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Rythu Kosam: Andhra Pradesh Primary Sector Mission Baseline Summary Report



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Rythu Kosam: Andhra Pradesh Primary Sector Mission

Baseline Summary Report

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Contents

Executive Summary	1
1. Background and Objectives	5
2. Overview of Andhra Pradesh State Agriculture	5
3. Pilot Sites of AP Primary Sector Mission	9
4. Sampling Framework.....	11
5. Methodology	13
5.1. Agriculture/horticulture/floriculture.....	13
5.2. Livestock.....	13
5.3. Fishing	13
5.4. Forestry	15
6. Findings from Baseline Survey	15
6.1 Distribution of sample across size groups and communities	15
6.2 Family size, extent of literacy and participation in labor market.....	16
6.3 Landholdings and extent of tenancy	16
6.4 Household assets and livestock ownership	17
6.5 Major crops and their productivity levels	17
6.6 Economics of crop/fish enterprises	18
7. Pilot Site GVA Estimations across Sub-sectors.....	21
8. Major Constraints and Potential Opportunities	28
9. Baseline Survey Insights from Rayalaseema Region.....	35
9.1 Overview of Rayalaseema Region agriculture	35
9.2 Findings from the baseline survey.....	36
9.3 Summary and way forward	47
10. Baseline Survey Insights from Delta Region	49
10.1 Overview of Delta Region agriculture	49
10.2 Findings from the baseline survey.....	51
11. Baseline Survey Insights from Coastal Andhra Region	62
11.1 Overview of Coastal Andhra Region agriculture	62
11.2 Findings from the baseline survey	65
11.3 Summary and way forward	74
12. Baseline Survey Insights from North Coastal Region	76
12.1 Overview of North Coastal Region agriculture	76
12.2 Findings from the baseline survey	77
12.3 Summary and way forward	87
References.....	89
Annexure-1.....	90
Annexure-2 (Sampling Details)	96
Annexure-3 Monitoring Indicators.....	98

Executive Summary

Andhra Pradesh has set a target for itself of becoming one of the top three states in India by 2022, in terms of socio-economic development and ease of doing business. The state aspires to achieve the status of a developed state in the country by 2029, and the vision is to lay the foundation for the Sunrise State of Andhra Pradesh. Achievement of this vision is incumbent upon fast-paced and sustainable double digit growth, delivered through a combination of programmatic and project interventions with a focus on sustainable and inclusive development. To achieve its vision, the government has charted out a multi-pronged strategy comprising seven missions, five grids, and five campaigns. Among the seven missions, Primary Sector Mission (Rythu Kosam Mission) is at the top with the aim of achieving double digit growth in agriculture and allied sectors. Massive outlay of investments over the next five-year period (2015-2020) is targeted in agricultural development under a consortium approach by bringing state, national, and international partners on board.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) located at Patancheru, Hyderabad, leads the consortium in partnership with the Government of Andhra Pradesh, and together they have designed a strategy to transform agriculture and allied sectors in the state. The prime focus of this mission is on improving soil fertility, increasing access to better seed, reducing the cost of cultivation, and enhancing productivity and value addition in the agriculture, horticulture, livestock and fisheries sub-sectors. To begin with, thirteen pilot sites representing 13 districts of the state were identified and established for introduction, testing and scaling-up of a range of technologies over a period of time. Proven technologies will be scaled-up to the entire district with suitable institutional reforms at different scales. Both supply and demand side interventions are aimed at for improving the livelihoods of farmers in the state.

With this background, the major objective of the present study is to document the current status of the thirteen pilot sites covering 267 villages from 38 mandals in 13 districts. The purposive randomized sampling framework was used to select representative villages from all study mandals. A primary household baseline survey was conducted from representative sample farmers (5222 HHs) in the 13 district pilot sites. 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. Innovatively, the present study has attempted to estimate the GVA at pilot site level using household survey information collected during baseline survey. Both household survey and secondary sources of information were harmonized in order to estimate the GVA values both at village and pilot site level. The Directorate of Economics and Statistics (DES) developed a methodology for district level estimation of GVA, which was modified and adapted for estimation of GVA using household level data. These estimates can be used as 'benchmark values' for monitoring the progress of the project over a period of time. Project impact assessment studies, if any, could be undertaken in the future using this baseline information. Overall, the comprehensive state-level baseline report also helps in identifying major constraints and devising suitable strategies in the pilot sites and the state as a whole.

On the whole, small and marginal farmers dominated (70%) the total sample. The average family size is about 4.0. Nearly 59% of the sample farmers are uneducated. About 55% of family members only participate in their farm activities/operations. The pooled average operational landholding per household was estimated at 1.78 ha. The extent of land tenancy in the total sample was calculated at 18.6%. More than 80% of sample households have a residential house, access to televisions and mobile phones. The average number of livestock animals per household was only 2.4. Recurrent droughts and yield gaps across crops is limiting the total agricultural potential realization in the state. Irrigated crops only were able to recover their total costs while majority of the rainfed crops experience negative net returns over total variable costs across pilot sites. Rearing of fish is more profitable than prawn cultivation due to low productivity and high volatility in output market prices. Agriculture, including horticulture, contributed around 60% of total GVA estimation across pilot sites. It was followed by fisheries (23%) and animal husbandry (17%).

The 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 to the total Primary Sector GVA of the state.

Key findings	Specific recommendations
<p>1. Recurrent droughts, uneven distribution of rainfall and low groundwater potential are the major concerns in Chittoor, Kadapa, Anantapur, Kurnool, Prakasam and Nellore district pilot sites.</p>	<p>1. High emphasis should be placed on <i>in-situ</i> and <i>ex-situ</i> water conservation technologies in the pilot site villages so that groundwater recharge and its efficiency in-use can be realized quickly. Measures to enhance water use efficiency to increase productivity need to be identified and promoted.</p> <p>2. The major tanks located in the pilot sites should be inter-connected through major irrigation canals, thereby the groundwater recharge can be improved much faster and assured irrigation will be available.</p>
<p>2. The extent of adoption of improved cultivars (including drought and disease tolerant ones) are still low in case of major crops, such as groundnut, red gram, sesame, greengram, cashewnut, tapioca, turmeric, citrus, pineapple, etc., in selected pockets of pilot site villages.</p>	<p>3. Huge opportunities for introduction of new improved cultivars, both in field and horticultural crops, are available that can improve productivity by 10-15% very quickly. Appropriate local alternate seed systems need to be developed and popularized.</p>
<p>3. Overall the soils are low-to-medium fertile and yield gaps exist for major crops in majority of the pilot sites. These are discussed in detail pilot site-wise in Section 6.5 of this report in comparison with district and national average yields.</p>	<p>4. Good scope for introduction of better management practices (including soil, water, crop, IPM practices and micro irrigation) is available to improve crop yields and minimize the per unit output costs. It will significantly improve the competitiveness of our commodities in international markets.</p> <p>5. Soil Health Management (SHM) and balanced fertilization strategies to build organic matter need to be scaled up.</p>
<p>4. On the whole the average milk productivity levels across the pilot sites 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 (especially in Rayalaseema districts).</p> <p>5. Majority of the sample farmers are not happy with milk pricing structure and adulteration practices followed by local dairy milk collection centers.</p>	<p>6. Enormous scope exists for introduction of cross-bred animals and creating awareness on feeding practices to increase the average milk productivity across pilot site villages.</p> <p>7. Fodder strategy for the state to be developed and implemented in a participatory manner.</p> <p>8. There is good scope for strengthening of formal market channels with regard to milk, meat and eggs trading as well as to avoid middlemen across all scales. The total output in this sector is marketed informally.</p>

Continued.

Key findings	Specific recommendations
<p>6. Absence of commodity-based market clusters and value chains (especially in the case of horticultural crops) even though the district pilot sites are producing huge quantities.</p> <p>7. Huge post-harvest losses (around 30%) due to lack of proper post-harvest handling measures, especially in case of vegetables and fruits.</p>	<p>9. The surplus fodder producing districts (such as Krishna, West Godavari and East Godavari) should be interlinked with fodder deficit districts (especially in Rayalaseema Region) in the lean period so that fodder scarcity can be mitigated partially.</p> <hr/> <p>10. Abundant scope for setting-up of infrastructure for scientific post-harvest handling of fruits and vegetables, including cold storages across pilot sites to minimize post-harvest losses.</p> <p>11. Huge opportunities available for piloting commodity specific value chains in order to target export markets.</p> <p>For example:</p> <p>Tomato and mango – Chittoor</p> <p>Acid lime and lemon – Nellore</p> <p>Chilies and turmeric – Guntur</p> <p>Groundnut – Anantapur and Chittoor</p> <p>Rice – Nellore and West Godavari</p> <p>Mango, cashewnut, banana – West Godavari</p> <p>Mango, tapioca - East Godavari</p> <p>Mango and vegetables – Krishna</p> <p>Cashewnut, pineapple and jackfruits – Srikakulam</p> <p>12. Good potential for encouraging commercial (coffee, pineapple) crops, floriculture clusters specifically in Chintapalle and other tribal areas of Visakhapatnam and Seethampet in Srikakulam districts.</p> <p>13. Organic farming clusters can be identified (especially in low input application sites of Visakhapatnam and Srikakulam) and promoted with proper branding and marketing facilities.</p>
<p>8. Low productivity levels in prawns and fish culture due to poor seed quality. High susceptibility to diseases is another problem with prawns.</p> <p>9. High volatility in output prices, steep rise in input prices and absence of output price information etc., are major challenges in the fishery sector.</p>	<p>14. Supply of high quality certified prawn seed in the state is much needed and appropriate mechanisms need to be put in place. Strong vigilance is required on periodical monitoring of private hatcheries.</p> <p>15. Stabilized prices along with cooperative storage facilities should be built in all prawn/ fish cultivating mandals to avoid distress sales.</p>

Continued.

Key findings	Specific recommendations
10. Sericulture industry is almost disappearing in the state due to crashing prices of cocoons and frequent disease outbreaks.	16. The domestic silk industry should be protected by supporting attractive remunerative output prices and controlling measures to make them competitive with cheap Chinese silk along with an appropriate duty and taxation regime.
11. Improper pooling, grading and marketing of valuable forest products/by-products generated in the state.	17. Forestry has enormous potential to contribute to state GDP through proper marketing of its products/by-products across pilot sites.
12. Labor scarcity is the biggest challenge across pilot sites in the state. During the period of peak agricultural operations farmers are incurring huge expenditure on labor, which thus reduce their net margins significantly.	18. Huge scope for introduction and piloting of ICT-based custom hiring centers across pilot sites. Fruit harvesters and power sprayers should be promoted in tandem with subsidies on a large scale.

1. Background and Objectives

Andhra Pradesh (AP) is poised on the edge of an interesting juncture in history as it tries to balance the varied challenges that the bifurcation has created for the residuary state against the opportunities that establishment of a new system of governance can create in the new state. Andhra Pradesh has started with renewed attention on making AP one of the three best states in the country by 2022. Challenges are far and many; however, the determination and drive to see that AP attains an enviable position in the country is a key objective driving the populace of the state.

Moving away from the 'business as usual approach', the Govt. of AP has initiated an intensive 'mission mode' approach that will speed up the growth process. It realizes that as we move along, every step of ours is going to lay a strong foundation in scripting the growth story of 'Sunrise Andhra Pradesh'. To achieve the state's 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 being built on. As part of the state's inclusive growth strategy, the prime focus is kept 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 the agriculture, horticulture, livestock and fisheries sub-sectors. As the state is perceiving the need for structural change – labor force shifting from agriculture to non-farm and service sectors – necessary skills need to be imparted to improve productivity of the abundant labor force.

Recently, the Government of Andhra Pradesh has also unveiled the 'Double Digit Growth Action Plan'¹ to achieve the status of a developed economy with per capita income likely to touch ₹ 0.662 million by 2029-30, if the economy grows consistently at the 10% level. In the event of growth rates crossing this critical threshold, the per capita income may even cross the ₹ 0.800 million mark. Specifically, to achieve double digit growth in agriculture in the state, the government has initiated the 'Primary Sector Mission' (Rythu Kosam Mission) with massive outlay of investments over the next five-year period (2015-2020) through a consortium approach by bringing state, national and international partners on board. Thirteen pilot sites corresponding to the 13 districts of the state have been identified for introduction, testing and scaling-up of a range of technologies over a period of time. Both supply and demand side interventions are being targeted for improving livelihoods of the farmers in the state.

Given this background, the major objective of the present study is to document the current status of the pilot sites covering 267 villages from 38 mandals in 13 districts. A primary household baseline survey was conducted from representative sample farmers (5222 HHs) in the 13 pilot sites. 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 the implementation of the project. The present report also attempted to estimate the total gross value addition (GVA) across sample villages and pilot sites as a whole, from different sub-sectors in the primary sector. Both household survey and secondary sources of information were harmonized to estimate the GVA values both at village and pilot site 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. Overall, this comprehensive state-level baseline report also helps in identifying major constraints and devising suitable strategies in the pilot sites and districts as a whole.

