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Status, Dynamics and Livelihood Contribution of Livestock in the Rainfed Areas of Andhra Pradesh

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1. Introduction

Out of the three dominant forms of livestock rearing, mixed crop-livestock systems are more prominent in rural India and Andhra Pradesh is no exception. This has been the practice since time immemorial. The size of livestock holding in relation to the farm and family size are such that the livestock production becomes a supplementary or complementary enterprise to the primary crop production. Equally or more important is the role of livestock in helping farmers cope with weather shocks.

The impressive economic growth witnessed in India led to a conspicuous change in consumption patterns of both rural and urban population in favour of livestock products and farmers have responded in raising the production levels through technology adoption as well as investments. However, considering the dominance of the land less and landed-poor in livestock holding, there is a need as well scope to improve the productivity levels and enhance the role of livestock in the livelihoods of the rural poor. It is with this view, we tried to put together information on the current status of livestock with respect to its size, distribution, productivity levels, strategies needed, etc in the selected project village clusters under NAIP which would help in designing appropriate interventions.

Livestock has always provided the much needed resilience to rainfed farming in most drought-prone regions of the country. However, over time the importance of livestock to rainfed farming declined and as a result the livelihoods of smallholder families started to wither away. Livestock serve not only as an effective enterprise in terms of converting the roughage into nutritious protein, but also recycles the nutrients to the soil for sustainable agricultural production. In the distressed and resource-poor agro-eco systems, the role of livestock is all the more important since they provide year-round liquidity that meets the domestic and farm needs of the agriculturists.

The eight districts where the NAIP-Component-3 sub project on "Sustainable Rural Livelihoods through Enhanced Farming System Productivity and Efficient Support Systems in Rainfed Areas" is in operation, are typically rainfed with varied agro-climatic conditions. The three districts in the Northern Telangana zone, viz., Adilabad, Warangal and Khammam represent high rainfall regions with dominance of tribals and forests. The Southern Telangana zone, represented by Nalgonda, Rangareddy and Mahabubnagar districts are faced with typical problems of land degradation, moisture stress and distress migration. The other two districts, Kadapa and Anantapur representing the Rayalaseema region fall under the scarce rainfall region. The relevance of livestock as a component of farming and livelihood systems is all the more pertinent in these districts, because, the agricultural production systems are typically extensive in nature.

In view of these, an attempt is made to understand the status of the livestock, its dynamics and contribution to rural livelihoods.

2. Methodology

Andhra Pradesh is divided into eight agro-climatic zones out of which three zones, viz., the North Telangana Zone, the South Telangana Zone and the Scarce Rainfall Zone of Rayalaseema are largely rainfed. The NAIP-Component-3 sub project on "Sustainable Rural Livelihoods through Enhanced Farming System Productivity and Efficient Support Systems in Rainfed Areas" is operating in cluster of villages of the eight districts representing significant part within these three zones.

Considering the three distinct agro-climatic regions covered in the project, the study area was selected to represent all the three regions. From the Northern Telangana region, two districts, viz., Warangal and Khammam were selected. Whereas, in the Southern Telangana region, Rangareddy and Mahabubnagar were selected. From the scarce rainfall region, Anantapur district was selected for this study. The data were collected from the households in villages of the respective clusters of the selected districts. From each cluster, a total of 30 households were selected on a random basis without regard to the land holding size. Thus, from the project districts, a total of 150 households formed the sample size (**Table 1**).

Table 1 : Sample frame work of livestock farmers in NAIP clusters

Cluster	% of Farmers					Total farmers (No)
	Landless	Marginal	Small	Medium	Large	
Jafergudem (Warangal)	17	17	20	26	20	**30**
Thummal-cheruvu (Khammam)	13	10	37	40	0	**30**
Jamistapur (Mahabubnagar)	0	27	49	17	7	**30**
Ibrahimpur (Rangareddy)	10	40	33	7	10	**30**
Pampanur (Anantapur)	3	7	3	54	33	**30**

Data on family size, land holding particulars, cropping pattern, livestock, fodder supply and feeding pattern, productivity, marketing and constraints were elicited from the respondents. The data so collected were compiled, analyzed and the results were compared cluster-wise. In order to understand the scale parameters, the data were post-stratified according to the farm holding size. The data were analyzed mainly using tabular analysis. The regression analysis was also done for estimating the production functions for dairy animals.

