

FEED AND FODDER SCENARIO IN ANDHRA PRADESH

Abstract

The importance of forages and livestock sector is being increasingly realized in recent times due to their multifaceted role in sustainable production, employment generation, drought proofing, natural resource conservation, nutritional security and export potential. Livestock contributes enormously to food security in various ways. Livestock is one of the main suppliers of proteins and essential micro-nutrients. They provide milk and meat for human consumption and manure for sustainable crop production. India offers abundant resources for cattle and poultry, which are essential for enhancing the socioeconomic circumstances of rural populations. India is the world's largest livestock owner, with 535.78 million animals, and it leads the world in the number of buffalo (109.85 million), goats (148.88 million), chickens (second largest market in the world), and sheep (74.26 million). However, the country's current supply of feed and fodder cannot keep up with the growing demand. Density of adult livestock units available per km² in Andhra Pradesh was 60ACU/km². Even though Andhra Pradesh state having adequate amount of dry matter available to the livestock, but if you go for district wise, many districts are suffering feed and fodder scarcity. This is due to small land holdings and lack of awareness on different fodder crop varieties. Mapping of districts based on dry matter (DM) availability was done to facilitate planning of fodder transportation across districts. Findings are pivotal for developing fodder plan for Andhra Pradesh.

Keywords: Dry Matter, fodder availability, livestock, Adult cattle units

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I. INTRODUCTION

Indian dairy production system is complex and generally based on traditional and socioeconomic considerations. However, there has been a rapid change in way of agriculture (i.e. cropping system, water resources, diversification of crops, and intensification of agriculture), increasing use of mechanical power, and transformation from sustenance farming to market oriented farming, changing food habits etc. India has 15 % of world cattle population and due to ever increasing population pressure of human, arable land is mainly used for food and cash crops, thus there is little chance of having good quality arable land available for fodder production, until milk production becomes remunerative to the farmers as compared to other field crops. In India, there is no practice of fodder production in rural areas and animals generally consume naturally grown grasses and shrubs which are of low quality in terms of protein and available energy, they are thus heavily dependent on seasonal variations and this result in fluctuation in fodder supply round the year. Hence, fodder scarcity as the main limiting factor in the task of improving livestock productivity and this result in affecting supply of milk round year.

Quantification of existing feed resources is necessary for the development of efficient feeding strategies and for the judicious utilization of available feed resources. Further, no published literature is available on the availability of district wise feed resources for livestock in Andhra Pradesh. Andhra Pradesh needs to pursue a systematic fodder planning strategy because it is the country's most flood-affected state in south India. This chapter brings out the availability of fodder as dry matter to the livestock, keeping district as the smallest unit. Some past efforts were reported by Raju *et al.* (2002), Anandan *et al.* (2003) and Anandan *et al.* (2005), but were based on crop production data of 1996–97, and Biradar and Kumar (2013) accounted data from 2005-11. This chapter accounted the crop production data from 2021-22 and categorized the districts based on the availability of dry matter vis-à-vis livestock population. It also reflects on the management of fodder deficiency at rural household level to sustain their livestock.

Fodder crops: The term forages means the plants used for feeding domestic animals. This includes both fodder and pasture plants

Fodders: Plants which are cultivated as forage are cut and fed to animals in the stalls.

Eg: Guinea grass, fodder maize, cowpea

Pastures: Plants which are grown in open uncultivated land where the animals are led to graze Eg: Cenchrus, marvel grass, spear grass

Fodder crops again broadly classified into two categories

1. **Temporary fodder crops:** These fodder crops relate to land used temporarily (less than 5 years) for herbacious forage. It includes

- **Grass**
Eg: Hybrid napier, Guinea grass, Sorghum, Maize
- **Legumes**
Eg: cowpea, Stylosanthus
- **Tress fodder**
Eg: Subabul, Glyricidia

2. **Permanent fodder crops** These fodder crops relate to land used permanently (for 5yrs or more) for herbacious forage, either cultivated or growing wild
Eg: Forest plants

Salient feature of fodder crops

- Short growth period
- Grown in closer spacing with high seed rate.
- Dense stand to smother weeds and prevent soil erosion.
- Improve soil health through addition of higher amount organic residue in the soil.
- Crop duration could be adjusted and risk due to aberrant weather condition minimised.
- High persistence and regeneration capacity reduce the need for frequent sowing and tillage. The cost of cultivation goes down in subsequent cut in case of multicut and/or perennial fodder as well as in forage-cum seed crops.
- Crop management differ with the purpose of growing fodder and mode of utilization
- Wider adaptability with the capacity to grow under stress condition.
- Economic viability depends upon secondary production (livestock product)
- High nutrient and water requirement under intensive cropping.