2. Overview of Andhra Pradesh State Agriculture

Andhra Pradesh lies between 12°41' and 19.07° N latitude and 77° and 84°40'E longitude and is bordered by Maharashtra, Chhattisgarh, Telangana and Odisha in the North, the Bay of Bengal

1. See more details in *Achieving Double Digit Inclusive Growth – A Rolling Plan 2015-16*, Government of Andhra Pradesh.

in the East, Tamil Nadu to the South and Karnataka to the West. Two major rivers, Godavari and Krishna, run across the state. The state is richly endowed with natural and human resources with competitive socio-economic advantages. Its geographical area of 160,205 km² makes it the 8th largest state in the country. Andhra Pradesh situated in a tropical region, has the 2nd longest coastal line in the country with a length of 974 km. The state has a forest area of 34,572 km² which accounts for about 21.58% of the total geographical area. The state has a variety of physiographic features ranging from high hills and undulating plains to coastal and deltaic environment.

The state has a population of 4.95 crores (as per the 2011 census) which accounts for 4.10% of India's population (10th most populous state in India). The growth rate of population has come down to 9.21% from 11.89% in 2001. Nearly 70.53% of the total population lives in rural areas while the remaining 29.47% lives in urban areas. East Godavari district with 5.285 million population is the most populous district in the state while Vizianagaram ranks at the bottom with 2.344 million. Overall, there are about 12.719 million households in the state and the average size of the household is 4.0. The density of population for Andhra Pradesh is 304 persons per km², as against 368 persons per km² at the all-India level as per census 2011. Among the districts, the density of population of Krishna is the highest at 518 while YSR Kadapa and Prakasam districts have the lowest population density with less than 200. The sex ratio in the state is up from 983 in 2001 to 997 in 2011, which is higher than the all-India ratio of 943 in 2011 and reflects the sustained efforts of the government in educating the people, especially those in rural areas. The literacy rate in Andhra Pradesh has witnessed an upward trend and it is 67.4% as per 2011 census. While the literacy rate in rural areas is 62.4%, in urban areas it is 79.2%. Male literacy stands at 74.8% while female literacy is at 60%. Among the districts, West Godavari is at the top with 74.32% of total literacy in 2011, and Vizianagaram is at the lowest with 58.89%.

Of the total geographical area of the state, 40.96% is under Net Area Sown (6.561 million ha), 21.80% under forest (3.493 million ha), 6.79% under current fallow lands (1.087 million ha), 12.37% under non-agricultural uses (1.982 million ha), 8.37% under barren and uncultivable land (1.341 million ha), and remaining 9.71% is under other fallow land, cultivable waste, lands like permanent pastures and other grazing lands during 2014-15. The soils in the state are dominated by red soils followed by black and alluvial soils. In general, the soil fertility level goes up when we move from red to alluvial soils. Overall, the state has been divided into four categories of watersheds, which are also called groundwater basins or assessment units. They are: safe, semi-critical, critical and over-exploited for estimation of groundwater resources. Out of 662 mandals in the state, 572 mandals are classified under safe category, 42 semi-critical, 7 critical and 41 over-exploited. The average annual normal rainfall of the state is 887 mm, two-thirds of it is received during the southwest monsoon period. The distribution is erratic, resulting in frequent droughts. Coastal Andhra receives rains mainly through southwest monsoon (80%), while Rayalaseema to a large extent during the northeast monsoon. Out of the total cropped area (6.5 million ha) in the state, only 3.0 million ha have access to irrigation (46%) while the rest is under rainfed cultivation.

Agriculture, which is mostly rainfed, has been the main occupation and source of livelihood for the farmers in the state. Nearly 68% of the total cropped area is under food crops and the remaining is under non-food crops. Totally cereals and millets together contribute about 39.03% of the total cropped area (see Figure 1). It was followed by other commercial crops (cotton, tobacco, as well as fruits and vegetables) which accounted for 29.64%. About 1.757 million ha cropped area is also under horticultural crops in the state. Oilseeds group occupied the third position (17.69%) in the total sown area in the state. Total pulses secured the fourth place in the state and have a coverage of about 13.64% in the total cropped area.

The individual crop area shares in total cropped area of the state during 2014-15 are depicted in Figure 2. More than 30% of total cropped area in the state is occupied by paddy. It was followed by groundnut (14.5%), cotton (8.3%), black gram (5.8%), and maize (4.3%). These five crops together have a share of nearly 65% of the total cropped area in the state during the study period. Among horticulture crops, mango is leading followed by chilies, cashewnut, banana, onion and turmeric.

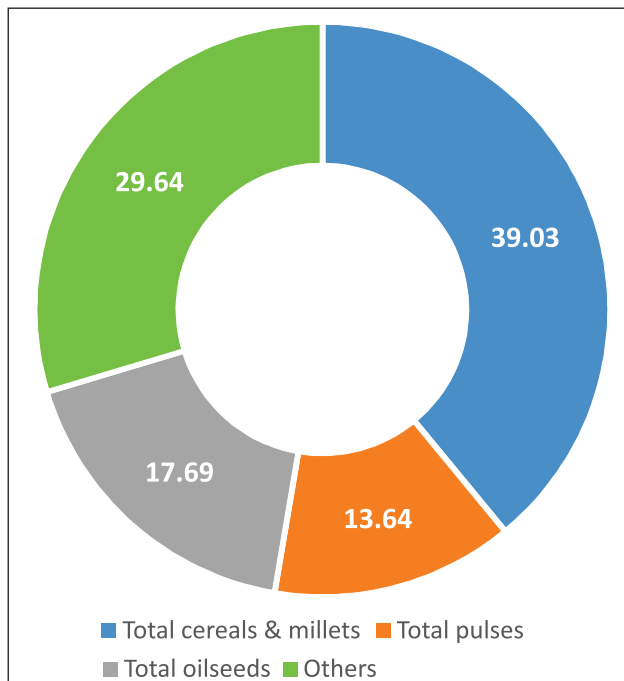


Figure 1. Share of total cropped area among crop groups.

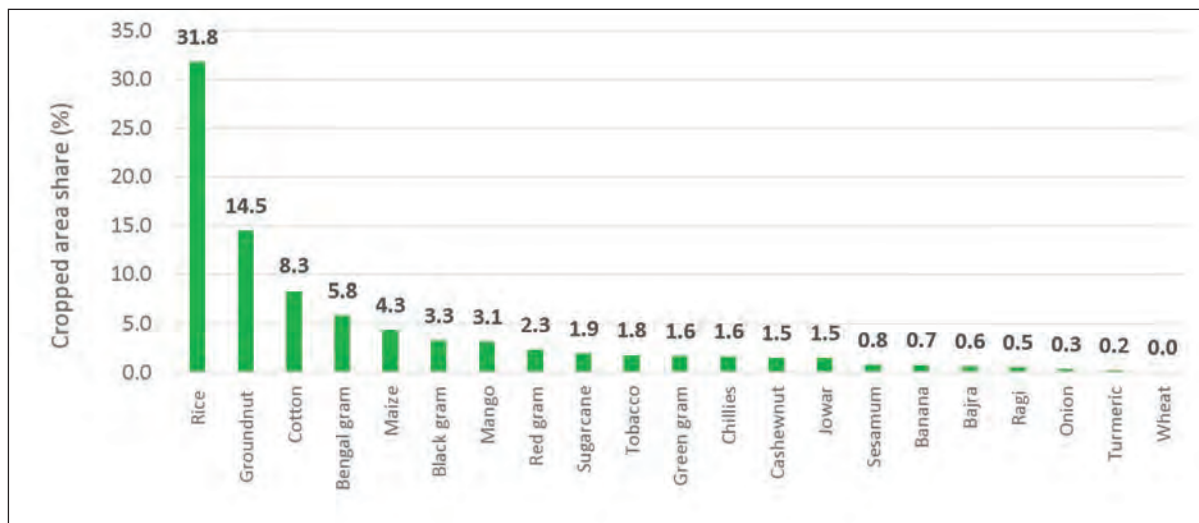


Figure 2. Crop-wise cropped area shares in the state (2014-15).

Similarly, the break-up from the 12th livestock census conducted in the state are summarized on the right. Sheep are the single largest (46.07%) contributor to total livestock population in the state. It was followed by buffaloes (21.95%), cattle (16.10%), and goats (15.30%). Pigs and other livestock animals together had a share of only 0.58% in this census.

Nearly 81.7 million poultry population also exists in the state. West Godavari, East Godavari, Krishna and Chittoor districts have a significant share of

Animal type	Population	% share
Cattle	4742654	16.10
Buffaloes	6464765	21.95
Sheep	13566729	46.07
Goats	4506324	15.30
Others	169799	0.58
Total	29450271	100.00

poultry population when compared with other districts. With nearly 1300 crores of egg production in the state annually, AP stands second in the country. In terms of meat production, it occupied 4th position with production of 0.5 million tons annually. The annual milk production of 0.1 million tons put the state at seventh position.

Fisheries is one of the most promising sub-sectors of the primary sector. It contributes substantially to economic growth and income generation for lakhs of dependent people in the state. About 1.4 million people are directly or indirectly employed in the state in this sector, which is recording faster growth than crop and livestock sub-sectors. About 0.438 million tons of marine fish and prawns were produced in the state during 2013-14. East Godavari, Visakhapatnam and Nellore districts collectively produced around 50% of the total marine production in the state. Nearly 1.242 million tons of inland fish and prawns are annually captured in the state with West Godavari and Krishna districts together contributing about 75% of the total inland fish and prawn production in the state. Approximately 50% of total marine exports in the country are met by the state during 2013-14. The overall comparative status of Andhra Pradesh State alongside India has been summarized and presented in Table 1.

Table 1. Comparative status of Andhra Pradesh vs. India, 2014-15.

Parameter	India	Andhra Pradesh
Geographical area (000 Km ²)	3287.5	163.0
Population (Crores 2011 census)	121.09	4.96
Males (crores)	62.32	2.48
Females (crores)	58.75	2.47
Urban (Crores 2011 census)	37.71	1.46
Males (crores)	19.54	0.72
Females (crores)	18.16	0.73
Rural (Crores 2011 census)	83.37	3.49
Males (crores)	42.77	1.75
Females (crores)	40.59	1.74
Literacy (% in 2011)	74.04	67.35
Males (%)	82.14	74.77
Females (%)	65.46	59.96
Annual normal rainfall (mm)	1176	887
GDP (₹ Crores in current prices, 2014-15)	12498662	520030
Agril. and allied sectors (₹ Crores)	2337249.8	143498
Industry sector (₹ Crores)	3962075.8	107224
Service sector (₹ Crores)	6199336.3	269307
Shares of sub-sectors in GDP (%)		
Agril. and allied sectors	18	27.6
Crops	11.8	15.4
Livestock	3.9	7.1
Forestry and logging	1.4	1.0
Fishing	0.9	4.1
Production ('000 tons)		
Total cereals and millets	245500	10618

Continued.

Table 1. Continued.

Parameter	India	Andhra Pradesh
Total Pulses	19270	1079
Total food grains	264770	11697
Total Oilseeds	32880	2242
Productivity (kg per ha)		
Paddy	2462	3094
Jowar	954	2247
Bajra (Pearl millet)	1214	1663
Maize	2553	6286
Bengal gram	912	1372
Green gram	475	611
Black gram	555	781
Red gram	849	565
Groundnut	996	749
Cotton	491	3237
Mango	7017	7898
Banana	35091	31145
Cashewnut	760	315

3. Pilot Sites of AP Primary Sector Mission

The Government of Andhra Pradesh has designed a strategy to transform agriculture and allied sectors in partnership with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) located at Patancheru near Hyderabad. This strategy is operationalized in a phased manner, setting the standards for a new development paradigm in tune with the change scenario, to enable Andhra Pradesh to take its place among the three best performing states in India by 2022. Initially this massive effort was called 'Primary Sector Mission' and later re-named as the 'Rythu Kosam' (meaning "For Farmers") Mission. The mission is implemented by adopting the principles of 4 I's: Innovate, Inclusive, Intensive and Integrated approach; 4 C's: Convergence, Collective action, Consortium to build partnerships, and Capacity building; and 4 E's: Efficiency, Equity, Environment protection and Economic gain. Overall the mission in the state is broadly focused on:

- a) Increasing productivity of the primary sector comprising Agriculture, Horticulture, Livestock, Fisheries, and Sericulture, etc.;
- b) Mitigating the 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, etc.

The mission is to execute this strategy effectively. Thirteen pilot sites (10,000 ha each) of learning in each of the 13 districts of Andhra Pradesh have been identified to operationalize the convergence of primary sector for increasing productivity, profitability and sustainability through science-led development and climate smart agriculture. In order to integrate, innovate, intensify, and to ensure inclusivity, a pilot site with a 10,000 hectare spread is being established in each study district. These pilot sites provide an on-farm field laboratory to test and evaluate technological, institutional, and policy innovations, and fine-tune them as needed before scaling-up in the districts. In 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.

The general criterion followed for selecting the pilot sites in each district are:

- 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 a pilot site in each district was done in several iterations with proper consent of district administrators (Collector and Chief Planning Officer), other line department officials at district and mandal level, interactions with farmers and communities and discussions with NGOs. By following the above criteria and similar steps, the pilot sites in all the 13 districts were identified. The district-wise distribution and coverage details of each pilot site are furnished in Table 2.

