Rythu Kosam:
Andhra Pradesh Primary Sector Mission
Rayalaseema Region Baseline Summary Report

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D Kumara Charyulu, D Moses Shyam, Suhas P Wani and KV Raju

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Executive Summary

Andhra Pradesh has set for itself the primary target of becoming a developed state in India by the year 2022, specifically in the areas of socio-economic development and ease of doing business. The vision is to lay foundation for the 'Sunrise state of Andhra Pradesh'. The achievement of this vision is incumbent upon a fast paced and sustained double-digit growth delivered through a combination of programmatic and project interventions with a focus on sustainable and inclusive development. To operationalize its vision, the state government has charted out a multi-pronged strategy comprising seven missions, five grids and five campaigns. Among the seven, primary sector mission (Rythu Kosam Mission) is on the top aiming for achieving double digit growth in agriculture and allied sectors. Massive outlay of investments over five year period (2015-2020) are targeted in agriculture development under consortium approach by bringing state, national and international partners on board. ICRISAT leads the consortium in partnership with the Government of Andhra Pradesh and has designed a strategy to transform the agriculture and allied sectors in the state. The prime focus of this mission is focused on improvement in soil fertility, access to better seed, reducing costs of cultivation, productivity enhancement and value addition in agriculture, horticulture, livestock and fisheries sub-sectors. Initially, thirteen pilot sites representing 13 districts of the state were identified and established for introduction, testing and scaling-up of technologies over a period of time. The proven technologies will be scaled-up to the entire district with suitable institutional reforms and different scales. Supply and demand side interventions are aimed for improving the livelihoods of the farmers in the state.

With this background, the major objective of the present study is to document the status of the four pilot sites covering 55 villages from 11 *mandals* (administrative divisions) in four districts (Chittoor, Kadapa, Anantapur and Kurnool) of Rayalaseema Region of Andhra Pradesh. Purposive randomized sampling framework was used to select representative villages from all study *mandals* in the region. A primary household baseline survey was conducted from representative sample farmers (1471 households) in the four districts' pilot sites. The present report attempts to estimate the total gross value addition (GVA) across sample villages and pilot site as a whole from different sub-sectors in the primary sector using information collected during baseline survey. Both household survey and secondary sources of information were complemented to estimate the GVA values at village and pilot site level. The methodology developed by the Directorate of Economics and Statistics (DES) for district level estimation of GVA was modified and adapted for estimation of GVA using household level data. These estimates can be used as 'benchmark values' for monitoring the project progress over a period of time. The project impact assessment studies if any could be undertaken in future using this baseline information. Overall, the Rayalaseema region-level baseline report helps in identifying major constraints and also helps in devising suitable strategies in the pilot site and districts as a whole.

Small and marginal farmers dominated (74%) the total sample in the region. The average family size in the region is about 4.5. Nearly 51.7% of total sample are un-educated. About 55.5% of family members participate in farm activities. The pooled average operational land holding per household was estimated at 1.42 ha and extent of land tenancy in the total region sample was calculated at 5.5%. More than 85%of sample households have residential house, access to television and mobile phone. The average number of livestock animals per household was 4.4 in the region. Recurrent droughts, acute shortage of irrigation water, uneven distribution of rainfall and yield gaps across crops limiting the total agricultural potential realization in the region. Paddy was the only irrigated crop that could recover its total costs, while majority of rainfed crops (groundnut and cotton) experienced negative net returns over total variable costs across the four study districts. Agriculture, including horticulture and animal husbandry contributed almost an equal share in the total GVA of Rayalaseema region. Fisheries sub-sector did not contribute to regional GVA estimation because of its absence in the four district pilot sites.

Other major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below. Immediate steps are required to address these issues for enhancing each sub-sector contribution in the total primary sector GVA of the Rayalaseema region.

Key findings	Specific recommendations
• Recurrent droughts, uneven distribution of rainfall and low ground water potential are the major concerns in Chittoor, Kadapa, Anantapur and Kurnool, district pilot sites.	• High emphasis on *in-situ* and *ex-situ* water conservation technologies in the pilot site villages so that groundwater recharges and its efficiency in-use can be realized quickly. Measures to enhance water use-efficiency to increase productivity needs to be identified and promoted. • The primary tanks located in the pilot sites should be inter-connected through major irrigation canals and thereby the groundwater recharge can be improved much faster and assured irrigation will be available.
• The extent of adoption improved cultivars (including drought and disease tolerant) are still low in case of major crops like groundnut, red gram, horse gram, mango, banana etc.	• Opportunities exist for introduction of new improved cultivars in field and horticultural crops leading to quick increase in productivity by at least 10-15%. Appropriate local alternate seed systems need to be developed and popularized.
• Overall the soil is low to medium fertile and yield gaps exists for major crops in the region. These are discussed in detail for each pilot site in comparison with district and national average yields.	• There exists good scope for better management practices (including soil, water, crop, integrated pest management (IPM) and micro irrigation) to improve crop yields and minimize per unit output costs. It will significantly improve the competitiveness of commodities in international markets.
• Predominantly the average milk productivity levels across the pilot sites in the region are low at 3-4 liters per animal per day. It might be due to poor feeding practices and fodder scarcity. • Majority of sample farmers are not happy with milk pricing structure and adulteration practiced by local dairy milk collection center. • Although 50% of small ruminants in the state are being reared in the region, there are no proper marketing channels and processing facilities.	• Enormous scope exists for introduction of crossbred animals and creating awareness on feeding practices to increase the average milk productivity. • Good scope for strengthening of formal market channels in case of milk, meat and eggs trading to avoid the role of middle men across all scales. The total output in this sector is marketed informally. • The surplus fodder producing districts (Krishna, West Godavari and East Godavari) should be inter-linked with fodder deficit districts (especially Rayalaseema region) in the lean period so that fodder scarcity can be mitigated. • Enormous potential for trading and scientific processing of meat from small ruminants reared in the region.
• Absence of commodity based market clusters and value chains (especially in case of horticultural crops) despite high production in the district pilot sites.	• Tremendous opportunities exist for piloting commodity specific value chains targeting export markets, eg, **Tomato**, vegetables and mango – Chittoor district, **Groundnut** – Districts of Anantapur, Kurnool and Chittoor, **Paddy** – Kurnool district and, **banana** – Kadapa district.
• Sericulture industry is dwindling in the region due to crashing prices of cocoons and frequent disease out breaks.	• The domestic silk industry should be protected by supporting with attractive remunerative output prices and controlling measures to make them competitive along the entry of cheap Chinese silk with appropriate duty and taxation regime.
• Unemployment in the villages is due to poor performance of agriculture and recurrent droughts in the region.	• Huge opportunity exists for promoting non-farm employment skill development in the region.

1. Background and Objectives

The new state of Andhra Pradesh is poised on an interesting juncture in political history as it tries to balance the varied challenges resulting from bifurcation. Despite innumerable challenges, Andhra Pradesh has initiated renewed attention to transform itself to top three best federal states in India by the year 2022.

Moving away from the 'business as usual approach', Government of Andhra Pradesh has initiated an intensive 'mission mode' approach to speed up growth process. To achieve state goals, it has put together seven missions, five grids and embarked on five campaigns. These are the three pillars of the new edifice that the state is building on. As part of state inclusive growth strategy, the prime focus is on the agriculture sector linked with improvement in soil fertility, access to better seed, reducing the cost of cultivation, productivity enhancement and value addition in agriculture, horticulture, livestock and fisheries sub-sectors. As the state is perceiving a structural change – labor force shifting from agriculture to non-farm and service sectors, imparting appropriate skills are necessary to improve productivity of abundant labor force.

The Government of Andhra Pradesh recently published 'Achieving Double Digit Inclusive Growth – A Rolling Plan 2015-16' to achieve the status of a developed economy with per capita income likely to touch ₹0.662 million by the year 2029-30. If the economy grows consistently at the 10% level and in the event of growth rates crossing this critical threshold, per capita income may go beyond the ₹0.800 million mark. Specifically, to achieve 'double digit growth' in agriculture the state government has initiated the 'primary sector mission' (Rythu Kosam Mission) with massive outlay of investments over five year period (2015-2020) by bringing state, national and international partners on board. As many as 13 pilot sites corresponding to 13 districts of the state are identified for introduction, testing and scaling-up a range of technologies over a period of time. Supply and demand side interventions are aimed for improving the livelihoods of the farmers in the state.

With this background, the major objective of the present study is to document the status of the four pilot sites covering 55 villages from 11 *mandals* (administrative divisions) in four districts (Chittoor, Kadapa, Anantapur and Kurnool) of Rayalaseema region of Andhra Pradesh. A primary household baseline survey was conducted from representative sample farmers (1471 households) in the four districts of the region. Information on socio-economic status, area allocation under different crops, average productivity levels, constraints for achieving double digit growth, accessibility to different technologies, credit and market access, perception about climate change, risk coping mechanisms etc, were collected and summarized before implementing the project. The present report also attempted to estimate the total gross value addition (GVA) across sample villages and pilot site as a whole from different sub-sectors in the primary sector. Household survey and secondary sources of information were complemented to estimate the GVA values both at village and pilot level. These estimates will be used as 'benchmark values' for monitoring the project's progress over a period of time. The project impact assessment studies if any could be undertaken in future using this baseline information. In addition, this comprehensive Rayalaseema region-level baseline report helps in, identifying major constraints and devising suitable strategies.

2. Overview of Agriculture in Rayalaseema Region

Rayalaseema is a geographic region in the Indian state of Andhra Pradesh. It includes the southern districts of Anantapur, Chittoor, Kadapa and Kurnool. With an area of 67,526 km^2 (42% of the state territory), Rayalaseema is larger than Kerala, Punjab, Himachal Pradesh and nine other federal states of India. It has a population of 15,184,908 (census, 2011), which is 30.03% of the state population. Rayalaseema borders the federal state of Tamil Nadu to the south, Karnataka to the west, Telangana to the north and the Coastal Andhra region of Andhra Pradesh to the east. The region is covered with 4259 census villages and 68 (statutory and census) towns. The average density of the population is estimated at 227 persons per km^2. The highest population density in the region was observed in Chittoor (275 persons per km^2) while the lowest was noticed in Anantapur district (213 persons per km^2). The average decadal growth of population

in the region was estimated at 12.29%. However, among the districts in the region, the highest growth in decadal population was observed in case of Kurnool district (14.85%). Based on the year 2011 census, the average literacy rate in the region was 65.59%. Overall, urban population has higher levels (76.19%) of literacy rates than the rural population in the region (61.08%). The annual normal rainfall in the region ranged between 550 and 750 mm. Out of four districts in the region, Chittoor (933.9 mm) received better annual normal rainfall followed by the districts: Kadapa (699.6 mm), Kurnool (670.5 mm) and Anantapur (552.3 mm).

