**Feed and Fodder scenario in Andhra Pradesh**

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**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 has vast resources of livestock and poultry, which play a vital role in improving the socio-economic conditions of rural masses. India is world’s highest livestock owner at about 535.78 million, first in the total buffalo population (109.85 million) in the world, second in the population of goats (148.88 million), second largest poultry market in the world and third in the population 74.26 million of sheep. But the present status of feed and fodder resources available in the country is not able to meet the emerging 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.

**KEY WORDS:** Dry Matter, fodder availability, livestock, Adult cattle units

**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
2. **Grass**

Eg: Hybrid napier, Guinea grass, Sorghum, Maize

1. **Legumes**

Eg: cowpea, Styalosanthus

1. **Tress fodder**

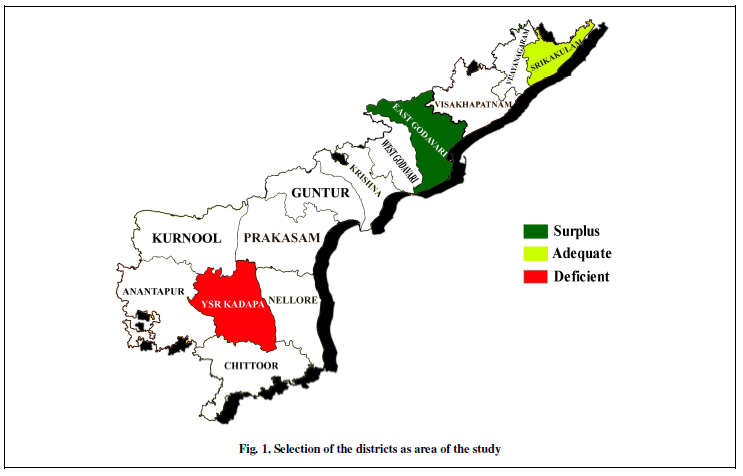
Eg: Subabul, Glyricidia

1. **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**

1. Short growth period
2. Grown in closer spacing with high seed rate.
3. Dense stand to smother weeds and prevent soil erosion.
4. Improve soil health through addition of higher amount organic residue in the soil.
5. Crop duration could be adjusted and risk due to aberrant weather condition minimised.
6. 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.
7. Crop management differ with the purpose of growing fodder and mode of utilization
8. Wider adaptability with the capacity to grow under stress condition.
9. Economic viability depends upon secondary production (livestock product)
10. High nutrient and water requirement under intensive cropping.

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**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 based on secondary data analysis) of Andhra Pradesh. This data was used to depict the fodder scenario at micro-level in Andhra Pradesh state.

## Table 2. Annual feed and fodder availability and requirement for livestock in respondents’ households

**(n=120)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type** | **Districts** | **Average herd size/house hold (ACU\*)** | **Average fodder/ACU** | | **Difference (tonnes)** | **Status** |
| **Requirement (tonnes)** | **Availability (tonnes)** |
| **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 (Deficient) | 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 (Deficient) | 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\*= Adult Cattle Unit

## 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).

**Feeding pattern followed by livestock farmers of Andhra Pradesh**

**Feeding Pattern for livestock followed by respondents in different seasons**

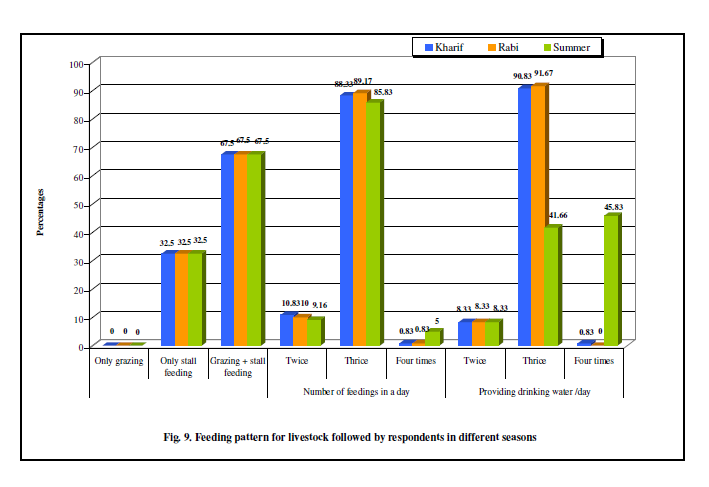
None of the respondents relied only on grazing to the livestock in all three seasons. One third of the respondents (32.5 %) however relied only on stall feeding and remaining 67.50 per cent respondents practiced both grazing and stall feeding to the livestock (Table 3 and Fig. 2). Majority of the respondents 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** | | ***Kharif*** | ***Rabi*** | ***Summer*** |
| 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 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.



## Fig.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.

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. 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.