The analysis of primary data was further complemented with discussions and consultations with the project partners and other stakeholders while devising strategies for improving the performance of livestock. The feedback obtained through different tools like PRA and focused group discussions and the animal health camps organized from time to time was also considered for suggesting strategies discussed in this paper.

3. Land Holding

The average land holding in the NAIP clusters was lowest (1.62 ha) in Mahabubnagar, while it was the highest (4.01 ha) in Anantapur (**Table 2**). The area under cultivation as percentage to the total land held by the sample farmers was the highest (92%) in Mahabubnagar followed by Warangal (91%). The percentage area cultivated was lower in Khammam and Rangareddy clusters. The area under irrigation was the highest (46%)

in Mahabubnagar and was the lowest in Anantapur cluster (22%). Two clusters, viz., Jaffergudem (Warangal) and Jamisthapur (Mahabubnagar) had about 8% of the farmers' land under wastelands.

Table 2 : Land holding pattern of livestock farmers

Cluster	Average holding (ha)	Area under cultivation (%)	Area under irrigation (%)	Waste-lands (%)
Jafergudem (Warangal)	2.7	90.6	27.3	8.2
Thummalcheruvu (Khammam)	1.9	77.5	32.9	0.0
Jamistapur (Mahabubnagar)	1.6	91.8	45.9	8.2
Ibrahimpur (Rangareddy)	1.6	77.3	27.3	0.0
Pampanur (Anantapur)	4.0	80.6	22.0	0.0

4. Cropping Pattern

The season-wise crops grown across the study areas are given in **Table 3**. In two of the clusters, viz., Warangal and Khammam, the cropping systems are cotton + redgram in rainfed lands and paddy in irrigated lands. In the Southern Telangana zone represented by Mahabubnagar, cropping pattern mostly was castor + redgram and jowar + redgram, whereas in Rangareddy cluster, it is predominantly jowar + redgram. In the scarce rainfall zone represented by Anantapur cluster, the cropping pattern in the drylands is mostly groundnut + redgram, while paddy is grown in wetlands.

Table 3 : Major cropping Systems in the Study Areas

Cropping System	Cluster
Cotton + redgram, chillies, tobacco and paddy	Jafergudem, (Warangal)
Cotton + redgram, paddy	Thummalcheruvu, (Khammam)
Castor + redgram, jowar + redgram, ragi, cotton, greengram + redgram	Jamistapur, (Mahabubnagar)
Jowar + redgram, ragi, maize, greengram, groundnut + redgram, paddy	Ibrahimpur, (Rangareddy)
Groundnut + redgram, maize, chillies, paddy	Pampanur, (Anantapur)

5. Livestock Composition

The average livestock held by farmers across clusters ranged between 10 & 24 with the lowest in Mahabubnagar and highest in Warangal. The livestock in terms of adult cattle units (ACU) was more or less uniform (8 ACU/household) across the clusters except in Mahabubnagar where it was 6 ACU. In three of the clusters, viz., Anantapur, Rangareddy and Khammam, the cattle population was higher. Sheep were predominant in Warangal while goats were dominant in Khammam and Rangareddy clusters **(Table 4).**

A starved buffalo looking out for fodder

An emaciated bullock

Table 4 : Average livestock holding in Study Areas (per farmer)

Cluster	Cattle	Buffaloes	Sheep	Goats	Total	ACU
Jafergudem (Warangal)	3	2	14	5	24	8.2
Thummalcheruvu (Khammam)	5	2	0	11	18	8.2
Jamistapur (Mahabubnagar)	3	3	3	1	10	6.4
Ibrahimpur (Rangareddy)	5	3	1	7	16	8.4
Pampanur (Anantapur)	6	1	7	4	18	8.3

Note: Animal number includes young ones also

The share of crossbred cattle and improved buffaloes were analyzed to assess the level of breed status in the NAIP clusters. Among the clusters, Mahabubnagar had highest share of crossbred / graded buffaloes with 8

and 49% under cattle and buffaloes, respectively. Thus, it had over one-third of the livestock (large ruminants) with better production potential. Khammam and Rangareddy clusters had only 6% of the total livestock under crossbred / graded buffaloes. In Anantapur cluster there was absolutely no penetration of graded buffalo breeds (**Table 5**).