Of the total geographical (6.72 million ha) area of the Rayalaseema region, only 39.8% (2.67 million ha) is the net area sown (including fish and prawn culture) under different crops. Only 4% of the total geographical area (0.26 million ha) is sown more than once. The gross irrigated area in the region is estimated to 0.81 million ha (around 20% share in the state). Agriculture which is mostly rainfed, has been the main livelihood occupation of farmers in the region. Nearly 47.2% of total cropped area is under food crops and the remaining under non-food crops. Total oilseeds contribute about 41.9% of entire cropped area (see Figure 1) followed by other commercial crops (such as cotton, tobacco including fruits and vegetables) accounted for 22.9%. Total pulses group occupied the third place (18%) in total sown area in the region. Total cereals and millets secured the fourth place and have the coverage about 17.2% in the region.

The individual crop area shares in total cropped area of the Rayalaseema region during the year 2014-15 are depicted in Figure 2. More than 30% of total cropped area in the region is occupied by groundnut, followed by cotton (9.4%), bengal gram (6.9%), rice (5.2%) and red gram (3.7%). These five crops had a total share of nearly 58% of the total cropped area in the region during the study period. Among horticulture crops, mango is leading followed by onion, chilies, banana, turmeric and cashew nut.

The break-up of 19th livestock census conducted in the region are summarized below. Sheep is the single largest (58.6%) contributor in total livestock population, followed by goats (15.9%), cattle (15.3%) and buffaloes (9.7%). Pigs and other livestock animals together had a share of only 0.5% in the 19th livestock census. Around 16.9 million population of poultry also existed in the region which accounts for 20.7 % of total state poultry population.

Fisheries play a minor role in the Rayalaseema region of Andhra Pradesh. The contribution of marine fisheries to GVA is almost absent in the region. Inland fish and prawn production only exists in the region around perennial water bodies but, their contribution to the total state production is meagre (2.8%). A comparative status of Rayalaseema region with the state of Andhra Pradesh and India has been summarized and presented in Table 1.
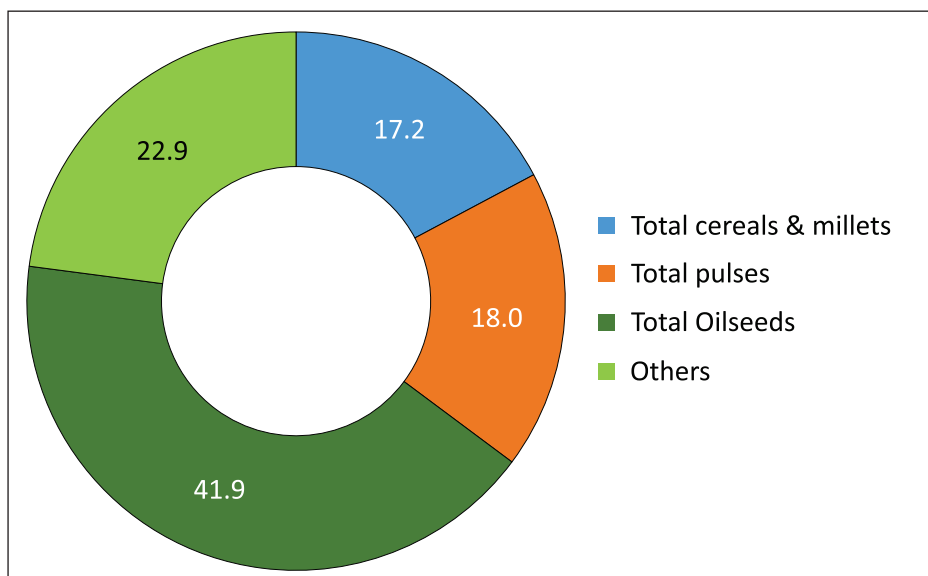
Figure 1. Share of total cropped area among crop groups.
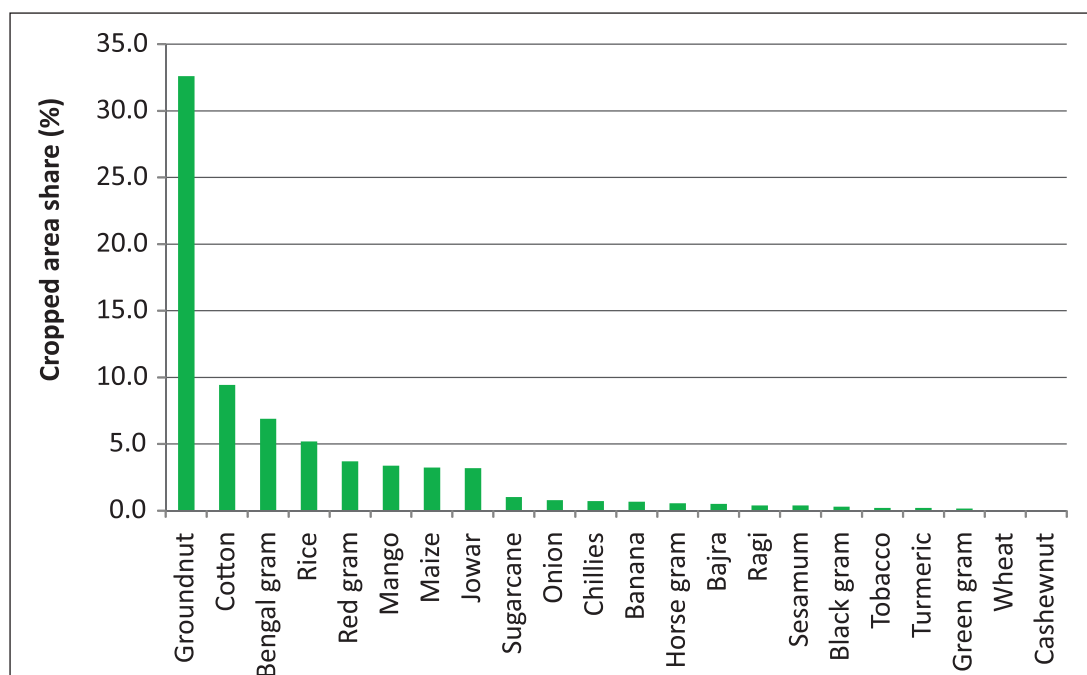
Figure 2. Cropped area shares by crops in the region (2014-15).

Table 1. Comparative status of Rayalaseema region along with Andhra Pradesh and India.

Parameter	India	Andhra Pradesh	Rayalaseema region
Geographical area (000 km^2)	3287.5	163.0	67.4
Population (Million 2011 census)	1210.9	49.6	15.2
Males (Million)	623.2	24.8	7.6
Females (Million)	587.5	24.7	7.5
Urban (Million 2011 census)	377.1	14.6	4.5
Males (Million)	195.4	7.2	2.3
Females (Million)	181.6	7.3	2.2
Rural (Million 2011 census)	833.7	34.9	10.7
Males (Million)	427.7	17.5	5.4
Females (Million)	405.9	17.4	5.3
Literacy (% in 2011)	74.04	67.35	65.59
Males (%)	82.14	74.77	75.18
Females (%)	65.46	59.96	55.95
GDP (₹ Million in current prices, 2014-15)	124986620	5200300	1312840
Agriculture and allied sectors (₹ Million)	23372498	1434980	364120
Industry sector (₹ Million)	396207580	1072240	284090
Service sector (₹ Million)	61993363	2693070	664630
Shares of sub-sectors in GDP (%)			
Agriculture and allied sectors	18.0	27.6	27.7
Crops	11.8	15.4	18.8
Livestock	3.9	7.1	7.5
Forestry and logging	1.4	1.0	1.3
Fishery	0.9	4.1	0.2

3. Pilot Sites of Andhra Pradesh Primary Sector Mission

In partnership with ICRISAT, the Government of Andhra Pradesh has designed a strategy to transform agriculture and allied sectors. This strategy will be operationalized in a phased manner, setting the standards for the new development. This massive effort was initially termed as 'Primary Sector Mission' and later renamed as '*Rythu Kosam*' (pro farmer) Mission. The mission will be implemented by adopting the principles of four 'I's: Innovate, Inclusive, Intensive and integrated approaches; four 'C's: Convergence, Collective action, Consortium to build partnerships and Capacity building; and four 'E's: Efficiency, Equity, Environment Protection and Economic gain.

Overall the mission in the state will broadly focus on:

a. Increasing productivity of the primary sector comprising Agriculture, Horticulture, Livestocks, Fisheries & Sericulture;

b. Mitigating impact of droughts through water conservation and micro-irrigation;

c. Post-harvest management to reduce wastages; and,

d. Establishment of processing, value addition capacity and supply chain of the identified crops.

To execute the mission strategy effectively, 13 pilot sites of learning in 13 districts of Andhra Pradesh were identified to operationalize the convergence of primary sector for increasing the productivity, profitability and sustainability through science led development and climate smart agriculture. In order to integrate, innovate, intensify ensuring inclusivity, a pilot site with 10,000 ha spread is being established in each study district. These pilot sites provide an on-farm field laboratory to help test and evaluate, technological, institutional, policy innovations and fine-tune them as needed prior to scaling-up in the districts. In the marketing parlance, these pilot areas identified in each district are test markets for innovations which will be demand driven and impact oriented with measurable indicators.

Six general criterion used for selecting pilot sites in each district: a. Representative site for the district in terms of Agro-Ecological Zones (AEZ) and cropping systems, b. Good potential for impact to bridge the yield gaps, c. Accessibility, d. Willingness of farmers to adopt new technologies, e. Presence of suitable institutions, and f. Predisposition for change.

The identification of pilot site in each district was done in several iterations with consent from District Collector (chief administrator and planning officer), other line department officials at district and *mandal* levels, interactions with farmers and communities and discussions with non-governmental organizations (NGOs). By following the above criterion, the pilot sites in all 13 districts were identified. Distribution and coverage details of each pilot site by district are furnished in Table 2.

The entire primary sector mission pilot sites are covering 267 villages (both agriculture and fishery) under 38 *mandals* in 13 districts of the state. Approximately 0.192 million farmer households are directly targeted for mission interventions across 13 pilot sites. A total population of 0.685 million are covered initially during 2015-16 cropping season. About 0.142 million ha of cropped area (including agriculture and horticultural crops) has been covered across 13 pilot sites corresponding to 13 districts in the state. Nearly 0.99 million population of livestock animals are also covered for wide range interventions under selected *mandals* in the mission pilot sites. Roughly 8892 ha of fishery area (including both prawns and fish cultivation) are also covered under mission interventions.

To summarize, the cumulative pilot site area represents about 1.75% of the total cropped area in the state. Approximately about 1.4% of the total state's population is covered in these pilot sites.

Table 2. Distribution and coverage of pilot sites under AP primary sector mission.

