

Performance of Rainfed Farming Systems in Mahaboobnagar district of Andhra Pradesh

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Andhra Pradesh is the 5th largest Indian State with a geographical area of 274.40 lakh ha. and a population of 75.7 million which is 7.37% of the country's population (2001 census). Agriculture contributes to the tune of 19% for the state GDP and provides employment to 65% of the state's population. The state enjoys a position of pre-eminence in respect of crop production.

The state is classified into seven agro climatic zones based on factors such as rainfall, soil type and topography. The seven zones are Krishna-Godavari zone with an annual rainfall of 800-1100 mm, the North Coastal Zone receiving a rainfall of 1000-1100 mm, the Southern Zone with a rainfall of 700-1100 mm, the North Telangana Zone with an annual rainfall of 900-1500 mm, the Southern Telangana Zone receiving a rainfall of 700-900 mm, the Scarce Rainfall Zone with 500-750 mm of rainfall and High altitude and Tribal Areas Zone receiving more than 1400 mm. The normal annual rainfall of the State is 925 mm, of which 68.5% is contributed by South-West Monsoons followed by 22.3% by North-East Monsoon. The rest 9.2% of the rainfall is received during the Winter and Summer months

The state has 115.32 lakhs operational holdings as per Agricultural Census 2000-01. Out of this, 70.23 lakhs holdings belong to marginal and 25.18 lakhs holdings belong to the small farmers. The rest of the holdings are held by the medium, and large farmers. The overall area operated by small and marginal farmers was found to be 46 percent of the total holdings.

Agriculture in the State has made rapid strides taking the annual food grains production from 56.20 lakh tonnes during 1955-56 to 160.28 lakh tonnes during 2000-01. The pattern of growth of Agriculture has however brought uneven development across regions in the State and also crops. However, over the years, a slackening tendency is found in the recent years due to degradation of natural resources leading to low levels of productivity.

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The state has a gross cropped area of 123.66 lakh ha. with a potential for gross irrigation to the extent of 47.81 lakh ha. (Source: Directorate of Economics & Statistics, Hyderabad). The main sources of irrigation are Canals contributing to 15.13 lakh ha, Tube wells (17.01 lakh ha), other wells (8.72 lakh ha), Tanks (5.38 lakh ha) and Other sources (1.57 lakh ha). All these sources depend on rainfall. The situation highlights that more than 50 percent of the area being cultivated, is under rainfed cultivation. Hence, any failure of monsoons during crop growth affects the crop production resulting in low yields. This situation demands an understanding of the present status of rainfed agriculture being followed by the farmers and the performance of farming systems so that efforts could be made for improving the same. Hence, an attempt was made to undertake the study in this direction with the following objectives.

1. To understand the profile of farmers in the rainfed areas
2. To study the access to inputs, technical services and advisory support by the farmers in rainfed areas
3. To explore the types of farming systems being followed by the farmers and examine their level of economic performance in the rainfed areas
4. To understand the constraints faced by the farmers in rainfed agriculture along with their suggestions for improvement.
5. To suggest strategies for improving the performance of farmers in rainfed areas.

Methodology

The study was carried out on an ex-post facto research design since many developmental activities have been undertaken over a period of time. Mahaboobnagar district in Andhra Pradesh was selected by using random sampling methodology from among the districts with higher levels of rainfed areas. Ghanapur mandal in Mahaboobnagar district was selected to represent the larger area under rainfed agriculture using random sampling methodology. From this mandal, two villages Salkapur and Nanajipet were selected, considering their level of response for developmental interventions.

From each one of the villages, four categories of the farmers were selected representing marginal, small, medium and large holder categories. Five farmers from each of the four categories were selected on a random sampling basis from each village. The data was collected from all farmers by using a pre tested well designed structured schedule. The data collected has been analyzed by using means and percentages. The presentation of the data has been done on comparative basis for various categories of the farmers relating to different aspects of the study in a simple tabular format.

1. Profile of rainfed farmers in Andhra Pradesh

The profile of the rainfed farmers in Andhra Pradesh is presented in Table-1.

Table- 1: Profile of Farmers in A P

S. No.	Indicator	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Age (yrs)	46	50	46	52	48.5
2	Education	1	3	4	10	4.5
3	Family size (No)	4.9	5.2	5.3	4.5	5.0
4	Male members (No)	2.2	2.5	2.8	2.1	2.4
5	Female members (No)	2.7	2.7	2.5	2.4	2.6

It is seen from the table that the average age of the farmers ranged from 46 years (marginal and medium) to 52 years on large farms. The same on small farms was 50 years. The mean average age for the sample as a whole was 48.5 years. The education status of the farming community revealed that the literacy was directly related to farm size. With regard to family size, it ranged from 4.9 on marginal farms to 5.3 on medium farms. The same was 5.2 and 4.5 on small and large farms respectively. It is thus evident that there was not much of heterogeneity in the demographic profile of the farming community except for the literacy level (one year to 10 years on marginal through large farms). The effect of literacy in the production process if any is detailed in the section on the economics of farming systems.

2. Land Resources among Rainfed Farmers

The details pertaining to the land resources held by the farmers are presented in table 2. It is observed that the average size of holdings for the sample as a whole was 2.80 ha. It was of the order of 0.7, 1.69, 3.04 and 5.61 ha on marginal, small, medium and large farms respectively. The size of the holding is of importance in the processes (agricultural production operations) from the economies / diseconomies of scale. The proportion of dryland to the total operational holding was 79% each on marginal and medium farms, 77% on small farms and 72% on large farms. It is thus seen that the farmers operate on a high risk contour combating the vagaries of the monsoon. Occurrence of drought and/or prolonged drought spells during the crop growth stage can drastically bring down the agricultural production thus pushing the farmers to the vicious poverty circle. The irrigation sources available with the farmers (chiefly bore wells) in general are able to cater to the requirements for one season alone due to continuous depletion of ground water. It is seen that only in case of large farms, 42% of the irrigated area was able to meet the requirement of kharif and Rabi crops.

