium and 17 farmers from large category were randomly chosen in probability proportion to their number, thereby making the ultimate sample of the study to 80.

3.2 COLLECTION OF DATA

The primary data on different aspects of the study were collected from the selected respondents with the help of a well structured pre-tested schedule by survey method.

Secondary data pertaining to the study were emanated from the records of the Chief Planning Office, Mandal Office and Mandal Live-stock Supervisory Offices.

3.3 METHODS OF EVALUATION

Cost of grazing: It included the cost of cultivation of farm grown fodder crop and the amount paid for the purchase of grazing fields.

Cost of feeding: The expenditure on the cost of feeding was calculated taking the actual expenses incurred on the purchase of feeds (concentrates), tree leaves etc.

Veterinary aid: This included the actual expenses incurred on disease control, deworming and deticking and preventive vaccination against the incidence of diseases like Enterotoxemia, Foot and Mouth disease etc.

Labour: The labour included hired labour and family labour. For estimating hired labour charges, the actual wages paid to the labourers were considered. For estimating family labour wages, the wages prevailing for the permanent labor in the villages were taken into consideration.

Miscellaneous charges: Expenditure on miscellaneous items was worked out based on the actual expenses incurred on transport and incidental charges at the time of obtaining loan and amount spent on transport of animals at the time of migration.

Interest on working capital: Interest on working capital was charged at the rate of 12.5 per cent per annum.

Interest on fixed capital: Interest on the present value of fixed assets was charged at the rate of 10 per cent per annum.

3.4 TOOLS OF ANALYSIS

Both tabular and functional analysis were used in this investigation to study the set objectives. Tabular analysis was applied to present resource endowment base, costs and returns in sheep farming etc.

3.4.1 Tabular Analysis

Variable costs: Variable costs included human labour costs, cost of grazing, cost of feeding, veterinary expenditure, and interest on working capital.

Fixed costs: Fixed costs included the initial value of the animals, cost of shed, cost of equipment and interest on fixed capital.

Gross returns: Gross returns included the total value of unsold sheep, income derived from the sale of the animals, manure and skins.

Net returns: Net returns were obtained by deducting total production costs from gross returns.

3.4.2 Functional Analysis

Since the production costs and returns were more of linear nature, the multiple linear regression technique is used in the analysis.

Multiple linear regression technique is applied to find out the influence of the various independent variables on the dependent variable. The model is given below:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots + b_nx_n$$

where,

Y = dependent variable

a = intercept

$x_1 \ldots x_n$ are the independent variables

$b_1 \ldots b_n$ are the partial regression coefficients.

Notations used

Y = Gross returns

x_1 = Flock size in terms of number of sheep

x_2 = Cost of equipment in rupees

x_3 = Cost of grazing in rupees

x_4 = Cost of feeding in rupees

x_5 = Cost of veterinary medicines in rupees

x_6 = Cost of labour in rupees

x_7 = Miscellaneous expenditure in rupees.

Opinion Survey

Opinion survey was conducted to know the practical problems of the sheep farmers in the production of sheep. The opinions thus collected were converted into simple percentages and presented in the fifth chapter.

3.5 CONCEPTS AND TERMS USED IN THE STUDY

Sheep farm: A sheep farm is one, which a farmer as an entrepreneur takes up the sheep farming either as a main or as a subsidiary enterprise with the objective of sheep production.

Ram : Adult male sheep, usually used for breeding.

Ewe : Female sheep which has given birth.

Lamb (male/female) : Young ones of either sex.

Hogget (male/female): Sheep of either sex which is matured or ready for breeding.

Sheep unit: A unit means 20 ewes + 1 ram in sheep which is normally treated as a viable unit by the veterinary specialists as well as financial institutions.

Flushing: Two weeks before the breeding season the ewes are given either extra grazing or good pasture or small quantity of concentrates. This practice helps in bringing most of the ewes to heat so that good lamb crop can be obtained. This extra care in feeding is called flushing.

Tupping: The act of breeding with ewes is called tupping.

Folding: It is the practice in which the animals are left in the

field overnight for their manure, for which the farmer is paid either in cash or in kind. The practice is also called penning.

Castration: Rendering sterile by removal or blocking the activity of testicles.

Culling: Removal of an ewe or ram from the flock, usually because of some defect viz., disease, old age etc.

Flock: A group of sheep.

Manure: Usually a mixture of feaces, urine, bedding, and waste feed.

Mortality rate: Proportion of the population which dies from the disease.

Shearing: Clipping the fleece either by hand or power.

Tattoo: A permanent marking of an animal by insertion of indelible ink under the skin, usually in the ear or flank.

Vaccination: An injection of a biological agent to produce live immunity to a disease.

Weaning: Removing young animals from their dam to terminate the suckling period.

3.6 LIMITATIONS OF THE STUDY

The data were collected personally by paying visits to the farmers by survey method. The data from the farmers were subjected to memory recall and hence there might be some approximation. However, utmost care was taken to collect reliable and accurate data as far as possible.

AGRO-ECONOMIC FEATURES

CHAPTER IV

AGRO ECONOMIC FEATURES OF THE STUDY AREA

The success of any enterprise (crop or livestock) mainly depends upon the agro-climatic conditions of that region. The economic appraisal of farm requires knowledge of physical, environmental and agro-climatic features of the area like location of the farm, rainfall, soil type, climate, irrigation facilities etc. Since the present study is confined to Nellore district and its mandals, an over view of agro-climatic features of the district and mandals will be very useful to have a comprehensive idea of the tract.

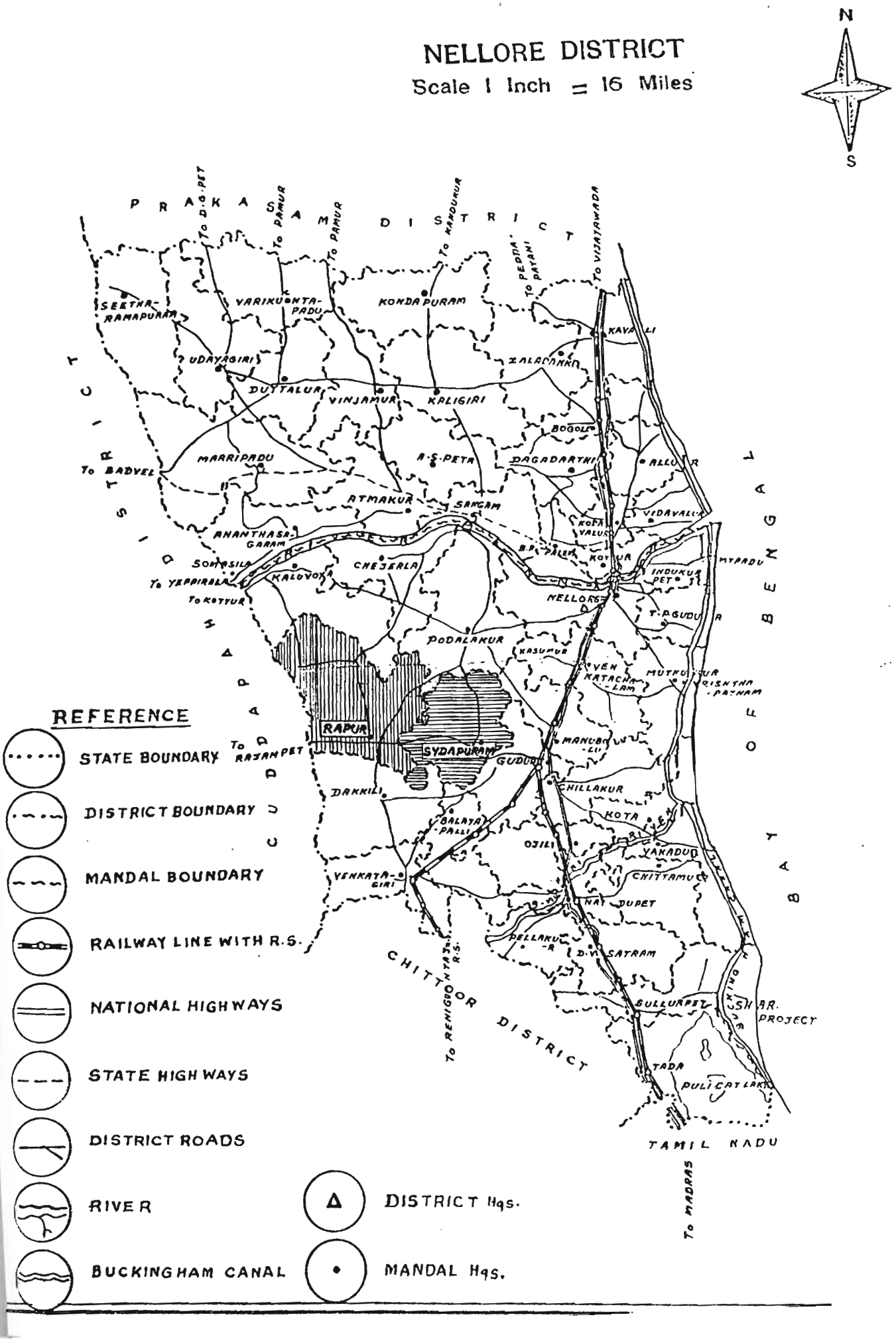
A. THE DISTRICT

4.1 PHYSIOGRAPHY

It is the Southern most coastal district of Andhra Pradesh extending over an area of 13,160 sq.kms and lying between 13°13' and 15°51' of the Northern latitude and 70°5' and 80°16' of the Eastern latitude. It is bounded by Prakasam district on the North, Bay of Bengal on the East, Chittoor district of Andhra Pradesh and Changalput district of Tamil Nadu on the South and Veligonda hills which separate it from Cuddapah district on the West as shown in Fig.1 The district is divided into three revenue divisions viz., Kavali, Nellore and Gudur. The district has got 46 mandals. There are 1200 villages in the district. The total population of the district as per the 1991 census was 23,92,260 with a density of 182 per sq.km.

NELLORE DISTRICT

Scale 1 Inch = 16 Miles



4.2 DEMOGRAPHIC CHARACTERISTICS

The details of population are provided in Table 1. It is evident from the table that the total population of the district was 23.92 lakhs (1991 census) comprising of 12.08 lakhs females and 11.84 lakhs males. The rural population in the district was 18.23 lakhs and was three times more than that of urban population which was 5.69 lakhs. The density of the population worked out to be 182 per sq.km. The percentage increase per decade was highest in the literacy and urban population. it is clearly evident from the Table that the number of cultivators is less than the number of agricultural labourers, which indicates the problem of unemployment. Increasing urbanization is one pointer in this direction. Encouraging the people to take up self-employment programmes like sheep rearing may curb the problem of unemployment.

4.3 CLIMATE AND RAINFALL

The climate is generally warm. The temperature increases gradually from January to May with a maximum of 30.6°C and then decreases upto December. Mean temperature of the district is 39.6°C and mean minimum temperature is 20.°C. The district receives rainfall both from South-West and North-East monsoons. The total rainfall received was 1705.7 mm in the year 1996-97. Normal annual rainfall of the district is 982 mm.

The percentage of RH is high in this area. In November and December it ranges from 84% to 64% and in the month of June it is low and ranges from 51% to 46%.

Table 1: **Population statistics of Nellore district**

S.No	Particulars	Unit	1981 census	1991 census	Decennial growth
1.	Population	Lakhs	20.15	23.92	18.71
2.	.males	"	10.19	12.08	18.54
3.	Fe Males	"	9.96	11.84	18.88
4.	Females per 100 males	No's	977	--	--
5.	Rural population	Lakhs	15.96	18.23	4.22
6.	Urban population	"	4.18	5.69	36.12
7.	Literates	"	6.48	9.71	49.84
8.	Workers	"	8.61	10.91	26.71
9.	Non-workers	"	10.79	13.01	0.21
10.	Cultivators	"	2.33	2.18	-6.43
11.	Agril. labourers	"	3.77	4.89	29.70
12.	Density of population per sq.km	No's	154	182	18.18
13.	Scheduled caste	Lakhs	4.16	5.23	25.72
14.	Scheduled tribes	"	1.77	2.14	20.90

Source: Hand Book of Statistics, Nellore District (1992-93).