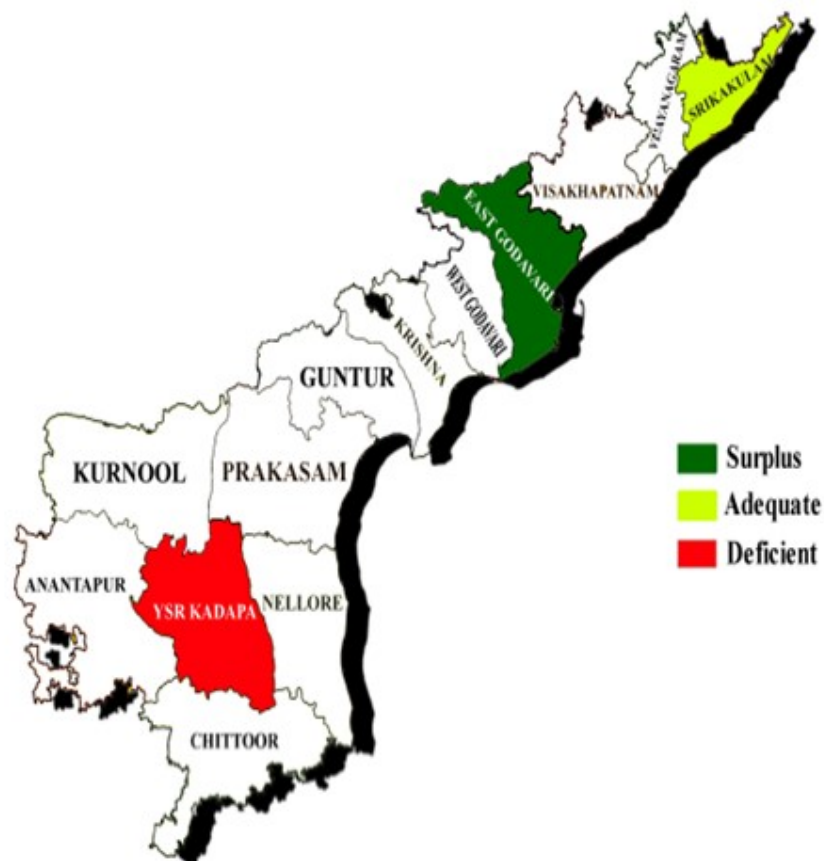


Figure1: Selection of the districts as area of the study.

Table 1: Consumption value of different species of livestock (Kg/animal/day)

Species		Green Fodder	Dry Fodder	Concentrates
Cattle	In-milk	4.75	5.50	0.64
	Dry	3.40	4.02	0.4
	Adult	4.06	6.03	0.33
	Young	2.18	2.13	0.18
Buffalo	In-milk	5.69	6.34	1.05
	Dry	5.44	4.95	0.52
	Adult	4.04	7.47	0.36
	Young	2.29	2.22	0.19
Goat		1.04	0.20	0.06
Sheep		1.01	0.20	0.04
Others		2.35	6.72	0.49

Source: NATP project database (Quantities of feed fed to different species within household premises, project database, 1998-2003).

Based on Primary data of livestock farmers about livestock holdings, fodder availability and utilization was collected using interview schedule through personal interview technique in three districts Fig.1 (East Godavari-surplus, Srikakulam-adequate and YSR Kadapa-deficient) of Andhra Pradesh. This data was used to depict the fodder scenario at micro-level in Andhra Pradesh state.

Table2: Annual feed and fodder availability and requirement for livestock in respondents' households

(n=120)

Type	Districts	Average herd size /household (ACU*)	Average fodder/ACU		Difference (tones)	Status
			Requirement (tones)	Availability (tones)		
Green fodder	East Godavari (Surplus)	4	2.83	8.50	5.67	Surplus
	Srikakulam (Adequate)	3	2.49	3.09	0.60	Surplus
	YSR Kadapa (Deficiency)	4	2.63	2.08	-0.56	Deficient
Dry fodder	East Godavari (Surplus)	4	2.02	6.25	4.43	Surplus
	Srikakulam (Adequate)	3	1.78	2.08	0.30	Surplus
	YSR Kadapa (Deficiency)	4	1.88	1.39	-0.50	Deficient
Concentrates	East Godavari (Surplus)	4	1.21	0.09	-1.12	Deficient
	Srikakulam (Adequate)	3	1.07	0.11	-0.96	Deficient
	YSR Kadapa (Deficient)	4	1.13	0.08	-1.05	Deficient