Overall, the entire primary sector mission pilot sites cover 267 villages (both agril. 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 the 2015-16 cropping season. About 0.142 million ha of cropped area (including agril. and horticultural crops) have 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 in 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. In a nutshell, the cumulative pilot site area represents about 1.75% of the total cropped area in the state. Approximately 1.4% of the total state's population is also being 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	90011	93412	0
YSR 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

*Minor changes carried out during baseline survey

**One mandal and eight villages commonly covered under both agriculture and fishery sub-sectors

#One mandal commonly covered under both agriculture and fishery sub-sectors

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 in each study district. In general, the pilot site in a district is comprised of both agricultural (mainly growing agriculture & horticulture crops) villages and a few fishery (mainly growing fish and prawns) villages. In the case of four Rayalaseema (Anantapur, Kurnool, YSR Kadapa and Chittoor) districts, it is solely represented by agricultural villages because of the absence of fishery villages in those selected mandals. All the 13 pilot sites from 13 districts together have been categorized as agriculture (30 mandals and 227 villages) and fisheries mandals (11 mandals and 47 fishery villages). As shown in Table 2 above, 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 exclusively. This spread of total project area itself represents the large diversity and variation among selected villages across districts. All 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 (AEZ). 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 cultivated both in rainy and post-rainy season, major horticultural crops grown, rearing of sericulture, fish and prawns cultivation, and finally extent of forest area available, etc.
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, Fish and Forestry). This value ranged from a minimum of '4' to a maximum of '9'.
4. It will be a herculean task to undertake a baseline survey covering 38 mandals and 267 villages from 13 pilot sites in 13 study districts of the state. To minimize the cost of survey and time, a sub-sample of 150 villages (covering 119 agril. and 31 fishery villages) were identified using a randomization procedure without losing their representativeness and by covering all the mandals in the study. Roughly 56% of sample villages have been covered from 38 mandals.
5. The total cumulative area covered in the primary sector mission (13 pilot sites @ 10,000 ha each) was estimated at 130,000 ha. The average operational landholding per household in the state was calculated at 1.08 ha based on the 2011 landholding census survey. The estimated coverage of households in the primary sector mission was nearly 120,370. In case of large scale representative household surveys, a reasonable coverage of 5% of the total population is good enough to minimize the marginal error. Thus, the present baseline survey has used this thumb rule and targeted an approximate sample of 6500 households (5% of 130,000 HH) across 13 districts.
6. The 2011 census conducted in the state has concluded that nearly 73% of total households are small (less than 5 acres of operational landholding), 9% medium (having operational landholding of above 5 acres and less than 10 acres) and 3% sample are large (>10 acres). Nearly 15% of the total households are under landless category. This category of farmers are highly dependent on primary sector for their livelihood. So, 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 ($150 \times 6 = 900$) were 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

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	2467	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	

understand the economies of scale of their cultivation. However, to keep enough representation for them in the household survey, a minimum of 30 farm households per village were surveyed. Thus, a total of 930 HH have been targeted from 31 fishery villages in ten mandals.

8. The leftover sample of 4670 HH (6500-900 landless + 930 fishery HH) have been distributed among 119 agricultural villages using the above mentioned sampling weights. Majority of the sample villages exhibited medium- to high-levels in the 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 survey in the AP Primary Sector Mission. 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 rearing and existence of forestry in the study villages, etc. 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 different sub-sectors, etc.,

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 indicate absolute no. of fishery samples covered in total

are furnished in Annexure-2. However, the sampling strategy above was planned for collecting the primary household data from targeted sample of 6462 HHs. 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 collected on socio-economic status, 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, etc. A difference of 1240 HHs of targeted sample did not recover during baseline surveys because of higher homogeneity in population and non-cooperation in a few sample villages (especially in fishery sample villages). The complete break-up of pilot site-wise details are summarized in Table 4. Overall, 81% of total targeted sample households were covered during the household survey. Out of the total sample interviewed (5222), nearly 4794 HHs were covered in agricultural sample villages while the rest (428 HH) were fishery sample villages.

5. Methodology

Simple tabular average analysis was used to analyze the household data collected in the primary household survey. The results are summarized district-wise in Section 6 of this consolidated baseline report.

For estimation of Gross Value Added (GVA) in primary sector from pilot site in each district, a production/value added approach was used. Among the three approaches (production, income, and expenditure) available, production/value added approach is mostly applied for the estimation of value added in primary sector. Income approach is normally applied for industry sector. Expenditure approach is applied in general in case of service sector.

As per standard definitions, the primary sector includes agriculture, horticulture, animal husbandry, fisheries, sericulture, forestry and logging, and mining and quarrying. But for the present study the primary sector is confined to agriculture, horticulture, animal husbandry, and fisheries only. The standard methodology defined by Directorate of Economics and Statistics² was adapted with suitable modifications for the estimation of GVA from different sectors in the pilot site using various estimates derived from household survey. The sector-wise methodology followed for estimation of 'Gross Product' is summarized below.

5.1. Agriculture/horticulture/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 and vegetables, fodders and by-products, etc (Table 5).

5.2. Livestock

This sector includes milk production from cows, buffaloes and goats; wool production from sheep and goats; egg production from poultry, and ducks, etc.; and meat production from poultry, sheep, goats, and donkeys. It also includes dung and other by-products from milch animals and other livestock. The incremental livestock value will also be considered in the estimation of GVA (Table 6).

5.3. Fishing

Village-wise value of inland fish/marine fish/prawns is estimated by multiplying the production with corresponding output prices. Fish sold as salted, dried and frozen should also be accounted.

2. National Account Statistics: Manual on Estimation of State and District Income (2008), published by CSO

Table 5. Estimation of agricultural sectoral inputs, outputs and gross product.

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

Table 6. Estimation of livestock sectoral inputs, outputs and gross product.

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

The average productivity level and various input material costs per acre 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.

5.4. Forestry

Major components of this sector are industrial wood (recorded and un-recorded), fuel wood and major/minor forest produce. However, the present study has attempted to capture only the fuel wood and forest produce components. 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 only. For obtaining complete information on the three seasons, previous year's data was collected. Overall, the summary of methods of estimation of GVAs across sub-sectors are summarized below in Table 7.

Table 7. 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)	HH survey and secondary information	HH survey and secondary information	HH survey and secondary information	Only secondary information	Total primary sector output
Estimation of input costs/unit (2)	HH survey	HH survey	HH 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, goats, 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 survey conducted across 13 study districts are summarized and discussed in the following sub-sections. 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 (nearly 119) covering about 4794 sample households in 13 pilot sites corresponding to 13 study districts in the state. Another 428 fishery sample households covered in the baseline survey are analyzed and summarized in relevant sub-sections. Overall a total of 5222 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 district-wise is presented in Annexure-1, Table 1. Totally, 4794 sample households were interviewed from 119 sample agricultural villages in the 13 pilot sites in the state. All the sample farmers are distributed and categorized under different

size groups based on their total operational landholding during the 2014-15 cropping season. Out of the total 4794 samples, 3371 sample households belonged to small size (<5 acres) farmers' category, followed by medium (between 5 and 10 acres) size (581 HH representing 12.1%), and large (>10 acres) size (264 HH; 5.5%) category. Nearly a total of 578 sample households belong to landless (operational landholding zero) category, who were also covered in the baseline survey. They contribute about 70.3%, 12.1%, 5.5% and 12.1% shares in the total baseline sample respectively, for small, medium, large and landless categories. This allocation among size groups is truly representative of the 2011 census survey conducted on 'operational landholdings' at state level. The pattern of distribution of sample among study districts was also closely representative of the district-level situation generated in the 2011 census survey. The highest sample of households were interviewed in Srikakulam district (650 HHs) while the lowest was in Nellore district (216 HHs). This variation was purely determined by the extent of spatial distribution (no. of villages) and diversity (dominance of different sub-sectors) of pilot site in each study district.

The total baseline sample was also categorized based on the community they belonged to, by district, and presented in Annexure-1, Table 1. Majority of the sample (1881 HHs) belong to Backward Caste (BC) community, followed by open (OC) community category (1605 HHs), Scheduled Caste (SC) community category (676 HHs), Scheduled Tribe (ST) community (621 HHs), and Others (11 HHs). They contributed approximately 39.2%, 33.5%, 14.1%, 13.0% and 0.2% respectively, for BC, OC, SC, ST and Other communities. The pattern of distribution of sample by community varied from district to 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, etc., are analyzed and presented in Annexure-1, Table 2. The average family size of the household for the total sampled farmers is 4.0. The highest family size (4.8) was noticed in case of Chittoor district while the lowest (3.5) was observed in Vizianagaram district. On the whole, only 41% of total sample had literacy across districts, out of which 13.4% had primary level of education, while another 27.6% had upper primary and above level of education status in the state. Nearly 59% of the total sample were uneducated or did not have access to education. The extent of illiteracy was much higher in the case of sample farmers from Srikakulam, Visakhapatnam and Vizianagaram districts. Presence of tribal and backward villages in these district pilot sites may be the reason for lower levels in the literacy rate. Special attention should be placed on promotion of education and other basic amenities in these districts. The highest literacy rate was noticed in the case of Chittoor district sample farmers than in any other district in the state. Majority of family members (55%) in the sample are participating in their own farm work. Almost all of the sample districts exhibited much higher levels of own farm labor participation than the pooled average sample. Another 47.5% of total family members were also participating in the outside labor market for their livelihood. Very few sample districts showed higher levels of outside labor market participation than total sample.

6.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details district-wise are furnished in Annexure-1, Table 3. The average total own landholding per household for the entire sample was estimated at 1.45 hectares, out of which 0.71 ha of land was covered with irrigation access while another 0.75 ha was grown under rainfed conditions. Both irrigated and rainfed landholdings contribute almost equal proportions (50% each) in case of pooled sample. In case of Rayalaseema districts, rainfed landholdings dominate in the total own landholding. But in the case of Guntur, Krishna and West Godavari districts, irrigated landholdings have the lion's shares in the total own landholdings. All the remaining districts have major share of own landholding under rainfed condition. The extent of average operational landholding for the total sample households was calculated at 1.78 ha. About 0.33 ha of cropland was leased-in from outside land market, which was under both rainfed and irrigated conditions. The extent of tenancy for the total sample households

was 18.6% (excluding landless households). The prevalence of tenancy was much more concentrated in Krishna, Guntur, West Godavari, East Godavari, Prakasam and Nellore districts. The rest of the sample districts exhibited very normal (less than 10%) levels of tenancy in the sample farmers.

6.4 Household assets and livestock ownership

The details about ownership of household assets and livestock for the total sample are presented district-wise in Annexure-1, Table 4. Nearly 96.2% of the total sample households said that they possess a residential house. Only about 13.5% sample households indicated that they also own a cattle shed for their buffaloes, cows and bullocks. Televisions (86.6%) and mobile phones (83.9%) are the most common consumer durables owned by many of the sample farmers across study districts. Approximately slightly more than a quarter (27.2%) of total sample farmers also possessed two wheelers. Slight variation in ownership was observed from item to item and its possession among study districts in the state.

The details about average livestock ownership per sample household is also summarized in Annexure-1, Table 4. On average, every 10 sample HHs had only one draft animal and every five sample HHs had one cow across study districts. Nearly 50% of the sample HHs had at least one buffalo across all districts. 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 2.4. The composition of different livestock animals varied significantly from district to district. Overall, the highest number of livestock animals per household was in Anantapur (5.1) while the lowest observed was in Srikakulam (0.5).

6.5 Major crops and their productivity levels

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

Paddy, groundnut and horse gram are the major crops observed in case of Chittoor pilot site. The average productivity levels in case of paddy (3.73 t ha^{-1}) and horse gram (0.54 t ha^{-1}) are on par with district average yields. But, groundnut productivity (0.60 t ha^{-1}) in the pilot site is lower by nearly 47% than the district average yield. The district has good potential for groundnut and its average yield is higher by 51% than state average yield and by 13.5% than national average yield.

In case of Kadapa, paddy, groundnut and cotton are the major crops grown by sample farmers in the pilot site. But the productivity of paddy (2.52 t ha^{-1}) in the pilot site exhibited nearly 13% lower yields than the average district yield (2.84 t ha^{-1}). Groundnut (0.62 t ha^{-1}) in pilot site also under performed by 54% than the district average yield. Relatively, the average productivity levels in case of cotton (1.38 t ha^{-1}) are on par with district average (1.47 t ha^{-1}). There is huge scope as well as potential for enhancing productivity levels across crops in the pilot site.

Paddy, groundnut and red gram are major crops cultivated in the pilot site of Anantapur district. The average pilot site productivity levels are on par with district average yields. But, they are lower than state average yields, especially in case of groundnut crop (32%). Groundnut being the major crop cultivated in the district, huge scope and potential exists in further enhancement of its productivity.

In case of Kurnool pilot site, paddy, groundnut and cotton are the major crops cultivated by the sample farmers. The performance of paddy (4.34 t ha^{-1}) was good and it is better than both the district (3.67 t ha^{-1}) and state average (3.09 t ha^{-1}) yields. But, the performance of groundnut and cotton is lower than district average yields. Potential opportunities are available for enhancing both cotton and groundnut yields in the pilot site.

Paddy, black gram and green gram are the major crops cultivated in the Nellore district pilot site. The average productivity levels of paddy (5.57 t ha^{-1}) was good and it is higher than district (4.05 t ha^{-1}) and state average yields. But natural calamities during harvesting time are the biggest

challenge in gathering up the bountiful harvest from the crop. The productivity levels of green gram (0.81 t ha^{-1}) and black gram (0.56 t ha^{-1}) is highly influenced by onset of monsoon and subsequent rainfall distribution in the district. Huge scope exists for further increase of productivity for black gram and green gram crops in the pilot site when compared with district average yields.

In the case of Prakasam pilot site, paddy, cotton and chickpea are identified as major crops grown by sample farmers. The paddy productivity (4.52 t ha^{-1}) level in the pilot site is better than district average yields (3.84 t ha^{-1}). But cotton (0.65 t ha^{-1}) and chickpea (1.12 t ha^{-1}) productivity levels are much lower than district average yields. Enormous potential can be tapped in the district by increasing the productivity of these crops.