4.4 LAND UTILIZATION

The pattern of land utilization is presented in Table 2.

The total geographical area of the district is 32.52 lakh acres, out of which around 8.83 and 7.51 lakh acres were the gross and net area sown respectively. In other words the total cropped area was only one-fourth of the total geographical area. About 13 per cent of the geographical area remained as barren and uncultivable land. About 16 per cent of the total geographical area was put to non-agricultural uses. As much as 18 per cent of the total area of the district was under fallows such as cultivable waste, current fallows and other fallows. The area under permanent pastures and other grazing lands was 8.31 per cent and is considered important for sheep rearing. These grazing lands combined with forest area constitute about 27 per cent. So the district can be considered resource rich for taking up sheep-rearing activity.

4.5 IRRIGATION

The irrigation in the district is provided from major, medium and minor sources. The gross irrigated area in the district was about 7.97 lakh acres. This constituted about 90% of the gross area sown. The major source of irrigation is Somasila project while medium irrigation source is Gandipalem reservoir. The minor sources of irrigation are tanks, wells and reservoirs. The particulars of source-wise irrigation of the total area are presented in Table 3.

Table 2: **Land utilization pattern in Nellore district during 1995-96**

S.No.	Particulars	Area in acres	% to total geographical area
1.	Total geographical area	32,52,006	100.00
2.	Forest	6,08,867	18.72
3.	Barren and unculturable land	4,39,851	13.52
4.	Land put to non-agricultural uses	5,27,.118	16.20
5.	Culturable waste	2,28,187	7.01
6.	Permanent pastures and other grazing lands	2,70,317	8.31
7.	Land under miscellaneous tree crops and groves not included in net area sown	41,557	1.27
8.	Other fallow lands	2,62,058	8.05
9.	Current fallow lands	1,07,596	3.30
10.	a) Net area sown	7,51,603	23.11
	b) Non-cropped area	14,852	0.45
	(Area under aquaculture, both fish and prawn culture)		
11.	Area sown more than once	1,31,788	4.05
12.	Gross cropped area	8,83,391	27.16

Source: Chief Planning Office, Nellore district.

Table 3: **Total area irrigated by different sources in Nellore district during 1991-92.**

S.No.	Source of irrigation	Area irrigated (in Acres)	Percentage to total
1.	Canals	2,78,569	34.92
2.	Tanks	2,40,524	30.15
3.	Wells	1,39,324	17.46
4.	Borewells	1,14,935	14.40
5.	Others	24,272	3.04
6.	Area irrigated more than once	1,20,718	15.13
7.	Net area irrigated	6,76,906	14.86
8.	Gross area irrigated	7,97,624	100.00

Source: Hand Book of Statistics, Nellore District (1992-93)

An area of about 2.78 lakh acres was irrigated under canals constituting 35 per cent of the gross irrigated area. Tanks could irrigate about 2.4 lakh acres which is 30 per cent of the gross irrigated area. Canals and tanks are the two important sources of irrigation, as they could irrigate about 65 per cent of the gross irrigated area in the district.

4.6 SIZE OF HOLDINGS

The total number of marginal farmers (below 1 ha), small farmers (between 1 to 2 ha) and medium farmers (2 ha and above) were 2.38, 0.7 and 0.17 lakhs respectively. These three groups operate an area of 2.58, 2.45 and 2.45 lakh acres respectively.

4.7 CROPPING PATTERN

The particulars of area under different crops are provided in the Table 4.

Table 4: **Area under principal crops for the year 1991-92 in Nellore district**

S.No.	Crop	Area (in Acres)	Percentage
1.	Paddy	5,64,678	62.00
2.	Jowar	22,206	2.43
3.	Bajra	12,086	1.32
4.	Ragi	6,766	0.74
5.	Greengram	22,150	2.43
6.	Horsegram	2,456	0.26
7.	Redgram	4,019	0.44
8.	Chillies	37,896	4.16
9.	Sugarcane	22,237	2.44
10.	Fruits & Vegetables	45,286	4.97
11.	Groundnut	1,14,614	12.58
12.	Gingelly	16,016	1.76
13.	Tobacco	27,430	3.01
14.	Cotton	12,808	1.40

Source: Hand Book of Statistics, Nellore District (1992-93)

The figures in the Table reveal that the principal crops grown are paddy, groundnut, chillies, tobacco, greengram, jowar and sugarcane.

4.8 YIELDS

The average yield particulars of principal crops are provided in Table 5.

It is evident from the Table that the yield levels of almost all crops were low. This indicates that the agriculture in the district continued to be backward. The people were also poor since the crop cultivation is not profitable in certain areas. Such lands can be put to profitable use for pasture development and fodder production for sheep and other livestock rearing.

4.9 FORESTS

Forests covering an area of about 6.08 lakh acres accounted for about 19 per cent of the total geographical area. These forests mostly consist of bamboo, casuarina and other shrubs. It would be profitable to bring these forest areas under silvi-pastoral systems for better live-stock production.

4.10 LIVESTOCK PARTICULARS

The details of livestock and poultry population are given in Table 6.

It is observed from the table that there is a general decline in the livestock population except in the case of goats and poultry.

Table 5: **Average yield of principal crops (per hectare in kgs) from 1986-87 to 1990-91**

S.No.	Crop	1986-87	1987-88	1988-89	1989-90	1990-91	Average for 5 years
1.	Paddy	2250	2606	2517	2508	2689	2514
2.	Jowar	569	430	567	487	564	524
3.	Bajra	1020	1073	1793	1248	1316	1290
4.	Ragi	1358	1229	1258	1379	1398	1324
5.	Greengram	292	437	301	209	210	290
6.	Chillies	748	958	1367	1662	2985	1544
7.	Sugarcane	62800	66054	64903	69020	66144	65784
8.	Groundnut	1343	--	1459	1513	1268	1117
9.	Tobacco	631	394	549	822	915	662
10.	Cotton	406	177	237	393	495	342

Source: Hand Book of Statistics, Nellore District (1992-93)

Table 6: **Particulars of livestock and poultry population**

S.No.	Particulars	1983	Percentage to total	1987	Percentage to total
1.	Cattle	4,46,442	26.70	4,08,133	26.04
2.	Buffaloes	5,20,226	31.11	5,17,468	33.02
3.	Sheep	4,05,643	24.26	2,44,649	15.61
4.	Goat	2,85,750	17.09	3,83,492	24.47
5.	Horses	95	0.005	87	0.005
6.	Pigs	13,470	0.80	12,211	0.78
7.	Others	1,060	0.06	1,273	0.08
8.	Total	16,72,086	100.00	15,67,313	100.00
9.	Poultry	16,78,806	--	20,05,429	--

Source: Hand Book of Statistics, Nellore District (1992-93).

Table 7: **Livestock and Veterinary services of Nellore district during 1995-96**

S.No.	Particulars	Number
1.	No. of Veterinary Hospitals	14
2.	No. of Veterinary Dispensaries	74
3.	No. of Rural Livestock Units	80
4.	No. of Sheep Supervisory Units	3
5.	No. of Sheep Extension Centres	24
6.	No. of Veterinary Health Centres (Poly Clinics)	1
7.	No. of Joint Directors	1
8.	No. of Deputy Directors	3
9.	No. of Assistant Directors	24
10.	No. of Veterinary Assistant Surgeons	88
11.	No. of Junior Veterinary Officers	30
12.	No. of Livestock Assistants	62
13.	No. of Veterinary Assistants	104
14.	No. of Veterinary Vaccinators	5
15.	No. of Enumerators	2
16.	No. of Sheep farms	1

Source: Chief Planning Office, Nellore District.

4.11 LIVESTOCK AND VETERINARY SERVICES

The details of livestock and veterinary services in the district are provided in Table 7. It is noted that there were 3 sheep supervisory units, 24 sheep extension centres and 1 sheep farm.

B. THE MANDALS

Two mandals in the district namely Sydapuram and Rapur were selected for the study as the sheep population in these two mandals was considered to be fairly high. These two mandals broadly represent the conditions which are congenial for sheep farming in the district. A brief description of the features of these two mandals is presented as follows:

SYDAPURAM MANDAL

4.12 LAND UTILIZATION PARTICULARS

The particulars of land utilization are presented in Table 8.

According to table the total geographical area of the mandal was 86,273 acres. The net area sown was 12,228 acres constituting about 14.17 per cent of the geographical area. Forests occupied 25.6 per cent of the total geographical area. Land under permanent pastures and other grazing lands constituted 5.76 per cent of the total geographical area which is important for sheep-rearing. Land which is not suitable for crop cultivation can be put to pasture development, which supports the sheep rearing activity.

4.13 LIVESTOCK PARTICULARS

The livestock particulars of the mandal are given in Table 9.

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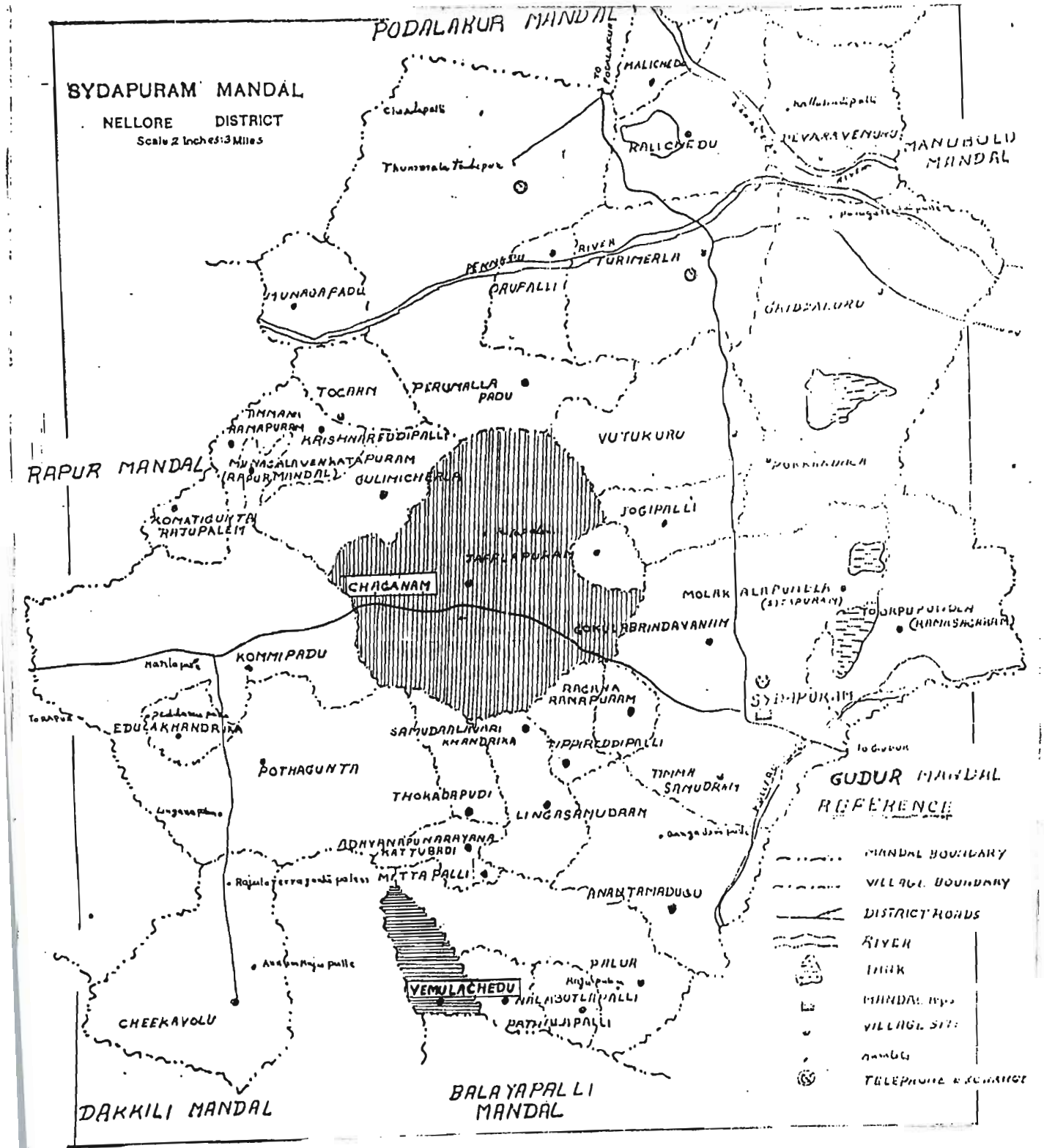
SYDAPURAM MANDAL
NELLORE DISTRICT
Scale 2 Inches:3 Miles
PODALAKUR MANDAL
MANUBOLU MANDAL
RAPUR MANDAL
DAKKILI MANDAL
BALAYAPALLI MANDAL
GUDUR MANDAL
RALICHEDU
DEVARAVENURU
PERUMALLAPADU
VUTUKURU
JOGIPALLI
CHAGANAM
KOMMIPADU
EDULAKHANDRIKA
POTHAGUNTA
THOKABAPUDI
LINGASAMUDARAM
ANANTAMADUGU
VEMULACHEDU
CHEEKAVOLU
REFERENCE
MANDAL BOUNDARY
VILLAGE BOUNDARY
DISTRICT ROADS
RIVER
TANK