ACU*=AdultCattleUnit

II. ANNUAL FEED AND FODDER AVAILABILITY AND REQUIREMENT FOR LIVESTOCK IN RESPONDENTS' HOUSEHOLDS

Mean herd size in East Godavari (surplus) and YSR Kadapa (deficient) districts was 4 Adult Cattle Units (ACUs) each, while it was 3 ACU in Srikakulam (adequate) district. In East Godavari district, green fodder is available in surplus, almost 5.67 tonnes than the requirement per ACU/year. In Srikakulam (adequate), the average excess green fodder available was only 0.60 tonnes/ACU/year. Respondents of Kadapa (deficient) district experienced an average green fodder shortage of 0.56 tonnes/ACU/year (Table 2).

East Godavari (surplus) and Srikakulam (adequate) which have had surplus dry fodder of 4.43 and 0.30 tonnes/ACU/year respectively, only Kadapa (deficient) district showed deficiency of 0.50 tonnes/ACU. However, in case of concentrates, respondents of all three districts mentioned that they experienced shortage of concentrates which was 1.12 tonnes/ACU in East Godavari (surplus), 0.96 tonnes/ACU/year in Srikakulam (adequate) and 1.05 tonnes/ACU/year in YSR Kadapa (deficient) districts.

Mean herd size was four ACU/ household in East Godavari (surplus) and YSR Kadapa (deficient) districts. But in YSR Kadapa the deficient district availability of green fodder is deficient of 0.56 tones, dry fodder deficient of 0.50 tones and concentrates deficient of 1.05 tones/ACU/year. This particular district belonged to drought prone area facing severe fodder scarcity. East Godavari and Srikakulam though belonged to surplus and adequate DM category, respectively, but, both have irrigation facility with high water table so, paddy is cultivated in 2-3 season leading to good production of paddy straw. However all three districts experienced deficiency in concentrate reason could be households unwillingness to purchase concentrates and also the cost factor discourages farmers to purchase concentrated feeds (Raju *et al.* 2017).

III. FEEDING PATTERN FOLLOWED BY LIVESTOCK FARMERS OF ANDHRA PRADESH

Feeding Pattern for Livestock Followed by Respondents in Different Seasons: None of the respondents relied only on grazing to the livestock in all three seasons. One third of the respondents (32.5%) however relied only on stall feeding and remaining 67.50 per cent respondents practiced both grazing and stall feeding to the livestock (Table 3 and Fig. 2). Majority of the respondents followed three times feeding to the livestock in *Rabi* (89.17 %), *Kharif* (88.33 %) and *summer* (85.83 %) seasons. About 10 per cent respondents fed twice a day to the livestock in all three seasons.

Table 3: Feeding Pattern for Livestock Followed by Respondents in Different Seasons (n=120)

Particulars		<i>Kharif</i>	<i>Rabi</i>	<i>Summer</i>
Only grazing		0 (0.00 %)	0 (0.00 %)	0 (0.00 %)
Only stall feeding		39 (32.5 %)	39 (32.5 %)	39 (32.5 %)
Grazing + stall feeding		81 (67.50 %)	81 (67.50 %)	81 (67.50 %)
Number of feedings in a day	Twice	13 (10.83 %)	12 (10.00 %)	11 (9.16 %)
	Thrice	106 (88.33 %)	107 (89.17 %)	103 (85.83 %)
	Four times	1 (0.83 %)	1 (0.83 %)	6 (5.00 %)
Providing drinking water /day	Twice	10 (8.33 %)	10 (8.33 %)	9 (8.33 %)
	Thrice	109 (90.83 %)	110 (91.67 %)	56 (41.66 %)
	Four times	1 (0.83 %)	0 (0.00 %)	55 (45.83 %)

Negligible per cent of respondent show ever mentioned that they practiced four times feeding to the livestock in *Kharif* and *Rabi*(0.83 % each) and *summer* (5.00 %). The vast majority of the respondents provided drinking water to the livestock thrice a day in *Rabi* (91.67 %) and *Kharif* (90.83 %) seasons. Twice a day water was provided to livestock by about 10 per cent respondents in all seasons. However as presented in Table 18, during summer, 45.83 per cent respondents opted to provide water four times adaytothelivestockwhile41.66per cent respondents provided three times.