District	No. of *mandals*	No. of villages	No. of households	No. of population	Pilot site cropped area (ha)	Livestock population (no.)	Fisheries area (ha)
Chittoor	2	18	6762	31317	9001	93412	0
Kadapa*	4	13	11246	46745	10314	146771	0
Anantapur*	3	14	5019	13556	12411	20,000	0
Kurnool	2	10	6864	26736	10299	24057	0
Nellore	3	11	9469	33876	11780	39915	367
Prakasam	4	28	20899	86722	8500	225550	3898
Guntur#	4	18	17634	63202	12987	19980	217
Krishna*	3	27	22805	76762	15182	60240	260
West Godavari**	2	12	23155	84044	12803	25400	1022
East Godavari	3	26	17487	67843	10470	146939	2163
Visakhapatnam	3	23	21673	33411	10516	31232	360
Vizianagaram#	2	23	8753	35976	8494	32555	451
Srikakulam#	3	44	20721	85581	9914	126595	154
Total	38	267	192487	685771	142671	992646	8892

** one *mandal* and eight villages covered under both agriculture and fishery sub-sectors
# one *mandal* covered under both agriculture and fishery sub-sectors
* minor changes carried out during baseline survey

4. Sampling Framework

The sampling framework has been designed for the entire 'Rythu Kosam Mission' which includes 13 pilot sites across 13 targeted districts in the state by considering the extent of diversity among study villages. Each pilot site has been identified with an approximate cropped area coverage of 10,000 ha per study district. In general, the pilot site in a district is comprised of agricultural (including horticulture crops) villages and few fishery (fish and prawns) villages. In case of four Rayalaseema districts (Ananatapur, Kurnool, YSR Kadapa and Chittoor), it is solely represented by agricultural villages because of absence of fishery villages. The 13 pilot sites from 13 districts have been distributed in 30 *mandals* and 227 villages in case of agricultural villages while another 47 fishery villages were covered in 11 *mandals*.

As shown in Table 2, there are 3 common *mandals* and 7 common villages across the pilot sites. Excluding these common pilot sites, the actual *mandals* and villages covered under the Rythu Kosam mission are 13 districts, 38 *mandals* and 267 villages. These sample villages together represent the state of Andhra Pradesh and its rich diversity among three regions (Rayalaseema, Coastal Andhra and North Coastal) and four agro-ecological zones (AEZs). A systematic sampling framework has been developed to cover this diversity by undergoing the following steps:

1. Characterization of all sample villages using information on type of agriculture (irrigated/rainfed), major crops of cultivation during rainy and post-rainy season, main horticultural crops grown, rearing of sericulture, fish and prawns cultivation and finally extent of forest area available .

2. Based on dominance of each sub-sector (agriculture, horticulture, sericulture, fisheries and forestry) in the sample villages, a scale of 1 to 3 (3 for significant area and 1 for low presence) was provided for better categorization of study villages. A total of six diversity categories of sample villages were identified.

3. A cumulative diversity scale for each sample village was calculated by adding the respective scales given for each sub-sector (agriculture, horticulture, sericulture, fisheries and forestry). This value has ranged from a minimum of '4' to a maximum of '9'.

4. To minimize the cost of survey and time, a sub-sample of 150 villages (covering 119 agricultural and 31 fishery villages) were identified using randomization procedure without losing their representativeness and by covering all the *mandals* in the study. 55% of sample villages have been covered from 40 *mandals*.

5. The total cumulative area covered in the primary sector mission is (13 pilot sites of 10,000 ha each) estimated to be 1,30,000 ha. The average operational landholding per household in the state was calculated at 1.08 ha based on the year 2011 landholding census survey. The estimated coverage of households in the primary sector mission would be nearly 120,370. In case of large scale representative household surveys, a reasonable coverage of 5 percent of the total population is adequate to minimize the marginal error. Thus, the present baseline survey has used this thumb rule and targeted an approximate sample of 6500 households (5 percent of 130,000 households) across 13 districts.

6. As per the 2011 census, nearly 73% of total households are small (less than 2 ha of operational landholding), 9 percent medium (having operational landholding of above 2 ha and less than 4 ha) and 3% sample are large (> 4 ha) and 15% of the total households fall under landless category. This category of farmers, are highly dependent on primary sector for their livelihood. Therefore, their representation in the household survey is critical for understanding the direct and indirect impact of different interventions in the pilot sites. A minimum of six landless farmers per village (150 x 6 = 900) are accommodated in the household survey to represent this category in the study.

7. The classification of fishery farmers' operational landholding details are not available at the state level. The household data collected in the fishery villages will be post-stratified to deeply understand the economies of scale of their cultivation. However to keep their representation in the household survey, a minimum of 30 farm households per village were surveyed. Thus, a total of 930 households have been targeted to cover 31 fishery villages in 10 *mandals*.

8. The left over sample of 4670 households (6500-900 landless + 930 fishery households) have been distributed among 119 agricultural villages using sampling weights (see Table 3). Majority of the sample villages exhibited medium to high levels of diversity scale (6 to 8) in their distribution. Thus, majority sample has been allocated to this category of villages.

9. Using the above sampling framework, a sub-sample of 55% sample villages have been identified for primary household. All the villages represented the calculated cumulative diversity scale range between 4 to 9 because of dominance of agricultural and horticultural crops, presence of sericulture cultivation, fisheries and existence of forestry in the study villages. More details regarding total study sampling framework, distribution of sample villages based on diversity scales, break-up of different categories of sample farmers across pilot sites, and distribution of sample among sub-sectors are furnished in Appendix-2. However, the below sampling strategy was planned for collecting the primary household data from targeted sample of 6462 households. The primary household survey was conducted during June, 2015 with structured questionnaires and trained field investigators. About 5222 sample households were interviewed from selected villages and information on socio-economic, assets position, cropping pattern, extent of adoption of technologies, average productivity levels among major crops, details about credit and market access, perceptions about climate change and risk coping mechanisms were collected. The difference of 1240 households of targeted sample was not covered during baseline surveys because of higher homogeneity in population and non-cooperation in few sample villages (especially in fishery). The complete break-up as per pilot site are summarized in Table 4.

Eighty one percent of total targeted sample households were covered during the household survey. Out of the total sample interviewed (5222), nearly 4794 households were covered in agricultural sample villages while the rest (428 households) were administered in case of fishery sample villages.

Table 3. Sampling strategy for cultivator households (n=4670).

Diversity category	Diversity scale	Diversity weight	Distribution of sample villages	Cul. Wt	Distribution of target sample (n=4670)	Avg. sample per village
1	4	0.10	4	0.41	97	24
2	5	0.13	4	0.51	121	30
3	6	0.15	68	10.46	2469	36
4	7	0.18	21	3.77	889	42
5	8	0.21	17	3.49	822	48
6	9	0.23	5	1.15	272	54
Total	39	1.00	119	19.8	4670	

Table 4. Sample distribution and coverage during baseline (BL) surveys.

District	Targeted BL sample	Sample covered in BL
Chittoor	486	481 (0)
Kadapa	396	396 (0)
Anantapur	402	366 (0)
Kurnool	228	228 (0)
Nellore	372	264 (48)
Prakasam	546	342 (91)
Guntur	444	359 (48)
Krishna	570	491 (125)
West Godavari	606	332 (22)
East Godavari	618	406 (52)
Visakhapatnam	462	423 (0)
Vizianagaram	504	460 (18)
Srikakulam	828	674 (24)
Total	6462	5222 (428)

Note: Figures in parenthesis indicates absolute no. of fishery sample coverage in the total

5. Methodology

Simple tabular average analysis was used to analyze data collected in the primary household survey. The results are summarized by district in section six of this consolidated Rayalaseema regional baseline report.

For estimation of GVA in primary sector from pilot site, production/value added approach was used. Among the three approaches (production, income and expenditure) available, production/value added approach is applied for the estimation of value addition in primary sector. Income approach is normally applied for industry sector and expenditure approach is applied in case of service sector.

As per standard definitions, the primary sector includes agriculture, horticulture, animal husbandry, fisheries, sericulture, forestry and logging, mining and quarrying. In the present study context, the primary sector is confined to agriculture, horticulture, animal husbandry and fisheries. The standard methodology defined by the Directorate of Economics and Statistics[1] was adapted with suitable modifications to estimate. The methodology followed for estimating 'Gross Product' by sector is summarized below:

[1.] National Account Statistics: Manual on Estimation of state and District Income (2008), published by Central Statistics Office.

Agriculture, horticulture and floriculture

This sector includes major agricultural crops (25), minor crops (17), small millets, other pulses, commercial crops, horticultural crops, plantation crops, flowers, sugars, oilseeds, fruits, vegetables, fodders and by-products.

Livestock

This sector includes milk production from cows, buffaloes and goat; wool production from sheep and goats; egg production from poultry; meat production from poultry, sheep, goat and donkeys. By-products such as dung from milch animals has been included. The incremental livestock value will also be considered in the estimation of GVA.

Item	Source of data	Method of estimation
Agriculture Horticulture Floriculture	Household survey and secondary statistics available at village level	Value of output= production x price (base year 2014-15)
Gross value of output (1)		
Less: inputs		
Seed Chemical fertilizers Organic manures Market charges Irrigation charges Electricity charges Pesticides and insecticides Diesel oil cost Machinery cost	Household survey	Average cost per hectare per crop
Total inputs (2)		
Gross product (1-2)		

Item	Source of data	Method of estimation
Milk Meat Wool Egg Dung cakes/dung	Household survey and secondary statistics available at village level	Value of output= production x price (base year 2014-15)
Incremental stock value	DES latest report	Value of output= production x price
Gross value of output (1)		
Less: inputs		
Livestock feed & roughages Concentrates Marketing cost Medicines and other costs	Household survey	Average cost per animal
Total inputs (2)		
Gross product (1-2)		

Fisheries

Value of inland fish, marine fish and prawns by village is estimated by multiplying the production with corresponding output prices. Fish sold as salted, dried and frozen need to be accounted. The average productivity level and various input material costs per hectare were estimated from household primary survey. The gross product from fisheries sector is estimated by deducting the input costs from the total gross value product.

Forestry

Major components of this sector are industrial wood (recorded and un-recorded), fuel wood, major and minor forest produce. However, the present study has attempted to capture fuel wood and forest produce components only. The gross value of output is estimated by multiplying the total forest produce with corresponding output prices (base year 2014-15). In case of forestry, the input costs were not captured in the household survey.

All the household survey information was collected with agricultural reference year 2014-15 crops. For obtaining the complete information on the three seasons, previous year data was collected. The summary of methods of estimation of GVAs across sub-sectors are summarized below.