Table- 2: Land resources among the rainfed farmers

S. No	Particulars (Average)	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Ownership status					
a	Owned	0.7	1.69	3.04	5.81	2.8
b	Total operational holding	0.7	1.69	3.04	5.81	2.8
2	Rainfed area	0.55	1.3	2.4	4.2	2.1
3	Irrigated area	0.15	0.39	0.64	1.61	0.7
a	Open wells (%)	-	-	20	0	5.0
b	Bore wells (%)	20	10	40	100	42.5
4	Seasonal Availability					
a	Kharif	y	y	y	y	-
b	Rabi	n	-	-	y*	-
5	Cost of irrigation (Rs/ha)	1200	1350	1400	2150	1525.0
6	Rainfed land value (Rs)	112667	126818	138500	144250	130559
7	Irrigated land value (Rs)	270000	295000	285000	318000	292000

*0.67 ha of the land under irrigation

It is thus concluded that the agricultural production in the study area is perpetual with the rainfed conditions thus indicating that production is directly proportional to the monsoon (occurrence and spread)

3. Livestock Ownership Pattern among Farmers

The livestock available with the farming community in the study region is detailed in Table 3. It is seen from the table that the component is integral with the different farm sizes operating in the study region. However, the scale and the type of the livestock component(s) are differing between the farm sizes. The Bovines (draught) and the caprines (sheep) are restricted to the marginal farms alone while the bovines for both draught and milch purposes are embedded with the small, medium and large farms. The proportion of milch cattle ranged from 40 to 80% on medium and large farms while the same was 50% on small farms. The back yard poultry existed but in negligible numbers and in very few cases across the different farm size groups and hence were not included in the livestock.

Table – 3: Livestock ownership pattern among farmers

Name of the animal	Category of farmers			
	Marginal	Small	Medium	Large
Bullocks	60	70	60	60
Buffaloes	-	30	10	80
Cows	-	20	30	-
Sheep	20	-	-	-

It is thus evident from the table that due to poor economic resource base, the marginal farmers are unable to access for milch cattle. The large farmers due to their stronger resource base over the other farm size groups (small and medium farms) have resorted to buffaloes for dairy purpose since maintenance cost is higher in buffaloes as against cows and the buffaloes also are higher milk yielder over cows.

4. Farm Assets

The details pertaining to the farm assets possessed by the sample farmers are presented in Table 4. It is evidenced from the data that the minimal working assets required for the

Table – 4: Farm assets pattern among the farmers

S.No	Items	Category of farmers			
		Marginal	Small	Medium	Large
1 (a)	Cattle shed - Katcha	30	50	20	20
(b)	- Pucca	-	-	10	50
2	Ploughs	60	60	50	100
3	Mould Board ploughs	60	50	60	100
4	Sickles	70	80	80	90
5	Hand Hoes	70	80	70	100
6	Spades	50	60	10	-
7	Blade harrow	-	-	-	40
8	Disc harrow	-	-	-	40
9	Farm tractor	-	10	10	40
10	Thresher	-	-	-	10
11	Harvester	-	-	-	10
12	Sprayers	-	-	10	60
13	Dusters	-	-	-	20

farm operations are owned by the marginal and small farms. The pucca cattle sheds are more pronounced on large farms while katcha cattle sheds are in built on the other farm size group's viz., marginal, small and medium. This has a bearing directly on the maintenance of the cattle. The farm tractors are restricted to only 10% each on small and medium farms while the same on large farms was 40%. The higher end machinery viz., harrows, threshers, harvesters were owned by large farmers.

Thus it is seen from the farm assets structure that the level of mechanization is minimal on marginal, small and medium farms. They depend on the large farmers for utilizing the services of the same on hire basis which constitutes to a considerable cost in the production process.

5. Access to Research Organizations

The exposure and contacts of the farming community with the research and developmental agencies involved in the agricultural sector play a vital role for making the best use of the technology(s) available and for solutions in the constraints confronted in the agricultural production.

Table – 5: Access to Research Organizations

S. No.	Details	Category of farmers			
		Marginal	Small	Medium	Large
1	Contact with researchers (%)	10	10	10	50
2	Trials undertaken (%)	-	-	-	10
3	Participation in krishimela / extension activities	-	-	-	10
4	Visit of researchers to farmer's fields				
a	Fortnightly	-	-	-	10
b	Monthly	-	-	-	20

It is seen from Table 5 that the level of exposure with the researchers was at the bare minimum i.e., 10% each on marginal, small and medium holdings while the same was 50% on large holdings. This suggests that the marginal, small and medium farmers are not fully aware of the latest developments in the technology front thus unable to harness the benefits of the same since technology is scale neutral. The on farm trials conducted were 10% on large farms. It is also noticed that the level of participation for exposure visits and extension activities were confined to large farms alone. Even the interaction with the researchers at different periodicity was observed in the large farms only.

It is thus imperative that there needs a strong mechanism for a strong farmer-

extension / researcher linkage for advocacy of the technology(s) to harness the maximum production in the study area.

6. Access to Various Extension Services

6.1. Access to Agricultural Extension Services

The agricultural extension services are being provided by the officials of the Dept. of agriculture in general. Table-6.1 reveals that only 40% of the farmers across all categories had contact with the extension agency. The large farmers tended to have weekly contacts with the extension agency followed by majority of other farmers through a quarterly contact. All the farmers tended to meet the extension agents at the panchayats office. Only 10 % of the medium farmers got the demonstrations and large farmers had exposure visits and none of the others had any participation in extension activity. Very few farmers could get the subsidies and inputs and availed for soil testing facility free of cost.