Table 5 : Share of crossbred cattle/ Graded Buffaloes

Cluster	(% to total livestock in the category)		
	Cattle	Buffaloes	Total Bovines
Jafergudem (Warangal)	12	22	16
Thummalcheruvu (Khammam)	1	18	6
Jamistapur (Mahabubnagar)	8	49	35
Ibrahimpur (Rangareddy)	4	9	6
Pampanur (Anantapur)	12	0	11

The pattern of livestock ownership based on the type and the combination of animals owned was analyzed across clusters and farmer categories. It may be noted those owning sheep only accounted for the majority (26%) followed by only buffaloes (24%) across the five clusters. In three clusters, viz., Mahabubnagar, Anantapur and Warangal, sheep owning farmers dominated the livestock owners while in the other two clusters exclusive buffalo owning livestock farmers dominated. Farmers owning more than two species of livestock accounted for minority. In clusters like Khammam and Rangareddy, farmers with a combination of buffaloes and goats rearing formed a considerable numbers with 27% of the sample respondents (**Table 6**).

Jersey crossbred cows under improper housing conditions

Table 6 : Ownership pattern of livestock – species combination wise

Species	Wara-ngal		Kham-mam		Mahabu-bnagar		Ranga Reddy		Anan-tapur		Overall	
	No	%	No	%	No	%	No	%	No	%	No	%
Only cattle	0	0	1	3	1	3	0	0	4	13	6	4
Only buffaloes	4	13	8	27	12	40	10	33	2	7	36	24
Only sheep	9	30	7	23	9	30	2	7	12	40	39	26
Only goats	5	17	6	20	0	0	8	27	2	7	21	14
Cattle + buffaloes	2	7	0	0	2	7	1	3	0	0	5	3
Buffaloes+sheep+ goats	0	0	0	0	2	7	1	3	2	7	5	3
Cattle+buffaloes+ sheep	0	0	0	0	1	3	0	0	0	0	1	1
Cattle+buffaloes+ goats	1	3	0	0	1	3	0	0	0	0	2	1
Cattle+buffaloes+ sheep+goats	0	0	0	0	0	0	0	0	0	0	0	0
Cattle + sheep	0	0	0	0	0	0	0	0	5	17	5	3
Cattle + goats	0	0	0	0	0	0	0	0	0	0	0	0
Buffaloes + sheep	6	20	0	0	2	7	0	0	2	7	10	7
Buffaloes + goats	3	10	8	27	0	0	8	27	0	0	19	13
Sheep + goats	0	0	0	0	0	0	0	0	1	3	1	1
Total	**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**	**150**	**100**

Ownership of combination of livestock species across different categories of land ownership indicated that as the farm size increased, the probability of owning various combinations of more than two livestock species tended to increase. This probably indicates that the relatively resource-rich farmers like medium and large farmers are prudent enough to realize that the risk bearing capability would increase with ownership of more livestock species as they do in the case of crop diversity (**Table 7**).

Table 7 : Ownership pattern of livestock by farmer category

Species	Landless		Marginal		Small		Medium		Large		Overall	
	No	%	No	%	No	%	No	%	No	%	No	%
Only cattle	0	0	2	7	1	3	0	0	3	10	6	4
Only buffaloes	1	3	11	37	10	33	10	33	4	13	36	24
Only sheep	2	7	8	27	10	33	14	47	5	17	39	26
Only goats	4	13	3	10	8	27	4	13	2	7	21	14
Cattle + buffaloes	0	0	1	3	2	7	1	3	1	3	5	3
Buffaloes+ sheep+goats	0	0	1	3	1	3	2	7	1	3	5	3
Cattle+buffaloes+ sheep	0	0	0	0	0	0	1	3	0	0	1	1
Cattle+buffaloes+ goats	0	0	0	0	0	0	1	3	1	3	2	1
Cattle+buffaloes+ sheep+goats	0	0	0	0	0	0	0	0	0	0	0	0
Cattle + sheep	0	0	1	3	0	0	3	10	1	3	5	3
Cattle + goats	0	0	0	0	0	0	0	0	0	0	0	0
Buffaloes + sheep	0	0	3	10	2	7	3	10	2	7	10	7
Buffaloes + goats	6	20	0	0	9	30	3	10	1	3	19	13
Sheep + goats	0	0	0	0	0	0	1	3	0	0	1	1
Total	**13**	**43**	**30**	**100**	**43**	**143**	**43**	**143**	**21**	**70**	**150**	**100**