Table 8 : **Land utilization particulars of Sydapuram Mandal during 1995-96**

S.No.	Particulars	Area in Acres	Percentage to total area
1.	Total geographical area	86,273	100.00
2.	Forest	22,092	25.60
3.	Barren and unculturable land	14,252	16.51
4.	Land put to non-agricultural uses	12,550	14.54
5.	Culturable waste	7,514	8.70
6.	Permanent pastures and other grazing lands	4,974	5.76
7.	Land under miscellaneous tree crops and groves not included in net area sown	718	0.83
8.	Other fallow lands	5,737	6.64
9.	Current fallow lands	6,208	7.19
10.	a) Net area sown	12,228	14.17
	b) Non-cropped area	--	--
	(Area under aquaculture both fish and prawn culture)		

Source: Chief Planning Office, Nellore District.

Table 9: **Livestock particulars of Sydapuram mandal during 1992-93**

S.No.	Particulars	Number	Percentage to total
1.	Cattle	3225	8.52
2.	Buffaloes	3752	9.92
3.	Sheep	26407	69.79
4.	Goat	780	2.06
5.	Work animals	3675	9.71
6.	Total Livestock	37839	100.00
7.	Poultry	36600	--

Source: Chief Planning Office, Nellore District

It is observed from the table that sheep constituted about 70 per cent of the total livestock population excluding poultry in the mandal. This mandal ranks first in the number of sheep population in the district.

RAPUR MANDAL

4.14 LAND UTILIZATION PARTICULARS

The particulars of land utilization of the mandal are presented in Table 10.

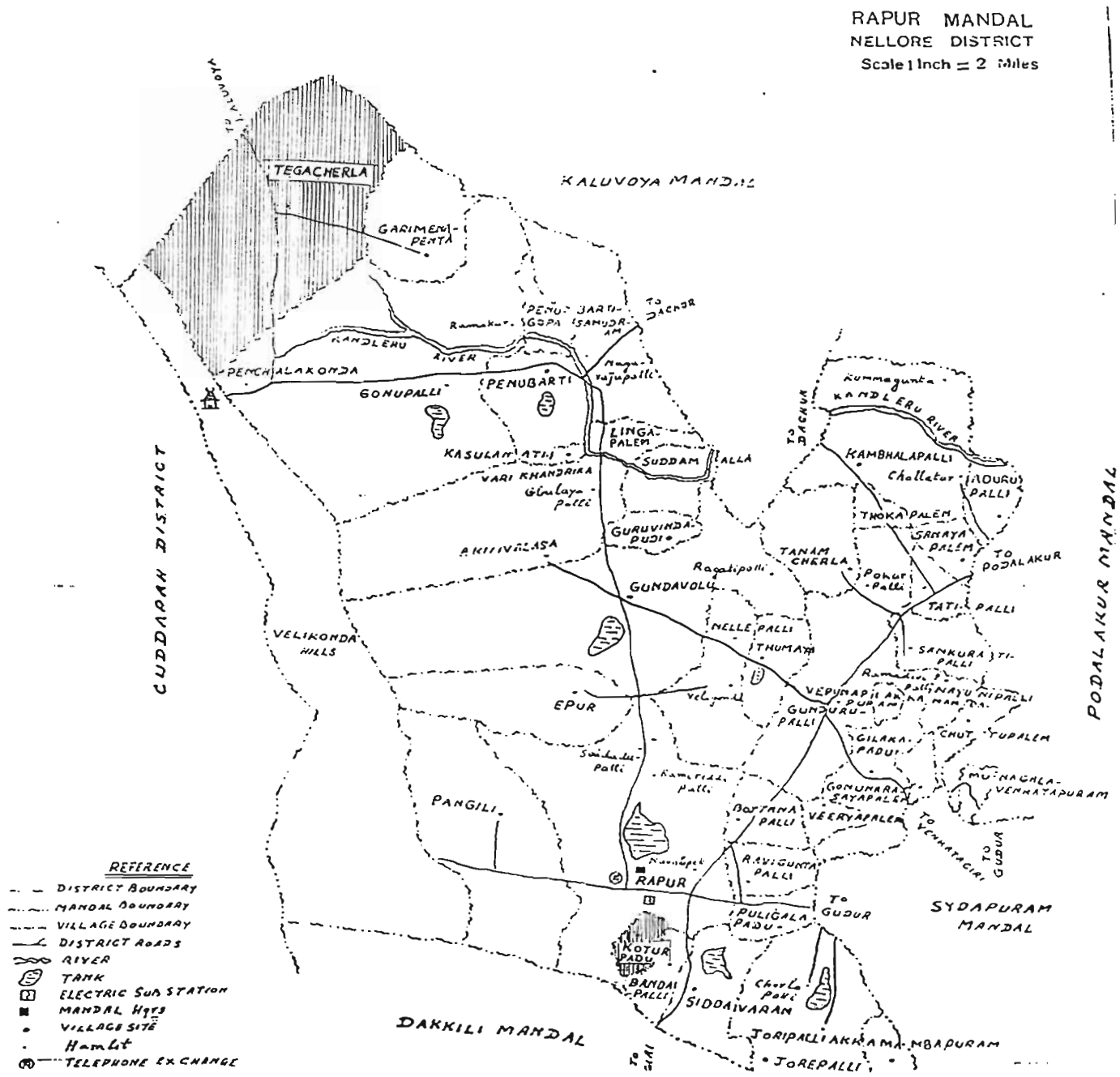
RAPUR MANDAL
NELLORE DISTRICT
Scale 1 Inch = 2 Miles
KALUVOYA MANDAL
TEGACHERLA
GARIMEM-PENTA
PENCHALAKONDA
GONUPALLI
PENUBARTI
KANDLERU RIVER
LINGA-PALEM
SUDDAM
KASULANATHI
VARI KHANDRIKA
Gulaya-Palli
GURUVINDA-PUDI
AKKIVALASA
GUNDAVOLU
VELIKONDA HILLS
CUDDAPAH DISTRICT
EPUR
PANGILI
RAPUR
KOTUR PADU
BANDAI PALLI
SIDDAIVARAN
TORIPALLI
TOREPALLI
DAKKILI MANDAL
To GUDUR
SYDAPURAM MANDAL
PODALAKUR MANDAL
To PODALAKUR
To BACHUR
KAMBHALAPALLI
Challatur
THOKA PALEM
TANAM CHERLA
Pokur-Palli
TATI-PALLI
NELLE PALLI
THUMATI
SANKURA TI-PALLI
GUNDURU-PALLI
GILAKA-PADU
CHUT TUPALEM
MUNAGALA-VENNATAPURAM
GONUMARA-SAYAPALEM
BORTANA PALLI
VEERYAPALEM
RAVIGUNTA PALLI
PULIGALA-PADU
To VENNATACHI
To GUDUR
REFERENCE
DISTRICT BOUNDARY
MANDAL BOUNDARY
VILLAGE BOUNDARY
DISTRICT ROADS
RIVER
TANK
ELECTRIC SUB STATION
MANDAL HQTS
VILLAGE SITE
Hamlt
TELEPHONE EXCHANGE

Table 10: **Land utilization particulars of Rapur mandal during 1995-96**

S.No.	Particulars	Area in Acres	Percentage to total area
1.	Total geographical area	1,20,928	100.00
2.	Forest	69,004	57.06
3.	Barren and unculturable land	6,664	5.51
4.	Land put to non-agricultural uses	9,481	8.13
5.	Culturable waste	8.992	7.43
6.	Permanent pastures and other grazing lands	8,761	7.24
7.	Land under miscellaneous tree crops and groves not included in net area sown	423	0.34
8.	Other fallow lands	4,212	3.48
9.	Current fallow lands	4,733	3.91
10.	a) Net area sown	8,298	6.86
	b) Non-cropped area (Area under aquaculture both fish and prawn culture)	--	--

Source: Chief Planning Office, Nellore District.

The total geographical area of the mandal was about 1,20,928 acres. Net sown area was only 6.86 per cent of the total geographical area. Most of the area was not suitable for crop cultivation. Hence there is a great scope for developing pastures to promote sheep rearing. 57 per cent of the total area was under forests. Permanent pastures and other grazing lands constitute about 7.24 per cent of the total geographical area. These areas provide grazing facilities for the sheep.

4.15 LIVESTOCK PARTICULARS

The livestock particulars are given in Table 11.

Table 11: **Livestock particulars of Rapur mandal**

S.No.	Particulars	Number	Percentage to total
1.	Cattle	4132	11.99
2.	Buffaloes	2799	8.12
3.	Sheep	22875	66.36
4.	Goat	1360	3.95
5.	Work animals	3303	9.58
6.	Total Livestock	34469	100.00
7.	Poultry	22740	--

Source: Chief Planning Office, Nellore District.

It is obvious from the table that 66 per cent of the total livestock in the mandal was constituted by sheep. This mandal ranked second in the district in sheep population.

C. THE VILLAGES

Chaganam and Vemulachedu villages in Sydapuram mandal and Tegacherla and Koturpadu villages in Rapur mandal were covered under the study.

Chaganam in Sydapuram mandal is situated at a distance of 7 km from Sydapuram. The geographical area of the village was 7,473 acres. The net sown area of the village was 1,033 acres constituting 13.82 per cent of the total geographical area of the village, 43 per cent of the total geographical area was under forests. The sheep population of the village was 3,380.

Vemulachedu village is situated at a distance of 11 km from Sydapuram. The geographical area of the village was 900 acres. About 30 per cent of the total geographical area was net area sown and about 38 per cent of the total area was under permanent pastures. This might be the reason for the village having highest population of sheep in the mandal. The sheep population of the village was 3,932.

The village Tegacherla is situated at a distance of 35 km from Rapur. Total geographical area of the village was 10,599 acres of which forests constituted 8,614 (81 per cent of the total area). The village has highest sheep population in the mandal i.e., 4,272.

Koturpadu village is situated at a distance of 2 km from Rapur. About 31 per cent of the total geographical area was net sown area. Sheep population of the village was 2,382.

The foregoing discussion on Agro-Economic features of the study area provides a good background to understand the economic aspects of sheep farming in the district.

RESULTS AND DISCUSSION

CHAPTER V

RESULTS AND DISCUSSION

An attempt is made in this chapter to present the results of the study and a critical discussion of the same. The results and discussion are presented under the following sub headings.

1. Socio-economic characteristics of the selected farmers
2. Management practices of sheep-rearing in Nellore district
3. Costs and returns of sheep
4. Economics of Ram-rearing
5. Functional analysis
6. Related issues
   a) Employment of labour
   b) Lambing
   c) Mortality
   d) Adoption of management practices
   e) Farmers' suggestions.