Table 6.1: Access to Extension Services in Agriculture

S. No.	Details	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Contact with extn. officials	30	30	40	60	40
2	Frequency of contact % (fortnightly)	10	30	40	80	40
3	Contact place of farmers (%) - Gram panchayat	40	40	40	80	50
4	Participation in activities					
a	Demonstrations	-	-	10	-	10
b	Exposure visits	-	-	-	40	40
5	Support services available					
a	Subsidy	-	10	20	10	13
b	Inputs	-	10	20	10	13
c	Soil testing					
i.	Availing soil test facility (%)	10	30	20	60	30
ii.	Distance (km)	14.2	5.6	6.5	16.7	11
d	Availing water test facility (%)	Not availing the services				

An overview of the results indicates a very weak linkage and support of the govt. extension system to the farmers. The pattern of extension through mass contact quarterly or half yearly had been the pattern emerging in A.P. This has also influenced the pattern of service delivery.

6.2. Access to Horticulture Extension Services

Horticulture is one of the components in the farming system that farmers can take advantage. In the rainfed areas horticulture can provide additional income apart from the field crops if properly planned and operationalized. Some of the enterprises in horticulture like leafy vegetables, other vegetable crops can also provide the farmers with quick income on day to day basis if properly planned and implemented. The information relating to the support from horticulture dept. and the contact of the horticulture extension system with the farmers was assessed in the study (table-6.2)

6.2. Access to Horticulture extension services

S. No.	Details	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Contact with extn. officials	-	-	-	20	5.0
2	Frequency of contact (Fortnightly)	-	-	-	20	5.0
3	Contact Place- Grama Panchayat	-	-	-	20	5.0
4	Supporting services - Inputs	-	-	-	10	2.5

It was interesting to note that only 20 % of the large farmers had contacts with the extension officials of the horticulture dept. They met the extension personnel fortnightly at gram panchayat office and half of them could get certain inputs from them. Apart from this, none of the farmers irrespective of the categories had any support either by way of technical advice or participation in extension activities or contacts with extension agency.

The results highlight a very weak linkage of the horticulture dept. with the farming community. One of the reasons for this phenomenon is the lack of sufficient man power within the horticulture dept. to provide extension services to the farmers. Since horticulture could be one of the crucial components to provide economic returns to the farmers, it is imperative to induct the horticultural extension knowledge through any mechanism within the extension delivery system.

6.3. Access to Animal Husbandry Extension Services

Rainfed farming systems apart from agriculture comprises of the components of

animal husbandry as a part of the production system activity. The main reasons for this type of pattern tested over time have been two fold. One of them being, a source of draught power to support agricultural activity and the other, being a source of economic return and nutritional support to the farm families.

Table – 6.3: Access to Extension Services of Dept. of Animal Husbandry

S. No	Details	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Contact with extrn. officials	56	45	40	50	47.8
2	Frequency of contact Half Yearly	78	45	30	50	50.8
3	Contact Place - Agril. Market Yard	33	18	30	40	30.3
4	Extension services Demonstrations	-	-	10	-	2.5
5	Supporting services					
a	Availing of services (AI, vaccination etc.)	44	18	40	50	38.0
b	Position of payment	56	18	50	50	43.5
c	Distance	6.8	2.4	1.8	2.9	3.5

An over view of the information in table-6.3 indicates that 56 % of the marginal farmers had contact with extension officials once in a half year, generally meeting them at market yards. In the case of small farmers, 45 % of them had contacts with the extension officials meeting them once in six months at the market yards. Similar was the situation among medium and large farmers. Only 10 percent of the medium farmers were provided the support of demonstrations and one of the other farmers were involved in the extension activities or training or exposure visits by the extension officials. All the farmers availed A.I. and vaccination facilities by payment basis covering a distance of 2 to 7 kms. and none of them were satisfied with the services.

An examination of the above results highlights the importance and need for farmers to access technical services through the extension officials in the case of animal husbandry. On the contrary, the department has not made any major move to provide the support services or involve them in extension activities to build up their knowledge and skills. Even the contact of the farmers of the animal husbandry personnel was found to be once in six months which is alarming. It is in this context necessary to build in a mechanism for providing appropriate and quick services to the farming community apart from building the capacity of the farmers in managing the animal husbandry enterprises

that can help in improving the economy of the rainfed farmers and build in sustainability of the farming systems

7. Access to Inputs

7.1. Access to Seed Material

Seed is one of the crucial inputs required in the farming activity by all the farmers. Across the farm categories, 70% of the total seed requirement was purchased (50% purchased through input dealer (private) and 20% from fellow farmers) while the remaining 30% was met from owned source. The distance for seed access ranged from 6-20 kms. Around 35% of the total seed was procured on credit basis. The adequacy of the seed was 43% while the availability of the same was 40% thus suggesting for a strong seed regulation mechanism.

Table 7.1: Access to Seeds

S. No.	Seeds	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Source:					
a	Input dealer	60	50	50	40	50
b	Fellow farmer	20	30	20	10	20
c	Own	20	20	30	50	30
2	Distance (km)	10.1	6	11.1	19.7	12
3	Adequacy of seeds (%)	50	40	40	40	43
4	Mode of purchase – by credit (%)	60	40	30	10	35
5	Timely availability	40	40	40	40	40
6	Satisfaction with the quality (%)	40	30	50	80	50

The results in table 7.1 reveal few important leads. Seed as an input is very crucial for the farmer; hence quality and timely availability are to be ensured. In the present context, since the farmers were either using their own seed material or from other farmers in the area, both the parameters could be ensured. Hence, the results provide a lead to promote farmer based seed production and distribution mechanism so that every one gets the benefit in an easy manner.