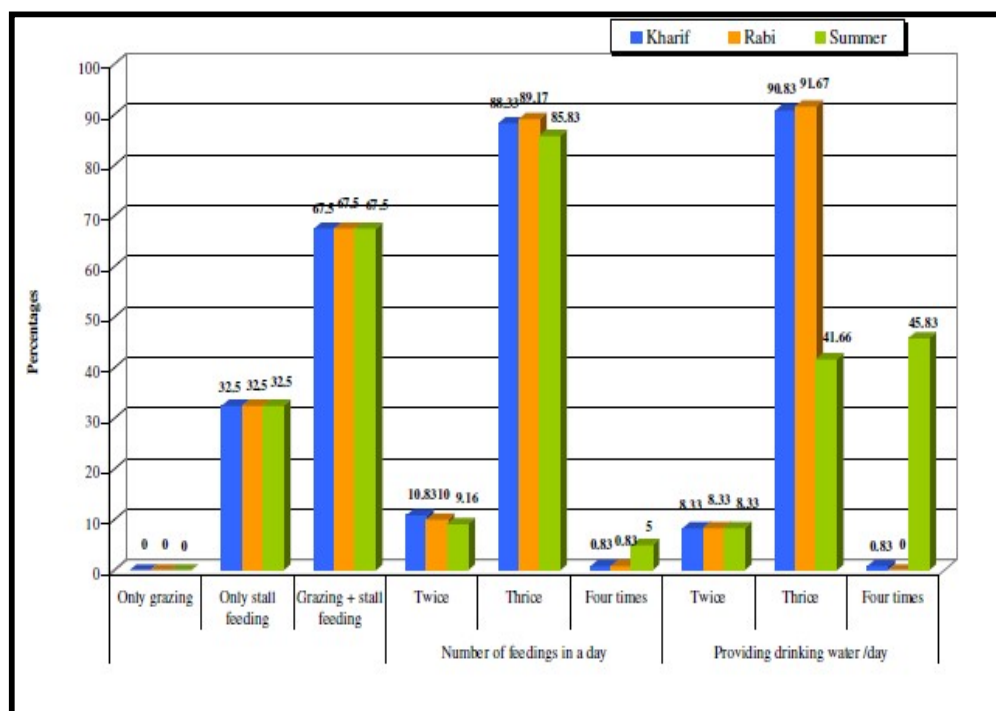


Figure 2: Feeding Pattern for livestock followed by respondents indifferent seasons

None of the respondents relied only on grazing to the livestock in all the three seasons (Table 3). Because, most of the grazing lands being common lands are shrunken and have become less productive. So, grazing alone could not suffice nutrient requirement of livestock

unlike other countries where grazing alone could be practiced. One third of the respondents mentioned that they practiced only stall feeding for their livestock. During field study it was observed that this particular practice was found mainly in East Godavari (Surplus) district as it has canal irrigation and paddy is cultivated in all seasons. Fish and Prawns are cultivated in large ponds created for the purpose. On the field bunds as well as bunds of farm pond respondents get green fodder which is fed to the livestock. So tending animals to graze adds to the cost of rearing when adequate green fodder is available. Majority of the farmers in Srikakulam having adequate DM and YSR Kadapa having deficient DM followed both grazing + stall feeding because availability of fodder was very less in these regions.

Most of the respondents followed three times feeding to the livestock in Rabi (89.17 %), Kharif (88.33 %) and Summer (85.83 %) seasons. About 10 per cent respondents fed twice a day to the livestock in all three seasons. Very small per cent of respondents however mentioned that they practiced four times feeding to the livestock in Kharif and Rabi (0.83 % each) and Summer (5.00 %). Large majority of the respondents provided drinking water to the livestock thrice a day in Rabi (91.67 %) and Kharif (90.83 %) seasons. Twice a day water was provided to livestock by about 10 per cent respondents in all seasons. However as presented in Table 18, during summer, 45.83 per cent respondents opted to provide water four times a day to the livestock while 41.66 per cent respondents provided three times.