Paddy, maize and black gram are major crops cultivated by sample farmers in the Guntur pilot site. Paddy, followed by maize, is the dominant cropping pattern in the pilot site villages. The pilot site productivity levels (5.73 t ha^{-1} for paddy; 1.79 t ha^{-1} for black gram) are better than the district average yields (3.34 t ha^{-1} for paddy; 1.08 t ha^{-1} for black gram) except in the case of maize (6.66 t ha^{-1} in the pilot site). Substitution of cereal-cereal cropping system with cereal-legume system is the biggest challenge in the pilot site. The long term sustainability of productivity levels among crops is a concern among farmers.

Paddy, maize and cotton are predominant crops grown in the Krishna district pilot site. The average productivity of paddy is 4.80 t ha^{-1} and maize is 6.50 t ha^{-1} in pilot sites. Paddy productivity is higher than the district average yield (3.23 t ha^{-1}) but maize productivity is on par with the district yield (6.92 t ha^{-1}). Good scope exists for further improvement of productivity in case of cotton (2.68 t ha^{-1}) crop. Issues, such as labor shortage and sustaining of long-term productivity levels are among the biggest challenges in the pilot site. More efforts are required for strengthening markets and value chains.

In case of West Godavari, paddy, maize and oil palm are major crops preferred by sample farmers in the pilot site. All the three crops performed well in terms of productivity levels (5.33 t ha^{-1} for paddy; 6.43 t ha^{-1} for maize; and 26.8 t ha^{-1} for oil palm). However, huge scope exists for introduction of mechanization, improved market access and value chains for sustaining long term productivity, coupled with increasing the competitiveness of production. These are important concerns that need special focus in this district.

Paddy, tapioca and cotton are major crops grown in the East Godavari district pilot site. All these three crops (4.06 t ha^{-1} for paddy; 12.9 t ha^{-1} for tapioca; and 1.57 t ha^{-1} for cotton) are performing well and their average productivity is higher than the district average yields (2.99 t ha^{-1} for paddy, and 1.13 t ha^{-1} for cotton) except for tapioca, where the productivity at district level is approximately around 20.16 t ha^{-1} . Introduction of mechanization and sustaining long term productivity levels are the key issues that need immediate attention. Improving market access and strengthening value chains offer good scope for increasing producer's share in consumer rupee.

Paddy performed well in the three north coastal district (Visakhapatnam, Vizianagaram and Srikakulam) pilot sites when compared with their respective district average yields. The productivity levels of maize is on par with district average yields in case of both Visakhapatnam and Vizianagaram district pilot sites. But it is relatively lower in Srikakulam pilot site. However, the productivity levels of maize in the three study districts are much lower than the state average yields. The average productivity levels of sugarcane in Visakhapatnam pilot site is lower by nearly 30% than district average yields. However, sesame in Vizianagaram and black gram in Srikakulam performed better than their corresponding district productivity levels.

6.6 Economics of crop/fish enterprises

The details on economics of major crop enterprises per ha across pilot site districts are summarized in Annexure-1, Table 6. Information on costs and returns per ha across crops cultivated in the pilot site were collected during primary household survey from one-fourth sample households. The information elicited were also complemented through village-level focus group discussions (FGDs) conducted in each sample village in the baseline survey. This information was collected on a 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, such as seeds, fertilizers, pesticides, machinery, labor and irrigation costs if any) were considered for deducting from total returns (including total output plus by-products if any) per ha. Fixed costs, such as rental value of own land per ha, depreciation of farm implements, etc., were not considered. The net returns per ha were estimated after deducting the 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-wise performances of major crops are discussed and summarized below.

With regard to the four Rayalaseema districts, paddy and vegetables were the major crops on irrigated land while groundnut, cotton, horse gram and red gram were the major rainfed crops preferred in the study. The cultivation of paddy is quite economical across the four districts, except in Anantapur district. Recurrent droughts and insufficient water during the crop period are the major problems expressed by sample farmers in these districts. Groundnut, the dominant rainfed crop in all the Rayalaseema districts, was unable to recover its total costs per ha. It just about earned 80-90% of its total costs across the four study districts. This is mainly due to poor yields per ha. The major reasons for low yields are: uncertain weather conditions and low/uneven distribution of rainfall during rainy season. Similarly, the performance of cotton was also poor in both Kadapa and Kurnool districts. Paddy, followed by cotton cultivation, was the uncharacteristic situation in case of Kadapa pilot site. High density cotton planting with little irrigation results in poor yields in this district. Therefore, this has to be strongly discouraged in the district. Comparatively the performance of horse gram was much better in Chittoor district where the crop has recovered its total variable costs and earned some marginal net returns. The cultivation of jowar in Anantapur district was the worst 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 have been much worse among all crops and study districts. Ideally, the total costs per ha should be recovered from its total returns per ha, then only will it be a viable option for farmers to continue in agriculture.

The cultivation of crops is quite economical in Coastal Andhra Pradesh districts – Nellore, Prakasam and Guntur – when compared with Rayalaseema's four districts. Paddy cultivation performed extremely well across the three study districts. Due to relatively better access to irrigation water in these districts, the paddy crop performed relatively better than in Rayalaseema districts. But extreme weather events, such as cyclones, floods, etc., are quite common during the crop period, which then destroy the entire paddy output in these districts. Maize and black gram are highly preferred options in rice-fallow situations. Even though maize cultivation in Guntur district is quite economical the long-term sustainability of soils and productivity in the pilot site is the biggest concern because of cereal-cereal rotations with high input use/intensive cultivation. Black gram is a highly recommended pulse crop in rice fallows and it is performing well in both Nellore and Guntur districts. Green gram is another rainy season pulse crop which is quite profitable in Nellore district. The cultivation of cowpea and cotton was not profitable in Prakasam district because of recurrent droughts and insufficient rain during the crop period. If we consider the total costs per ha, paddy and maize are the only crops which could at least recover from its total returns. All other rainfed crops across study districts were unable to recover their total costs per ha.

All the major crops cultivated in Krishna, West Godavari and East Godavari district pilot sites recovered their total variable costs and earned some marginal net returns per ha. Paddy performed quite well in all the three study districts. Similarly, maize also recovered its total variable costs in both Krishna and West Godavari districts. Commercial crops, such as cotton, oil palm, tapioca and banana did well and earned significant net returns per ha. Among all the crops, tapioca performed extremely well and earned significant returns (3.10 B:C ratio) on each rupee invested in its cultivation. Guaranteed irrigation facilities in all the three study districts and reasonably good exposure of sample farmers to better management practices might have helped them to make agriculture a viable option/enterprise. However, enormous scope still exists for introduction or setting-up of scientific post-harvest handling facilities and value chains across commodities in these districts.

The performance of agriculture in three north coastal districts (Visakhapatnam, Vizianagaram and Srikakulam) pilot sites are mixed. Paddy, the major irrigated crop in these districts, was not able to recover its total variable costs in both Visakhapatnam and Srikakulam districts. It just recovered its total variable costs in Vizianagaram district. Maize also performed well in both Vizianagaram and Srikakulam district pilot sites, but it did not recover its total variable costs in the case of Visakhapatnam district pilot site. Sugarcane, another major irrigated crop grown in Visakhapatnam district, recovered its total variable costs and earned significant profits per ha. Sesame in Vizianagaram and black gram in Srikakulam districts also exhibited better recovery of total variable costs per ha. If we consider the total costs per ha, all the rainfed crops across districts were unable to recover them.

For further details on costs and returns of various crops per ha across pilot sites refer to the district specific Baseline Reports prepared under similar guidelines.

The details about economics of prawn/fish cultivation enterprises (per cycle per ha) across pilot sites are furnished in Annexure-1, Table 7. As indicated in the earlier sections, the cumulative area covered under fish/prawn cultivation in the 13 district pilot sites is 8892 ha. This total area is spread over approximately 47 fishery villages covered in 11 mandals of the 13 study districts. Enough care was taken to accommodate a significant number of fishery sample households in the representative baseline survey conducted for Andhra Pradesh Primary Sector Mission. Around 428 fishery sample households were also interviewed with a well-structured questionnaire. These primary household surveys were also complemented with village-level focus-group discussions (FGDs). The details about socio-economic characteristics, average productivity levels and economics of fish/prawn cultivation were captured during the survey. The data were thoroughly analyzed and results are discussed district-wise below.

The cultivation of prawns was a dominant activity in only six district pilot sites out of 13 districts in the Primary Sector Mission. They are: Nellore, Prakasam, Guntur, Krishna, West Godavari, and East Godavari districts. Total variable costs (seed, feed, medicines, electricity and watch & ward) per cycle per ha and total returns (outputs plus by-products if any) per cycle per ha were elicited from one-fourth of the sample farmers across sample villages and districts. The net returns per cycle per ha was estimated after deducting the total variable costs from total returns per cycle per ha. Overall, the economics of prawn cultivation per cycle makes it viable only in Nellore, Krishna, and East Godavari districts. It is not economically viable in the rest of the three districts as they did not recover their total variable costs per cycle per ha. Some of the major reasons for low total returns per cycle per ha in prawn cultivation are as follows:

- a) Poor seed quality – private hatcheries dominate the supply and no quality monitoring from government;
- b) Low success rate and susceptibility to diseases;
- c) Low productivity levels (hardly one ton per cycle per acre);
- d) High feed and medicinal costs – No monitoring or regulation from govt. side;
- e) High electricity costs per unit;
- f) Fluctuating outprices (₹260 per 40 count of prawns) – No regulation or source of information in the entire state.

Similarly, the economics of fish cultivation per cycle per ha across sample districts are summarized in Annexure-1, Table 7. The cultivation of fish is a dominant activity mainly in three districts out of 13 districts in Andhra Pradesh. Krishna, West Godavari and East Godavari are the major fish growing districts while it was observed very minimally in Nellore, Prakasam and Guntur districts. Just like in the case of prawns, the costs and returns from sample fish farmers were collected during primary household survey. Overall, fish rearing is more profitable than prawns cultivation in these districts. All the three sample districts indicated good economic returns over total variable costs per ha per cycle. The average productivity levels in case of fish are good and relative feed prices are lower in fish

cultivation. There is good domestic demand and very stable market prices for fish in markets in the state. However, very slight fluctuations were observed mainly due to traders or middlemen in fish marketing/trading. The state has very good scope to further enhance production in the near future. Introduction of scientific post-harvest handling measures, value and supply chains, etc., will further propel this industry in the state.

7. Pilot Site GVA Estimations across Sub-sectors

The details about pilot site-wise Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Annexure-1, Table 8. As described in the earlier sections, estimation of current value of GVA in the 13 pilot sites corresponding to 13 districts of Andhra Pradesh is one of the major objectives of the AP Primary Sector Mission baseline survey. These values will be used as a benchmark before the implementation of Primary Sector Mission/Rythu Kosam Project activities across 13 district pilot sites. Any monitoring or impact studies carried out in future over a project period will use this baseline information as reference benchmark points for 2015. The primary household survey information (including FGDs) 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 were furnished in detail 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. They are: agriculture, horticulture, animal husbandry and fisheries sub-sectors. 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 detail by sub-sector below.

Overall, the total estimated GVA from AP Primary Sector Mission 13 pilot sites are ₹1247.3 crores, of which 761.21 crores (61.3%) are contributed by the agriculture sub-sector, including horticulture. Another 207.15 crores are contributed by animal husbandry, which accounts for 16.69% share in total GVA of the AP Primary Sector Mission pilot sites. The fisheries sub-sector alone added nearly another 272.91 crores (21.99%) to total GVA estimations. The sector-wise contributions and corresponding share value are depicted in Figure 3.

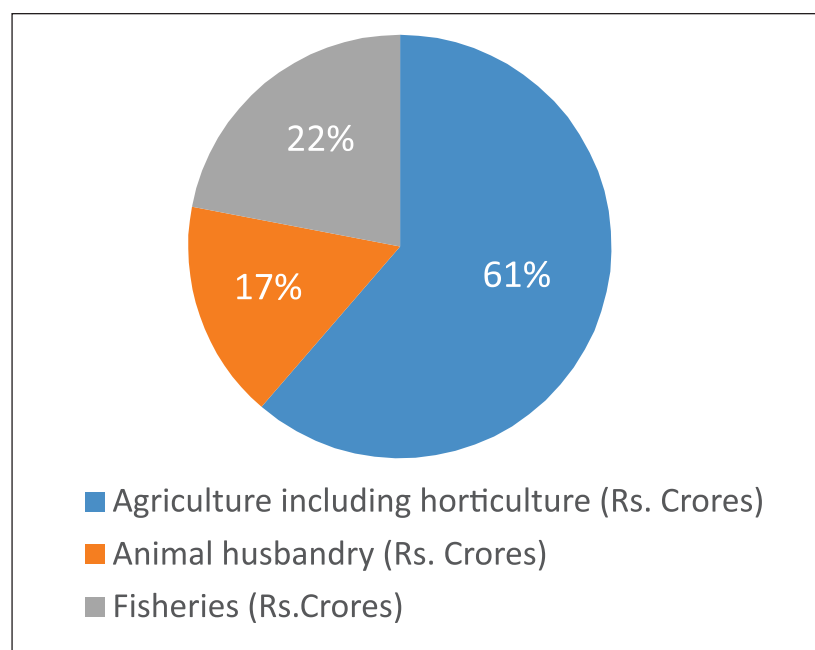


Figure 3. Sub-sector wise shares in the total GVA estimation.