7.2: Access to Fertilizers

The second important input in modern day agriculture is fertilizer.

Table 7.2 : Access to fertilizers

S. No.	Fertilizers	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Source :					
a	Input dealer	100	100	100	100	100
2	Distance (km)	6.1	7	8.5	17.3	10
3	Adequacy (%)	60	50	70	70	63
4	Purchase by credit (%)	90	70	50	30	60
5	Timely availability	70	80	70	80	75
6	Satisfaction with the quality (%)	80	60	90	100	83

It could be noted from the table-7.2 that irrespective of the category and scale of operation all the farmers depended upon the input dealers as the main source of fertilizers. This is so since no government agency is operating fertilizer sales and the industry do not have their own counters. The distance traveled by farmers to access fertilizers ranged from 6 – 17.3 kms. Majority of the farmers except marginal purchased fertilizers by cash. Most of the farmers were satisfied with the quality and timely availability and adequacy of the fertilizers with the input dealers. Since the farmers in the district mainly grow few crops all the requirements are limited. The present situation is traced.

7.3. Access to Plant Protection Chemicals

Modern technology has made it imperative to use plant protection chemicals for ensuring a better crop yield in the recent times. As such, all the farmers irrespective of the scale of operation depended upon the input dealers for their plant protection input requirements. They traveled from 4-15kms to access the inputs. A small majority of the marginal and medium farmers purchased the inputs by credit where as the others by cash. A large number of farmers across the categories found the supplies to be timely, adequate and were satisfied with the quality except the marginal farmers (Table 7.3).

Table – 7.3: Access to Plant Protection Chemicals

S. No	Pesticides	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Source :					
a	Input dealer	100	100	100	100	100.0
2	Distance (km)	6.1	7	8.5	17.3	10
3	Adequacy (%)	67	82	60	90	74.8
4	Purchase by credit (%)	56	18	40	10	31.0
5	Timely availability	44	82	60	90	69.0
6	Satisfaction with the quality (%)	67	82	60	90	74.8

The area under the study being a rainfed region, most of the farmers grew few crops and hence their own requirements were limited. The existing supply line met their requirements. In the case of marginal farmers due to the limited scale of operation and capacity to invest, most of them purchased the inputs on credit and possibly were in the grip of the dealers who exploited them. They need a protective mechanism to support their cause.

7.4. Access to Credit

Agriculture has become a capital intensive enterprise over the years, since various inputs including labour has to be paid for immediately.

Table – 7.4: Access to Sources of Credit

S. No.	Credit	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Source :					
a	Bank	20	20	80	50	42.5
b	Money Lender	40	90	40	40	52.5
c	SHG	10	20	10	-	10
d	Others	10	-	10	30	12.5
2	Distance (km)	2.2	0.9	1.7	10.9	3.9
3	Timely availability	67	64	70	100	75.3
4	Adequacy	67	64	60	90	70.3
5	Rate of interest	24	22.9	19.5	27.2	23.4

Hence, the information in table - 7.4 revealed that all the farmers irrespective of the scale of operation borrowed capital from different sources to meet the farm demands. The marginal farmers depended on fellow farmers, money lenders within a distance of 2.2 kms. Similar was the position among the small farmers. On the contrary, the medium and big farmers depended on banks, money lenders, fellow farmers and other sources. More than 60 % of the farmers irrespective of categories indicated timely availability and adequacy. However, the rate of interest was found to be ranging from 14 % to 36 % in the area depending on the source. The data reveals few key aspects.

There are multiple sources of funding to farmers in the rural areas. However, the reach of the commercial banks was limited to medium and large farmers within limited percentage. Due to this, farmers are depending on other sources by paying very high rate of interest. Even the interest charged by the banks is felt to be higher. Considering the enterprise outputs and its price range, the situation demands reforms in the credit delivery mechanism in the area.

7.5 Access to Market

Marketing the farm produce is a crucial requirement of the farmers after production. Since the farmers would have invested a large part of their capital on the production of various products, they intend to get the benefit as early as possible to meet their personal needs, repay the debts taken and also to invest in the next enterprise. Hence, any farmer tends to mark this produce at the earliest opportunity.

Table 7.5: Access to Market

S. No.	Marketing	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Source of information					
a	Extension worker	10	20	-	10	10.0
b	Fellow farmer	20	-	10	10	10.0
c	Mass media	30	10	-	-	10.0
d	News paper	-	-	-	10	2.5
e	Input dealer	10	5	10	-	6.3
f	Others	10	-	-	10	5.0
g	Own	10	5	-	-	3.8
2	Sale of produce by farmers (%)	100	82	80	80	85.5

3	Type of produce					
a	Sale of raw produce (%)	100	82	80	80	85.5
b	Sale of processed produce (%)	-	18	20	20	14.5
4	Place of selling					
a	Regulated market	20	36	50	50	48.0
b	Trader	22	46	40	20	32
c	Middlemen	40	18	10	30	20.0
5	Market distance (km)	18.2	15.1	8.9	22.9	16.3
6	Mode of Selling					
a	Individual	78	64	70	90	75.5
b	Group	22	36	30	10	24.5
7	Satisfaction with price (%)	11	18	20	-	12.3

It could be observed from the above table that multiple sources of information were used by the farmers to get market information. The major sources used by the farmers were extension workers, fellow farmers and the mass media apart from input dealers. Very few farmers were using the newspapers.

Almost all the farmers sell the produce in the raw form mainly in the regulated markets through middlemen and others, irrespective of the category of farmers. For marketing the produce, farmers have to travel a distance from 8-23 kms, most of them sell immediately and very few in groups and a high majority of them are not satisfied with the price they get in the market.