Sources of data across sub-sectors

Source of information	Agriculture including horticulture (a)	Livestock (b)	Fisheries (c)	Forestry (d)	Total primary sector (a+b+c+d)
Estimation of Output (1)	household survey and secondary information	household survey and secondary information	household survey and secondary information	Only secondary information	Total primary sector output
Estimation of input costs/ unit (2)	household survey	household survey	household survey	DES guidelines will be followed	Total input costs excluding labor costs
Gross product (1-2)	Gross product from agriculture including horticulture, floriculture, vegetables, fodder crops etc.	Gross product from cows, buffaloes, goat, sheep, poultry, ducks and incremental value etc.	Gross product from prawns, fish (inland and marine), salted fish, dried fish etc.	Gross product will be estimated using DES guidelines and methodology	Primary sector GVA estimation for pilot site/ district

6. Findings from Baseline Survey

The findings from baseline surveys conducted across four study districts in the Rayalaseema region are summarized and discussed in the following subsections. Simple tabular analysis was used to analyze the primary household survey data collected during baseline survey referring to the cropping year 2014-15. Specifically, the results presented below are summarized from agricultural sample villages (55) covering 1471 sample households in four pilot sites. Due to absence of fishery sample villages in the four study district pilot sites, the baseline did not capture any sample households from the fishery sector. A total of 1471 sample baseline farmers' household data have been analyzed and summarized in this report.

6.1 Distribution of sample across size groups and communities

The distribution of total baseline survey sample by district in the region is presented in Appendix-1 Table 1. On the whole, 1471 sample households were interviewed from 55 sample agricultural villages.

All the sample farmers are distributed and categorized under different size groups based on their total operational land holding during the year 2014-15 cropping season. Out of the total 1471 sample, 1085 sample households belonged to small size (< 2 hectares) farmers category followed by medium (between 2 and 4 hectares) size (152 households and represents 10.33%) and large (> 4 hectares) size (50 households which represents of 3.4%) category. The baseline survey also covered 184 sample households belonging to landless (operational landholding zero) category. Contribution is approximately 73.7%, 10.3%, 3.4% and 12.6% shares in the total baseline sample for small, medium, large and landless categories respectively. This allocation among size groups is truly representative to the year 2011 census survey conducted on 'operational landholdings' at state level. The pattern of distribution of sample among study districts was also closely representative to the district level situation generated in 2011 census survey.

The total baseline sample in the region was also categorized based on the community they belonged, by district and is presented in Appendix-1 Table 1. Majority of sample (640 households) belong to Backward Caste (BC) community followed by Open Community (OC) category (504 households), Scheduled Caste (SC) community category (243 households), Scheduled Tribe (ST) community category (75 households) and others (9 households). They contributed approximately 43.5%, 34.3%, 16.5%, 5.1% and 0.6% respectively for BC, OC, SC, ST and Other communities. The pattern of distribution of sample by community varied for each district.

6.2 Family size, extent of literacy and participation in labor market

The details of average family size, extent of literacy and participation in labor market are analyzed and presented in Appendix-1 Table 2. The average family size of the household for total sampled farmers is 4.5. The highest family size (4.8) was noticed in case of Chittoor district while the lowest (4.0) was observed in Ananthapur district. On the whole, only 48.3% of total sample in the region had literacy. Out of which, 16.5% had primary level of education while another 31.8 % had upper primary and above level of education status. Out of the total sample, 51.7% were un-educated or did not have access to education. The extent of illiteracy was higher in case of Kurnool and Anantapur districts. A special attention should be placed for promotion of education and other basic amenities in these districts. The highest literacy rate was noticed in case of Chittoor district compared to any other district in the state. Majority of family members (55.6%) in the sample are participating in their own farm. Majority of sample districts exhibited much higher levels of own farm labor participation on par with the pooled average. Another 48.8 % of total family members were also participating in the outside labor market for sustenance. Most of the sample districts in the region showed higher levels of external labor market participation.

6.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details by district in the Rayalaseema region are furnished in Appendix-1 Table 3. The average own landholding per household for the entire region sample was estimated at 1.41 ha. Out of which, 0.46 ha of land was covered with irrigation access while another 0.95 ha was grown under rainfed situations. Specifically in the Rayalaseema districts, rainfed landholdings dominate the total own landholding. However in case of Guntur, Krishna and West Godavari districts, irrigated landholding are having lion's share in total own land holdings. The extent of average operational landholding for the total sample households in the region were calculated at 1.42 ha. A negligible share of crop land was leased from outside land markets in the region. The extent of tenancy for the total sample households was only 5.5 % (excluding landless households).

6.4 Household assets and livestock ownership

The details about owning of household assets and livestock for the total sample in the Rayalaseema region are presented by district in Appendix-1 Table 4. Out of the total sample households, 98.3% expressed they possess a residential house. About 11.5 % sample households indicated that they also own cattle shed for accommodating and rearing buffaloes, cows and bullocks. Television (89.9%) and mobile phones (93.9%) are most common consumer durables owned by many of the sample farmers across study districts in the region. Approximately a quarter (23.4%) of total sample farmers also possessed two wheelers.

The details about average livestock ownership per sample household is summarized in Appendix-1 Table 4. On an average, every fifth sample household in the region had one draft animal. Similarly, every third sample household in the Rayalaseema region had one cow and buffalo. Apart from these animals, many sample households also own young stock, sheep, goats and poultry in a significant manner. So, the total number of livestock animals owned by each sample household was estimated at 4.4. The composition of different livestock animals varied significantly from district to district in the region. Overall, the highest number of livestock animal per household was in case of Anantapur (5.1) while the lowest was observed in case of Chittoor (3.4).

6.5 Major crops and their productivity levels

The details about major crops grown in each pilot site in the region and their corresponding productivity levels in comparison with district, state and national average yields are summarized in Appendix-1 Table 5. The district and pilot site productivity levels are discussed below:

Paddy, groundnut and horse gram are the major crops observed in Chittoor. The average productivity levels in case of paddy (3.73 ton per hectare) and horse gram (0.54 ton per hectare) are on par with district average yields. Nevertheless, groundnut productivity (0.60 ton per hectare) in the pilot site is lower by nearly 47 % when compared to the district average yield. The district has good potential in case of groundnut and its average yield is higher by 51 % than state average yield and by 13.5 % compared to national average yield. Crops like pearl millet, finger millet, groundnut, cotton and potato showed lower productivity levels in the pilot sites when compared with district average yields. The mean productivity levels of fruits and vegetables in the pilot site were good while the sole limitation was insufficient irrigation water.

In case of Kadapa district, paddy, groundnut and cotton are the major crops grown but, the productivity of paddy (2.52 ton per hectare) in the pilot site exhibited nearly 13 % lower yields than the average district yield (2.84 ton per hectare). Additionally groundnut (0.62 ton per hectare) in pilot site also under performed by 54% compared to district average yield. Relatively, the average productivity levels in case of cotton (1.38 ton per hectare) are on par with district average (1.47 ton per hectare). Tremendous scope and potential exists to enhance productivity levels across crops in the pilot site.

Paddy, groundnut and red gram are major crops cultivated in Anantapur district. Although average pilot site productivity levels are on par with district average yields, they are lower than state average yields. In case of groundnut, crop yields were 32% lower. Groundnut being the major crop cultivated in the district, huge scope and potential exists to further enhance productivity. The mean productivity levels were significantly lower in case of pearl millet, horse gram, castor and cotton in relation to their district average yield as reported by Directorate of Economics and Statistics.

In case of Kurnool, paddy, groundnut and cotton are the major crops cultivated. The performance of paddy (4.34 ton per hectare) was good and it is better than both, the district (3.67 ton per hectare) and state average (3.09 ton per hectare) yields. The performance of groundnut and cotton is lower than district average yields. Potential opportunities are available for enhancing cotton and groundnut yields in the pilot site. All other crops exhibit at least 10-20% higher margin of yields compared to district mean yields. This indicates the huge potential of the Kurnool pilot site to prosper in future through introduction of improved cultivars, better management practices and market linkages.

6.6 Economics of crop and fish enterprises

The details about economics of major crop enterprises per ha across pilot site districts are summarized in Appendix-1 Table 6. The costs and returns per ha information across crops cultivated in the pilot site were collected from one-fourth sample households. The information was elicited and complemented through village level focus group discussions (FGDs) conducted at each sample village in the baseline survey. This information was collected on one year recall basis pertaining to the 2014-15 cropping year. While calculating the economics of crops cultivation, only total variable costs (paid out costs across each

operation like seeds, fertilizers, pesticides, machinery, labor and irrigation costs if any) was considered for deduction from total returns (includes total output plus by-products if any) per ha. The fixed costs like rental value of own land per ha, depreciation of farm implements etc, was not considered. The net returns per ha were estimated after deducting total variable costs per ha from total returns per ha. The benefit-cost ratio (B: C ratio) was calculated by dividing the total returns with total variable costs per ha. The details about pilot site performances of major crops in the Rayalaseema region are discussed and summarized below:

In case of four Rayalaseema districts, paddy and vegetables were the major crops in irrigated land while groundnut, cotton, horse gram and red gram were the primary rainfed crops preferred in the study districts. The cultivation of paddy is quite economical across four districts except in case of Anantapur district (see Figure 3). Recurrent droughts and in-sufficient water during crop period are the major problems expressed by sample farmers in these districts. Groundnut being the dominant rainfed crop in the entire Rayalaseema districts did not recover its total costs per ha (see Figure 4). It barely earned 80-90 % of its total costs across four study districts. This is mainly due to poor yields per ha. The major reasons for low yields are: uncertain weather conditions, low and uneven distribution of rainfall during rainy season. Similarly, the performance of cotton was also poor in case of Kadapa and Kurnool districts. Paddy followed by cotton cultivation was the peculiar situation in case of Kadapa where due to high density cotton planting and little irrigation availability resulted in poor yields. This has to be strongly discouraged in the district. The performance of horse gram was much better in case of Chittoor district where the crop recovered its total variable costs and earned some marginal net returns. The cultivation of sorghum (jowar) in Ananatapur district was the poorest among all crops where only 60% of total variable costs per ha were recovered. If we consider the total costs per ha (total variable costs plus fixed costs), the situation would be worst among all crops and study districts. Ideally, the total costs per ha should be recovered from its total returns per ha only then will it become a viable option for farmers to continue in agriculture.