The majority of participants reported providing their livestock with feeding and drinking water three times a day during all three seasons. This is a common practice in southern India. Despite allowing animals to graze, considering the limited productivity of our current grazing lands, grazing primarily serves as exercise for the livestock. As a result, feeding them three times a day in the cattle-shed becomes crucial for their sustenance. In the hot summer months, where temperatures in Andhra Pradesh can rise significantly (reaching 40-44°C), 45.83 percent of the respondents wisely provided water to their livestock four times a day. Meena *et al.* (2020) indicated that nearly half (49.86 %) of the participants practiced a combination of grazing and stall-feeding methods. Conversely, 50.14 percent of respondents in the semi-arid zone of Rajasthan solely relied on stall feeding for their livestock. A mere 2.08 percent managed to provide feed four times a day. In terms of feeding frequency, 50.14 percent of participants offered feed to their animals twice a day, while 50.00 percent and 2.64 percent of respondents provided feed to their animals three and four times a day, respectively. In relation to water supply, more than half (53.34 %) of the respondents ensured their animals had access to water three times a day. A smaller proportion, specifically 33.75 percent, provided water to their animals twice a day, while only 12.91 percent offered water four times daily.

IV. FODDER UTILIZATION PRACTICES FOLLOWED BY FARMERS

Cultivation of fodder crops by the respondents: Para grass, Fodder Sorghum, Bajra Napier hybrid and Guinea were the four fodder crops cultivated by the respondents (Table4).

Among these four fodder crops, 50.83 per cent, 57.50 per cent and 40.00 per cent respondents cultivated Bajra Napier Hybrid in East Godavari (surplus), Srikakulam (adequate) and YSR Kadapa (deficient) covering an area of 7.4 acres, 8.1 acres and 6.6 acres land area, respectively.

Table4: Cultivation of fodder crops by the respondents of different categories of districts

(n=120)

Fodder crops cultivated	East Godavari(Surplus) n ₁ =40		Srikakulam (Adequate)n ₂ =40		YSR Kadapa (Deficient)n ₃ =40	
	Respondents(%)	Mean area cultivated(acre)	Respondents (%)	Mean area cultivated (acre)	Respondent (%)	Mean area cultivated (acre)
Paragrass	3(7.50)	1	2(5.00)	0.90	0(0.00)	0
Foddersorghum	12(30.00)	1.5	14(35.00)	1.82	22(55.00)	9.5
BajraNapierhybrid	22(55.00)	7.4	23(57.50)	8.1	16(40.00)	6.6
Guinea	3(7.50)	0.95	1(2.50)	0.1	2(5.00)	0.4

Fodder sorghum was cultivated by 30 per cent of the respondents in East Godavari(surplus), 35 percent in Srikakulam (adequate) and 55 per cent in YSR Kadapa (deficient) districts. Respective total areas covered by the respondents of these districts were 1.5 acres, 1.82 acres and 9.5acres. In East Godavari (surplus) 7.50 percent and Srikakulam (adequate) 5.00 per cent of the respondents cultivated para grass in total area of 1 acre and 0.90 acres, respectively. None of the respondents cultivated paragrass in YSR Kadapa (deficient) district. Guinea grass was cultivated by 7.50 per cent of respondents in East Godavari (surplus), 2.50 per cent in Srikakulam (adequate) and 5.00 per cent in YSR Kadapa (deficient) districts with total area of 0.95acres,0.1acres and0.4 acres, respectively.

Para grass, Fodder Sorghum, Bajra Napier Hybrid and Guinea were the four fodder crops mentioned by the respondents. Among these four fodder crops, 50.83 percent, 57.50per cent and 40.00 per cent respondents cultivated Bajra Napier Hybrid in East Godavari (surplus), Srikakulam (adequate) and YSRK adapa (deficient) covering an area of 7.4 acres, 8.1 acres and 6.6 acres land area, respectively. Bajra Napier Hybrid is very impressive fodder crop as it grows like a sugarcane and gives very high tonnage green fodder yield. In a gap of three-four weeks, it grows tall and becomes ready for harvest. So, it is a very popular fodder crop among farmers.

Fodder Sorghum was cultivated by 30 per cent of the respondents in East Godavari (surplus), 35 per cent in Srikakulam (adequate) and 55 per cent in YSR Kadapa (deficient) districts. Respective total area covered by the respondents of these districts were 1.5acres, 1.82 acres and 9.5acres. This crop is known traditionally as one of the best fodder crops and it forms anexcellent dry fodder. It does not need any irrigation facility and external inputs. Remaining two crops Paragrass and Guineagrass were cultivated by negligible percent of respondents in all three districts, as these crops are specific to waterlogged and shade

conditions.