An over view of the results provides few key insights into the rainfed farmers situation. Farmers tend to take multiple sources of information and there is no single channel providing this properly. Hence, there is a need to build in this. Secondly, most of the farmers tend to sell through multiple channels individually wherein the possibility of exploitation with lack of bargaining is possible. This again demands the need for introducing mechanism to guard the farmers. This would help in providing proper marketing support apart from price.

8. Factors influencing Farmers Decisions

An attempt was made in the study to understand the factors that influenced farmers decision making in relation to the choice of crops, cropping pattern, enterprises, investments to be made etc.

Table – 8: Factors influencing Farmer's Decisions

S. No.	Factors	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Availability of Labour	78	64	80	90	78.0
2	Availability of Irrigation	67	55	70	60	63.0
3	Availability of Credit	33	18	30	30	27.8
4	Availability of Animal labour	-	-	10	10	5.0
5	Availability of Machinery	-	-	-	10	2.5
6	Crop varieties and their duration	11	-	-	-	2.8
7	Home needs	33	73	70	50	56.5
8	Market situation	56	45	80	40	55.3
9	Agro climatic conditions	-	-	20	-	5.0
10	Availability of seeds	-	18	20	-	9.5
11	Availability of Fertilizers	-	-	10	20	7.5
12	Risk bearing ability	44	64	50	70	57.0

A perusal of table-8 indicates that the major factors influencing decision making were found to be the availability of labour followed by irrigation potential, home needs, risk bearing ability, market situation and credit. A similar pattern of factors was found among most of the indicators. However, in the case of marginal farmers, the home needs were found to be a crucial factor among only 33 % of the community. This was possibly seen since these farmers being marginal had also the access to other supplies through the public distribution system at a cheaper cost, hence, could meet their home requirements.

Any further intervention for improving the farmer's situation should take into account the factors that farmers consider as crucial to take up decisions. The situation demands promotion of labour saving devices so that availability of labour may not act as a major factor to influence adoption decisions. Similar is the case with credit, markets etc. which can help to improve the risk bearing ability of the farmers and influence faster decision making in favour of improved technologies.

9. Share of Different Inputs in Production

The present day agriculture demands an investment on external inputs like seeds, fertilizers, chemicals, irrigation and labour to maximize the benefits. Though these

inputs are crucial, they account for large scale investment on the part of the farmers. An attempt in this study was made to understand the percentage share of different inputs towards production cost of the farmers.

9. 1. Agriculture

In the case of agricultural crops, the major proportion of the operating expenses is incurred towards labour (human and bullock) (Table 9.1). It was of the order of 52.59% on marginal farms, 51.2% on small farms, 47.2% on medium farms and 41.23% on large farms. The reversal relation with the farm size is due to the higher level of mechanization in vogue on the large farms as against the other category of farms. The next item in proportion to the cost was the fertilizers. It was directly related with farm size thus implying the resource base and the affordability of the farmers in using this input. It ranged from 24 to 29.70 % on marginal and large farms. The same for the average sample was 25.98%. The cost incurred on the seed was 12.50% for the sample as a whole. It ranged from 11.9% on small farms to 13.10% on medium farms. The same on marginal and large farms was 12.74 and 12.24% respectively. The cost incurred towards the application of need based plant protection chemicals ranged from 9.2% on marginal farms to 14.1% on large farms.

Table – 9.1: Percentage share of inputs in Dept. of Agriculture

S. No.	Items	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Seeds	12.74	11.9	13.1	12.24	12.50
2	FYM	1.04	2.84	2.84	2.2	2.23
3	Fertilizers	24	24.06	26.15	29.7	25.98
4	Plant protection	9.2	9.5	10.2	14.1	10.75
5	Irrigation	0.43	0.5	0.51	0.53	0.49
6	Labour	52.59	51.2	47.2	41.23	48.06

Since the farmers in the present context were from rainfed areas, hardly any investment has gone into the irrigation. Most of the costs have to be borne by the farmers and except for the FYM and part of the family labour, all the costs have to be paid off during the crop season. Hence, the rainfed farmer is not in the control of his own situation, as he has to depend on external inputs including labour. The situation demands introduction of labour saving devices through induction of appropriate small scale farm machinery that can be operated by the farmers apart from a cropping pattern which can sustain reduced labour cost and provide comparatively higher returns.

9.2 Animal Husbandry

Table – 9.2: Percentage share of inputs in Dept. of Animal Husbandry

S. No.	Items	Category of farmers				Average
		Marginal	Small	Medium	Large	
1	Feed management	84.1	74.8	67.8	61.3	72
2	Health care	3.9	5.2	8.8	9.5	6.85
3	General management	2	4	5	7.2	4.55
4	Labour cost	10	16	18.4	22	16.6

The data revealed that the major constituent of the operational cost incurred towards animal husbandry was the feed component (Table 9.2) . It was inversely proportional to farm size. The proportion of cost incurred on the same ranged from 61.3% on large farms to 84.1% on marginal farms. The other important cost component was towards labour. It was directly related to farm size. It ranged from 10% on marginal farms to 22% on large farms. The expenditure on health care was ranging from 3.9% on marginal farms to 9.5% on large farms

Since, feed management is a crucial factor for the livestock enterprises, it is necessary that mechanism should be evolved to promote community based feed and fodder production and distribution systems in the local areas for sustenance of small and marginal farmers who have limited land resources.

10. Economics of Rainfed Farming Systems

An attempt is made in this section to study the economics under different scenarios of farming. The data reveals that there are different situations viz., agriculture based and Agriculture + Livestock based. The discussion is made individually for the respective scenario /system.

Agriculture based: The agriculture based cropping ranged from raising single crop to four crops during the study period.

Single crop based: The crops cultivated are castor, maize and sorghum by different categories of farmers.