6. Livestock and Equity

It is generally understood that there will be a skewed distribution of wealth including land among different classes / categories of owners. However, relatively liquid wealth (assets) such as livestock is believed to contradict such theorem. Hence, gini coefficients were worked out for the land and livestock owned by the respondent farmers separately. It is interesting to note that the gini value of land distribution was 0.43 while gini value for the livestock holding distribution was only 0.32. This clearly indicates

that the livestock brings greater equity, as the Lorenz curve move towards the egalitarian line (**Fig.1**).

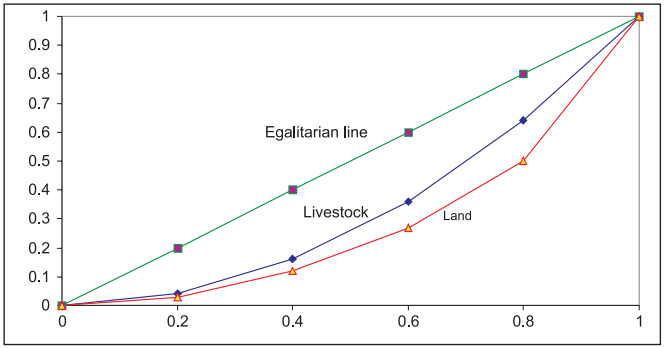


Fig.1: Lorenz Curve for Land and Livestock Distribution Among Farmers

7. Resource Base for Livestock Rearing

7.1 Grazing area

Grazing forms the major source of roughage for the livestock both small and large ruminants in the country side. Therefore, the extent of land available for grazing like forest area, fallows, wastelands and specified grazing / pasture lands was taken into account to estimate the total grazing land available in a particular cluster (**Table-8**). Similarly, the total livestock reared in each of these clusters was converted into Adult Cattle Units (ACU). The grazing pressure as measured by grazing incidence (livestock units / ha of grazing land) was worked out. Among the five studied clusters Anatapur (4.13) has the highest grazing incidence while Khammam (0.21) has the lowest incidence. This may be due to fact that while in Anantapur the livestock density is relatively high and in Khammam, the grazing lands, especially forest areas are more.

Sole feeding of dry crop residues:
A common practice in rural areas

Barren grazing lands to feed small ruminants
during lean season

Table 8 : Grazing incidence in NAIP clusters (ACU/ha)

Cluster	Grazing land (ha)	Livestock (ACU)	Grazing inci--dence (ACU/ha)
Jafergudem (Warangal)	519.0	702.8	1.4
Thummalcheruvu (Khammam)	5700.0	1176.6	0.2
Jamistapur (Mahabubnagar)	483.0	1431.4	3.0
Ibrahimpur (Rangareddy)	552.0	1476.2	2.7
Pampanur (Anantapur)	505.0	2085.0	4.1

7.2. Feed and fodder Supply

The crops grown by farmers served as source of roughages in the form of sorghum stover, paddy straw, groundnut haulms and other materials which formed the major portion of fodder. The supply of fodder from the roughage yielding crops grown by the farmers was estimated based on the conversion ratios of grain to roughages. The season and cluster-wise average roughage available with the farmers were worked out and are presented in (**Table 9**). Among the five clusters studied, maximum roughage availability was reported by the farmers of Warangal cluster with 52 q/farmer/year followed by Anantapur (36 q/farmer/year). The fodder availability, from crop by-products was lower in Khammam and Mahabubnagar clusters compared to the other clusters. Considering the average livestock owned (ACU) by the farmers in the respective clusters, the potential supply for each ACU worked out to 6.21 q/year in Warangal followed by Anantapur and Mahabubnagar clusters (**Table 10**).