Table5: Method of livestock feeding followed by the respondents
(n=120)

Districts	Green fodder		Dry fodder	
	Unchaffed	Chaffed	Only dry fodder	Mixed with green fodder
EastGodavari-Surplus	39(97.50)	1(2.50)	40(100.00)	0(0.00)
Srikakulam-Adequate	34(85.00)	6(15.00)	38(95.00)	2(5.00)
YSRKadapa-Deficient	35(87.50)	5(12.50)	37(92.50)	3(7.50)

Note: Figures in brackets are percentages

V. METHOD OF LIVESTOCK FEEDING FOLLOWED BY THE RESPONDENTS

Large majority of respondents (97.50 %) in East Godavari-surplus reported that they feed green fodder to the livestock without chopping it and only 2.50 per cent expressed that they feed it to livestock by chopping it (Table5 and Fig. 3). Almost an equal percentage of the respondents in Srikakulam-adequate (85.00%) and YSR Kadapa-deficient districts (87.50 %) feed green fodder to the livestock without chopping it and only 15.00 per cent in Srikakulam –adequate and 12.50 per cent in YSR Kadapa-deficient districts expressed that they feed green fodder to livestock by chopping it.

Cent per cent of the respondents (100.00 %) in East Godavari-surplus reported that they feed dry fodder directly without mixing with green fodder. Almost an equal per cent of the respondents in Srikakulam-adequate(95.00%) and in YSR Kadapa-deficient (92.50 %) districts feed dry fodder directly to livestock. Only 5.00 per cent and 7.50 per cent of the respondents feed dry fodder mixed with green fodder to livestock in Srikakulam-adequate and YSR Kadapa-deficient districts, respectively.

Large majority of respondents in all three districts reported that they feed green fodder to the livestock without chopping it (Table. 5). Green fodder is very succulent as well as soft. Livestock consumes it totally without wasting any part of green fodder unless the one fed is over matured and has thick stem. So farmers might have preferred to feed green fodder to the livestock without chopping. Dry fodder was fed to livestock without mixing with green fodder by cent per cent, 95 per cent and 92.5 per cent of respondents in East Godavari(surplus), Srikakulam (adequate) and YSR Kadapa (deficient) districts, respectively. Usually, farmers during the period when green is available, feed livestock entirely with greens. Also, livestock once starts feeding on greens would not touch dry fodder. Mixing becomes possible only when green as well as dry fodder are chaffed together

in power/manual operated chop cutter, which is not possessed by many farm households (Table 5).

Meena *et al.* (2020) reported that a majority portion of farmers (66.52 %) opted to provide green fodder to their animals after chaffing, while a mere 5.00 percent chose to give green fodder without chaffing. In terms of dry fodder, fewer than one third of the farmers (30.26 %) offered it to their animals after supplementing it with concentrate. Some farmers (30.70 %) exclusively provided dry fodder, while others (29.45 %) mixed it with green fodder. A small subset of farmers (9.59 %) also supplied animals with dry fodder that had been moistened with water. In conclusion, the study reveals that the majority of farmers used a combination of dry fodder with concentrate or green fodder to maintain their animals' productivity. This approach was favored over providing dry fodder alone, as it might not suffice to meet the animals' nutritional needs.