Further details on costs and returns of various crops per ha across pilot sites are available in the district specific baseline reports prepared under similar guidelines. The details about economics of fish cultivation were not presented in the Rayalaseema region because of non-coverage of baseline sample households from fishery villages in the region.
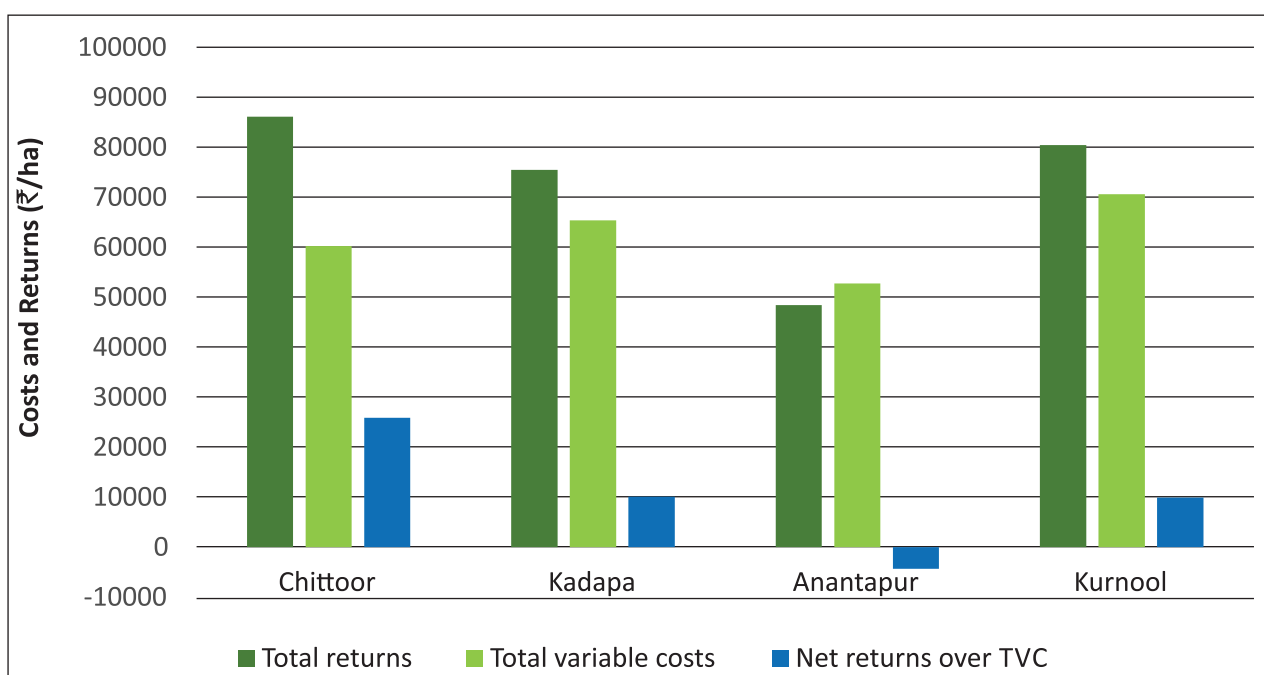

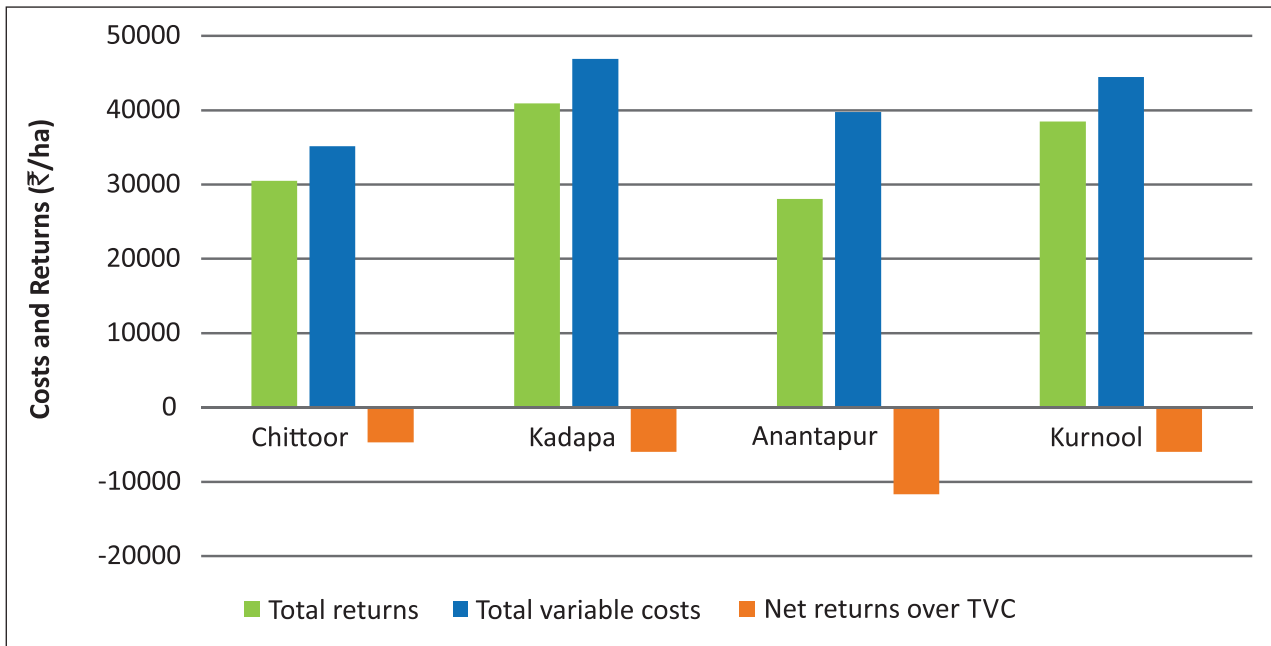Figure 3. Performance of paddy in Rayalaseema region.

Figure 4. Performance of groundnut in Rayalaseema region.

7. Pilot Site GVA Estimations across Sub-sectors

The details about pilot site Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Appendix-1 Table 7 for the Rayalaseema region. As described in the earlier sections, estimation of current value of GVA in the 13 pilot sites corresponding to 13 districts of Andhra Pradesh state is one of the major objectives of the Andhra Pradesh Primary Sector Mission baseline survey. However, the present report summarizes the results for the four major districts in the Rayalaseema region.

These values will be used as bench mark value before the implementation of Primary Sector Mission/ Rythu Kosam Project activities across the four district pilot sites. Any monitoring or impact studies in future will be carried out over a project period, will use this baseline formation as reference bench mark points during the year 2015. The primary household survey (including FGDs) information coupled with secondary sources of information were used for the estimation of GVAs across sub-sectors. The complete details about methodology used across sub-sectors are furnished in section 5 of this report. The present study has considered only four major sub-sectors in the estimation of total GVAs of primary sector namely: agriculture, horticulture, animal husbandry and fisheries. The current estimation of GVAs are devoid of both sericulture and forestry contributions due to limited or insufficient data. However, additional efforts are in place to estimate these contributions as well. The results generated from primary household data analysis are discussed in detailed below:

The total estimated GVA from Andhra Pradesh Primary Sector Mission four pilot sites in the Rayalaseema region are ₹1347.5 million. Out of which, 672 million (49.87 %) are contributed by agriculture sub-sector including horticulture. Another 675.5 million are contributed by animal husbandry which accounts for 50.13 % share in total GVA of the Andhra Pradesh Primary Sector Mission. The fisheries sub-sector was unable to add GVA value because of its non-coverage in the four pilot sites of the region. The sector-wise contributions and corresponding share values are depicted in Figure 5.

Among all the four pilot sites, Kadapa district pilot site has contributed the highest value (457.9 million) followed by Kurnool district pilot site (374 million) and Anantapur district pilot site (261.5 million). The lowest GVA value was recorded by Chittoor district pilot site (254.1 million). The total GVA values by district and by pilot site are presented in Figure 6.
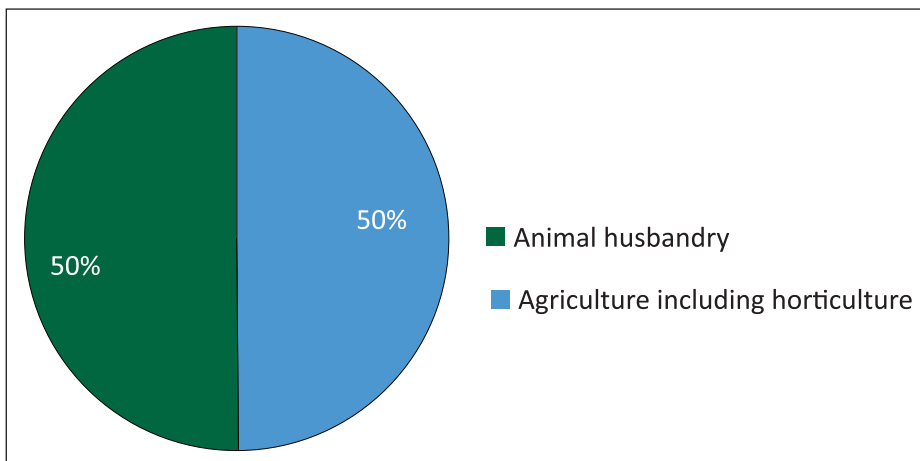
Figure 5. Sub-sector wise shares in the total GVA estimation.
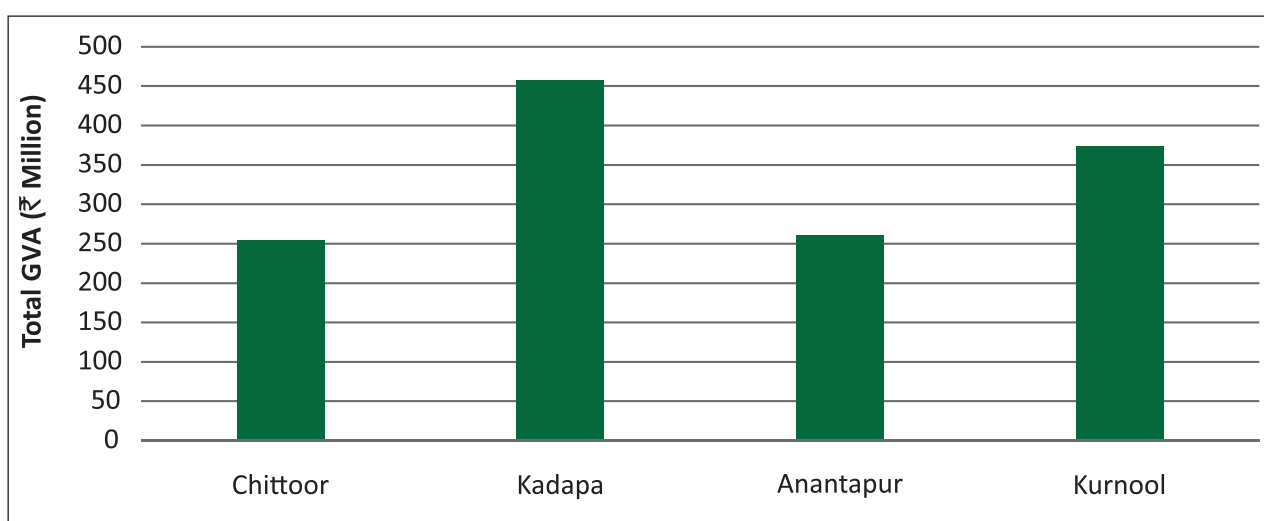
Figure 6. Total GVAs estimations by district pilot in the region.