5.1 SOCIO-ECONOMIC CHARACTERISTICS OF SELECTED FARMERS

The socio-economic characteristics of the farmers have a bearing on the size, operation, and efficiency of the sheep farming. The study of the socio-economic characteristics of the farmers also indicates the prospects, potentials and problems of sheep farming. Hence, an attempt is made to study and present these characteristics briefly in the ensuing paragraphs.

5.1.1 Family size and composition

Since sheep farming was taken up largely as a family-oriented profession, the availability of labour from the family played an important role in the enterprise. Therefore, the family composition and size were studied and the information is presented in the table 12. It is obvious from the table that at all farms level, the average size of the family was 8.02. The males, females and children constituted 27.18, 28.18 and 44.64 per cent of the total family size respectively. At the large sized farm level, the average size of the family was 10, with 40 per cent children and 30.50 per cent females and 29.50 males. The minimum size of the family was found in case of medium farmers with 7 members, on an average. The children constituted 43.57 per cent of the total members of the family. The highest percentage of children in the family was found in the case of small farmers with 48.95. It was verified in the survey about 87 per cent of the members were engaged in sheep rearing were males.

5.1.2 Literacy levels of the selected farmers

It is noted from the table 13 that at all farms level the percentage of illiterates was 56.25 in the selected families. Only 27.5 per cent and 15 per cent of the members in the families had education upto primary and secondary levels. The percentage of illiteracy declined with the increase in the size group of farmers. It declined from 68.96 per cent on small farms to 29.41 per cent on large farms. The percentage of illiterates was 58.82 among medium farmers. Among the small farmers, the percentage of members having education upto primary and secondary levels were 24.13 and 6.89 and among medium farmers it was 23.52 and 17.64 per cent.

Table 12: **Family size and composition of the selected sample farmers (Average and Percentage)**

	Small		Medium		Large		All-farms	
	Av.	%	Av.	%	Av.	%	Av.	%
Average size of the family	8.09	100.00	7.00	100.00	10.00	100.00	8.02	100.00
a) Males	2.03	25.09	1.95	27.86	2.95	29.50	2.18	27.18
b) Females	2.10	25.96	2.00	28.57	3.05	30.50	2.26	28.18
c) Children	3.96	48.95	3.05	43.57	4.00	40.00	3.58	44.64

Table 13: **Literacy level of the selected farmers**

S.No.	Category of the farm	Illiterate		Literate					
		No.	%	Primary		Secondary		College	
				No.	%	No.	%	No.	%
1.	Small	20	68.96	7	24.13	2	6.89	—	—
2.	Medium	20	58.82	8	23.52	6	17.64	—	—
3.	Large	5	29.41	7	41.17	4	23.52	1	5.88
4.	All farms	45	56.25	22	27.50	12	15.00	1	1.25

5.1.3 Occupational pattern of the selected farmers

It was noted that all the farmers were engaged in both the occupations, i.e., sheep-rearing and also agriculture. Both are complementary to each other. Sheep-rearing was the main occupation for 63.75 per cent of the farmers at all farms level, while 23.75 per cent of the farmers had agriculture as the main occupation and 12.50 per cent of sheep farmers had agriculture labour as the main occupation. At the large farms level, no one had agriculture labour as main occupation, while 5.88 per cent had agricultural labour as main occupation in case of medium farmers. But 27.58 per cent of small sheep farmers had agriculture as the main occupation (Table 14).

Sheep-rearing was subsidiary occupation to 36.25, 55.17, 23.52 and 29.41 percentages at all farms level, small, medium and large farmers level.

5.1.4 Caste particulars of the selected farmers

The caste composition of the selected farmers is presented in the Table 15.

It is observed from the table that the overwhelming majority of the sheep farmers belonged to weaker sections, that is, backward classes and scheduled castes. At the all-farms level, 70 per cent and 11.25 per cent of the sheep farmers belonged to backward classes and scheduled castes. The maximum percentage of sheep farmers was found in the backward class group with 79.41. In all the size groups, majority of sheep farmers were from backward classes. Thus, the relationship between the sheep-reaing and weaker sections was well-established. The

Table 14: **Occupational pattern of the selected farmers**

S.No.	Occupation	Small		Medium		Large		All-farms	
		No.	%	No.	%	No.	%	No.	%
1.	Main occupation								
	a) Sheep rearing	13	44.82	26	76.47	12	70.58	51	63.75
	b) Agriculture	8	27.58	6	17.64	5	29.41	19	23.75
	c) Agril. labour	8	27.58	2	5.88	—	—	10	1 2.50
2.	Subsidiary occupation								
	a) Sheep rearing	16	55.17	8	23.52	5	29.41	29	36.25
	b) Agriculture	9	31.03	22	64.70	12	70.58	43	53.75
	c) Agril.labour	4	13.79	4	11.76	—	—	8	10.00

Table 15: Caste particulars of the selected farmers

S.No.	Category of the fare	Oc		BC		SC		ST	
		No.	%	No.	%	No.	%	No.	%
1.	Small	3	10.34	18	62.06	6	20.68	2	6.89
2.	Medium	4	11.76	27	79.41	3	8.82	—	—
3.	Large	6	35.29	11	64.70	—	—	—	—
4.	All-farms	13	16.25	56	70.00	9	11.25	2	2.5

encouragement to sheep-rearing would lead to the development of weaker sections.

5.1.5 Members engaged in sheep-rearing

The particulars of members engaged in sheep-rearing are furnished in Table 16.

At the all-farms level, the percentage of adult males engaged in sheep farming was about 72 and that of the adult females was about 12. The percentage of male children in sheep-rearing was about 15.

Only males were engaged in sheep rearing in the case of large farmers. About 19% of the farmers were females who were engaged in sheep-rearing in the case of medium group of farmers. It was noted that the children were engaged in sheep-rearing in all the categories of farmers.

5.1.6 Land holding particulars of the selected farmers

It is seen from the Table 17 that at the All-farms level, the total holding and cultivated area of the selected farmers was about 402 acres and 259 acres respectively. An extent of about 143 acres out of 402 acres of land holdings was under fallows. This would provide grazing facilities to the sheep.

It is clear from the Table that the average size of land holdings are showing an increasing trend from small farmer to large farmer category. At all farms level the average size of total holding was 5.02 acres while the average size of cultivated holding was 3.24 acres.

Table 16: **Members engaged in sheep farming (Average and percentage)**

S.No.	Category of the fare	Males						Females						Grand total	
		Adults		Children		Total		Adults		Children		Total			
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1.	Small	34 (1.17)	73.91	6 (0.20)	13.04	40 (1.37)	86.95	4 (0.13)	8.69	2 (0.06)	4.34	6 (0.20)	13.04	46 (1.58)	100
2.	Medium	45 (1.32)	65.21	11 (0.32)	15.94	56 (1.64)	81.15	13 (0.38)	18.84	-- --	--	13 (0.38)	18.84	69 (2.02)	100
3.	Large	25 (1.47)	83.33	5 (0.29)	16.66	30 (1.76)	100	-- --	--	-- --	--	-- --	--	30 (1.76)	100
4.	All-farms	104 (1.3)	71.72	22 (0.275)	15.17	126 (1.575)	86.89	17 (0.212)	11.72	2 (0.02)	1.37	19 (0.23)	13.10	145 (1.812)	100

Figures in parentheses indicate average number.

Table 17: **Land holding particulars of the selected farmers**

S.No.	Category of the farm	No. of families	Total holding		Cultivated holding		Irrigated		Unirrigated		Fallow	
			Acres	Total Value (Rs.)	Acres	Total Value (Rs.)	Acres	Total Value (Rs.)	Acres	Total Value (Rs.)	Acres	Total Value (Rs.)
1.	Small	29	98.00 (3.37)	9,19,000	52.00 (1.79)	7,95,250	19.50 (0.67)	5,16,000	32.50 (1.12)	2,79,250	46.00 (1.58)	1,23,750
2.	Medium	34	165.25 (4.86)	19,26,000	104.25 (3.06)	17,51,500	49.50 (1.45)	12,97,500	54.75 (1.61)	4,54,000	61.00 (1.79)	1,74,500
3.	Large	17	138.50 (8.14)	20,80,500	103.00 (6.05)	19,69,750	58.50 (3.44)	15,17,500	44.50 (2.61)	4,52,250	35.50 (2.08)	1,10,750
4.	All farms	80	401.75 (5.02)	49,25,500	259.25 (3.24)	45,16,500	127.50 (1.59)	33,31,000	131.75 (1.64)	11,85,500	142.50 (1.78)	4,09,000

Figures in parentheses are average land holdings.

The average fallow land per farm was 1.78 acres at all-farms level.

5.1.7 Sheep holding particulars of the selected farmers

The details of sheep holding particulars of the selected farmers were presented in Table 18.

It is obvious, from the table, that the total number of sheep held by the selected farmers was 4896 and the average size of sheep holding per farm was 61.2 at all-farms level. For small, medium and large farms the average size of sheep holding was 24.55, 62.61 and 120.88 respectively. On an average, each farmer has one ram which was used for breeding purpose. The average number of ewes per farm in case of small, medium, large and all-farms was 17.34, 46.97, 93.05 and 46.02 respectively.

From the table it can be observed that the ewes constituted majority of the flock. Of the total number of sheep 70.64, 75.01, 76.98 and 75.20 per cent was constituted by ewes in case of small, medium, large and all-farms respectively.

The number of rams per farm unit ranged from 0.79 to 1.64. Ram to ewe ratio of the total flock in the case of medium, large and all-farms indicated that one ram was present per 46, 56 and 43 ewes respectively. They are not in tune with the recommendations made by research workers as well as Government. Smith (1963) opined that 40 ewes and a ram would be an economical flock size. The recommendation of the Government is one ram for 20 ewes. Thus, the number of rams in the different flocks was inadequate.

Table 18: **Sheep holding particulars of the selected farmers**

S.No.	Category of the farm	No. of families	No. of sheep		Rams		Ewes		Lambs				Ram/ Ewe Ratio
			No.	%	No.	%	No.	%	Male		Female		
									No.	%	No.	%	
1.	Small	29	712 (24.55)	100	23 (0.79)	3.23	503 (17.34)	70.64	12 (0.41)	1.68	174 (6.0)	24.43	21.87
2.	Medium	34	2129 (62.61)	100	35 (1.02)	1.64	197 (46.97)	75.01	18 (0.53)	0.84	479 (14.09)	22.49	45.63
3.	Large	17	2055 (120.88)	100	28 (1.65)	1.36	1582 (93.06)	76.98	18 (1.06)	0.87	427 (25.12)	20.77	56.50
4.	All-farms	80	4896 (61.2)	100	86 (1.07)	1.75	3682 (46.02)	75.20	48 (0.6)	0.98	1080 (13.5)	22.05	42.81

Values in parentheses are average number of sheep.

5.1.8 Source for starting sheep-farming

For more than half of the farmers sheep-rearing was a hereditary occupation. About 46 per cent of farmers started sheep-rearing with own capital. A very small percentage of farmers used borrowed capital in starting the sheep-rearing and all of these farmers belonged to the small farmers group. Only about 21 per cent of the small farmers were able to start the sheep-rearing with borrowed capital. This underlines the importance of providing more capital/credit to the people belonging to weaker sections to start the sheep farming (Table 19).

5.2 MANAGEMENT PRACTICES OF SHEEP-REARING IN NELLORE DISTRICT

An attempt has been made in the study to know the sheep-rearing practices followed in the study area. Management practices adopted by the farmers in sheep-rearing helps in a better understanding of the general awareness level of the farmers. It also helps in a better under-standing of the problems faced by the farmers and to draw policy measures for improvement of sheep-rearing. Following are the management practices adopted by the farmers in the study area.