Top feed from perennials like glyricidia, a source of protein

Table 9 : Feed and fodder supply potential across clusters

(q/household)

Cluster	Kharif		Rabi		Total / year	
	Crop by-products (roughage)	Concen-trates	Crop by-products (roughage)	Concen-trates	Crop by-products (roughage)	Concen-trates
Jafergudem (Warangal)	34.5	2.6	17.0	2.4	51.5	5.0
Thummalcheruvu (Khammam)	21.7	1.7	0.0	0.0	21.7	1.7
Jamistapur (Mahabubnagar)	16.1	1.7	6.8	3.8	22.9	5.5
Ibrahimpur (Rangareddy)	22.0	2.1	9.9	4.3	31.9	6.4
Pampanur (Anantapur)	32.0	4.0	4.2	2.5	36.2	6.5

Table-10 : Feed and fodder supply and requirement (q/ACU)

Cluster	Average livestock size (ACU)	Supply per ACU		Requirement	
		Crop by-products (roughage)	Concen-trates	Crop by-products (roughage)	Concen-trates
Jafergudem (Warangal)	8.3	2.7	0.6	32.4	3.5
Thummalcheruvu (Khammam)	8.2	3.8	0.2	10.8	1.2
Jamistapur (Mahabubnagar)	6.4	6.3	0.9	17.6	5.3
Ibrahimpur (Rangareddy)	8.4	3.4	0.8	52.8	4.7
Pampanur (Anantapur)	8.2	4.4	0.8	26.0	4.7

Stover in transport

Degrained cobs, a potential fodder, going as waste

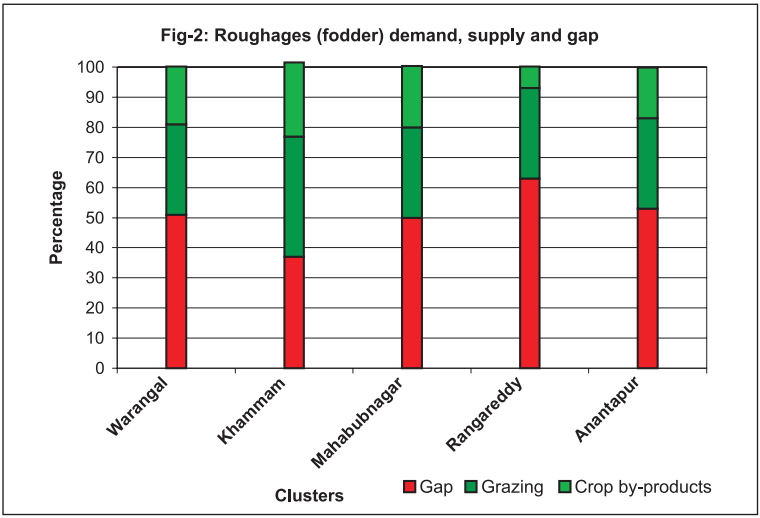
Besides the roughages, the crops grown by farmers yielded concentrates like cake from groundnut and bran from rice which are nutritive feed material for the livestock, especially the milch cattle. Given the conversion factors, the concentrates available with the farmers were also worked out. Across the clusters, the average concentrate potentially available with the farmers was the highest in Mahabubnagar (0.9 q/annum) followed by Rangareddy and Anantapur (0.8 q each/annum). Khammam cluster had very low (0.2 q/year) concentrate availability with each farmer. The farmer category wise analysis of concentrate feed from crops indicated that the average quantity available ranged from 0.4-0.8 q/year.

Fodder supply potential was also analysed across farmer category (**Table 11**). Obviously, the quantity of fodder available from roughages increased with the farm size. In terms of average fodder supply per ACU, there was marginal difference across the farmer categories with slightly higher availability in the case of medium and large farmers. As far as season-wise crop by-products supply is concerned, the marginal and small farmers had more or less equal supply from Kharif and Rabi crops compared to their medium and large counterparts.