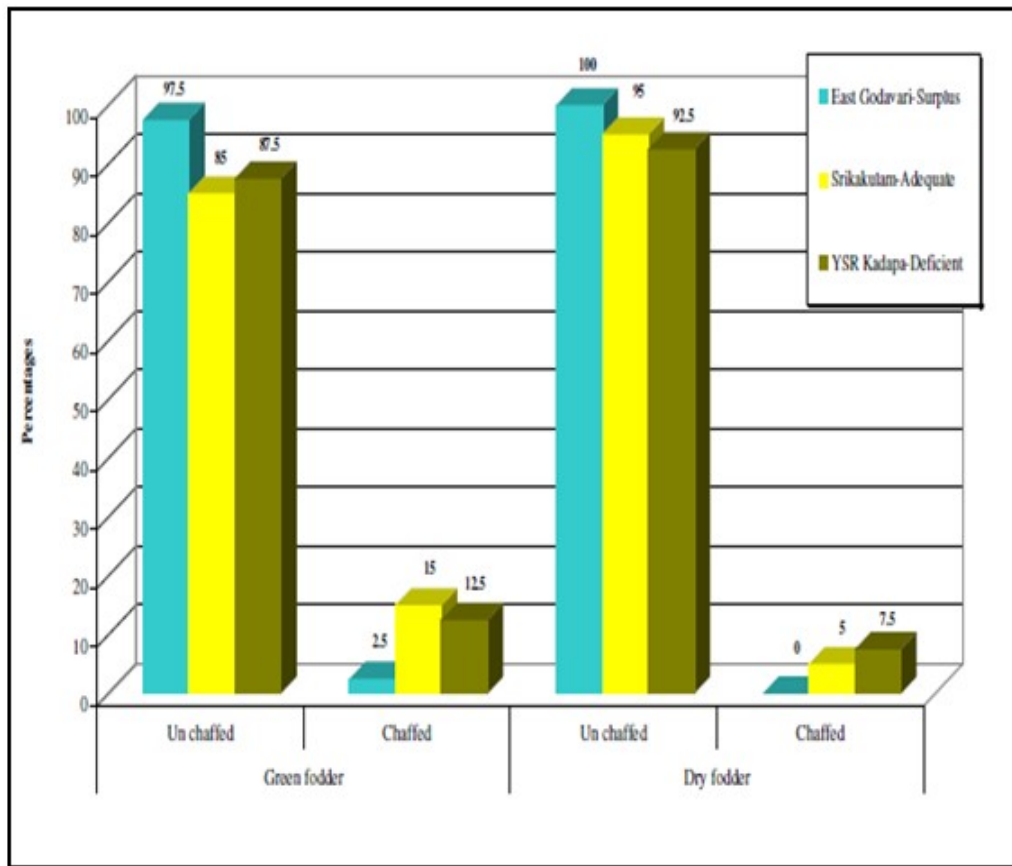


Figure 3: Method of livestock feeding followed by the respondents

Table 6: Type of crop residue stored/stacked by the respondents of different categories of districts of Andhra Pradesh for lean season usage

(n=120)

Type of fodder		East Godavari (Surplus) n ₁ =40		Srikakulam (Adequate) n ₂ =40		YSR Kadapa (Deficient) n ₃ =40	
		F	P	F	P	F	P
Stover (Thick stemmed)	Sorghum	0	0	0	0	8	6.67
	Straw (Slenderstem)	Paddy	40	33.33	40	33.33	40
Legumes (hay)	Greengram	0	0	19	5.83	0	0
	Blackgram	0	0	19	5.83	0	0
	Groundnut	0	0	0	0	3	2.50

VI. TYPE OF CROP RESIDUE STORED/STACKED BY THE RESPONDENTS OF DIFFERENT CATEGORIES OF DISTRICTS OF ANDHRA PRADESH FOR LEAN SEASON USAGE

The outcomes outlined in Table 6 make it evident that the practice of stacking crop residue is not much prevailed in the study area except for paddy straw. All the respondents of three districts mentioned that they stack paddy straw. In Srikakulam (adequate), 15.83 percent each stored hay of green gram and blackgram. Very negligible percent of respondents in YSR Kadapa (deficient) mentioned that they store sorghum stover (6.67 %) and groundnut haulms (2.50%).

The findings showcased in Table 6 indicate that the practice of stacking crop residue is not much prevailed in the study area except for paddy straw which was stacked by 33.33 per cent each in all three districts. All the respondents of three districts mentioned that they stack paddy straw. In Srikakulam (adequate), 15.83 per cent each stored hay of greengram and black gram. Very negligible per cent of respondents in YSR Kadapa (Deficient) mentioned that they store sorghum stover (6.67 %) and groundnut haulms (2.50 %). This table reflects the prevalence of poor practice of storing crop residue in Andhra Pradesh. In all these districts, paddy is cultivated as major crop and paddy straw is available in adequate quantity throughout the year either with the individual households or in neighboring villages. Due to this many farmers might not have felt the need to stack paddy straw in the backyard. Another reason could be that stacking crop residue of any crop is a time as well as labour demanding task. Labour wages are very high. So farmers might have felt that it's not economical to stack crop residue for lean season use. Only those who had spare labour at family might have resorted to stack crop residue, the percentage of which seemed extremely less especially for leguminous crops. The similar results reported by Singh *et al.* (2013) that generally, paddy straw is stored/stacked in a corner of a courtyard in the open. The loose piles of paddy straw are stacked together for future usage.