The highest value of GVA contributed in the agricultural sub-sector including horticulture was Kurnool district (266 million) followed by Kadapa district (220.6 million) and Chittoor district pilot site (142.4 million). The lowest value was contributed by Anantapur district pilot site (43 million). In case of animal husbandry, the highest value was contributed by Kadapa district pilot site (237.3 million) followed by Anantapur district pilot site (218.5 million) and Chittoor district pilot site (111.7 million). It is good to see both Kadapa and Anantapur district pilot sites contributing significantly in the animal husbandry sub-sector although they are relatively backward in agriculture sub-sector. The lowest value GVA from animal husbandry sub-sector in the region was contributed by Kurnool district (108 million). The fisheries sub-sector did not contribute due to its non-coverage in the four pilot sites. The composition of each pilot site GVA by sub-sector are summarized in Figure 7.

The dominance and significant share contributions of different sub-sectors in each district total pilot site GVA estimations in the Rayalaseema region are presented in Figure 8. Eighty four percent share of total GVA in the Anantapur district pilot site is contributed by animal husbandry sub-sector. Contrary to Anantapur, Kurnool district pilot site had the highest share (71.12 %) from contribution of agriculture including horticulture. In case of Chittoor and Kadapa, both agriculture including horticulture and animal husbandry played a significant role in the total GVA contributions.

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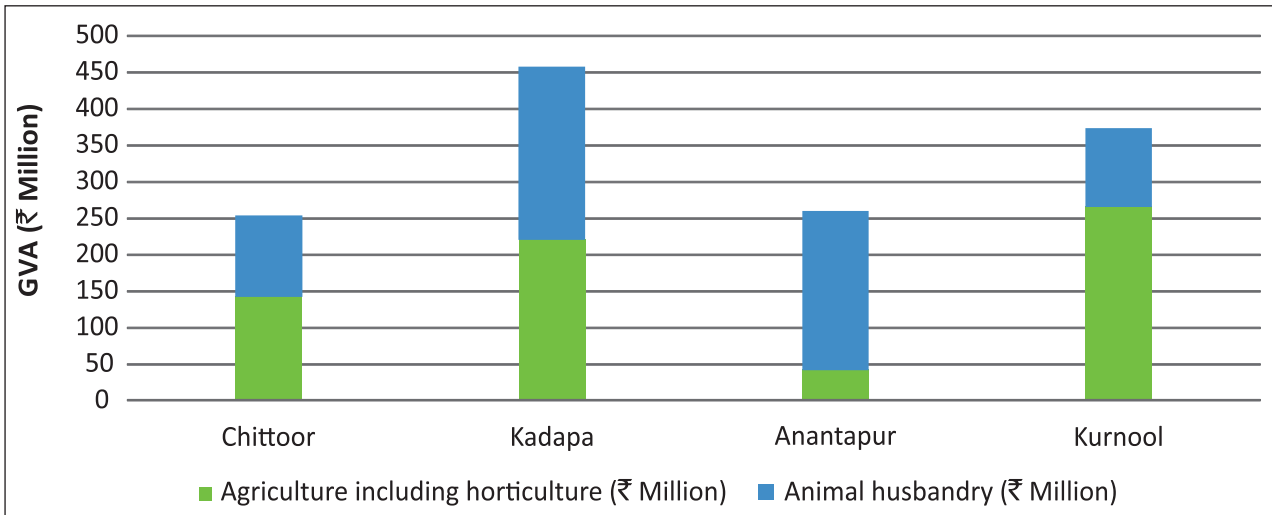
Figure 7. Composition of pilot site GVAs by sub-sector in the region.
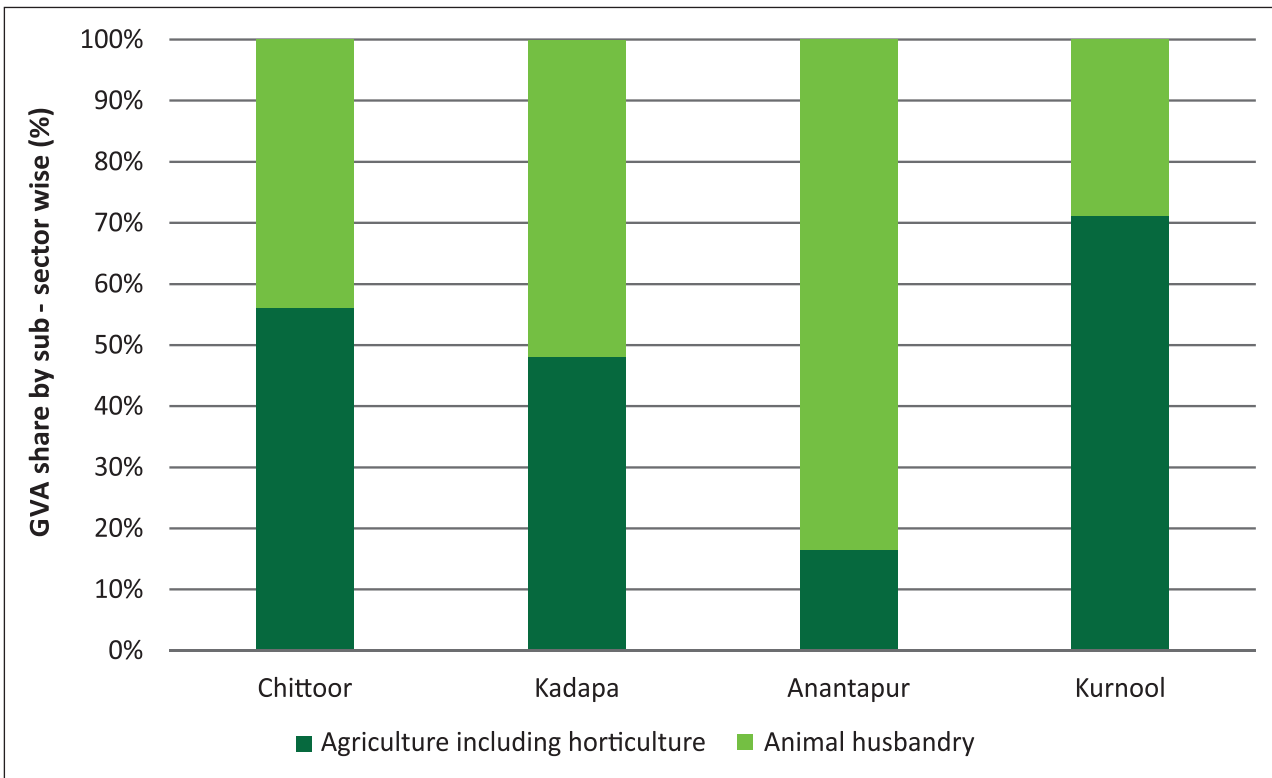
Figure 8. Shares of different sub-sectors in total GVA.

The total district GVA value per pilot site village was estimated to understand the extent of potential contributed by each pilot village in the Rayalaseema region. Figure 9 depicts estimations by district in the region. The per village contribution of GVA was the highest in case of Kurnool district pilot site followed by Kadapa and Anantapur district pilot sites. The lowest contribution per district pilot site village was noticed in case of Chittoor district. It is very interesting to understand that each district pilot site village in Kurnool is contributing nearly 2 to 3 times higher GVA value compared to each district pilot site village in Chittoor. There is clear disparity among these villages in terms of potentiality to contribute to total GVA in the pilot site of Rayalaseema region.

Similarly, the GVA values per district pilot site household was estimated and compared across study districts in the Rayalaseema region. The details are furnished in Figure 10 in a descending order of merit. Kurnool district pilot site households retained their first rank followed by Anantapur and Kadapa districts
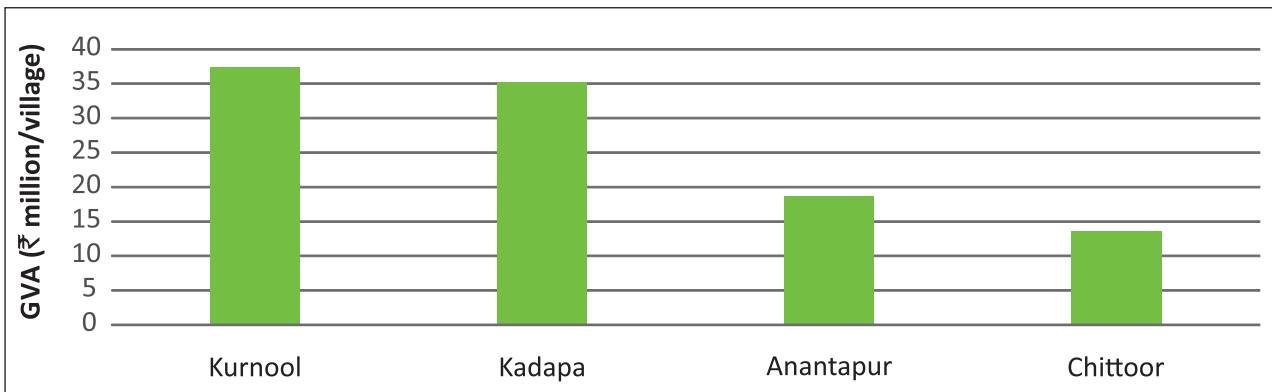
Figure 9. GVA value per each pilot site village (₹ million) in the region.
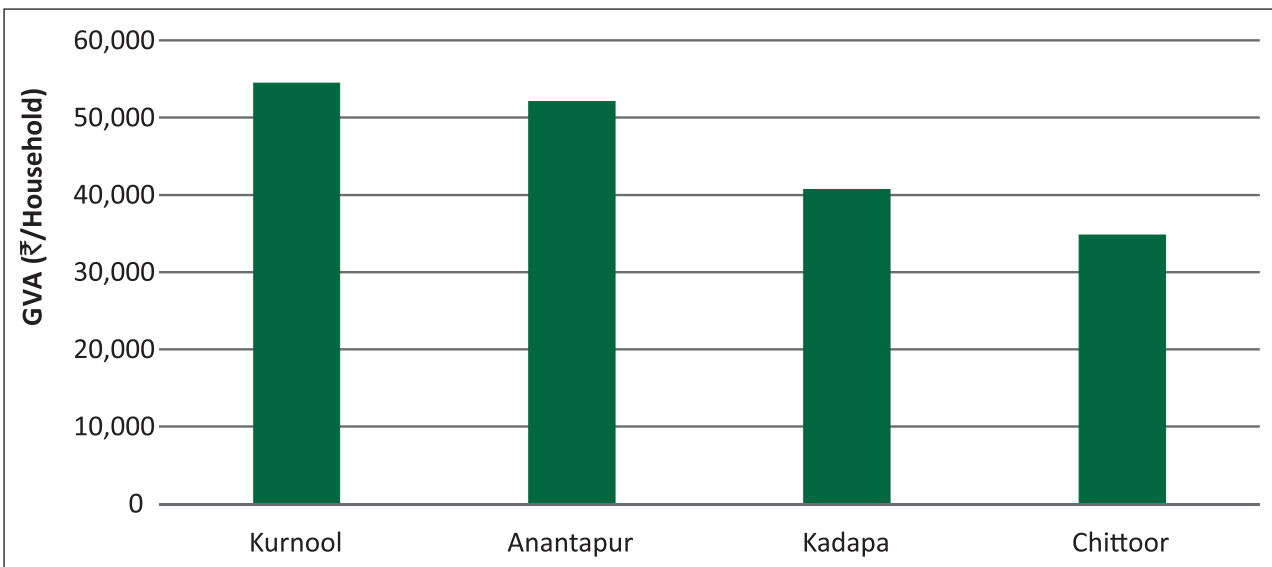
Figure 10. GVA value per district pilot site household (₹/household) in the region.

pilot site households. The average household earnings per annum during the year 2014-15 in the Kurnool district pilot site was calculated at ₹54,487. While the lowest earning per pilot site household annually at ₹34,781, was observed in case of Chittoor district. The average earnings from agriculture and allied sectors of Kurnool district per household was more than 1.57 times higher than an average sample household earnings in Chittoor district pilot site.