Breeding: The most common breed of sheep in this area is Nellore breed. The Nellore breed consists of three types viz., Jodepi (white with black colour underneath), Yerupu (brown colour) and Palla (white colour). But the Yerupu and Palla types were rarely seen. The most common type is Jodepi. The Nellore breed is mutton type and no wool is obtained from the sheep. Farmers retain the ewes for about 4 to 5 lambings. On an average, the ram to ewe ratio was found to be 1:43. The average lambing per cent was 79 at all farms level while the sex ratio of male and female lambs born was 1:1,

Table 19: **Source for starting sheep farming (Total and percentage)**

S.No.	Category of the farm	Hereditary		Started with own capital		Started with borrowed capital	
		No.	%	No.	%	No.	%
1.	Small	16	55.17	7	24.13	6	20.68
2.	Medium	17	50.00	17	50.00	—	—
3.	Large	8	47.05	9	52.94	—	—
4.	All farms	41	51.25	33	46.25	6	7.5

though various authors reported different sex ratios of lambs born they are not significantly different from the present findings. It was noted during the survey that ewes and rams of about one year were used for breeding which is not a good practice because at this age they are not fully developed. It was observed that breeding was uncontrolled as the rams were grazed and penned together with the ewes and were rarely separated as it involved aditional labour for grazing them separately. The method of mating followed was natural flock mating. Lambs were usually weaned at the age of 5 to 6 months which is quite late.

Grazing and Feeding: The sheep were grazed for about 8 to 10 hours on an average and they cover about 2 to 4 kms a day. In the scarcity areas during summer the sheep farmers were forced to migrate in search of grazing lands. Sheep could live on pastures and cultivated waste land as their feed requirement was not rigid and they were fed on many types of weeds and as such they were excellent destroyers of weeds.

No fodder crops were grown exclusively for sheep feeding and no supplementary feeds were given to the sheep. Lambs were fed with green leaves and grass for two months. Flushing was not at all followed.

Sheep were watered one to two times per day. The main source of water for sheep were village ponds, canals, tanks and irrigation wells.

Migration: About 40 per cent of the flock owners were forced to migrate to provide adequate grazing and watering to sheep during

summer. They returned at the onset of monsoon, usually in the month of June.

Housing and Penning: It was found that most of the sheep were not provided with shelter and they were penned in the open fields. It was observed that the amount spent towards housing was just 2.4 per cent of the total cost of production. It was also found that the average floor area per sheep was less than 1 square meter. Most of the farms do not have drainage facilities in the penned area, as there was no pucca flooring. Most of the sheep were not protected from rain, wind, cold and from hot sun.

Health Coverage: The survey revealed that sheep were prone to various infectious diseases like contagious pleuro pneumonia, enterotoxaemia, foot and mouth disease, Sheep pox, Rinder pest and non-infectious diseases such as tymponitis, dysentry, besides ecto and endo parasitic infestations. Mortality details were covered separately. Only 55 per cent of the total selected farmers followed timely vaccination.

Other Practices: Shearing was not at all practiced as the Nellore breed of sheep produces no wool. Tattooing is also not at all practiced by the farmers in the study area. Care of pregnant ewes was practised by only 30 per cent of the total farmers. The sheep were not milked in the area as the quantity of milk produced was negligible. The milk was fed to the lambs.

5.3 THE STRUCTURE OF COSTS AND RETURNS OF SHEEP FARMING

The study of costs and returns of sheep farming will help to determine the profitability of the enterprise. It is useful to the farmer in maximizing the profits by adopting the efficient production system and also helps the Government in the formulation of policies and programmes for sheep development. Hence, an attempt is made here to study the costs and returns of sheep farming in Nellore district of Andhra Pradesh.

Cost structure

The cost structure consisted of two components, namely, fixed costs and variable costs. Initial value of sheep, cost of shed, cost of equipment, rate of interest on fixed capital were included under fixed costs. The variable costs consisted of cost of grazing, cost of feeds, cost of veterinary medicines, cost of labour and miscellaneous expenditure.

A. All farms

The details of various items of costs incurred in sheep-rearing are presented in Table 20. It is obvious from the table that the total cost of rearing the sheep at all-farms level was Rs.74064. An amount of Rs.61,420/- and Rs.12,644/- was towards fixed costs and variable costs. Fixed costs constituted about 82.93 per cent, while variable costs formed about 17.07 per cent of the total costs. The initial value of sheep was the single largest cost of the rearing the sheep. It formed about 79.49 per cent of the total cost. The cost of shed was about Rs.1780/- only, which formed about 2.4 per cent of total cost. The cost incurred on equipment was meagre with an amount of Rs.534/-

Table 20: **Cost of sheep rearing**

S.No.	Category of the farm	Fixed Costs						Variable Costs							T.C.
		Total No. of sheep	Initial value of sheep	Cost of shed	Cost of equip-ment	Rate of interest (10%)	T.F.C	Cost of grazing	Cost of feeding	Cost of vety. medicine	Labour costs	Misc. expendi-ture	Rate of interest (12.5%)	T.F.C.	
1.	Small	712	21,765	912	168	108	22.953	691	247	377	4740	336	799	7190	30143
			(72.20)	(3.03)	(0.56)	(0.36)	(76.15)	(2.29)	(0.82)	(1.25)	(15.73)	(1.11)	(2.65)	(23.85)	(100)
2.	Medium	2129	64,526	2190	551	274	67,541	1608	476	1430	6060	742	1290	11606	79147
			(81.53)	(2.76	(0.70)	(0.35)	(85.34)	(2.03)	(0.60)	(1.80)	(7.66)	(0.94)	(1.63)	(14.66)	(100)
3.	Large	2055	94,706	2214	1123	334	98,377	4676	2647	3264	7040	1367	2374	21368	119745
			(79.09)	(1.85)	(0.94)	(0.28)	(82.16)	(3.90)	(2.21)	(2.73)	(5.88)	(1.14)	(1.98)	(17.84)	(100)
4.	All farms	4896	58,875	1780	534	231	61,420	2353	854	1438	5866	728	1405	12644	74064
			(79.49)	2.40)	(0.72)	(0.31)	(82.93)	(3.18)	(1.16)	(1.94)	(7.92)	(0.98)	(1.90)	(17.07)	(100)

Figures in parentheses are percentage to total cost.

constituting only 0.72 per cent of the total cost. It is revealed from this analysis that housing facilities and equipment used in sheep rearing were not significant.

Among the variable costs, the labour item was considered to be important. This formed about 7.92 peer cent of the total cost. The cost of labour worked out to Rs.5,866/-. The labour cost was mainly towards the watch and ward, taking sheep out for grazing, feeding and drinking water etc. Using the veterinary medicines, sweeping the shed etc. required labour. Cost of grazing the sheep worked out to Rs.2,353/ - forming about 3.18 per cent of the total cost. The cost of grazing means that the expenditure was incurred towards payment for the land used for grazing purpose. The cost of veterinary medicines worked out Rs.1,438/- i.e., about 1.94 per cent of the total costs. This indicated that veterinary care of the sheep was negligible. Miscellaneous expenditure formed about 0.98 per cent of the total cost. This included expenses incurred on transport and amount spent on transport of animals at the time of migration. The analysis of cost of sheep-rearing indicated that sheep-rearing was carried on in the most traditional and conservative manner.

B. Size-wise analysis

It is observed from the table that the total costs of sheep-rearing worked out to Rs.30,143/-, Rs.79,147/- and Rs.1,19,745/- per flock of sheep in small, medium and large size groups respectively. The number of sheep in each size group was different. The number of sheep increased with the increase in size of the flock. It was, therefore, natural that the costs both of fixed and variable in absolute

terms also increased with the increase in size of the flock. This could never be otherwise.

However, the difference in fixed cost among the three size groups was discernible.

The percentage of total fixed costs in the total costs in the case of medium farms was the highest with 85.34, while the same was the lowest with 76.15 in the case of small farms. The same was 82.16 per cent in the total costs in the case of large farms. The cost of shed in terms of percentage to total cost was declining as the size of flock increased, whereas the cost of equipment in terms of percentage to total cost was increasing as size of the flock increased. The percentage of cost in the total cost on grazing, feeding and veterinary medicines was the highest in the case of large farms as against that of small and medium farms. However, the percentage of cost of labour in the total cost was the highest in the small farms, followed by medium and large farms. The percentage of variable costs in total costs was 23.85, which was maximum in the case of small farms and it was minimum in the case of medium farms with 14.66.

The comparison of costs among the different size groups was not desirable, as the number of sheep in each group differed from the other. However, the comparison in terms of percentages on various items of cost among the different size groups and at All-farms level served the purpose of determining the differences in cost of rearing sheep among the different size groups and also the level of maintenance of sheep in different groups and at all-farms level. However, the best way to measure the differences in cost of rearing the sheep

was to compare through the estimation of cost of rearing of each sheep on an average.

The particulars of cost of sheep rearing on per sheep basis are furnished in Table 21.

It is revealed from the table that the cost of rearing one sheep worked out to Rs.214.26, Rs.308.69, Rs.208.51 and Rs.187.49 at all farms, small, medium and large farms levels respectively. It was, thus, obvious that the cost of rearing a sheep declined with increase in the size of farm/flock. Economies of scale were observed to be operating in the case of large sheep farms.

The foregoing cost analysis brought out the fact that the labour was the single largest cost item in rearing of the sheep and all other items of costs were of minor nature. The expenditure on grazing, feeding, veterinary medicines, housing, equipment etc. was not substantial or significant. The only major item of cost in sheep rearing was the initial value of sheep.

The cost analysis clearly indicated that sheep farming was carried-on in Nellore district in a traditional manner and the modern production technology is yet to be adopted. The level of productivity/ production and profita-bility would be determined only when the returns pattern from the sheep rearing is estimated.

Returns pattern

The returns from sheep rearing included the value of sold animals, manures and skins besides the value of unsold animals. The details of returns pattern are provided in Table 22.

Table 21: **Cost of sheep-rearing (Average/sheep)**

(In rupees)

S.No.	Category of the farm	Total No. of sheep	Total cost of rearing	Cost of rearing/sheep
1.	small	712	219791	308.69
2.	Medium	2129	443938	208.51
3.	Large	2055	385299.9	187.49
4.	All farms	4896	1049028.9	214.26

Table 22 : **Returns from sheep-rearing**

S.No.	Category of the farm	Value of unsold sheep	Value of sold animals	Manures	Skins	Gross returns	Net returns	B.C.R.
1.	Small	34545 (82.90)	5021 (12.05)	1862 (4.46)	240 (0.57)	41668 (100)	11525	0.38
2.	Medium	96522 (83.32)	13170 (11.36)	5779 (4.98)	365 (0.31)	115836 (100)	36689	0.46
3.	Large	181323 (82.95)	27388 (12.52)	9117 (4.17)	755 (0.34)	218583 (100)	98838	0.82
4.	All farms	91875 (83.08)	13237 (11.97)	5068 (4.58)	402 (0.36)	110582 (100)	36517	0.49

Figures in parentheses indicate percentage to gross returns.

A. All farms

The gross returns obtained from sheep rearing were valued at Rs.1,10,582/-. The value of unsold animals was the single largest contributory factor to the gross returns. About 83 per cent of gross returns were supposed to be obtained from the value of the unsold sheep. The value of sheep sold was about Rs.13,237/- which formed about 12% of the gross returns. An amount of Rs.5,068/- was received from the manure. This constituted about 4.58 per cent of the gross returns. However, the returns from skins appeared to be extremely low, with just 0.36 per cent of the gross returns.

The net returns were estimated to be about Rs.36,518/-. The benefit-cost ratio worked out to 0.49.

B. Size-wise analysis

The gross returns were estimated to be Rs.41,668/-, Rs.1,15,836/- and Rs.2,18,583/- on small, medium and large sheep farms respectively. Naturally the gross returns increased with the increase in farm size. The returns pattern among the different size groups was similar to that of the All-farms.

The net returns were estimated at Rs.11,525/-, Rs.36,689/- and Rs.98,838/- in small, medium and large farms respectively. The B.C. ratio was 0.38, 0.46 and 0.82 on small, medium and large farms respectively. It might be noted that the B.C. ratio was increasing with the increase in size of flock. One other important measure to compare the returns pattern among the different size groups would be to work out returns per 1 kg of meat in each size group and at All-farms level. The details are presented in the Table 2[illegible].