Table 10. Costs and Returns from Agriculture / Farming Systems in Mahaboobnagar District of Andhra Pradesh

Farm Category / Enterprise	% of farmers to total under respective farm size	Average yield (qtl/ha)	Gross Returns (Rs/ha)	Operational Costs (Rs/ha)	Net Benefit (Rs/ha)	Input Output ratio
Single Crop enterprise						
Marginal						
Sorghum	10	3.50	1680	2950	-1270	0.57
Maize	20	25.33	10978	8310	2668	1.32
Castor	30	6.50	7800	6255	1545	1.25
Small						
Maize	10	13.50	6413	5897	516	1.09
Medium						
Castor	20	8.00	9600	6994	2606	1.37
Maize	20	13.75	6531	6047	484	1.08
Single Crop enterprise + Livestock (Milch)						
Medium						
Sorghum	10	4.00	4800	3458	1342	1.39
Buffaloes			21000	11500	9500	1.83
Total			25800	14958	10842	1.72
Double Crop enterprise						
Small						
Castor	20	7.42	8603	6067	2537	1.42
Maize		11.00	5033	6136	-1104	0.82
Total			13636	12203	1433	1.12
Medium						
Castor	20	6.88	8250	6269	1981	1.32
Maize		13.50	6480	6875	-395	0.94
Total			14730	13144	1586	1.12
Large						
Castor	20	9.00	10800	8780	2020	1.23
Maize		21.00	10710	6815	3895	1.57
Total			21510	15595	5915	1.38

Double Crop enterprise + Livestock (Milch)						
Small						
Castor	30	7.00	8400	6525	1875	1.29
Maize		0.00	0	2250	-2250	0.00
Buffaloes			39000	20000	19000	1.95
Total			47400	28775	18625	1.65
Medium						
Castor	30	7.54	9600	7212	2388	1.33
Paddy		37.67	21031	12638	8392	1.66
Cows			46600	28800	17800	1.62
Total			77231	48650	28581	1.59
Small						
Castor	20	6.25	7500	5415	2085	1.39
Sorghum		7.50	6000	3475	2525	1.73
Cows			57730	39600	18130	1.46
Total			71230	48490	22740	1.47
Double Crop enterprise + Livestock (Caprine)						
Marginal						
Maize	20	0	0	5400	-5400	0.00
Paddy		33.00	18315	10032	8284	1.83
Sheep			18000	6550	11450	2.75
Total			36315	21982	14334	1.65
Three crop enterprise						
Marginal						
Castor	20	6.00	7200	5950	1250	1.21
Sorghum		10.00	5000	4800	200	1.04
Maize		25.00	12125	9275	2850	1.31
Total			24325	20025	4300	1.21
Small						
Castor	20	8.00	9520	6408	3112	1.49
Sorghum		4.50	3150	3086	64	1.02
Maize		19.00	8930	10310	-1380	0.87
Total			21600	19804	1796	1.09

Large						
Castor	20	9.00	10800	6346	4454	1.70
Maize		16.00	8000	5185	2815	1.54
Paddy		25.00	15000	9678	5322	1.55
Total			33800	21209	12591	1.59
Large						
Paddy	30	28.00	22400	10060	12340	2.23
Maize		19.50	9653	6087	3566	1.59
Pigeon pea		5.00	5500	2520	2980	2.18
Total			37553	18667	18886	2.01
Three crop enterprise + Livestock (milch)						
Large						
Paddy	20	52.00	29120	15430	13690	1.89
Maize		8.00	3600	7800	-4200	0.46
Castor		2.00	2400	7335	-4935	0.33
Buffaloes			23100	13250	9850	1.74
Total			58220	43815	14405	1.33
Four crop enterprise						
Large						
Castor	10	8.70	10440	8084	2356	1.29
Onion		250.00	62500	43730	18770	1.43
Paddy		39.25	24335	13865	10471	1.76
Finger millet		5.00	2625	1734	891	1.51
Total			99900	67413	32487	1.48

Sorghum: It is seen from the table that sorghum crop was confined to marginal farms alone and to the extent of 10% only. The net returns were negative (Rs.-1270/ha) due to very poor yield which is chiefly attributed to the delayed monsoon. Sorghum cultivation during delayed monsoon in the study region triggers the heavy incidence of Shoot fly which cannot be controlled. The above is the sole reason for drastic reduction in the area under sorghum in the district.

Castor: Castor crop is perpetual in majority of the farming systems in the study region chiefly on account of the ease in management and the demand for lower level of purchased inputs vis-à-vis other commercial crops in the region. The study reveals that the yield ranged from 6.50 to 8.00 qtl/ha on marginal and medium farms respectively

thereby resulting in additional net returns of Rs.1545 and 2606/ha respectively. Higher level of yields on the medium farms is due to the management aspects as evidenced by the higher cost of cultivation. The profitability ratio was also high on medium farms as compared to marginal farms.

Maize: The area under maize has shown gradual increase during the last two-three years owing to the demand by the poultry feed industry and also for catering to the requirements of fodder to the livestock. The data reveals that the average yield was almost the same on small and medium farms (13.50 and 13.75 qtl/ha respectively). The additional net returns were Rs.516 and 484/ha on small and medium farms.

Single Crop and Livestock (Milch)

This system was confined to only 10% of the Medium farms. The data reveals that the contribution from the livestock was almost eightfold over the crop enterprise thus indicating the importance of livestock in mitigating the risk. The total returns from the system was Rs.10842 with the contribution from the crop sector being only Rs.1342.

Double Crop Enterprise

The principal crops cultivated under this system were castor and maize by small, medium and large farms.