The contradictory results observed in Anonymous, (2012e), collecting, fencing and protecting crop residue, particularly teff straw is practiced mainly to preserve biomass for stall feeding, construction and marketing purposes. Maize and sorghum stover were commonly used for fuel wood and construction. An increase in population was another factor that has necessitated house construction and hence placed more pressure to use teff straw for this purpose.

VII. SPATIAL ARRANGEMENT OF DISTRICTS OF ANDHRA PRADESH BASED ON DRY MATTER AVAILABILITY

Andhra Pradesh, state as a whole, had adequate DM. But at district level three big districts of the state had deficient DM availability. Like at all India level, surplus districts in Andhra Pradesh states are located contiguously. This is an advantage for the state to plan fodder movement policy across the state. State has only 13 districts and in majority district, paddy is the main crop. So, paddy straw is available in most of the districts. During the household survey it was observed that many farmers store paddy straw not systematically. So, government should encourage farmers to form bales and store in the backyard. Bales take less space as well as are very convenient to stack. There are machines available already which are used by large paddy growers. These machines while harvesting grains, simultaneously rolls the straw and makes bundles. Andhra Pradesh government should incorporate baling component for judicious use of straw for feeding. It should encourage small paddy growers to make use of baling technology of paddy straw by ensuring accessibility to small baling machines.

1. Contribution of different Dry Matter sources across districts of Andhra Pradesh:

Contribution of crop residue was more to the total DM availability in most of the districts of Andhra Pradesh. Crop residue is poor in nutritional quality. State must look for the ways to enhance its quality so that livestock production can be enhanced many folds. So, the state should take up mass awareness programs about enrichment and fortification of crop residue using simple methods like soaking in water before feeding, use of salt, molasses, urea etc for fortification and enrichment. Use of social media gives advantage to the government to popularize these simple technologies. A scoping study about pros and cons of crop residue enrichment at farmers' level would help to design extension messages. These messages should be shared with the farming community using social media platform. Equally important is increasing the share of green fodder in livestock diet. State has considerable area under irrigation. Fodder production technologies like fodder production on field bunds and in backyards must be promoted using state extension machinery especially among small and marginal farmers. Large and medium farmers must be encouraged to allocate few cents of land for cultivation of high yielding improved fodder crops like bajra napier hybrid, guinea grass, lucerne etc. State should also develop grasslands in each village either using silvi-pastoral system or grass legume mixed paddocks.

2. Contribution of Different Crop Residue across Districts of AP:

Fine straw contribution is more in most of the districts. As mentioned earlier paddy straw is the major source. As fodder, rice straw has low energy and protein contents. Its utilization is limited due to minimal contents of digestible nutrients and various characteristics such as palatability, variable nutritional values, high silica and oxalates, and sometimes presence

of adulterants when not properly collected and stored. Various technologies are available to treat rice straw and enhance its nutritional value. The physical process is a practical and inexpensive method to enhance utilization and recycling of nutrients from rice straw when used as fodder for ruminants. These physical processes include soaking, grinding or chopping, pelleting, steaming pressure, and gamma irradiation. These processes promote physical changes in rice straw, such as reducing particle size, which lessens rumination time for the animal; enriching softness of the straw's fibrous components to make it more palatable to the animal; and hastening nutrient digestion. There are many chemical and biological processes. But considering the practicability, government through various platforms must popularize these simple yet very useful physical practices

Percentage DM availability from legume straw to the total crop residue in all districts of Andhra Pradesh

Contribution of legume straw is very less in most of the districts of Andhra Pradesh. Legumes are cheap sources of protein for the livestock. Besides legumes improve livestock health as well as productivity. Many leguminous fodder crops, shrubs and trees are available. Fodder crop like Lucerne is a very nutritious fodder. It is a fresh alternative to concentrate feeds. Maharashtra and Gujarat have successfully promoted this crop. On the similar lines, as state has good irrigation source, such crops must be promoted by the government. As a policy measure, state must plan to produce or procure adequate quantity of Lucerne seed and distribute among farmers. Some districts of the state are successfully growing Subabul for timber purpose and Stylosanthes for seed purpose. Farmers of these districts must be educated to make use of loppings or hay for feeding to the cattle. Promotion of legumes for feeding livestock has great economical and nutritional benefit to the state. Making forage legume seed available and creating awareness about legume based feed using extension agencies as well a social platforms must form a part of the policy.

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