Table 23: **Cost of production of meat per 1 kg (Average)**

(In rupees)

S.No.	Category of the farm	No. of sheep sold	Body weight of sheep (kg's)	Cost of production of sheep	Cost of production (kg's)
1.	Small	173	13	308.69	23.74
2.	Medium	592	14	208.51	14.89
3.	Large	647	15	187.49	12.50
4.	All farms	1412	14	214.26	15.30

It is obvious from the table that returns obtained per 1 kg of meat were Rs.51.24 in small, Rs.59.01 in medium, Rs.64.73 in large and Rs.62.36 at all-farms level.

Similarly, the cost and returns per kg of mutton were also worked out and the details are presented in Table 2 . Since the sheep-rearing in Nellore district was carried on in traditional manner, the actual expenditure incurred was low. It was only the initial expenditure that mattered.

The cost of production of meat per 1 kg worked out to Rs.15.30 at all-farms, Rs.23.74 on small, Rs.14.89 on medium and Rs.12.50 on large farms respectively. The cost of production of 1 kg meat declined as the size of flock inceased which might be due to economics of scale.

The foregoing analysis clearly indicated that sheep-rearing was a profitable proposition. However, the improved production technology, if adopted, would certainly enhance the productivity and profitability to the sheep farmers.

5.4 ECONOMICS OF RAM-REARING

It was observed in the study area that some farmers adopted the practice of ram-rearing. Farmers purchase ram lambs at the age of 1 to 2 months and sell them away for mutton when they attain 6 to 7 months age. Farmers get quick returns as the gestation period is 5 to 6 months only. The distingushing feature between ram-rearing and sheep-rearing is that, in the case of ram-rearing farmers sell away all the animals at the end while they sell away only ram lambs retaining

Table 24: **Particualrs of returns to farmers per 1 kg of meat (Average)**

(In rupees)

S.No.	Category of the farm	No. of sheep sold	Body weight (kg's)	Price received for sale of sheep	Returns/Kg
1.	Small	173	2250	1,15,290	51.24
2.	Medium	592	8290	4,89,240	59.01
3.	Large	647	9705	6,28,204	64.73
4.	All farms	1412	19768	12,32,734	62.36

ewe lambs with them for flock development in the case of sheep-rearing. Sheep-rearing is a continuous process unlike ram-rearing.

An attempt is made in the present study to workout the costs and returns of ram-rearing. For this purpose, 5 ram-rearing units were selected and the data were collected with the help of a schedule. The average number of rams held by the farmers was 35. The economics of ram-rearing are presented in Table 25. It can be observed from the table that the total cost incurred per flock amounted to Rs.35,580/- and the same per ram worked out to be Rs.1,016/-. Of this total cost, 74 percentage was incurred towards the purchase of ram lambs. Cost of human labour worked out to be 15 per cent of the total cost. Feeding cost worked out to be Rs.33/- per ram which is 3.26 per cent of the total cost. Cost of shed was Rs.1,600/- per farm which amounted to 4-5 per cent of the total cost.

The gross returns per farm worked out to be Rs.45,583/- and Rs.1,302/- per ram. Of the gross returns around 91 per cent was from the sale of rams. On an average each ram was sold at Rs.1,132/-. Returns from manure accounted for 8.94 per cent of the gross returns. Net returns worked out to be Rs.10,003/- per farm and Rs.286/- per ram. Benefit cost ratio was found to be 0.28.

Table 25 : **Economics of Ram-rearing**

S. No.	Particulars	Value (Rs.)		Percentage
		Per flock*	Per ram	
Costs				
1.	Initial value of rams	26,400	754.28	74.19
2.	Cost of shed	1,600	45.71	4.49
3.	Cost of equipment	250	7.14	0.70
4.	Feeding costs	1,160	33.14	3.26
5.	Cost of Veterinary medicines	550	15.71	1.54
6.	Cost of human labour	5,340	152.57	15.00
7.	Miscellaneous expenditure	280	8.0	0.79
8.	Total costs	35,580	1016.57	100.00
Returns				
9.	Value of sold rams	41,380	1132.28	90.78
10.	Manure	4,075	116.43	8.94
11.	Skins	128	3.65	0.28
12.	Gross returns	45,583	1302.37	100.00
13.	Net returns	10,003	285.8	—
14.	Benefit cost ratio	0.28	0.28	—

* Flock of 35 rams.

5.5 FUNCTIONAL ANALYSIS

An attempt has been made to assess the influence of various input factors on the gross returns in sheep farming with the help of multiple linear regression function. Since the production costs and returns in sheep-rearing were more of linear nature, the above function was used in the analysis. This function determines the contribution of each input to the gross returns in combination with other inputs.

The problem of multi-collinearity was tested and it was found that the results of regression analysis are free from multi-collinearity (correlation matrix appended).

Further analysis was carried on by stepdown regression method for various categories of farmers and the best fits were finally chosen for interpretation of results. The variables retained in the chosen functions for the different categories of farmers are presented hereunder.

Small size:

y = Gross returns per farm in rupees

x_1 = Flock size in terms of no. of sheep.

x_6 = Cost of labour in rupees.

Medium size:

Y = Gross returns per farm in rupees

x_1 = Flock size in terms of no. of sheep

x_2 = Cost of equipment in rupees

x_4 = Cost of feeding in rupees

Large size:

Y = Gross returns per farm in rupees

x_1 = Flock size in terms of no. of sheep

x_5 = Cost of veterinary medicines in rupees.

All-farms:

Y = Gross returns per farm in rupees

x_1 = Flock size in terms of no. of sheep

x_3 = Cost of grazing in rupees

x_5 = Cost of veterinary medicines in rupees

x_6 = Cost of labour in rupees

x_7 = Miscellaneous expenditure in rupees.

The regression coefficients of factors influencing gross returns in sheep farming are presented in Table 26.

a. All-farms

At all-farms level, the coefficient of multiple determination (R^2) was 0.94. Therefore, this variation in gross returns was explained by the variables namely flock size (x_1), cost of grazing (x_3), cost of veterinary medicines (x_5), cost of labour (x_6) and miscellaneous costs (x_7). The regression coefficients of x_1, x_3, x_5, x_6 and x_7 were 250.13, 0.64, -1.84, 0.91and 4.67 respectively. All these variables showed positive influence on the gross returns except cost of veterinary medicines(x_6). Among these variables, flock size is highly significant at one per cent level indicating that one unit increase in flock size, *ceteris paribus,* would increase the income from sheep by 250 units. Similarly one unit increase in x_3 (cost of grazing), x_6 (cost of labour) and x_7 (miscellaneous costs) would contribute to 0.64, 0.91 and 4.67 units increase in gross returns, while it decreases by 1.84 units on the costs incurred on veterinary medicines. This suggests that expenses on veterinary medicines may be reduced.

Table 26: **Regression coefficients of factors influencing returns in sheep farming**

S.No.	Particulars	Small	Medium	Large	All-farms
1.	Number of observations	29	34	17	80
2.	Constant (a)	8038.65	9933.03	17414.84	4146.59
3.	Size of flock (x_1)	151.42** (30.68)	247.78** (42.94)	243.00** (62.72)	250.13** (33.43)
4.	Cost of equipment in rupees (x_2)	—	-4.33+ (2.28)	—	—
5.	Cost of grazing in rupees (x_3)	—	—	—	0.64* (0.27)
6.	Cost of feeding in rupees (x_4)	—	-7.98** (2.51)	—	—
7.	Cost of veterinary medicines in rupees (x_5)	—	—	-2.92* (1.35)	-1.84* (0.86)
8.	Cost of human labour in rupees (x_6)	-0.98** (0.38)	—	—	0.91+ (0.50)
9.	Miscellaneous costs in rupees (x_7)	—	—	—	4.67** (1.46)
10.	Coefficient of multiple determination (R^2)	0.540**	0.598**	0.517**	0.946**

Figures in parentheses indicate standard errors.

* Significant at 5 per cent level ** Significant at 1 per cent level + Significant at 10 per cent level.

b. Small farms

The coefficient of multiple determination (R^2) was about 0.54. This variation in gross returns was explained by all the variables included in the function. The regression coefficients of x_1 (flock size) and x_6 (cost of labour) were 151.42 and -0.98. The flock size has positive influence on the gross returns while it was negative for labour. Both the flock size and cost of labour were significant at 0.1 per cent level of probability. The significance of coefficients of flock size suggests that there is a possibility of increasing the returns. In other words, it implies that a unit increase in flock size would contribute an increase of 151.4 units in gross returns. The negative regression coefficient of the variable cost of labour suggests the excessive use of human labour. Hence, their reduction is recommended. The analysis in case of small farms suggests that by increasing the flock size and proportionally increasing the level of labour use gross returns can be increased.

c. Medium farms

The coefficient of multiple determination (R^2) was 0.59. This shows that all the variables included in the function explained 59 per cent of variation in gross returns. 247.78, -4.33, -7.98 were the regression coefficients of x_1 (flock size), x_2 (cost of equipment) and x_4 (cost of feeding) respectively. Out of these three variables, flock size is highly significant at one per cent level of probability and has positive influence on gross returns. A unit increase in flock size would contribute 247 units of increase in gross returns. Economies of scale are implied here. The negative regression coefficients of the two variables viz., cost of equipment and cost of feeding shows the exces-

sive utilization of the equipment and feeds. Hence, the medium farmer is recommended to reduce the costs of feeding in order to improve the gross returns.

d. Large farms

The estimated coefficient of multiple determi-nation was 0.51. The regression coefficients of x_1 (flock size) and x_5 (cost of veterinary medicines) were 243.00 and -2.92 respectively. The variable flock size has positive influence on gross returns and is significant at one per cent level of probability. The variable cost of veterinary medicines has negative influence on gross returns and is significant at 10 per cent level of probability. The negative sign of the regression coefficient of the variable cost of veterinary medicines suggests that the large farmers are spending more than what is needed on health care of the sheep flock. Hence the large farmers can improve their gross returns by reducing the expenditure on veterinary medicines.

The results of the functional analysis highlighted that the flock size made the highest contribution to gross returns on all size groups. It was due to this fact, that the size of flock might be increased to get higher returns on all sizes of farms.

6. RELATED ISSUES

a) Employment of human labour

As explained earlier, labour was one of the important inputs in sheep-rearing. This enterprise provided employment for carrying out various activities, such as, marketing, utilizing byproducts, such as manure, assembling, processing, marketing of skins, leather industry etc.

An attempt is made here to study the employment of labour in sheep rearing at farmers' level only.

Labour included both family labour and hired labour. The details of labour employment are furnished in Table 27.

It is obvious from the table that major share of labour was provided from family for the purpose of sheep-rearing. It ranged from 66.67 to 82.35 per cent of the total labour utilized in sheep-rearing. Hired labour formed only a small portion of total labour. It was, thus, clear that sheep-rearing was mostly a family-oriented enterprise, which utilized the family labour. The number of persons engaged in sheep-rearing was 49, 68, 30 and 147 at small, medium, large and all-farms levels respectively. The labour employed per farm, on an average, in terms of persons was 1.69, 2.00, 1.76 and 1.84 on small, medium, large and all-farms respectively. These persons were engaged in the rearing activity throughout the year.

The above analysis indicated ,that, more than one person in each family was engaged throughout the year in rearing the sheep. Thus sheep rearing provided self-employment and proved to be one of the best avenues of providing employment to the rural families and one of the rural development programmes.

b) Lambing For prolification or multiplication of the sheep efficient lambing practice is absolutely needed. The sheep farmers should provide facilities to increase the lambing percentage. The details of production and reproduction traits are provided in Table 28.