Similarly, the average total GVA contributions from each per ha landholdings in district pilot site was calculated and compared among study districts in the Rayalaseema region (see Figure 11). Also, per ha agricultural land in Kadapa district pilot site contributes ₹44,396 per annum towards total GVA of the district primary sector. It was the highest value observed in the Rayalaseema region among study districts. The average earnings from each per ha cultivated land was the lowest in Anantapur (₹26,150) district pilot site. Cultivation of more commercial crops in the district might have helped the Kadapa district to earn 1.69 times higher income than a typical rainfed per ha cultivation in Anantapur district. Further detailed break-up of GVA values across four pilot sites in the region are summarized in Appendix-1 Table 8.

8. Major Constraints and Potential Opportunities

All district pilot sites have enormous potential to grow and contribute to the region and state GVA of Primary Sector. The sample farmers' across pilot sites are highly determined and have a strong interest to continue in agriculture and allied activities provided it becomes highly remunerative. However, there are

Figure 11. GVA value per each district pilot site ha area (₹ per ha) in the region.

few constraints observed across pilot site locations which are hindering agriculture and allied activities growth and development in the respective districts and pilot sites. To harness the fullest potential or growth across sub-sectors, the state has to undertake certain immediate measures to lift constraints. There is also a need for proactive policies and institutional reforms to achieve the targeted 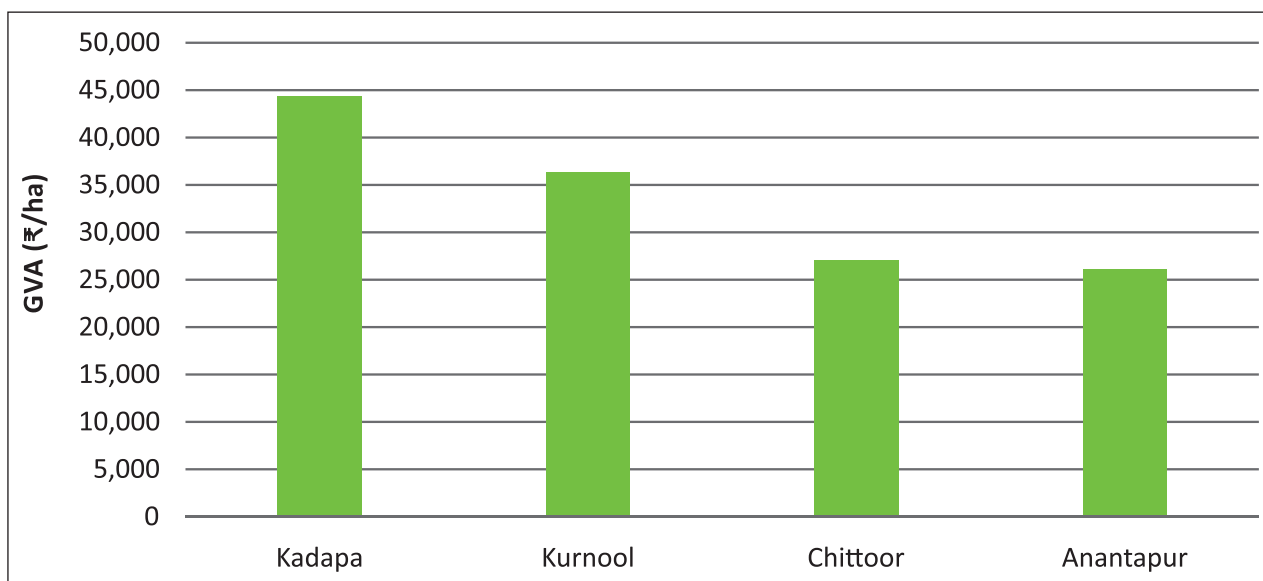'double digit growth' in primary sector of the state. Constraints and potential opportunities available across sub-sectors of Rayalaseema region primary sector by district, are listed below:

District	Major constraints	Potential opportunities
Chittoor	• Recurrent droughts and frequent failure of bore wells • High risks in crops cultivation due to insufficient water availability • Fodder shortage for jersey cows • Imported Chinese silk crashing domestic prices • Access to quality agricultural inputs • Under penetration of crop insurance schemes	• Congenial climate, diversity of crops and huge demand from metros (Chennai and Bangalore) • Potential opportunity for tomato, mango, banana and potato value chains and setting up of processing units • Immense potential for sericulture industry and mulberry cultivation • Good scope for increasing the milk productivity and meat industry • Huge scope for insurance industries with suitable insurance products
Kadapa	• Recurrent drought and in-sufficient rains over a period of time • Low productivity of agriculture across crops • Low margins in crops cultivation due to high inputs costs • Fodder shortage during lean periods • Absence of non-farm opportunities • Under penetration of crop insurance schemes	• Huge scope for water conservation measures including Direct Seeded Rice (DSR) methods of paddy cultivation • Introduction of legumes in paddy fallows • Good scope for turmeric, tomato and cotton commodity market linkages and value chains • Good market potential for rearing of small ruminants and increasing milk productivity • Dryland horticulture need to be promoted and soil test-based Integrated Nutrient Management • Enormous scope for insurance industries with suitable insurance products

Continued

District	Major constraints	Potential opportunities
Anantapur	• Severe water scarcity and erratic rainfall pattern or distribution • Yields gaps among crops cultivation • Low margins in agriculture and temporary migration • Fodder shortage is the biggest challenge • Very limited non-farm opportunities • Under penetration of crop insurance schemes	• Immense scope for *in-situ* soil & water conservation measures • Introduction of drought and heat tolerant technologies, especially in case of groundnut and pigeonpea crops • Good scope for increasing milk and meat production in the pilot site through animal husbandry as a business • Proper groundnut market linkages and value chains in the district need to be promoted • Value chain and crop diversification • Huge scope for insurance industries with suitable insurance products
Kurnool	• Vagaries of monsoon and frequent failure of crops • Low productivity levels and narrow margins in agriculture • Low productivity levels of milk and fodder shortage • Lack of non-farm employment opportunities • Poor access to institutional credit facilities • Under penetration of crop insurance schemes	• High emphasis should be on soil and water conservation measures and recharge of ground water levels • Soil test based integrated nutrient management (INM) and polyhouse cultivation • Develop seed industry in the district • Huge scope for insurance industries with suitable insurance products • Introduction of drought and heat tolerant technologies across crops and mechanization • Dryland horticulture • Huge scope for introduction of cross-bred buffaloes and increasing the milk production levels • Development of non-farm employment skillset and other opportunities • Strengthening the access to formal markets

9. Summary and Way Forward

The comprehensive baseline survey conducted in the region has covered about 1471 sample households spread over 55 villages from 11 *mandals* in four districts (Chittoor, Kadapa, Anantapur and Kurnool) of Rayalaseema region in Andhra Pradesh. Specifically, the results are summarized from agricultural sample villages (32) covering about 1471 agricultural sample households in the four pilot sites corresponding to four study districts in the region. Small and marginal farmers dominated (74%) the total baseline sample in the region. The average family size in the region is about 4.5. Nearly 51.7% of total sample are un-educated. About 55.5% of family members participate in their farm activities/operations. The pooled average operational land holding per household was estimated at 1.42 ha. The extent of land tenancy in the total region sample was calculated at 5.5%. More than 85% of sample households have residential houses, access to television and mobile phones. The average number of livestock animals per household was 4.4 in the region. Recurrent droughts, acute shortage of irrigation water, uneven distribution of rainfall and yield gaps across crops are limiting the total agricultural potential realization in the region. Irrigated crops (hardly paddy) were able to recover their total costs while majority of rainfed crops (groundnut and cotton) experienced negative net returns over total variable costs across four study districts. Agriculture including horticulture and animal husbandry contributed almost equal share in the total GVA of Rayalaseema region. Fisheries sub-sector did not contribute to regional GVA estimation because of its absence in the four district pilot sites.

Other major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below. Immediate steps are required to address these issues for enhancing each sub-sector's contribution in the total primary sector GVA of the Rayalaseema region.

Key findings	Specific recommendations
• Recurrent droughts, uneven distribution of rainfall and low ground water potential are the major concerns in Chittoor, Kadapa, Anantapur and Kurnool, district pilot sites.	• High emphasis should be given for *in-situ* and *ex-situ* water conservation technologies in the pilot site villages so that the groundwater recharge and its efficiency in-use can be realized quickly. Measures to enhance water-use-efficiency to increase productivity needs to be identified and promoted.
	• Main tanks located in the pilot sites should be inter-connected through major irrigation canals and thereby the groundwater recharge can be improved much faster and assured irrigation will be available.
• Adoption of improved cultivars (including drought and disease tolerant) are still low in case of major crops like groundnut, red gram, horse gram, mango, banana etc, in selected pockets of pilot site villages.	• Immense opportunities exist to introduce new improved cultivars both in field and horticultural crops so that the productivity can be improved at least 10-15% very quickly. Appropriate local alternate seed systems need to be developed and popularized.
• Overall the soil is low to medium fertile and yield gaps exists for major crops in the region. These are discussed in detail by pilot site in comparison with district and national average yields.	• Good scope for introduction of better management practices (including soil, water, crop, IPM practices and micro irrigation) to improve the crop yields and minimize the per unit output costs. It will significantly improve the competitiveness of our commodities in international markets.
• The average milk productivity levels across the pilot sites in the region are low at 3-4 litre per animal per day. It might be due to poor feeding practices and fodder scarcity in the pilot sites.	• Enormous scope for introduction of crossbred animals and creating awareness on feeding practices to increase the average milk productivity across pilot site villages.
• Majority of sample farmers are not happy with milk pricing structure and adulteration followed by local dairy milk collection centers.	• Good scope for strengthening of formal market channels in case of milk, meat and eggs trading to avoid the role of middle men across all scales. The total output in this sector are marketed informally.
• Fifty percent of small ruminants in the state are being reared in this region yet no proper marketing channels and processing facilities exist.	• The surplus fodder producing districts (Krishna, West and East Godavari) should be inter-linked with fodder deficit districts (especially Rayalaseema region) in the lean period so that fodder scarcity can be mitigated.
	• Enormous potential for trading and scientific processing of meat from small ruminants grown in the region.
• Absence of commodity based market clusters and value chains (especially in case of horticultural crops) even though the district pilot sites are producing extensively.	• Huge opportunities for piloting commodity specific value chains for targeting export markets, eg, **Tomato**, vegetables and mango – Chittoor **Groundnut** – Anantapur, Kurnool and Chittoor **Paddy** – Kurnool and **banana** – Kadapa.
• Sericulture industry is dwindling in the region due to crashing prices of cocoons and frequent disease out breaks.	• The domestic silk industry should be protected by supporting with attractive remunerative output prices and controlling measures to make them competitive along the entry of cheap Chinese silk with appropriate duty and taxation regime.
• Unemployment is rampant in the villages due to poor performance of agriculture and recurrent droughts in the region.	• Massive opportunity for promotion of non-farm employment skill development in the region.