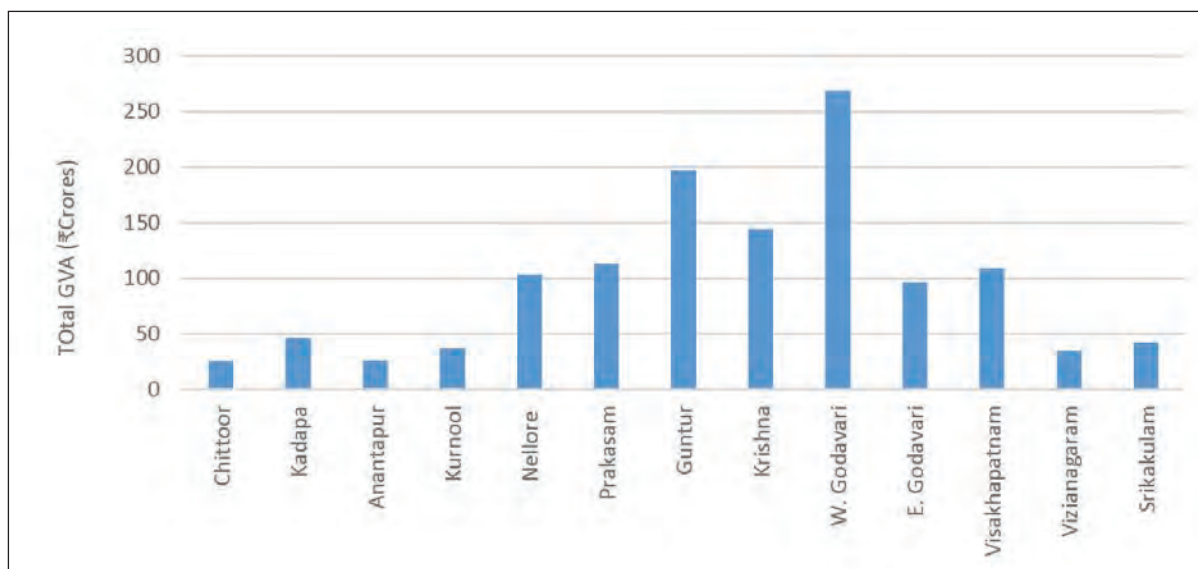


Figure 4. Total GVAs estimations by district pilot site.

Taking into account contribution from three sectors (agriculture, animal husbandry and fisheries), among all the 13 pilot sites West Godavari district pilot site has contributed the highest value (268.38 crores) followed by Guntur district pilot site (196.97 crores) and Krishna district pilot site (143.61 crores). The lowest GVA value was added by Chittoor district pilot site (25.41 crores). The total GVA values by district pilot site are presented in Figure 4.

Contribution of agricultural sub-sector including horticulture to GVA was highest in West Godavari district pilot site (163.50 crores) followed by Guntur district pilot site (163.36 crores) and Visakhapatnam district pilot site (102.71 crores). The lowest value was contributed by Anantapur district pilot site (4.30 crores). In case of animal husbandry sub-sector, the highest value was contributed by Krishna district pilot site (57.03 crores) followed by Kadapa district pilot site (23.73 crores) and Anantapur district pilot site (21.85 crores). It is good to see both Kadapa and Anantapur district pilot sites contributing significantly to the animal husbandry sub-sector even though they are relatively backward in the agriculture sub-sector. The lowest value GVA from animal husbandry sub-sector was contributed by Vizianagaram district (3.14 crores). It is very surprising to see the lower contribution (8.48 crores) of West Godavari district pilot site in the animal husbandry sub-sector even though the pilot site has enormous potential and resources to contribute. In case of fishery sub-sector, the highest contribution was seen from West Godavari district pilot site (96.40 crores). It was followed by Prakasam district pilot site (78.00 crores) and East Godavari district pilot site (32.10 crores). Nearly six districts (four Rayalaseema districts plus Visakhapatnam and Vizianagaram) pilot sites did not contribute to fisheries sub-sector because of non-coverage of fishery villages in those pilot sites. The composition of each pilot site GVA sub-sector-wise is summarized in Figure 5.

Overall, the dominance and significant share contributions of different sub-sectors in each district's total pilot site GVA estimations are presented in Figure 6. Nearly 95% share of total GVA in the Visakhapatnam district pilot site is contributed by agriculture including horticulture sub-sector. In contrast to Visakhapatnam, Prakasam district pilot sites had the lowest share (14.79%) of contribution from agriculture including horticulture in the total GVA estimation of that district pilot site. But the fisheries sub-sector has contributed nearly 69.11% share of total GVA value in Prakasam district. Animal husbandry has significantly contributed (83.56%) to the total GVA estimations of Anantapur district pilot site. In the case of West Godavari, the contributed share of animal husbandry in the total district pilot site GVA was low at 3.16%.

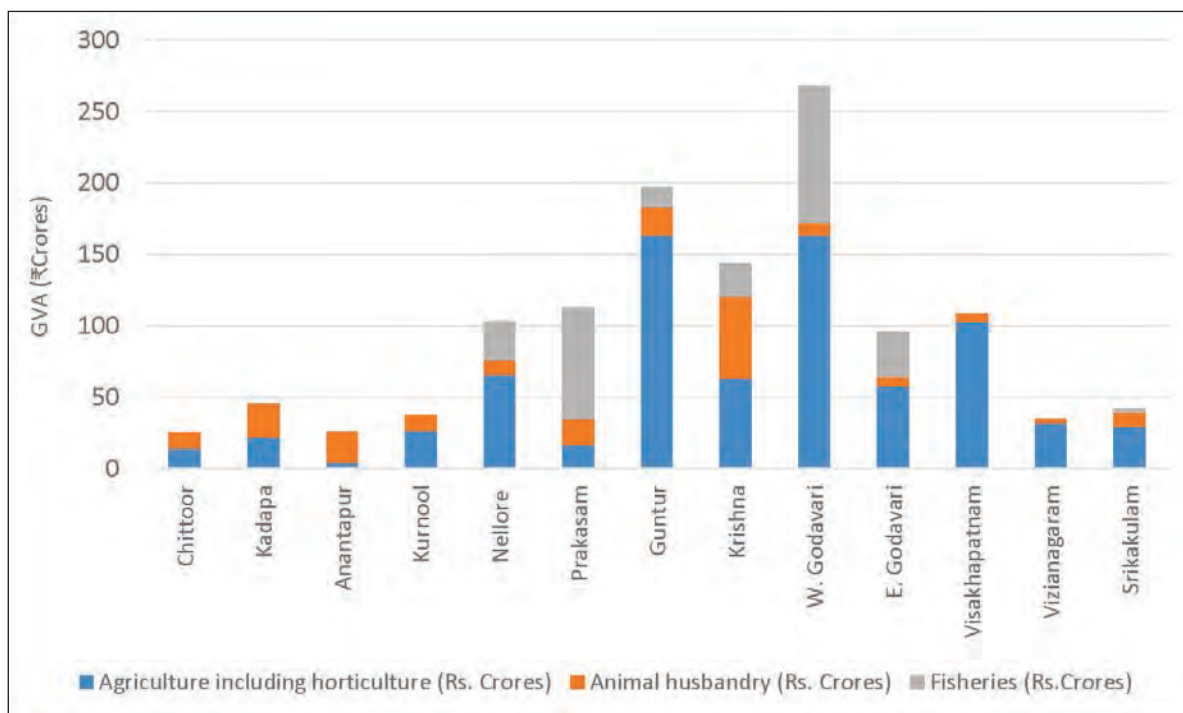


Figure 5. Composition of pilot site GVAs sub-sector-wise.

The total district GVA value per pilot site village was estimated in order to understand the extent of potential contributed by each pilot village. District-wise estimations are summarized in Figure 7. Obviously per village contribution of GVA was the highest in case of West Godavari district pilot site followed by Guntur and Nellore district pilot sites. The lowest contribution per district pilot site was noticed from Srikakulam district. It is very interesting to note that each district pilot site village in West Godavari is contributing nearly 23 times higher the GVA value than each district pilot site in Srikakulam. There is huge disparity among these villages in terms of potential to contribute to total GVA in the pilot site.

Similarly, the GVA values per district pilot site household was estimated and compared across the study district. Details are furnished in Figure 8 in descending order. West Godavari district pilot site households retained their first rank followed by Guntur and Nellore districts' pilot site households.

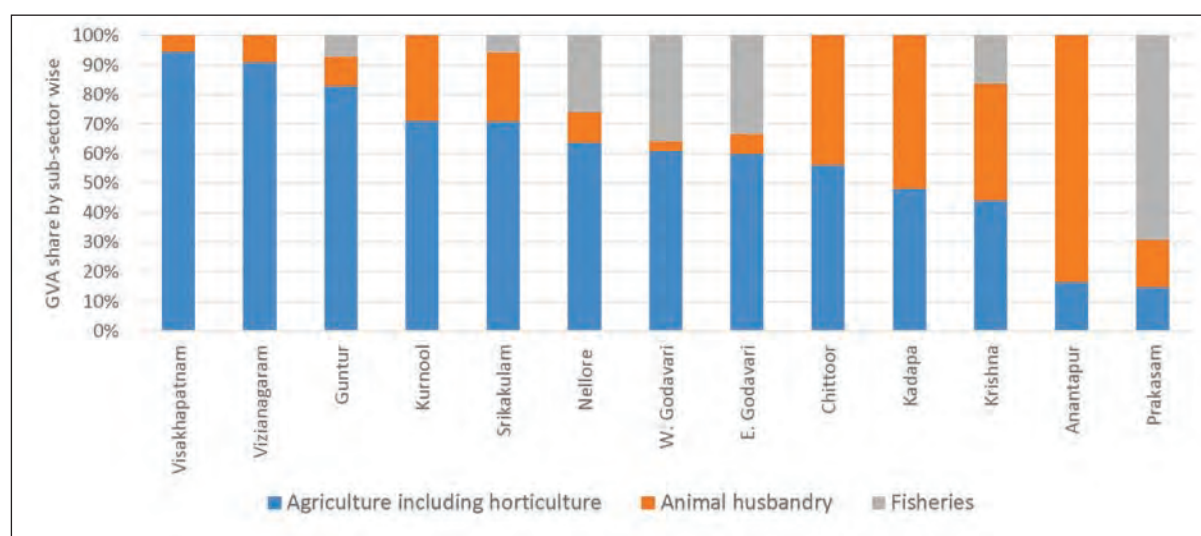


Figure 6. Shares of different sub-sectors in total GVA.

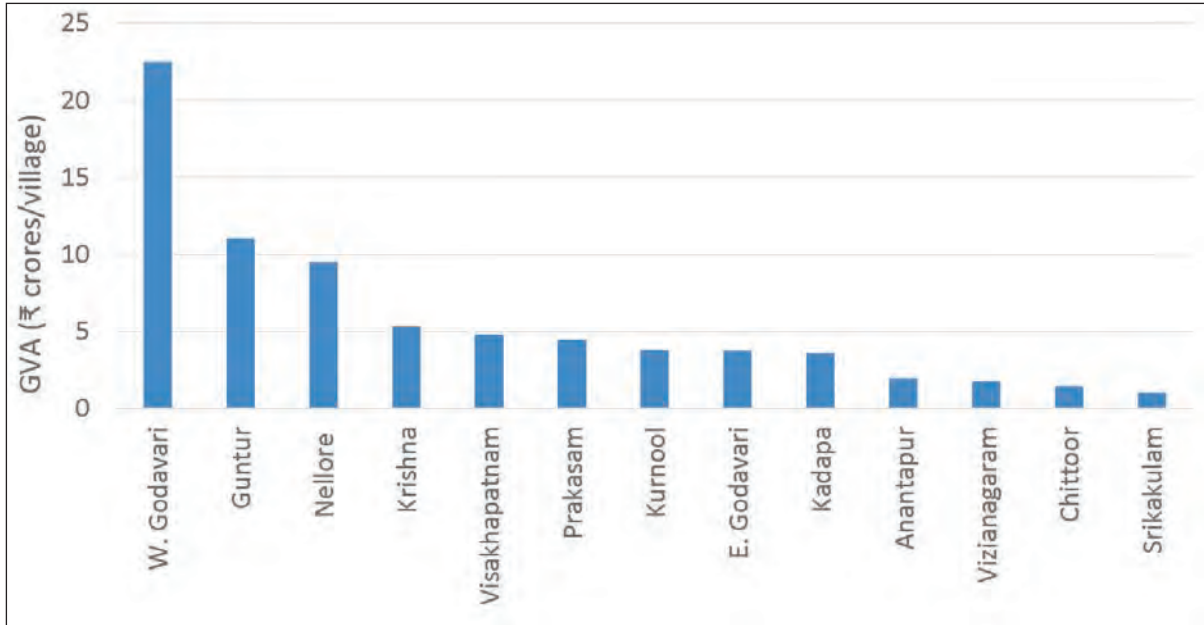


Figure 7. GVA value per pilot site village (₹ crores).

The average household earnings per annum during 2014-15 in the West Godavari district pilot site was calculated at ₹ 1,16,338, while the lowest earning per pilot site household per annum (₹22,240) was observed in Srikakulam district. The average earnings from agriculture and allied sectors of West Godavari district per household was more than five times higher than the sample household earnings in Srikakulam district pilot site.