Table 11: Feed and fodder supply (q) across farmer categories

Category of farmers	Kharif		Rabi		Total		Average livestock size (ACU)	Supply per ACU	
	Crop by products (roughage)	Concentrates	Crop by products (roughage)	Concentrates	Crop by products (roughage)	Concentrates		Crop by products (roughage)	Concentrates
Marginal	10.4	1.1	10.5	2.1	20.9	3.2	4	5.2	0.8
Small	14.3	1.5	15.7	1.4	30.0	2.9	7	4.3	0.4
Medium	27.0	4.0	33.9	2.5	60.9	6.5	9	6.8	0.7
Large	58.0	5.0	37.1	2.8	95.1	7.8	14	6.8	0.6

The cluster-wise fodder demand, supply and gap was analyzed and the same are depicted in the graph (**Fig.2**). It may be noted that in Khammam cluster where the forests are a significant source for grazing, contributed to the major source for roughage. The fodder (roughage) scarcity was the highest in Rangareddy with over 60 % followed by Anantapur cluster.



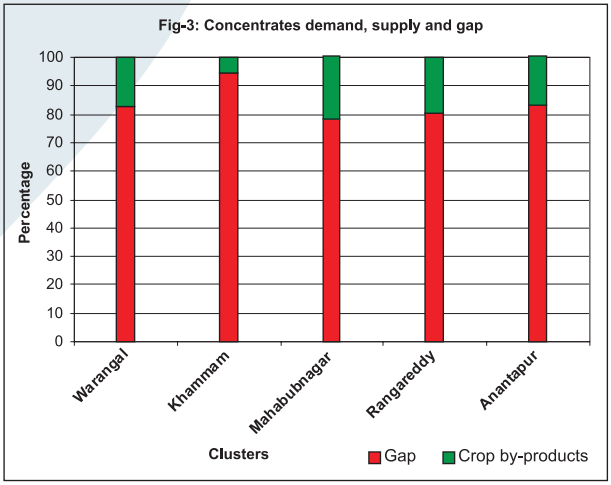
Besides the crop by-products, the milch cattle are occasionally fed with concentrates in the form of rice bran, groundnut cake along with mineral mixture. The quantity of rice bran supplemented ranged between 139 to 315 kg/milch animal/year. Generally, as the farm size increased, the quantity of rice bran also increased. Similarly, the quantity of groundnut cake fed to the milch animals ranged between 127 and 640 kg/animal/year (**Table 12**).

Table 12 : Concentrate supplementation for milch cattle

(Kg/animal/yr)

Farmer category	Rice Bran	Groundnut cake	Mineral Mixture	Total
Landless	139	540	0	679
Marginal	156	443	100	699
Small	126	127	0	253
Medium	231	165	100	496
Large	315	640	50	1005

The supply of concentrates as sourced to the crop by-products accounted for the highest in Mahabubnagar (22%) followed by Rangareddy (20%). The contribution of crops as a source of feed (concentrates) was the lowest in Khammam as the cotton was the main crop grown there (**Fig.3**)



Most of the problems associated with productivity of livestock in general and large ruminants in particular were due to inadequate quality supply, low quality feed and poor fodder management, as it emerged during the series of animal health camps conducted across the clusters.

8. Livestock Health

Out of the five clusters only Ananthapur and Mahabubnagar clusters had Rural Livestock Units (RLU). Data on the animal health care practices adopted were obtained from the farmers from the survey. It was noted that the practice of deworming of animals was lower in landless and the marginal farmers compared to farmers of other categories. The practice of purchasing veterinary medicines was common across all the farmer categories (**Table 13**).

Table 13 : Livestock health care across farmers' categories

Farmer category	% farmers practising deworming	Farmers purchasing other medicines (%)
Landless	23	62
Marginal	38	59
Small	77	40
Medium	67	33
Large	50	41

9. Livestock Production

9.1. *Milk*

Among the five clusters, the milk yield was higher in Anantapur with almost 3.5 l/day/ACU. Lowest milk yield has been reported in Warangal cluster with 1.63 (**Table 14**). The milk productivity both in respect of cows and buffaloes was the highest in Anantapur followed by Rangareddy. The farmer category wise milk productivity is given in **(Table 15)**. The marginal farmers obtained highest milk yield than their other counter parts in the case of buffaloes.