Castor: The productivity of castor ranged from 6.88 qtl. /ha on medium farms to 9.00 qtl. /ha on large farms. The same was 7.42 qtl. /ha on small farms. The profitability was the highest (Rs.2537/ha on small farms) followed by Rs.2020 and 1981/ha on large and medium farms respectively thus indicating the doctrine of efficiency in production for increased profitability. The results indicate the varied levels of efficiency of farming across the different size groups.

Maize: It is seen from the table that the productivity was directly related to farm size. It ranged from 11 to 21 qtl/ha on small and large farms while the same was 13.50 qtl/ha on medium farms. The additional net returns was positive (Rs.3895/ha) on large farms alone while it was negative on the other farms thereby suggesting the levels of technical efficiencies with which the farms are operating.

For the system in Toto, the additional net returns were Rs.1433, 1586 and 5915/ha on small, medium and large farms respectively.

Double Crop Enterprise+ Livestock (milch)

The above system was in vogue to an extent of 50% among the small farms and 30% among the medium farms.

Castor-Maize-Buffaloes: It is seen that the total additional net returns realized from the system was Rs.18625 with livestock being the major contributor. The maize crop was a failure due to the prolonged drought after sowings while the productivity of castor was 7 qtl/ha.

Castor-Sorghum-Cow: The total additional net returns accrued from this system was Rs.22740/ha with the contribution from agriculture being less than 25%.

Castor-Paddy-Cow: It is observed from the table that the total returns derived from this system combination were Rs.28581. The contribution from agriculture to the total income was more than 50%.

Double Crop Enterprise+ Livestock (Caprine)

Maize-Paddy-Sheep: This combination was resorted by 20% of the marginal farmers. The data suggests that the system additional returns derived were Rs.14334. The returns derived from paddy was Rs.8284/ha while there were no additional net returns from maize due to the failure of the crop. It is thus seen that the risk is minimized by resorting to livestock (sheep in this case).

Three Crop Enterprise

The different crop combinations taken up by various farm sizes are discussed in detail.

Castor-Sorghum-Maize: This combination enterprise was operational on 20% each on the marginal and small farms. The data reveals that the additional net returns for the enterprise as a whole was more profitable on marginal farms (Rs.4300/ha) as against Rs.1796/ha on small farms. The higher returns that have been realized on marginal farms are perhaps on account of better management practices adopted by them coupled with enhanced resource use efficiency.

Castor-Maize-Paddy: This enterprise was confined to 20% of the large farms. The results indicate that the net returns accrued was Rs.12591/ha with paddy contributing to almost 48% of the returns.

Paddy--Maize-Pigeon pea: The system resorted to by 30% of the large farmers resulted in additional net returns of Rs.18886/ha. The contribution of Paddy was maximum (Rs.12340/ha followed by Rs.3566 and 2980/ha with Maize and pigeon pea respectively).

Three Crop Enterprise + Livestock (Milch)

Castor-Maize-Paddy –Buffaloes: This system operational by 20% of the large farmers

resulted in total net additional returns of Rs.14405. The contribution from Paddy was Rs.13690/ha, from buffaloes was Rs.9850 while the productivity of castor and maize crops were affected due to biotic stresses thus pegging down the total profitability of the system.

Four Crop Enterprise

Castor-onion-paddy-finger millet: This system was in vogue to the tune of 10% of the large farmers. The total net additional net returns accrued from the above system was Rs.32487/ha with onion being the major contributor of Rs.18770/ha

11. Problems in Rainfed Farming Systems

The rainfed farmers in A.P. have provided a feed back on the problems being faced by them in their situations in relation to various aspects of agriculture.

Table – 11: Problems faced by Rainfed Farmers in the State

S.No.	Problems	Farmers (%)
Problems related to inputs		
1	Poor quality seeds	20.8
2	Problem of pests & diseases	36.0
3	Spurious seeds and pesticides	26.3
4	Shortage of fertilizer in season	19.3
5	Receipts were not given by the input dealers	28.3
Problems related to credit		
1	Non availability of credit in time (banks- disbursing loans after monsoon showers)	58.3
2	The interest rate of moneylenders, self-help groups & input dealers are very high (varies from 24% to 48%)	46.9
Problems related to marketing		
1	Problem of measurement & low prices with middlemen	68.0
2	AMC - The immediate needs of the farmers are not fulfilled due to delayed payments	55.2
3	Due to high cost of transport farmers have to wait for the group to sale.	39.8
4	Fluctuations in prices	70.2
Problems related to Animal husbandry		
1	Veterinary hospital is located at mandal/block level	80.3

2	No support system to take the animal (injured/ ill health) for treatment.	68.9
3	Demanding money for services without providing receipts	31.2
4	The success rate of AI is very limited and charging Rs 50/- animal.	46.4
Other problems		
1	Lack of storage facilities	26.5
2	Lack of information on diversification (crop and farming System)	37.6
3	Erratic rains	78.9
4	Lack of extension services during peak agricultural seasons (for selection of seeds & pest outbreaks)	67.3
5	Animal problem (Wild boars are spoiling the groundnut crop)	39.3

Thirty per cent of the farmers found pests and diseases to be a major problem for rainfed crops followed by spurious seeds and pesticides and poor quality of seeds apart from shortage of fertilizers during seasons (Table 11). All these aspects related to arrangement of supplies of inputs that are crucial for agricultural activity on which the farmer is investing a lot. The situation demands proper regulation and control in terms of quality and timeliness of inputs being supplied to the farming community.

A majority of farmers found the non availability in time to be a major hurdle apart from the very high interest rates charged by the money lenders or SHGs or the input dealers. Since credit is a dire requirement of the farmers irrespective of different categories in the rainfed areas, the context highlights needs for reforms in credit assessment and delivery to make the farming system sustainable and efficient in the rainfed areas.