Table 27: **Employment of human labour**

S.No.	Category of the farms	No. of people engaged in sheep farming				Total No. of men employed	Average per farm
		Owned labour	% to total labour	Hired labour	% to total labour		
1.	Small	40	81.63	9	18.37	49	1.69
2.	Medium	56	82.35	12	17.65	68	2.00
3.	Large	20	66.67	10	33.33	30	1.76
4.	All-farms	116	78.91	31	21.09	147	1.84

Table 28: **Production and reproduction traits (Average)**

S.No.	Category of the farm	Lambing frequency	No. of lambs/lambing	Lambing percentage	Lamb sex ratio (M : F)
1.	Small	1.04	1	80.12	44.91:55.09
2.	Medium	1.06	1	80.09	50.75:49.25
3.	Large	1.03	1	78.00	52.44:47.56
4.	All-farms	1.04	1	79.20	49.34:50.66

It is obvious from the table that single lamb per sheep was the main characteristic of the sheep lambing. The lambing frequency was 1.04, 1.06, 1.03 and 1.04 in case of small, medium, large and all-farms level respectively. The lambing percentage was around 79 in the case of all-farms and it was 80.12, 80.09 and 78 in the case of small, medium and large farms respectively. The lamb sex ratio indicated that female lambs were slightly more in case of small farms. It has shown nearly 1:1 ratio in case of other farms.

c) Mortality

Mortality of sheep was proved to be one of the important factors causing heavy loss to the farmers. The mortality in sheep was due to a variety of factors. The details of the important factors are furnished in Table 29.

On an average, the percentage of sheep died out of the total sheep population was 18.39 at the all-farms level. It ranged from 17.17 on large farms, 22.94 on small farms, while the same remained at 17.92 on medium farms. The major reason for mortality in sheep was the out-break of diseases, such as sheep pox, foot and mouth, pneumonia and respiratory diseases etc. About 14 per cent of total sheep died due to out-break of diseases at the all-farms level. The mortality due to out-break of diseases was maximum in the case of small farms with sheep mortality of 20.78 per cent of the total sheep population, followed by medium farmers with the sheep mortality of 13.57 per cent of the total sheep. However, the mortality was only 11.97 per cent of the total sheep in the case of large farms. The mortality of sheep increased with the decrease in the size of flock. In

Table 29: **Reasons for mortality (Total and percentage)**

S.No	Category of the farm	Due to out-break of disease		Due to exposed to rain, cold & heat		Killed by wild animals & accidents		Total No. dead		Total popu-lation	Remain-ing population
		No.	%	No.	%	No.	%	No.	%		
1.	Small	192	20.78	15	1.62	5	0.54	212	22.94	924	712
2.	Medium	352	13.57	98	3.78	15	0.58	465	17.92	2594	2129
3.	Large	297	11.97	115	4.63	14	0.56	426	17.17	2481	2055
4.	All-farms	841	14.02	228	3.80	34	0.57	1103	18.39	5999	4896

otherwords, the mortality of sheep declined with the increase in size of farm. This might be due to better care comparatively taken by the large farmers.

The reverse was true in the case of mortality due to the exposure of sheep to rain, cold and heat. The mortality of sheep declined with the decline in the sheep farm size. Perhaps, the small farmers could provide better housing facilities to protect the sheep from adverse climatic conditions. They might have accommodated them in their huts, houses or sheds in case of rains, etc. On an average, about 4 per cent of the total sheep died due to exposure of sheep to adverse climatic conditions, such as rain, cold and heat.

About 0.57 per cent of the total sheep died due to accidents and killed by wild animals.

The mortality percentage of sheep was high in the case of small farms. Out-break of diseases was the major factor causing mortality.

The analysis indicated the importance of disease control, better housing/shelter conditions, protection from accidents and wild animals, etc in the sheep-rearing to save the farmers from heavy losses due to mortality.

d) Adoption of management practices in sheep rearing

The productivity of the sheep in the district was found to be low and this was mainly due to lack of adoption of management practices. The details of adoption of management practices are presented in Table 30.

Table 30: Adoption of management practices (Total and percentage)

S.No.	Management practices		Small		Medium		Large		All-farms	
			No.	%	No.	%	No.	%	No.	%
1.	Supplementary feeding		--	--	--	--	3	17.65	3	3.75
2.	Stall feeding		--	--	--	--	--	--	--	--
3.	Deworming done -	Once	15	51.72	28	82.35	13	76.47	56	70
		Twice	--	--	2	5.88	3	17.65	5	6.25
		Thrice	--	--	--	--	--	--	--	--
4.	Deticking -	Once	12	41.38	19	55.88	9	52.94	40	50
		Twice	--	--	4	11.76	5	29.41	9	11.25
		Thrice	--	--	--	--	--	--	--	--
5.	Timely vaccination		10	34.48	22	64.70	12	70.58	44	55
6.	Visit of Vety.Doctor/ Extension worker		---------- Irregular and occasional ----------							
7.	Flushing followed		--	--	--	--	--	--	--	--
8.	Care of pregnant ewes		--	--	15	44.12	9	52.94	24	30
9.	Culling		25	86.21	30	88.23	16	94.12	71	88.75
10.	Cross-breed		--	--	--	--	--	--	--	--
11.	Ownership of rams Ram-Ewe ratio		23 1:22	--	35 1:46	--	28 1:56	--	86 1:43	--
12.	Rams from Govt. or others		2	6.9	2	5.88	3	17.65	7	8.75
13.	Weaning (timely)		3	10.34	7	20.59	5	29.41	15	18.75
14.	Special feeding to young ones		29	100	34	100	17	100	80	100
15.	Tattooing		--	--	--	--	--	--	--	--
16.	Dripping		--	--	--	--	--	--	--	--
17.	Shearing		--	--	--	--	--	--	--	--
18.	Castration		--	--	--	--	--	--	--	--

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It was noted from the table, that, no farmer adopted the practice of stall feeding the sheep. But, a small number of large farmers adopted the practice of supplementary feeding. External and internal parasites were responsible to some extent for the loss in weight of the sheep. Although deworming was recommended to be done thrice, none of the farmers did this thrice. About 70 per cent of the farmers did deworming once and 6.25 per cent of the farmers did deworming twice at the all-farms level. It was only about 51.72 per cent of small farmers adopted deworming and that too they did this practice only once. Deticking was also done only once in the case of sheep of the small farmers. It was adopted by about 41 per cent of the small farmers. Deticking was adopted once by about 50 per cent and twice by about 11.25 per cent of farmers at the all-farms level. Timely vaccination was given to sheep by 55 per cent of farmers at all-farms level. Flushing was not done by any farmer.

Most of the farmers adopted the practise of culling. 88.75 per cent of the farmers adopted culling at all-farms level. Timely weaning was not practised by most of the farmers in the study area. Weaning at the age of 3 months is recommended. But, only 19 per cent of the farmers adopted timely weaning. Tattooing, dripping and castration were not at all practised by the farmers. Shearing was not adopted because the Nellore breed is of mutton type and produces no wool. Ram - ewe ratio was found to be 1:43 at all farms level, while it was 1:22, 1:46 and 1:56 on small, medium and large farms respectively.

The information presented in the table clearly revealed that the level of management practices adopted by the farmers in general was

very low. Lack of knowledge and economic capacity of the farmers, veterinary services, credit, etc. were responsible for non-adoption of management practices.

e) Farmers' suggestions

In order to overcome several problems and remove the constraints in the sheep rearing as an enterprise, the farmers made several suggestions. These were analysed and presented in the Table 31.

It might be noted that each farmer gave more than one suggestion. The most important suggestion that emerged from the farmers was that sheep cooperatives should be formed. Indeed, it was the best suggestion, as the cooperatives alone could provide the required impetus to the sheep rearing activity as an enterprise. Realizing the dire need for control of parasites, the farmers suggested to conduct mass deworming and deticking camps in the villages. In the absence of organized sheep markets, the farmers were bound to be cheated and exploited by middlemen. Hence, 91 per cent of the farmers desired that sheep markets should be organized in rural areas. About 90 per cent of the farmers expressed that they need the services of the Veterinary Doctor. Extension services and credit facilities were also demanded by the farmers.

Table 31: Suggestions from the farmers (Total number and percentage)

S.No.	Category of the farm	1	2	3	4	5	6	7	8	9	10
1.	Small	29 (100)	5 (17.24)	29 (100)	27 (93.10)	25 (86.21)	12 (41.38)	28 (96.55)	25 (86.21)	21 (72.41)	13 (44.82)
2.	Medium	32 (94.12)	9 (26.47)	34 (100)	30 (88.23)	31 (91.18)	17 (50.00)	32 (94.12)	33 (97.06)	29 (85.29)	25 (73.53)
3.	Large	13 (76.47)	3 (17.65)	17 (100)	15 (88.23)	15 (88.23)	11 (64.70)	16 (94.12)	15 (88.23)	13 (76.47)	10 (58.82)
4.	All-farms	74 (92.5)	17 (21.25)	80 (100)	72 (90.00)	71 (88.75)	40 (50.00)	76 (95.00)	73 (91.25)	63 (78.75)	58 (72.5)

Figures in parentheses indicate percentages

1. Conducting mass deworming and deticking camps in village
2. Supply of new breeds
3. Supply of medicines at subsidised rates
4. Requirement of service of Veterinary Doctor
5. Supply of feed mixture through Veterinary Department
6. Supply of new fodder seeds
7. Formation of sheep cooperatives
8. Establishment of organised sheep markets
9. Services of extension personnel
10. Role of commercial banks, Dept. of Animal Husbandry, Special assistance programmes for weaker sections pertaining to sheep rearing.

SUMMARY AND CONCLUSIONS

CHAPTER VI
SUMMARY AND CONCLUSIONS

The present study was conducted with the following objectives.

1. To study the sheep-rearing practices in Nellore district.
2. To estimate costs and returns and profitability of sheep farms according to size.
3. To assess the factors affecting sheep farming.
4. To study the adoption of recommended technology.
5. To study the economics of ram-rearing and disposal.

To fulfil the above objectives an ultimate sample of 80 sheep farmers, comprising of 29 small, 34 medium and 17 large farmers were selected randomly. Well structured schedule was prepared and administered to the selected respondents for securing the needed data. Both conventional and functional analysis were used in the processing and presentation of the data. The data on production pertained to the production period of 1996.

6.1 MAJOR FINDINGS

The average size of family was 8, 7 and 10 in the case of small, medium and large farms respectively. A great majority i.e., upto 87 per cent of the members engaged in sheep farming were males. The percentage of illiterate farmers was about 69 on small, 59 on medium and 29 on large farms.

All the selected farmers were engaged in both the occupations, i.e., sheep rearing and also agriculture. Sheep rearing was main

occupation for about 45, 76 and 71 per cent of the small, medium and large farms respectively.

Mostly, male members were employed in sheep farming i.e., utpo about 87 per cent and remaining 13 per cent were female members. On an average 2 members were engaged per unit of sheep farming. But in the case of small farms only one member was engaged per unit of sheep farming.

6.1.1 Resource Base of Sample Farms

The average number of sheep was 25, 63, 121 and 61 respectively on small, medium, large and at all-farms level. The number of rams per farm unit engaged from 1 to 2 in case of small, medium and large farms. Almost one ram was present per 43 ewes. The cultivated holding of farmers increased with increase in sheep farm size. For more than half of the farmers (51 per cent) sheep rearing was a hereditary occupation. About 46 per cent of the selected farmers started sheep rearing with own capital.

6.1.2 Management Practices of Sheep Rearing

The most common breed of sheep reared was Nellore breed. Farmers retained ewes for about 4 to 5 lambings. On an average ram to ewe ratio was found to be 1:43 at all farms level. The method of mating followed was natural flock mating. Lambs were usually weaned at the age of 5 to 6 months which is quite late. No fodder crops were grown exclusively for sheep feeding and no supplementary feeds were given to the sheep. About 40 per cent of the flock owners were forced to migrate to provide adequate grazing to sheep during

summer. Most of the sheep were not provided with shelter. Average floor area per sheep was less than 1 sq. meter.

Sheep pox, Enterotexaemia, Rinder pest and Foot and Mouth diseases were reported from the study area.

No shearing was practised as no wool was produced by the Nellore breed. Tattooing was also not practised.

6.1.3 Cost Structure

The total cost of sheep maintenance at all-farms worked out to be Rs.74,064/- per flock, out of which Rs.61,420/- and Rs.12,644/- were towards fixed costs and variable costs respectively. In other words, fixed costs constituted about 83 per cent of the total costs while variable costs being 17 per cent. Of the total costs, initial value of sheep constituted 80 per cent.