References

Central Statistical Organization. 2008. National Account Statistics: Manual on Estimation of State and District Income, 2008.

Government of Andhra Pradesh, Planning Department. 2014. Achieving Double Digit Inclusive Growth – A Rolling Plan 2015-16. Directorate of Economics and Statistics.

Government of Andhra Pradesh, Planning Department. 2015. Socio Economic Survey 2014-15.

Government of India. 2014. 19th Livestock Census-2012. All India Report. Ministry of Agriculture. Department of Animal Husbandry, Dairying and Fisheries. Accessed from http://dahd.nic.in/documents/statistics/livestock-census.

Government of Andhra Pradesh, Directorate of Economics and Statistics. 2015. Statistical Abstract Andhra Pradesh, 2014.

Government of Andhra Pradesh, Directorate of Census Operations. 2014. Census of India 2011, Andhra Pradesh.

Appendix-1

Table 1. Distribution of sample (agriculture) in Rayalaseema Region.

District	Total sample	Distribution by size group				Distribution by community				
		Small	Medium	Large	Landless	OC	BC	SC	ST	Others
Chittoor	481	384	41	8	48	158	256	61	1	5
Kadapa	396	290	50	7	49	190	144	41	18	3
Anantapur	366	261	36	18	51	94	171	46	55	0
Kurnool	228	150	25	17	36	62	69	95	1	1
Rayalaseema region*	1471	1085	152	50	184	504	640	243	75	9
	(100)	(73.7)	(10.3)	(3.4)	(12.6)	(34.3)	(43.5)	(16.5)	(5.1)	(0.6)

* Figures in parenthesis indicates their respective shares to total sample

Table 2. Socio-economic details of sample in Rayalaseema region.

District	Avg. family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Un-educated	Primary	Upper primary and above	Own farm* (no.)	Outside farm* (no.)
Chittoor	4.8	45.7	15.0	39.3	2.5	1.9
Kadapa	4.5	49.7	21.0	29.3	2.5	2.2
Anantapur	4.0	55.5	15.6	29.0	2.4	2.3
Kurnool	4.5	55.9	14.4	29.7	2.4	2.4
Rayalaseema region	4.5	51.7	16.5	31.8	2.5	2.2

* including children in the family

Table 3. Landholding particulars in Rayalaseema region pilot sites (ha).

District	Own landholding (ha)			Operational landholding (ha)			Extent of tenancy in the sample%
	I	R	T	I	R	T	
Chittoor	0.40	0.81	1.21	0.40	0.77	1.17	4.0
Kadapa	0.45	0.89	1.34	0.45	0.85	1.34	6.0
Anantapur	0.45	0.86	1.31	0.47	0.84	1.32	3.0
Kurnool	0.53	1.26	1.78	0.53	1.34	1.86	9.0
Average	0.46	0.95	1.41	0.46	0.95	1.42	5.5

I: irrigated; R: Rainfed; T: Total

Table 4. Household assets and livestock ownership in Rayalaseema region pilot sites.

District	% sample households possess assets					Average no. per sample household			
	Residential house	Cattle shed	Tele-vision	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total livestock animals*
Chittoor	97.7	22.3	91.3	94.6	42.8	0.1	0.6	0.0	3.4
Kadapa	98.2	9.6	89.4	93.7	14.1	0.0	0.3	0.8	4.6
Anantapur	98.6	6.0	91.3	92.4	19.7	0.2	0.4	0.1	5.1
Kurnool	98.7	8.3	87.7	94.7	17.1	0.3	0.1	0.8	4.3
Average	98.3	11.5	89.9	93.9	23.4	0.2	0.4	0.4	4.4

* includes draft animals, cows, buffaloes, young stock, sheep, goats and poultry

Table 5. Major crops and their average productivity levels by pilot-site.

District	Major crops	Productivity during baseline (2014-15) (Kg/ha)	District average productivity (Kg/ha)	state average productivity (Kg/ha)	Nation average productivity (Kg/ha)
Chittoor	Paddy	3733	3390	3094	2462
	Groundnut	602	1131	749	996
	Horse gram	537	543	527	NA
Kadapa	Paddy	2521	2843	3094	2462
	Groundnut	626	1356	749	996
	Cotton	1382	1471	3233	489
Anantapur	Paddy	3189	2177	3094	2462
	Groundnut	511	430	749	996
	Red gram	636	186	565	806
Kurnool	Paddy	4342	3670	3094	2462
	Groundnut	931	1016	749	996
	Cotton	1347	3335	3233	489

Table 6. Economics of crop enterprises in Rayalaseema region pilot sites.

District	Crop	Total returns (₹ per ha)	Total variable costs (₹ per ha)	Net returns over TVC (₹ per ha)	B:C Ratio
Chittoor	Paddy	86089	60251	25839	1.43
	Groundnut	30475	35136	-4661	0.87
	Horse gram	32710	20340	12370	1.61
Kadapa	Paddy	75417	65341	10075	1.20
	Groundnut	40928	46881	-5953	0.90
	Cotton	81819	88579	-6760	0.90
Anantapur	Paddy	48419	52757	-4337	0.92
	Groundnut	28084	39767	-11683	0.71
	Jowar	11362	17278	-5916	0.66
Kurnool	Paddy	80450	70556	9895	1.14
	Groundnut	38497	44467	-5970	0.87
	Cotton	49771	55600	-5829	0.90

Table 7. Primary sector GVA estimations in Rayalaseema pilot sites (base year: 2014-15).

	Sub-sector wise				Sub-sector wise share		
District	Agriculture including horticulture (₹ million)	Animal husbandry (₹ million)	Fisheries (₹ million)	Total GVA estimation (₹ million)	Agriculture including horticulture	Animal husbandry	Fisheries
Chittoor	142.4	111.7	0.00	254.1	56.04	43.96	0.00
Kadapa	220.6	237.3	0.00	457.9	48.18	51.82	0.00
Anantapur	43	218.5	0.00	261.5	16.44	83.56	0.00
Kurnool	266	108	0.00	374	71.12	28.88	0.00
Regional total	672	675.5	0.00	1347.5	49.87	50.13	0.00

Table 8. District-wise pilot site GVA by unit values.

District	GVA/pilot site village (₹ million)	GVA/pilot site household (₹/household)	GVA/pilot site cropped area (₹/ha)
Chittoor	13.6	34,781	27,122
Kadapa	35.2	40,717	44,396
Anantapur	18.6	52,102	26,150
Kurnool	37.4	54,487	36,314

Appendix-2 (Sampling Details)

Table 1. Extent of coverage of pilot site by district.

Sl. No	District	Pilot site coverage		Pilot site coverage	
		No. of *mandals*	No. of Agril/ Hort villages	No. of *mandals*	No. of Fishery villages
1	Anantapur	2	14	0	0
2	Kurnool	2	10	0	0
3	YSR Kadapa	4	14	0	0
4	Chittoor	2	18	0	0
5	SPS Nellore	2	8	1	3
6	Prakasam	2	13	2	15
7	Guntur	2	14	3	4
8	Krishna	2	22	1	3
9	West Godavari	2	12	1	8
10	East Godavari	2	16	1	10
11	Vishakapatnam	3	23	0	0
12	Vizinagaram	2	21	1	2
13	Srikakulam	3	42	1	2
	Total	30	227	11	47

Table 2. Extent of diversity in total pilot site villages (only for agriculture and horticulture villages).

District/Diversity scale	4	5	6	7	8	9	Total
Anantapur			12		2		14
Chittoor					18		18
East Godavari			9	7			16
Guntur			14				14
Kadapa			3	7	4		14
Krishna			22				22
Kurnool		6	4				10
Nellore			5	3			8
Prakasam			13				13
Srikakulam	9		14	19			42
Visakhapatnam			13	3	7		23
Vizianagaram			17	4			21
West Godavari			4			8	12
Grand Total	9	6	130	43	31	8	227

Table 3. Extent of diversity in selected baseline villages (only for agriculture and horticulture villages).

District/ Diversity scale	4	5	6	7	8	9	Total
Anantapur			7		2		9
Chittoor					9		9
East Godavari			5	4			9
Guntur			8				8
Kadapa			1	4	3		8
Krishna			11				11
Kurnool		4	2				6
Nellore			4	2			6
Prakasam			7				7
Srikakulam	4		6	8			18
Visakhapatnam			6	1	3		10
Vizianagaram			8	2			10
West Godavari			3			5	8
Grand Total	4	4	68	21	17	5	119

Table 4. Targeted baseline sample coverage across sub-sectors.

District	Agriculture sample					Fishery sample*	Grand total
	Landless	Small	Medium	Large	Total		
Anantapur	54	290	31	27	402	0	402
Chittoor	54	369	36	27	486	0	486
East Godavari	54	230	72	46	402	216	618
Guntur	48	208	56	24	336	108	444
Kadapa	48	286	38	24	396	0	396
Krishna	66	297	66	33	462	108	570
Kurnool	36	156	18	18	228	0	228
Nellore	36	172	38	18	264	108	372
Prakasam	42	203	28	21	294	252	546
Srikakulam	108	472	118	58	756	72	828
Visakhapatnam	60	307	65	30	462	0	462
Vizianagaram	60	312	30	30	432	72	504
West Godavari	48	273	71	34	426	180	606
Grand Total	714	3575	667	390	5346	1116	6462

* few landless households also covered in fishery sample

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