In the same fashion, the average total GVA contributions from each per ha landholding in district pilot site was calculated and compared among study districts (see Fig. 9). Per hectare of agricultural land in West Godavari district pilot site is contributing almost ₹210,404 per annum towards total GVA

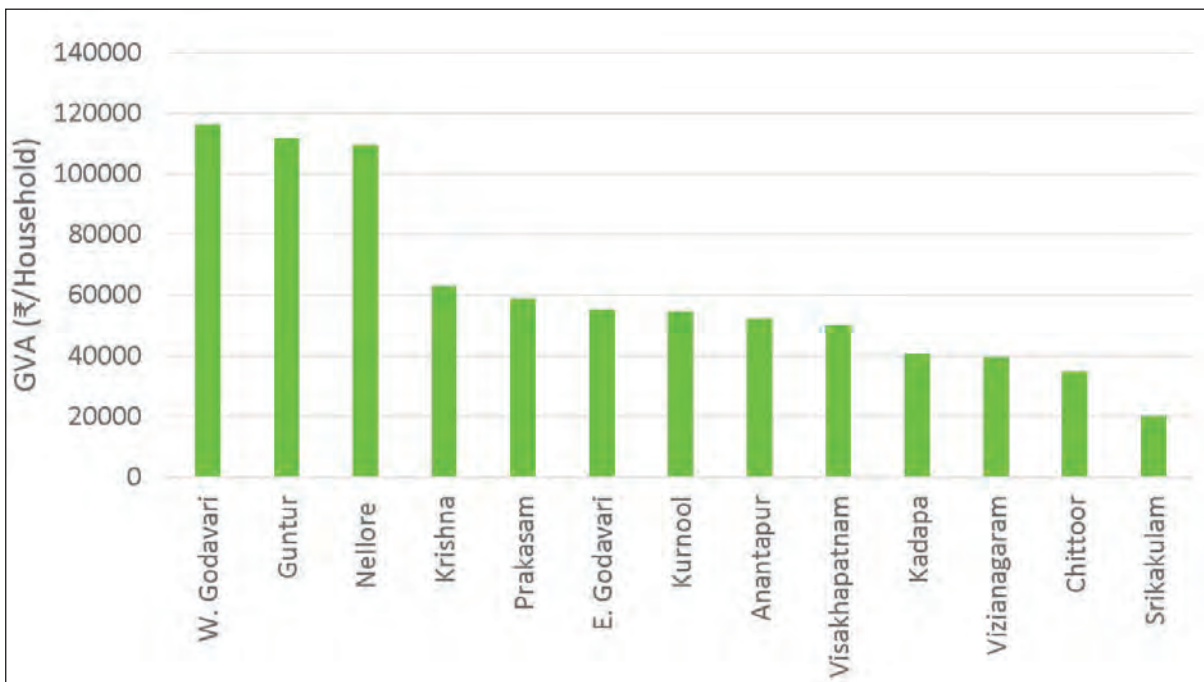


Figure 8. GVA value per district pilot site household (₹/household).

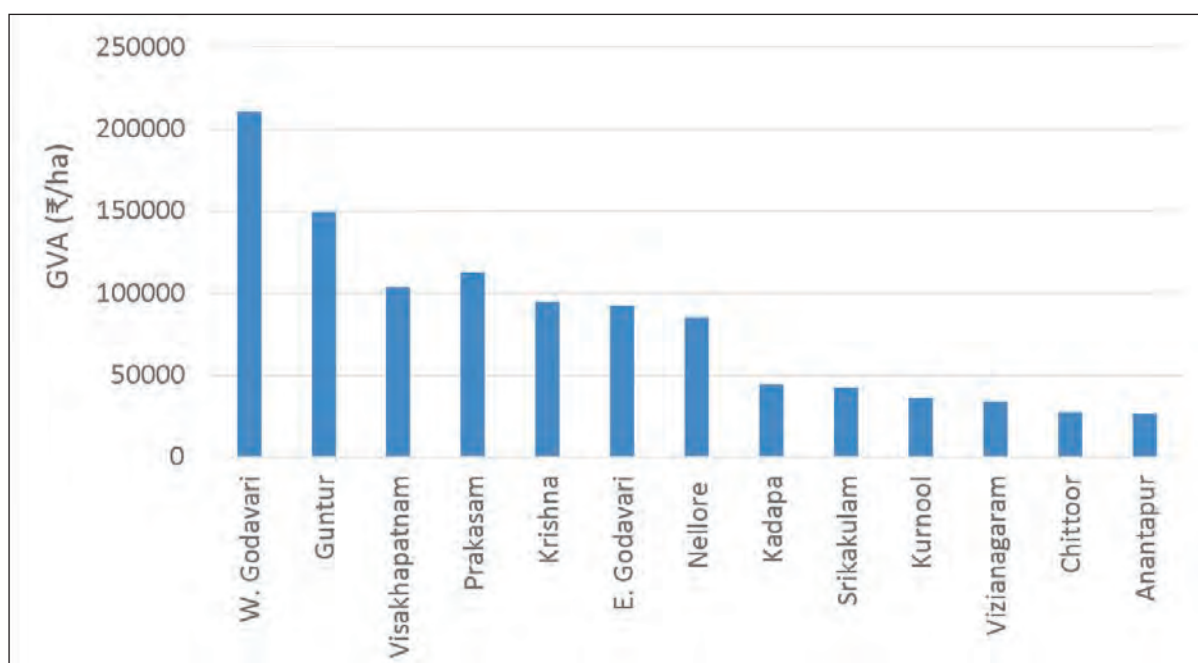


Figure 9. GVA value per district pilot site ha area (₹ per ha).

of the district's primary sector. The highest value was observed in West Godavari district followed by Guntur and Visakhapatnam districts. The average earnings from each per ha cultivated land was the lowest in Anantapur (₹26,150) district pilot site. Due to high intensification of commercial crops cultivation and access to better irrigation facilities could have helped the West Godavari district to earn at least a six times higher income than the typical rainfed per ha cultivation in Anantapur district. Detailed break-up of GVA values across 13 pilot sites are summarized in Annexure-1, Table 9.

Per hectare GVA values estimated using pilot site baseline information were extrapolated and used to project the Primary Sector GVA values at the entire district level. The calculated unit GVA values per ha were multiplied with gross cropped area sown in the respective district during 2014-15 to obtain the projected GVA values at each district level. District-wise details are summarized and presented in Annexure-1, Table 10.

GVA values region-wise

The GVA values across pilot-sites are summarized by four regions for better brevity of results and understanding of the ground realities. The four regions are identified based on their resemblance in crops cultivation and other physical characteristics.

Among the four regions, the pilot sites located in Delta Region (Krishna, West and East Godavari districts) contributed significantly to the total GVA value estimation. It was followed by Coastal Andhra Region pilot site villages. Both North Coastal and Rayalaseema regions' district pilot site villages are contributing significantly lower GVA values. However, the share of agriculture, including horticulture, was relatively lower in Rayalaseema Region when compared with the other three regions. In contrast to this, the contribution of animal husbandry was much more prominent in Rayalaseema Region than in others. The fisheries sub-sector is contributing only in Coastal Andhra and Delta regions while it was almost absent in the other two regions. Below are the region-wise constraints and potential opportunities for introduction of various growth engines.

Table 8. GVA values across four regions.

Region	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share (%)		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agriculture including horticulture	Animal husbandry	Fisheries
Rayalaseema	67.20	67.55	0.00	134.75	49.87	50.13	0.00
Coastal Andhra	245.67	48.53	118.70	412.90	59.50	11.75	28.75
Delta	284.41	72.09	151.88	508.38	55.94	14.18	29.88
North Coastal	163.93	18.98	2.33	185.24	88.50	10.25	1.26
Total	761.21	207.15	272.91	1241.27	61.33	16.69	21.99

Rayalaseema Region: Chittoor, Anantapur, Kurnool and Kadapa districts

Coastal Andhra Region: Nellore, Prakasam and Guntur

Delta Region: Krishna, West Godavari and East Godavari districts

North Coastal Region: Srikakulam, Vizianagaram and Visakhapatnam

Table 9. Region-wise constraints and potential opportunities.

Region	Major constraints	Potential opportunities
Rayalaseema	<ul style="list-style-type: none"> Recurrent droughts, low water table, frequent failure of bore wells High risks in crops cultivation and low productivity levels due to low WUE & land degradation Severe fodder shortage and low productivity levels of milk, meat Poor access to quality agricultural inputs and institutional credit facilities Disappearance of sericulture industry 	<ul style="list-style-type: none"> Huge scope for <i>in-situ</i> and <i>ex-situ</i> soil and water conservation practices and interlinking of village tanks with canals Promote livestock industry through introduction of cross-bred cows, improved buffaloes, sheep and goats, and poultry and interlinking of fodder surplus districts with deficit places Intervene to minimize degradation, and promote organic matter and soil health building measures. Development of market and processing linkages for tomato, mango, groundnut, banana, turmeric and mulberry, etc. Introduce and pilot efficient, transparent multi-peril crop insurance scheme to smoothen farmers' income and consumption Farm and non-farm skill development and creation of employment opportunities Promote dryland horticulture Use punitive and rewarding policies to eliminate water guzzling crops, such as paddy, sugarcane, banana, etc., that use groundwater

Continued.

Table 9. Continued.

Region	Major constraints	Potential opportunities
Coastal Andhra	<ul style="list-style-type: none"> • Extreme weather events (cyclones and floods) coupled with drought is the common challenge for agriculture • Low productivity levels across crops and milk • High labor and input costs across crops narrowing the net returns per ha • Poor seed quality and low productivity levels in case of prawns cultivation • Poor market and value chain facilities 	<ul style="list-style-type: none"> • High emphasis should be on soil and water conservation measures and recharge of groundwater levels • Promote value chain for rice processing, grading and exporting • Promote horticulture and strengthen markets and value chains for lemon, acid lime, Batavia fruit, chillies, turmeric, papaya, yam, and other vegetables • Promote marine fish production, processing and export markets through quality standards • Supply of quality seed, quality feed at reasonable prices and regulation of output prices are major interventions required for strengthening prawn cultivation • Develop and promote commercial scale animal husbandry and dairying through value-added business • Farm mechanization to enhance efficiency and productivity
Delta	<ul style="list-style-type: none"> • Absence of proper infrastructure for efficient management of both supply and value chains across commodities • High input cereal intensification cropping systems • Lack of time/interest in livestock rearing • Labor shortage is the biggest problem • Low productivity levels and occurrences of diseases in prawns cultivation 	<ul style="list-style-type: none"> • Growing peri-urban demand for vegetables, fruits, milk and meat in the region • Good potential for introduction of ICT-based mechanization clusters in the region • Animal rearing business model • Potential opportunities for strengthening market linkages and value chains for oil palm, coconut, cocoa, mango, banana, tapioca, cashewnut, etc. • Enormous potential for development of fish and prawn industry to be harnessed • Promote value chains and farm-based industries to engage human resource gainfully
North Coastal	<ul style="list-style-type: none"> • Majority are small and marginal farmers with low economic capacity • Low input agriculture and lack of awareness in tribal areas • Low adoption of technologies and poor productivity levels across field and horticultural crops • Poor market linkages and traders play a major role • Highly prone to climatic aberrations and cyclones 	<ul style="list-style-type: none"> • Good scope for further increase of productivity levels and introduction of new technologies • Ample scope for converting the area into organic clusters, branding and marketing • Enormous potential for introduction of new commercial crops, such as coffee, lemon grass, flax seed and floriculture, etc. • Huge opportunities for marketing of forest products • Value chains for mango, cashewnut, coffee, pineapple and jackfruit, etc.

8. Major Constraints and Potential Opportunities

By and large, all the district pilot sites have enormous potential to grow and contribute to the state GVA of primary sector. The sample farmers across pilot sites are highly determined and have a strong interest in continuing with agriculture and allied activities, provided it becomes highly remunerative. But a few constraints have been observed across pilot site locations, which are hindering the growth and development of agriculture and allied activities in the respective districts and pilot sites. To realize the fullest potential for growth across sub-sectors, the state has to undertake certain immediate measures to remove these constraints. There is also a need for proactive enabling policies and institutional reforms to achieve the targeted 'double digit growth' in primary sector of the state. The district pilot site-wise constraints and potential opportunities available across sub-sectors of the primary sector are listed below.

Table 10. District-wise constraints and potential opportunities.

District	Major constraints	Potential opportunities
Chittoor	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Congenial climate, diversity of crops and huge demand from metros (Chennai and Bengaluru) • Potential opportunity for tomato, mango, banana and potato value chains and setting up of processing units • Huge potential for sericulture industry and mulberry cultivation • Good scope for increasing milk productivity and meat industry • Huge scope for insurance industries with suitable insurance products
Kadapa	<ul style="list-style-type: none"> • Recurrent droughts and insufficient 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 	<ul style="list-style-type: none"> • 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 needs to be promoted and soil test-based INM • Huge scope for insurance industries with suitable insurance products

Continued.

Table 10. Continued.