Majority of the respondents provided three times feeding and drinking water to the livestock in three seasons. This is the usual practice followed in southern India. Because even if animals are grazed, looking into the productivity of our present grazing lands it just serves the purpose of exercise to livestock and feeding three times at cattle-shed thus become important to sustain them. In summer, the temperatures in Andhra Pradesh shoot up very high (40-440C) and hence it was prudent to provide water to livestock four times a day as was followed by 45.83 per cent of the respondents. Meena *et al.* (2020) indicated that grazing and stall-feeding method was practiced by 49.86 per cent of the respondents and half (50.14 %) of the respondents followed only stall feeding to the livestock in semi arid zone of Rajasthan. Only 2.08 per cent were able to provided feed four times in a day followed by half of the respondents (50.14 %) were providing feed to their animals two times in a day, 50 per cent and 2.64 per cent of the respondents were providing feed to their animals three and four times in a day, respectively. More than half of the respondents (53.34 %) were providing water to their animals thrice in a day. Only 33.75 and 12.91 per cent of them provided water to their animal two and four times in a day, respectively.

## 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 (Table 4).

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.

## Table 4. Cultivation of fodder crops by the respondents of different categories of districts

**( n=120)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fodder crops cultivated** | **East Godavari (Surplus) n1=40** | | **Srikakulam (Adequate) n2=40** | | **YSR Kadapa (Deficient) n3=40** | |
| **Respondents (%)** | **Mean area cultivated (acre)** | **Respondents (%)** | **Mean area cultivated (acre)** | **Respondents (%)** | **Mean area cultivated (acre)** |
| Para grass | 3 (7.50) | 1 | 2 (5.00) | 0.90 | 0 (0.00) | 0 |
| Fodder sorghum | 12 (30.00) | 1.5 | 14 (35.00) | 1.82 | 22 (55.00) | 9.5 |
| Bajra Napier hybrid | 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 9.5 acres. In East Godavari (surplus) 7.50 per cent 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 0.95 acres, 0.1 acres and 0.4 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 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. 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 1.5 acres, 1.82 acres and 9.5 acres. This crop is known traditionally as one of the best fodder crops and it forms an excellent dry fodder. It does not need any irrigation facility and external inputs. Remaining two crops Para grass and Guinea grass were cultivated by negligible per cent of respondents in all three districts, as these crops are specific to waterlogged and shade conditions.

## Table 5. Method of livestock feeding followed by the respondents

**(n=120)**

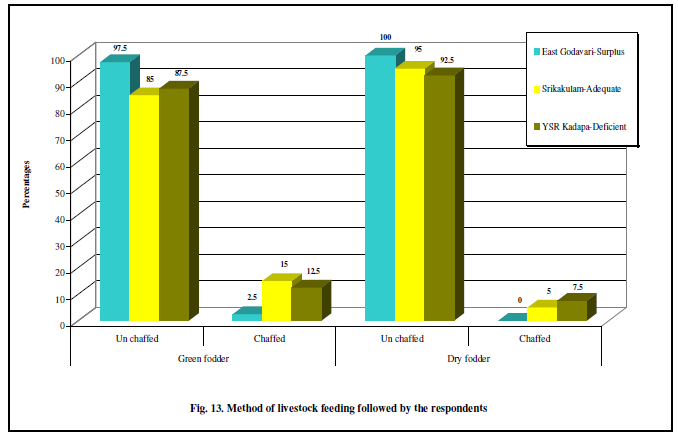
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Districts** | **Green fodder** | | **Dry fodder** | |
| **Un chaffed** | **Chaffed** | **Only dry fodder** | **Mixed with green fodder** |
| East Godavari-Surplus | 39 (97.50) | 1 (2.50) | 40 (100.00) | 0 (0.00) |
| Srikakulam-Adequate | 34 (85.00) | 6 (15.00) | 38 (95.00) | 2 (5.00) |
| YSR Kadapa-Deficient | 35 (87.50) | 5 (12.50) | 37 (92.50) | 3 (7.50) |

Note: Figures in brackets are percentages

## 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 (Table 5 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 percentage 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) indicated that majority of the farmers (66.52 %) were providing green fodder to the animals after chaffing, only 5.00 per cent of the farmers were providing green fodder to the animals without chaffing. Less than one third of the farmers (30.26 %) were providing dry fodder to the animals after supplementing it with concentrate. Some of the farmers (30.70 %) provided only dry fodder and some of them (29.45 %) were mixing it with green fodder. Few farmers (9.59 %) were also providing dry fodder to the animals after moistening it with water. It can be concluded that most of the farmers were providing dry fodder to the animals either after supplementing it with concentrate or green fodder to maintain the productivity of the animals as feeding of dry fodder alone may not be sufficient.

## Fig.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) n1 = 40** | | **Srikakulam (Adequate) n2 = 40** | | **YSR Kadapa (Deficient)**  **n3 = 40** | |
| **F** | **P** | **F** | **P** | **F** | **P** |
| **Stover (Thick stemmed)** | Sorghum | 0 | 0 | 0 | 0 | 8 | 6.67 |
| **Straw (Slender stem)** | Paddy | 40 | 33.33 | 40 | 33.33 | 40 | 33.33 |
| **Legumes hay** | Green gram | 0 | 0 | 19 | 15.83 | 0 | 0 |
| Black gram | 0 | 0 | 19 | 15.83 | 0 | 0 |
| Groundnut | 0 | 0 | 0 | 0 | 3 | 2.50 |

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

It is clear from the results presented in Table 6 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 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 %).

It is clear from the results presented in Table 6 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 green gram 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.

**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.

## 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 popularise 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 silvipastoral system or grass legume mixed paddocks.

**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 popularise 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 as social platforms must form a part of the policy.

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