Table 14 : Milk productivity in NAIP clusters

(l/animal/day)

Cluster	Cow	Buffaloe	Overall / ACU
Jafergudem (Warangal)	1.1	2.9	1.6
Thummalcheruvu (Khammam)	1.9	3.2	2.4
Jamistapur (Mahabubnagar)	2.7	3.4	2.8
Ibrahimpur (Rangareddy)	3.0	3.3	2.8
Pampanur (Anantapur)	3.8	4.0	3.5

Table 15 : Milk productivity in NAIP clusters by farmers' category

(l/animal/day)

Category of farmers	Cow	Buffaloe	Overall / ACU
Landless	2.8	3.3	2.7
Marginal	2.5	3.9	3.0
Small	3.0	2.6	2.4
Medium	1.7	3.6	2.3
Large	3.2	3.3	2.9

9.2.*Consumption and Market Surplus of milk*

Among the five clusters studied, the daily milk production per household was the highest (7.73) in Anatapur and it was lowest (4.23) in Rangareddy cluster. The share of home consumption of milk was about 27% in Khammam cluster, which is predominantly a tribal and remote area. Thus,

the resultant marketed surplus was 73% of the total milk production. The level of milk consumption per household was the lowest (0.56 l /day) in Warangal cluster. This meant the marketed surplus was the highest (89%) in this cluster (**Table 16)**.

Table 16 : Milk consumption and market surplus in NAIP clusters

Cluster	Total Milk Production (l/household/day)	Home consum-ption (%)	Marketed (%)
Jafergudem (Warangal)	5.1	11 (0.56)	89
Thummalcheruvu (Khammam)	6.4	27 (1.7)	73
Jamistapur (Mahabubnagar)	6.9	19 (1.35)	81
Ibrahimpur (Rangareddy)	4.2	22 (0.92)	78
Pampanur (Anantapur)	7.7	15 (1.12)	53

NB: Figures in parentheses are actual consumption (l/household/day)

The milk consumption and the level of market surplus were also analyzed across farm categories (**Table 17).** The share of consumption of milk by small farmer households was the highest at 23% of the total production. The level of household consumption of milk was less than one litre among the landless, marginal and small farmers. The share of milk marketed to the production was the lowest among small farmers, this of course is the trade of for home consumption.

Table 17 : Milk consumption and market surplus in NAIP clusters in farmers' category

Farmer Category	Total Milk Production (l/household /day)	Home consumption (%)	Marketed (%)
Landless	6.04	16 (0.98)	84
Marginal	4.41	19 (0.84)	81
Small	4.29	23 (0.98)	77
Medium	9.30	17 (1.55)	83
Large	5.59	20 (1.09)	80

NB: Figures in parentheses are actual consumption (l/household/day)

9.3 *Meat*

Production of small ruminants was worked out based on the disposal of sheep (rams) and goats (bucks) by the farmers. The average age of sale of sheep ranged between 12-17 months with least in Rangareddy and highest in Mahabubnagar clusters (**Table 18**). The live weight at sale of sheep ranged between 19-34 kg/animal. The corresponding sale price ranged between Rs.1900-3200 per animal. Similarly, estimates for goat production were worked out. The average age of sale of goats for meat purpose ranged between 12 and 19 months. The live weight of such animals sold was in the range of 18 to 30 kg/animal. The highest price received for goats was in Mahabubnagar cluster with Rs.2880 per animal followed by Anantapur with Rs.2550 (**Table 19**).

Table 18 : Pattern of sheep marketing

Cluster	Age at sale (months)	Live weight at sale (kg/ animal)	Sale price/ animal (Rs.)
Jafergudem (Warangal)	16	28	2520
Thummalcheruvu (Khammam)	-	-	-
Jamistapur (Mahabubnagar)	16	19	1900
Ibrahimpur (Rangareddy)	12	20	2200
Pampanur (Anantapur)	17	34	3200

Table 19 : Pattern of goats marketing

Cluster	Age at sale (months)	Live weight at sale (kg/ animal)	Sale price/ animal (Rs.)
Jafergudem (Warangal)	18	22	1717
Thummalcheruvu (Khammam)	19	19	1557
Jamistapur (Mahabubnagar)	16	23	2880
Ibrahimpur (Rangareddy)	12	18	1545
Pampanur (Anantapur)	16	30	2550

9.4 *Manure*

The average livestock manure production among the households ranged between 33-45 q per annum and almost entire quantity was used in their

agricultural lands. Only a limited quantity of livestock manure was sold in Rangareddy, Khammam and Mahabubnagar clusters (**Table 20**).