District	Major constraints	Potential opportunities
Anantapur	<ul style="list-style-type: none"> • Severe water scarcity and erratic rainfall pattern or distribution • Yield 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 	<ul style="list-style-type: none"> • Huge scope for <i>in-situ</i> soil & water conservation measures • Introduction of drought & heat tolerant technologies, especially in groundnut and pigeonpea • 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	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • High emphasis should be on soil and water conservation measures and recharge of groundwater levels • Soil test-based 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 milk production levels • Development of non-farm employment skillset and other opportunities • Strengthening access to formal markets
Nellore	<ul style="list-style-type: none"> • Extreme weather events (cyclones and floods, etc.) and water scarcity • Poor yields and drying up of orchards during drought years • Poor milk productivity levels even though enough fodder is available • Low productivity levels in case of prawns cultivation • Poor market and value chain facilities • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Emphasis should be on soil and water conservation measures and improving groundwater levels • Huge potential for rice processing, grading and exporting • Good scope for strengthening the lemon, acid lime and Batavia fruit market linkages and value chains • Need for pilot of climate-smart studies and technologies • Creating awareness among farmers is the key to increasing productivity levels • Access to quality seed and output price regulation are the key initiatives required for prawn cultivation

Continued.

Table 10. Continued.

District	Major constraints	Potential opportunities
		<ul style="list-style-type: none"> • Weather-based insurance to cover risks due to weather aberrations • Huge scope for insurance industries with suitable insurance products
Prakasam	<ul style="list-style-type: none"> • Severe water scarcity and erratic rainfall distribution • Low productivity levels across major crops • Low profitability in agriculture due to increased inputs costs • Fodder scarcity is the biggest concern • Low productivity levels in prawn cultivation • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Major investments should focus on soil and water conservation technologies for immediate recharge of groundwater • Good scope for introduction of climate smart cultivars to minimize yield losses • Huge potential for introduction of cross-bred buffaloes and small ruminants to generate additional incomes • Supply of quality seed and regulation of output prices are major interventions required for strengthening prawn cultivation • Enormous potential for scientific post-harvest handling of prawns and fish production in the pilot site • Huge scope for insurance industries with suitable insurance products
Guntur	<ul style="list-style-type: none"> • Sustaining the productivity of commercial crops cultivation is the biggest challenge • Lack of interest or time on rearing milch animals • High labor and inputs costs across crops narrowing the net returns per acre • Poor productivity levels in milk yields • Low average productivity levels in prawns cultivation • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of losses 	<ul style="list-style-type: none"> • Huge scope for introduction of IPM/sustainable management practices for long-term sustainability of crop yields and to increase their corresponding competitiveness in the international market • Crop diversification and balanced application of fertilizers should be promoted and scaled-up • Ample opportunities for scientific post-harvest handling of chilies, turmeric and banana crops • Huge scope for introduction of value chains in yam, papaya and other vegetable crops • Good potential for introduction of cross-bred buffaloes as there is abundant fodder available in the pilot site • Supply of quality seed and price regulation of output prices are the critical steps needed for strengthening prawn cultivation in the pilot site • Huge scope for insurance industries with suitable insurance products
Krishna	<ul style="list-style-type: none"> • Low yields in case of water intensive crops, such as sugarcane • Absence of proper infrastructure for efficient management of both supply & value chains across commodities • Poor milk productivity levels even though fodder is available in abundance 	<ul style="list-style-type: none"> • Growing peri-urban demand for vegetables, fruits, milk and meat in the district pilot site • Good scope for introduction of disease resistant cultivars in case of black gram and green gram • Good potential for introduction of mechanization clusters in the district pilot site

Continued.

Table 10. Continued.

District	Major constraints	Potential opportunities
	<ul style="list-style-type: none"> • Poor quality seed supply for prawn cultivation • Absence of non-farm employment skillset development to meet the demands of the new capital city – Amaravati • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Yield gaps in milk productivity levels across pilot site villages can be reduced • Scientific processing, grading and packaging aspects would allow significant margins in both prawn and fish cultivation in the pilot site • Huge scope for insurance industries with suitable insurance products
West Godavari	<ul style="list-style-type: none"> • High input cereal intensification cropping systems/rotations • Labor shortage is the biggest problem • High costs of cultivation and narrow margins • Lack of time/interest in livestock rearing • Low productivity levels and occurrences of diseases in prawn cultivation • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • High potential for introduction of legumes in rice fallows, and thereby increase in cropping intensity • Good scope for introduction of mechanization clusters • Potential for piloting of IPM/better management practices for long-term sustainability of crop yields • Abundant fodder availability and good potential for increasing milk productivity levels • Potential opportunities for strengthening market linkages and value chains for oil palm, coconut, cocoa, mango, chilies, banana, etc. • Enormous potential for development of fish and prawn industry • Huge scope for insurance industries with suitable insurance products
East Godavari	<ul style="list-style-type: none"> • Scope for further increase in productivity levels of sugarcane, cashewnut, tapioca, etc. • Labor shortage and high input costs per ha • Low milk productivity levels • Low productivity levels and occurrences of diseases in prawn cultivation • Dominant role of traders or middlemen in trading horticultural crop outputs • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Huge scope for introduction of better technologies and improved cultivars in case of all commercial crops • Good potential for piloting of mechanization clusters • Abundant fodder availability for increasing milk productivity levels • Vast potential for processing, grading and exporting of tapioca, oil palm, cashewnut, mango, and banana products • Enormous potential for development of fish and prawn industry • Huge scope for insurance industries with suitable insurance products

Continued.

Table 10. Continued.

District	Major constraints	Potential opportunities
Visakhapatnam	<ul style="list-style-type: none"> • Low input agriculture and lack of awareness in tribal areas • Low adoption of technologies and low productivity levels across field and horticultural crops • Poor market linkages and traders play a major role • Poor productivity levels of milk and low domestic demand • Highly prone to climatic aberrations and cyclones • Under penetration of crop insurance schemes 	<ul style="list-style-type: none"> • Huge scope for converting the area into organic clusters, branding and marketing • Enormous potential for introduction of new commercial crops, such as coffee, lemon grass, flax seed and floriculture, etc. • Good scope for further increase of cropping intensity • Huge opportunities for pooling, grading and exporting of valuable forest products • Ample scope for setting up of value chains in mango, cashewnut and coffee • Huge scope for insurance industries with suitable insurance products
Vizianagaram	<ul style="list-style-type: none"> • Small and marginal farmers with low economic capacity • Low awareness and poor adoption of technologies • Low productivity levels across field and horticultural crops • Poor productivity levels of milk • Water scarcity in selected pockets • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Good scope for further increase of productivity levels and introduction of new technologies • Excellent opportunities for plantation crops and trading • Good scope for introduction of cross-bred animals and further increase in milk productivity levels • Huge scope for development of non-farm employment opportunities and skills • Huge scope for insurance industries with suitable insurance products
Sriakulam	<ul style="list-style-type: none"> • Small and marginal farmers with low economic capacity • Low input agriculture and low productivity levels • Low livestock activity and poor demand for milk • Poor market linkages and traders play a major role • Highly prone to climatic aberrations and cyclones • Under penetration of crop insurance schemes • Reluctance of insurance companies to cover shrimp crop due to high risk of crop losses 	<ul style="list-style-type: none"> • Ample scope for converting the area into organic clusters, branding and marketing • Good scope for <i>in-situ</i> and <i>ex-situ</i> water conservation practices to improve groundwater recharge • Creating awareness on livestock rearing and small ruminants • Huge potential for scientific post-harvest handling of major horticultural crops, such as mango, pineapple, jackfruit and cashewnut • Good scope for strengthening commercial capture of marine fisheries and brackish prawns due to longest coastline in the state • Huge scope for insurance industries with suitable insurance products

After critically examining the district-wise major constraints and potential opportunities, the present study has also attempted to summarize the overall key findings of the baseline survey and corresponding specific recommendations at the state level in Table 11 below.

Table 11. Summary of key findings and specific recommendations.

Key findings	Specific recommendations
1. Recurrent droughts, uneven distribution of rainfall and low groundwater potential are the major concerns in Chittoor, Kadapa, Anantapur, Kurnool, Prakasam and Nellore district pilot sites.	1. High emphasis should be given to <i>in-situ</i> and <i>ex-situ</i> 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 need to be identified and promoted. 2. The major 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.
2. The extent of adoption of improved cultivars (including drought and disease tolerant ones) are still low in major crops, such as groundnut, red gram, sesame, greengram, cashewnut, tapioca, turmeric, citrus, pineapple, etc., in selected pockets of pilot site villages.	3. Huge opportunities available for introduction of new improved cultivars both in field and horticultural crops so that productivity can be improved at least by 10-15% very quickly. Appropriate local alternate seed systems need to be developed and popularized.
3. Overall the soils are low- to medium-fertile and yield gaps exist for major crops in most of the pilot sites. These are discussed in detail by pilot site in Section 6.5 of this report in comparison with district and national average yields.	4. Good scope for introduction of better management practices (including soil, water, crop, IPM practices and micro irrigation) to improve crop yields and minimize the per unit output costs. It will significantly improve the competitiveness of our commodities in international markets. 5. Soil Health Management (SHM) & balanced fertilization strategies to build organic matter (OM) need to be scaled-up.
4. On the whole the average milk productivity levels across the pilot sites 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 (especially in Rayalaseema districts).	6. Enormous scope for introduction of cross-bred animals and creating awareness on feeding practices to increase the average milk productivity across pilot site villages. 7. Fodder Strategy for the state to be developed and implemented in a participatory manner.
5. Majority of sample farmers are not happy with milk pricing structure and adulteration practices followed by local dairy milk collection centers.	8. Good scope for strengthening of formal market channels for milk, meat and eggs trading in order to avoid the role of middlemen across all scales. The total output in this sector is marketed informally. 9. 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 partially.
6. Absence of commodity-based market clusters and value chains (especially horticultural crops) even though the district pilot sites are producing huge quantities	10. Abundant scope for setting up of infrastructure for scientific post-harvest handling of fruits and vegetables, including cold storages across pilot sites to minimize post-harvest losses.

Continued.

Table 11. Continued.

Key findings	Specific recommendations
7. Huge post-harvest losses (around 30%) due to lack of proper post-harvest handling measures, especially for vegetables and fruits	<p>11. Huge opportunities for piloting commodity specific value chains for targeting export markets.</p> <p>For example:</p> <p>Tomato and mango – Chittoor</p> <p>Acid lime and lemon – Nellore</p> <p>Chilies and turmeric – Guntur</p> <p>Groundnut – Anantapur and Chittoor</p> <p>Rice – Nellore and West Godavari</p> <p>Mango, cashewnut, banana – West Godavari</p> <p>Mango, tapioca – East Godavari</p> <p>Mango and vegetables – Krishna</p> <p>Cashewnut, pineapple, and jackfruit – Srikakulam</p>
8. Low productivity levels of prawns and fish culture due to poor seed quality. High susceptibility to diseases is another problem in prawns.	<p>12. Good potential for encouraging commercial crops (coffee, pineapple), and floriculture clusters specifically in Chintapalle and other tribal areas of Visakhapatnam and Seethampet in Srikakulam districts.</p>
9. High volatility in output prices, steep rise in input prices, and absence of output price information, etc., are major challenges in the fishery sector	<p>13. Organic farming clusters can be identified (especially in low input application sites of Visakhapatnam and Srikakulam) and promoted with proper branding and marketing facilities.</p> <p>14. Supply of high-quality certified prawn seed in the state is much needed and appropriate mechanisms need to be put in place. Strong vigilance is required along with periodical monitoring of private hatcheries.</p>
10. Sericulture industry is almost disappearing in the state due to crashing prices of cocoons and frequent outbreaks of diseases	<p>15. Stabilized prices along with cooperative storage facilities should be built in all prawn/fish cultivating mandals to avoid distress sales.</p>
11. Improper pooling, grading and marketing of valuable forest products/by-products generated in the state	<p>16. The domestic silk industry should be protected by supporting it with attractive remunerative output prices along with controlling measures and appropriate duty and taxation so as to make it competitive, given the entry of cheap Chinese silk.</p>
12. Labor scarcity is the biggest challenge across pilot sites in the state. During peak agricultural operations period, farmers are incurring huge expenditure on labor which is limiting their net margins significantly.	<p>17. Forestry has enormous potential to contribute to the state's GDP through proper marketing of its products/by-products across pilot sites.</p>
	<p>18. Huge scope for introduction and piloting of ICT-based custom hiring centers across pilot sites. Fruit harvesters and power sprayers should be promoted through subsidies on a large scale.</p>

9. Baseline Survey Insights from Rayalaseema Region

9.1 Overview of Rayalaseema Region agriculture

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 km² (42% of the state territory), Rayalaseema is larger than Kerala, Punjab, Himachal Pradesh and nine other states in India. It has a population of 15,184,908 (2011 census), which is 30.03% of the state population. Rayalaseema borders the 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 km². The highest population density in the region was observed in Chittoor (275 persons per km²) while the lowest was in Anantapur district (213 persons per km²). The average decadal growth of population in the region was estimated at 12.29%. But among the districts in the region, the highest growth in decadal population was observed in case of Kurnool district (14.85%). Based on the 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) receives better annual normal rainfall followed by 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 be only about 0.81 million ha (around 20% share in the state). Agriculture, mostly rainfed, has been the main livelihood occupation of the farmers in the region. Nearly 47.2% of total cropped area is under food crops and the remaining under non-food crops. Total oilseeds together contribute about 41.9% of total cropped area (see Figure 10). It was followed by other commercial crops (cotton, tobacco, fruits and vegetables) which accounted for 22.9%. The total pulses group occupied third place (18%) in the entire sown area of the region. Cereals and millets together secured the fourth place and cover about 17.2% area in the region.