A large number of farmers expressed the problems relating to marketing being delayed payments, high cost of transportation, price fluctuations and measurement issues. This calls for a drastic improvement in the marketing operations, breaking in the monopoly of APMCs and promoting direct marketing by the farmers and farmer's organizations.

In the context of animal husbandry, location of veterinary hospital which was generally far off for the treatment of animal was found to be a major hurdle followed by lack of support system for transportation of the animal, demand for money without providing receipts by the animal husbandry officials apart from low success rates of the A.I. services. All these problems highlight lack of farmer centered approach in provision of animal husbandry extension services by the department. This needs a drastic change.

Apart from the above problems, farmers have indicated lack of storage of facilities,

lack of technical assistance during crop seasons and on crop diversification by the concerned extension agencies and few localized problems like wild boars in specific areas. The overall analysis of the problems in rainfed farming systems highlights the need to reorient the extension machinery and the research systems to the needs of the farming community. All these above problems should form a major component of the strategic plan of the district. Hence, the need for developing a district based strategic agricultural development is found to be crucial for addressing the problems of the farmers and dovetailing them as inputs to develop development programme to be implemented by the extension delivery systems.

12. Suggestions for Rainfed Farming Systems

The study also enlisted suggestions of the farmers to improve their own rainfed farming systems.

Table- 12: Suggestions for Rainfed Farming Systems

S. No.	Suggestions	Farmers (%)
1	Subsidy and good quality seed should be provided	39.8
2	Crop insurance has to be implemented	41.2
3	Development of need based extension services especially in peak agricultural season	23.7
4	Storage facilities should be improved	19.6
5	Development of farm machinery suitable for rainfed areas	21.8

As Table 12 indicates, majority of the farmers wanted a crop insurance programme to be implemented as a mechanism to avert risk followed by provision of good quality seed along with subsidy, promotion of farm machinery for rainfed areas, need based extension services and storage facilities.

These suggestions are crucial from the point of view of farmers needs and can help improve the farming conditions in the area.

13. Summary and Conclusions

Predominance of rainfed farming systems in the state highlights the importance to be given to uplift the farming communities from the present stage of development. As was evident from the study the rainfed farmers continue to be in a stressful situation due to the vagaries of nature leading to uncertain rainfall and production, exposure to high risk in marketing and prices apart from lack of proper access to research, extension support, and credit requirements. In view of this, it becomes imperative to provide

effective support systems for providing technology and skills, credit, marketing apart from empowering the farmers through developing farmer's organizations. To streamline the whole process of development, there is need for appropriate farmer supportive policies and programmes.

It can be concluded from the analysis that there is high divergence level operational across different farm size groups which can be attributed to the market and non market forces. The acreage allocation is done on the resource status of the farmers, the lag price of the principle crop / competing crop and also keeping in mind the requirements in the domestic front (including livestock as well). The agriculture based cropping (single through four crops) was to the extent of 68% while agriculture + livestock based cropping system was to the extent of 32%. The livestock component has been a major support system to the sustenance owing to the crop failures and/or low yield level of crops. This calls for the livestock component to be perpetual within the farming system for minimization of risk and for enhanced income generation.

The analysis suggests that a high degree of resource-use inefficiency is in vogue as amply evidenced by the wide variations in yield levels vis-à-vis the cost of cultivation. The inefficiency is more pronounced in maize crop as seen by the response of the crop to the inputs. The study area plagued by high fluctuations in the monsoon both in terms of quantity and distribution tends to pull down the productivity levels. Added to the above, the resource conditions of the farmers also inhibit the optimum application of the purchased inputs. There is a high productivity gap existing due to the convergence of all the aforesaid activities / events.

Against the above backdrop, the following interventions are warranted to give a fillip to agricultural productivity in the region.

- Castor crop has a comparative advantage in the region over the dryland crops across different farming systems since sorghum and maize crops fail due to stress created when there is a prolonged drought.
- Maize crop is advisable if there is the possibility of life saving irrigation.
- Sorghum crop is to be avoided during delayed monsoon since shoot fly is a menace due to delayed drought.
- Contract farming is a viable proposition (with a transparent MOU) for enhancing the productivity and thereby resulting in additional income.
- The livestock intervention / development from the present level of 32 per cent needs to be increased to at least 64 per cent through milch / caprine / poultry is a safe proposition to minimize the risk and for enhancing the income generation and/or

nutritional security.

- An immediate action plan for enhancing the availability of fodder through fodder banks for the livestock is warranted to cater to the minimum bare requirements for the draught animal power in vogue and also for enhancing the contribution of livestock in the farming systems. This draws the attention for Institutional linkage support mechanism for introduction / enhancing the livestock component.
- The study suggests for institutional credit availability through input-output marketing mechanism to ease the burden of the farmers from the clutches of the unorganized credit sources since they account for almost 54-70%. The output marketing of the agricultural commodities through tie up and/or pledge finance from institutional sources is necessitated for avoiding the sale of produce at depressed prices.
- Advocacy of the weather based crop insurance and the other crop based insurance activities
- It is observed that irrespective of the farm size, there is high level of farm inefficiencies (level of physical inputs and managerial inputs) resulting in technical inefficiencies thereby having an adverse impact on the productivity due to the yield gaps. These gaps are to be plugged for enhancing the yield /unit area. The research and development agencies are to play an important role for the adoption of the recommended technology through assessment of the existing practices and refinement of the same.

Predominance of rainfed farming systems in the state highlights the importance to be given to uplift the farming communities from the present stage of development. As was evident from the study the rainfed farmers continue to be in a stressful situation due to the vagaries of nature leading to uncertain rainfall and production, exposure to high risk in marketing and prices apart from lack of proper access to research, extension support, and credit requirements. In view of this, it becomes imperative to provide greater emphasis and support for the rainfed farming systems through specific developmental programmes.