Cost of human labour formed about 8 per cent of the total costs, which is a major item in variable costs. Cost of grazing was Rs.2,353/- at all farms level constituting 3 per cent of the total costs. An amount of Rs.1,438/- was spent on veterinary medicines at all-farms level.

The total costs incurred in sheep farming worked out to Rs.30,143/-, Rs.79,147/- and Rs.1,19,745/- on small, medium and large farms respectively. Percentage of fixed costs was highest in the case of medium farm (85%) and lowest in the case of small farms (76%). The cost of rearing a sheep worked out to Rs.309/-, Rs.208/- and Rs.187/- in case of small, medium and large farms respectively. It was noticed that the cost of maintenance of sheep decreased with increase in the size of farm.

6.1.4 Returns

The gross returns at all-farms level was Rs.1,10,582/- per flock. Value of unsold animals contributed maximum to the gross returns. About 83 per cent of the gross returns were obtained from the value of unsold sheep. 12 per cent of the gross returns were obtained from sale of sheep. About 4 per cent of the gross returns were realised from sheep manure.

The gross returns obtained from sheep worked to Rs.41,668/-, Rs.1,15,836/- and Rs.2,18,583/- in case of small, medium and large farms respectively.

The net returns obtained from sheep farming worked out to Rs.36,517/- per flock at all-farms level and Rs.11,525/-, Rs.36,689/- and Rs.98,838/- on small, medium and large farms respectively.

6.1.5 Cost of Production per Sheep and Costs and Returns per 1 kg of Meat

The cost of production of meat worked out to be Rs.15/- per 1 kg at all-farms level and it was Rs.24/-, Rs.15/- and Rs.12/- in case of small, medium and large farms respectively. But the returns received were Rs.62/- per 1 kg at all-farms level and were Rs.51/-, Rs.59/- and Rs.65/- in case of small, medium and large farms respectively.

6.1.6 Economics of Ram-Rearing

The total cost of production worked out to be Rs.35,580/- per a flock of 35 rams, while it was Rs.1,016/- per ram. Initial value of the ram constituted 74 per cent of the total costs. Gross returns

worked out to be Rs.45,583/- per flock and Rs.1,302/- per ram. Net returns obtained per flock were Rs.10,003/- and Rs.286/- per ram.

6.1.7 Functional Analysis

The results of the functional analysis highlighted that the size of flock had significant influence on the gross returns. However the other variables in sheep farming like cost of grazing, cost of veterinary medicines, cost of human labour and miscellaneous costs cotributed to the total returns. Size of flock and cost of human labour signifi-cantly contributed to the gross returns in the case of small farms. The negative regression coefficient of the variable cost of labour suggested the excessive use of human labour on small farms. In the case of medium farms, size of flock and cost of feeding significantly contrib-uted to the total returns. The cost incurred on equipment and feeds was more on medium farms. It was found that large farmers were spending excessively on veterinary medicines.

6.1.8 Employment of Human Labour

Human labour included owned family labour and hired labour. The average number of persons employed per farm worked out to be 1.69, 2.00, 1.76 and 1.84 respectively for the small, medium, large and all-farms. The above figures showed that atleast one person in each family was engaged in sheep rearing. In case of large farmers, more hired labour was employed.

6.1.9 Lambing

It was seen that single lamb per sheep was the main characteristic of the sheep lambing. Lambing frequency was found to be one. The

lambing percentage was around 79 in the case of all-farms and it was 80, 80 and 78 in the case of small, medium and large farms respectively. Lamb sex ratio was found to be 1:1 on an average.

6.1.10 Mortality

At all-farms level, the mortality percentage was 18. About 76 per cent of the total sheep died due to the outbreak of diseases. Due to lack of proper shelter and housing facilities, the sheep were exposed to rain, cold and heat and this exposure caused the mortality of sheep to the extent of 21 per cent.

6.1.11 Adoption of Recommended Technology

Housing facilities provided by sheep farmers were very poor. Supplementary and stall feeding practices were not seen at all. Deworming was done by 70 per cent of farmers at all-farms level. About 6 per cent of the farmers adopted deworming twice in a year. It was also noticed that flushing was not adopted by any farmer. Timely vaccination was done in case of 55 per cent of the sheep farmers at all-farms level. Care of pregnant ewes was taken up by 30 per cent of the farmers. The ratio of ram to ewe was also quite large. This ranged from 1:32 to 1:56 as against the suggested ratio of 1:20. Culling was done by 89 per cent of the farmers at all-farms level.

6.1.12 Farmers Suggestions

The most important suggestion that emerged from the farmers was that sheep cooperatives should be formed. Realizing the dire need for control of parasites, the farmers suggested to conduct mass deworming and deticking camps in the villages. 91 per cent of the farmers desired that sheep markets should be organised in rural areas.

6.2 POLICY MEASURES

Based upon the results of the study, the policy measures pertaining to sheep development are suggested as follows:

1. In view of low level of returns and incomes from sheep farming to the farmers, it is suggested to ensure better production per head of sheep. The production of mutton should be increased from the present level of 10-12 kg to 18-20 kg.

2. In the light of declining grazing facilities and the non-adoption of the practice of providing the supple-mentary feeds to sheep in the district, it becomes absolutely necessary to provide better grazing and feeding facilities to sheep.

Provision of drinking water to sheep at regular and frequent intervals is necessary. The kuntas and tanks in the villages may be repaired, if existed.

3. Lack of proper shelter or housing facilities has been responsible for outbreak of diseases and low health status of sheep, which cause heavy loss and damage to the farmer. The shelter provided through enclosures of thorny bushes should be replaced by good sheds to protect the sheep from rain, cold and heat. Further, provision of flooring and drainage facilities goes a long way in improving the health status of sheep.

4. Non-adoption of improved technologies and better management practices has been the major factor for the low productivity of sheep. Mortality caused heavy loss to the sheep farmers. Therefore, the reduction of loss due to mortality should receive top-most priority.

Disease control must be taken up on a massive scale. Timely vaccination and simple measures like deworming and deticking may be extended to all the sheep population. Organisation of deworming and deticking camps at the villages would be useful. Supply of rams at the rate of one for every 20 sheep may be ensured. Care of pregnant ewes would help to increase lambing rate for proliferation and multiplication of sheep population.

5. The officials of Animal Husbandry Department should form into diagnostic teams to identify the diseases and advise the farmers about the treatment needed. The needed vaccines should be produced and provided to the farmers in the required quantity and in the right time in addition to other veterinary medicines. In view of the poverty of the sheep farmers, it is suggested to supply the veterinary medicines at subsidised rates in the interest of the development of sheep.

6. The lack of adoption of improved technologies and management practices in sheep farming was largely due to lack of knowledge and technical know-how of the farmers in addition to lack of physical facilities and other economic factors. It is therefore, recommended that extension and training programmes besides demonstrations are to be conducted to educate the farmers in the adoption of scientific management practices. Since the extension activity so far as sheep development was concerned appears to be on low key, it needs to be strengthened. There should be live and regular contact between the sheep farmers and Extension workers.

7. As sheep farming has been suffering from lack of cash for investment, supply of credit to farmers is of paramount importance.

The co-operatives, commercial banks and government agencies should come forward to extend credit facilities to sheep farmers in a big way so as to enable them to take up sheep farming on commercial lines to make it a really profitable proposition.

8. Research and development in sheep farming should receive top priority. Intensification of technologies to achieve the targets of per capita production of mutton and wool of the desirable quality is recommended. More research is needed on the use of supplements and the methods of feeding them (mainly nitrogen and minerals) to ameliorate nutrient deficits. The budgetary allocation for development of sheep should be enhanced.

9. Sheep farmers should be organised on co-operative basis for securing fuller benefits from production and marketing of sheep and byproducts. Further, a co-operative sheep growers' federation at the state level may be established to serve the sheep farmers by providing all the necessary support and facilities in sheep farming.

The policy measures as suggested above would be useful in making sheep farming a profitable enterprise to provide a better standard of living to the millions of sheep farmers, particularly the rural poor shepherds in Nellore district in particular and the country as a whole in general.

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APPENDICES

CORRELATION MATRIX : SMALL FARMS

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	Y
X_1	1.00000	-0.28535	0.57429	0.38733	0.77529	0.01257	0.09246	0.65192
X_2	-0.28535	1.00000	0.01139	0.22834	-0.27000	0.01024	-0.04398	-0.21640
X_3	0.57429	0.01139	1.00000	0.54926	0.62609	0.04426	0.03639	0.34802
X_4	0.38733	0.22834	0.54926	1.00000	0.18399	-0.26780	0.27380	0.32867
X_5	0.77529	-0.27000	0.62609	0.18399	1.00000	0.15208	-0.08295	0.50915
X_6	0.01257	0.01024	0.04426	-0.26780	0.15208	1.00000	-0.33173	-0.33141
X_7	0.09246	-0.04398	0.03639	0.27380	-0.08295	-0.33173	1.00000	0.08811
Y	0.65192	-0.21640	0.34802	0.32867	0.50915	-0.33141	0.08811	1.00000

CORRELATION MATRIX : MEDIUM FARMS

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	Y
X_1	1.00000	-0.10847	0.50287	0.08109	0.66611	0.19354	0.22666	0.66674
X_2	-0.10847	1.00000	0.46454	-0.24345	0.23453	0.18686	-0.19230	-0.20774
X_3	0.50287	0.46454	1.00000	-0.32919	0.57245	0.15291	0.15444	0.34876
X_4	0.08109	-0.24345	-0.32919	1.00000	-0.01635	0.19356	-0.24768	-0.26961
X_5	0.66611	0.23453	0.57245	-0.01635	1.00000	0.10405	0.31241	0.44614
X_6	0.19354	0.18686	0.15291	0.19356	0.10405	1.00000	-0.04829	0.05806
X_7	0.22666	-0.19230	0.15444	-0.24268	0.31241	-0.04829	1.00000	0.42969
Y	0.66674	-0.20774	0.34876	-0.26961	0.44614	0.05806	0.42969	1.00000

CORRELATION MATRIX : LARGE FARMS

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	Y
X_1	1.00000	0.45742	0.46381	-0.18690	0.53145	-0.12925	0.30286	0.59772
X_2	0.45742	1.00000	-0.05985	0.02822	0.12095	-0.09375	-0.39715	0.04114
X_3	0.46381	-0.05985	1.00000	0.18046	-0.01154	-0.06127	0.13911	0.59790
X_4	-0.18690	0.02822	0.18046	1.00000	-0.32585	-0.06744	-0.17557	-0.00941
X_5	0.53145	0.12095	-0.01154	-0.32585	1.00000	-0.19218	0.32591	-0.02156
X_6	0.12925	-0.09375	-0.06127	-0.06744	-0.19218	1.00000	-0.15980	0.10036
X_7	0.30286	-0.39715	0.13911	-0.17557	0.32591	-0.15980	1.00000	0.30491
Y	0.59772	0.04114	0.59790	-0.00941	-0.02156	0.10036	0.30491	1.00000

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CORRELATION MATRIX : ALL-FARMS

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	Y
X_1	1.00000	0.87450	0.88464	0.80486	0.94504	0.79380	0.86148	0.96501
X_2	0.87450	1.00000	0.80040	0.76119	0.85436	0.75635	0.71517	0.84345
X_3	0.88464	0.80040	1.00000	0.86828	0.83669	0.66637	0.78289	0.88410
X_4	0.80486	0.76119	0.86828	1.00000	0.76645	0.62889	0.71160	0.80704
X_5	0.94504	0.85436	0.83669	0.76645	1.00000	0.75405	0.85554	0.90022
X_6	0.79308	0.75635	0.66637	0.62889	0.75405	1.00000	0.68193	0.78965
X_7	0.86148	0.71517	0.78289	0.71160	0.85554	0.68193	1.00000	0.87190
Y	0.96501	0.84345	0.88410	0.80704	0.90022	0.78965	0.87190	1.00000

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