Table 20 : Livestock manure production and recycling

Cluster	Production (q)	Consumption (%)	Sale (%)	Sale price (Rs/q)
Jafergudem (Warangal)	42	100	-	-
Thummalcheruvu (Khammam)	33	95	5	115
Jamistapur (Mahabubnagar)	45	99	1	100
Ibrahimpur (Rangareddy)	40	95	5	120
Pampanur (Anantapur)	33	100	-	-

Penning of small ruminants during off-season migration

10. Constraints

The problems faced by the farmers in rearing livestock both large and small ruminants were elicited separately for from the sample respondents across the five NAIP clusters (**Table 21**). The major problem expressed in livestock rearing is related to difficulty in procurement of quality animals in case of both large and small ruminants. The next major constraint faced pertains to veterinary care. Fodder scarcity and marketing are the other two problems experienced by the farmers.

Table 21 : Livestock management constraints as expressed by farmers (%)

Constraints	Large ruminants	Small ruminants
Procurement of quality animals	36	33
Fodder related	23	17
Veterinary care	34	29
Marketing	21	15

11. Conclusions

The foregoing analysis makes it clear that any strategy for improving the productivity of livestock must involve three major elements: augmenting the supply of feed and fodder, better delivery of health care services and improvement of different livestock breeds. Though these problems are well known, earlier efforts did not make the desired impact because of the gaps in delivery mechanisms and lack of awareness among the livestock owners about various problems that affect livestock productivity. The following generic and specific strategies need to be adopted for improving the livestock status and productivity in the NAIP clusters:

- Conduct animal health camps at least twice a year to raise the awareness among the farmers about the incidence of various diseases.
- Demonstrate technologies that help augment feed and fodder availability. These technologies may range from raising fodder species through silvipasture on CPRs and private lands to such technologies as *azolla* cultivation at backyard and feed enrichment methods.
- Evolve a para worker cadre in vet health care with necessary capacity building in terms of knowledge, skill and infrastructure to deliver the health services at the doorstep of the farmers. This cadre should in the long run be self-supporting and making a living out of their services.
- Prophylactic measures need to be strengthened by streamlining delivery of veterinary services and linking different livestock development programmes of the state. This calls for large-scale investments in capacity building and knowledge empowerment initiatives.
- Implement a carefully planned breed improvement with the participation of the people.
- The specific strategies that emerged from the empirical study of the clusters, consultations with various stakeholders viz., farmers, departments of Animal Husbandry and Agriculture, NGOs are detailed below:

Warangal

- As commercial crops like cotton, chillies, tobacco and redgram dominate the cropping systems in Warangal, there is wide spread fodder scarcity. This calls for encouraging cultivation of fodder

including fodder trees/shrubs in CPRs and growing of perennial fodder species like Napier x Bajra crosses (C0-1, C0-3, APBN-1, etc.) in areas with access to irrigation.

Khammam

- Milk does not find a prominent place in the diet of the local tribal population. Hence its production is not given importance by the tribals. However, with the increased procurement price, milk production could be a remunerative activity. Besides, it will also help prevent widespread malnourishment in tribal children and women. Therefore, there is a need for taking proactive steps to increase milk consumption and production by the tribal populations.
- Improving local breeds for higher productivity with a systematic AI programme needs to be the priority in this area. Further, efficient utilization of available fodder resources also needs to be emphasized.

Mahabubnagar

- Development of CPRs needs to be promoted to augment fodder supply specifically for the small ruminants, as there is a severe shortage of fodder.
- Chopping of sorghum stover, which is available in large quantity, needs to be promoted to reduce wastage (by at least 50%) and improve digestibility. This will help tide over fodder shortage in summer thereby preventing distress sale of animals.

Rangareddy

- Promote horti-pastoral systems for increasing productivity of small ruminants, as there are a large number of orchards in the cluster.

Anantapur

- Farmers in Anantapur feed animals with groundnut haulms in large quantity without mixing it with any other roughage. As a result much of the protein available in the groundnut haulms is not digested fully in the rumen of the animal. There is an urgent need to educate farmers on the use of groundnut haulms by mixing it in appropriate quantity of non-legume fodder.
- Promote horti-pastoral systems with Stylo and Cenchrus for augmenting the fodder availability in the cluster.

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