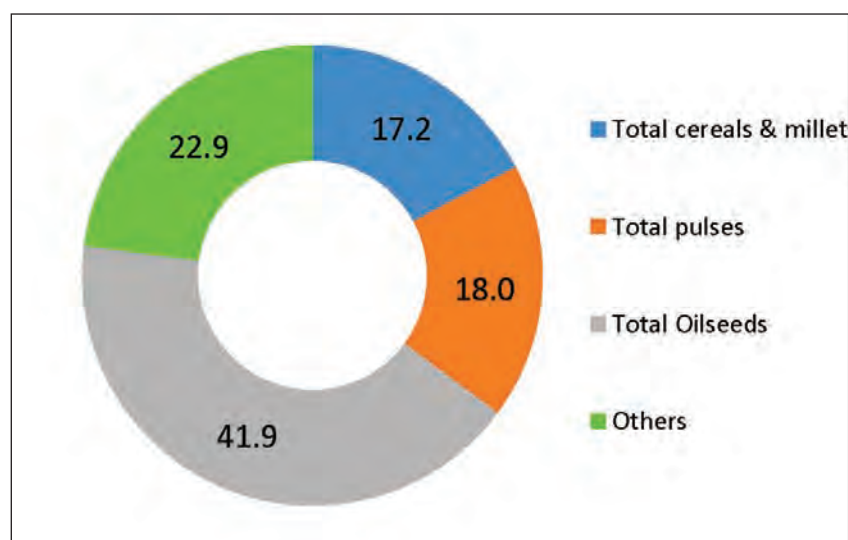


Figure 10. Share of total cropped area among crop groups.

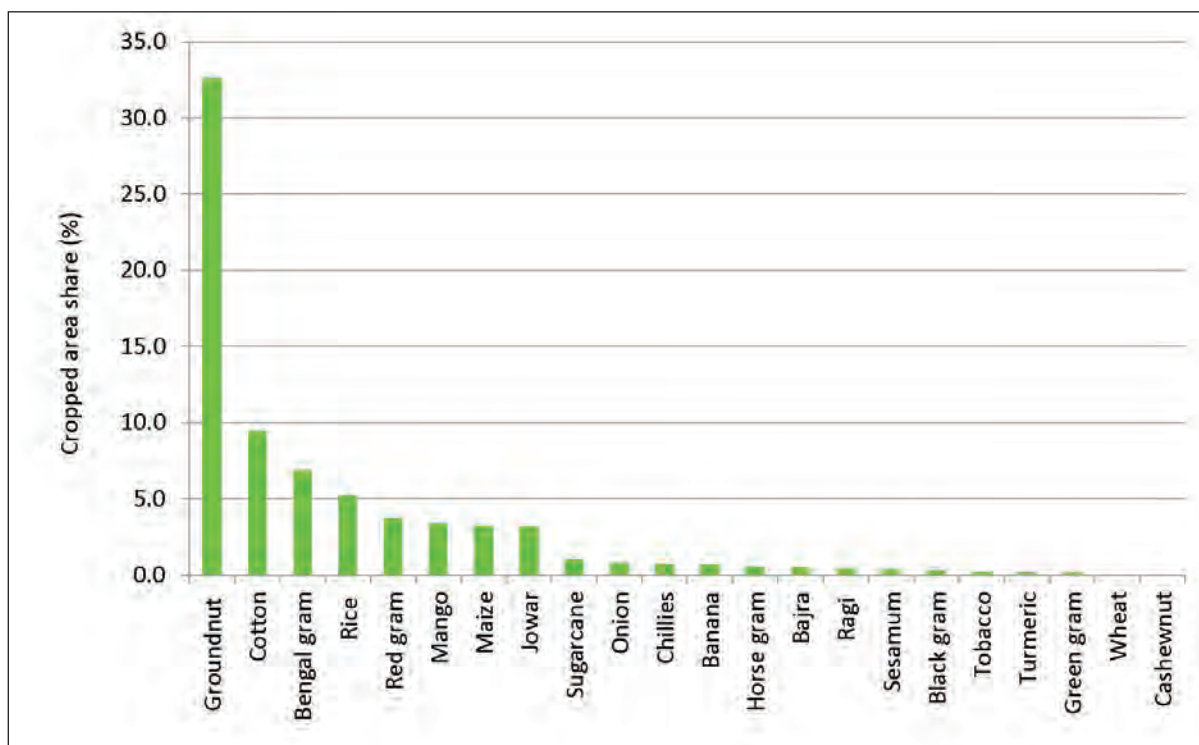


Figure 11. Crop-wise cropped area shares in the region (2014-15).

The individual crop area shares in total cropped area of the Rayalaseema Region during 2014-15 are depicted in Figure 11. More than 30% of the total cropped area in the region is occupied by groundnut. It was followed by cotton (9.4%), Bengal gram (6.9%), rice (5.2%), and red gram (3.7%). All these five crops together held a total share of nearly 58% of the total cropped area in the region during the study period. Among horticulture crops, mango leads followed by onion, chillies, banana, turmeric and cashewnut.

Similarly, the break-up given in the 12th livestock census conducted in the region are summarized below. Sheep were the single largest (58.6%) contributor to the total livestock population in the region, 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 12th livestock census. Around 16.9 million poultry also existed in this region which accounts for 20.7% of the state's total poultry population.

Relatively, 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 is very meagre (2.8%) in the total state production. Overall, the comparative status of Rayalaseema Region versus the state and country has been summarized and presented in Table 12.

9.2 Findings from the baseline survey

Findings from the baseline survey conducted across four study districts in the Rayalaseema Region are summarized and discussed in the following sub-sections. Simple tabular analysis was used to analyze the primary household survey data collected during the baseline survey from the cropping year 2014-15. Specifically, the results presented below are summarized from agricultural sample villages (nearly 32) covering about 1471 sample households in four pilot sites corresponding to the four study districts of the region. Due to absence of fishery sample villages in the four study district

Table 12. Comparative status of Rayalaseema Region vs. AP and India.

Parameter	India	Andhra Pradesh	Rayalaseema Region
Geographical area (000 Km ²)	3287.5	163.0	67.4
Population (Crores 2011 census)	121.09	4.96	1.52
Males (crores)	62.32	2.48	0.76
Females (crores)	58.75	2.47	0.75
Urban (Crores 2011 census)	37.71	1.46	0.45
Males (crores)	19.54	0.72	0.23
Females (crores)	18.16	0.73	0.22
Rural (Crores 2011 census)	83.37	3.49	1.07
Males (crores)	42.77	1.75	0.54
Females (crores)	40.59	1.74	0.53
Literacy (% in 2011)	74.04	67.35	65.59
Males (%)	82.14	74.77	75.18
Females (%)	65.46	59.96	55.95
GDP (₹ Crores in current prices, 2014-15)	12498662	520030	131284
Agril. and allied sectors (₹ Crores)	2337249.8	143498	36412
Industry sector (₹ Crores)	3962075.8	107224	28409
Service sector (₹ Crores)	6199336.3	269307	66463
Shares of sub-sectors in GDP (%)			
Agril. and allied sectors	18	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
Fishing	0.9	4.1	0.2

pilot sites, the baseline did not capture any sample households from the fishery sector. Overall a total of 1471 sample baseline farmers' household data have been analyzed and summarized in this report.

9.2.1 Distribution of sample across size groups and communities

The distribution of total baseline survey sample by district in the region is presented in Table 13. Overall, 1471 sample households were interviewed from 32 sample agricultural villages in the four pilot sites of the Rayalaseema Region. All the sample farmers were distributed and categorized under different size groups based on their total operational landholding during the 2014-15 cropping season. Out of the total 1471 sample, 1085 sample households belonged to small size (<5 acres) farmers' category, followed by medium (between 5 and 10 acres) size (152 HH and represents 10.33%), and large (>10 acres) size (50 HH which represents 3.4%) category. Nearly a total of 184 sample households belong to landless (operational landholding zero) farmers' category, which is also covered in this survey. They contribute approximately about 73.7%, 10.3%, 3.4% and 12.6% shares in the total baseline sample respectively, for small, medium, large and landless categories. This allocation among size groups is truly representative of the 2011 census survey conducted on 'operational landholdings' at the state level.

The total baseline sample in the region was also categorized based on the community they belonged to, district-wise, and presented in Table 13. Majority of the sample (640 HHs) belong to Backward Caste (BC) community followed by open category (504 HHs), Scheduled Caste (SC) community

Table 13. Size group and community-wise distribution of sample (agril.) in the region.

District	Total sample	Distribution by size group				Distribution community wise				
		Small	Medium	Large	Landless	OC	BC	SC	ST	Others
Chittoor	481	384	41	8	48	158	256	61	1	5
YSR 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
Total*	1471	1085	152	50	184	504	640	243	75	9
	(100.0)	(73.7)	(10.3)	(3.4)	(12.6)	(34.3)	(43.5)	(16.5)	(5.1)	(0.6)

* Figures in parenthesis indicate their respective shares in total sample

category (243 HHs), Scheduled Tribe (ST) community category (75 HHs), and Others (9 HHs). 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 from district to district.

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

The details of average family size, extent of literacy and participation in labor market etc., are analyzed and presented in Table 14. The average family size of the household for the total sampled farmers in the region is 4.5. The highest family size (4.8) was noticed in case of Chittoor district while the lowest (4.0) was observed in Anantapur district. On the whole, only 48.3% of total sample in the region had literacy, of which 16.5% had primary level of education while another 31.8% had upper primary and above level of education status in the region. Nearly 51.7% of the total sample were uneducated or did not have access to education. The extent of illiteracy was much higher in the case of Kurnool and Anantapur districts' sample farmers. Special attention should be placed on promotion of education and other basic amenities in these districts. The highest literacy rate was noticed in Chittoor district sample farmers than in any other district in the state. Majority of family members (55.6%) in the sample work in their own farm. Many of the sample districts exhibited similar 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 their livelihoods. In general, most of the sample districts in the region showed higher levels of outside labor market participation.

Table 14. Socio-economic details of sample in Rayalaseema Region.

District	Avg. family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Uneducated	Primary	Upper primary and above	Own farm* (no.)	Outside farm* (no.)
Chittoor	4.8	45.7	15.0	39.3	2.5	1.9
YSR 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
Average	4.5	51.7	16.5	31.8	2.5	2.2

*including children in the family

9.2.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details district-wise in the Rayalaseema Region are furnished in Table 15. The average total own landholding per household for the entire region sample was estimated at 1.41 ha, out of which 0.46 ha of land had access to irrigation while another 0.95 ha was grown under rainfed situation. Especially in Rayalaseema districts, rainfed landholdings dominate in the total own landholding category. But in the case of Guntur, Krishna and West Godavari districts, irrigated landholdings have the lion's share in the total own landholdings category. The extent of average operational landholding for the total sample households in the region was calculated at 1.42 ha. A very negligible share of cropland was leased-in from outside land markets of the region. The extent of tenancy for the total sample households was only 5.5% (excluding landless households).

Table 15. 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
YSR 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

9.2.4 Household assets and livestock ownership

The details about ownership of household assets and livestock for the total sample in the Rayalaseema Region are presented district-wise in Table 16. Nearly 98.3% of the total sample households stated that they possess a residential house. Only about 11.5% sample households indicated that they also own cattle sheds for accommodating their buffaloes, cows, and bullocks. Television sets (89.9%) and mobile phones (93.9%) are the 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. Slight variation in ownership was observed from item to item and its possession among study districts in the region.

The details about average livestock ownership per sample household is also summarized in Table 16. On average, every fifth sample HH in the region had one draft animal. Similarly, every third sample HH in the Rayalaseema region also had one cow and buffaloes. Apart from these animals, many

Table 16. Household assets and livestock ownership in Rayalaseema Region pilot sites.

District	% sample households possess assets					Average no. per sample HH			
	Residential house	Cattle shed	Television	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total*
Chittoor	97.7	22.3	91.3	94.6	42.8	0.1	0.6	0.0	3.4
YSR 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.

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 in the region 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 animals owned per household was recorded in Anantapur (5.1) while the lowest was observed in Chittoor (3.4).

9.2.5 Major crops and their productivity levels

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 Table 17. Both district and pilot site-wise productivity levels are discussed below.

Paddy, groundnut and horse gram are the major crops observed in the Chittoor pilot site. The average productivity levels in case of paddy (3.73 t ha⁻¹) and horse gram (0.54 t ha⁻¹) are on par with district average yields. But the groundnut productivity (0.60 t ha⁻¹) in the pilot site is lower by nearly 47% than 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% than national average yield. Crops, such as pearl millet (bajra), 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 and the only limitation for them was availability of sufficient irrigation water.

Table 17. Productivity levels of major crops across pilot sites.

Crop	Avg. pilot site (1)	Avg. dist (2)	Avg. state (3)	Avg. nation (4)	% change (1 over 2)
Chittoor					
Paddy	3733	3390	3094	2462	10
Pearl millet (bajra)	803	2184	1663	1214	-63
Sorghum (jowar)	2894	833	2247	954	247
Maize	9469	5423	6286	2553	75
Horse gram	537	543	527	NA	-1
Finger millet	747	1348	1045	NA	-45
YSR Kadapa					
Paddy	2521	2843	3094	2462	-11
Pearl millet	810	1933	1663	1214	-58
Sorghum	1022	1653	2247	954	-38
Maize	5527	6753	6286	2553	-18
Horse gram	636	643	527	NA	-1
Groundnut	626	1356	749	996	-54
Anantapur					
Paddy	3189	2,177	3094	2462	46
Pearl millet	865	921	1663	1214	-6
Sorghum	849	611	2247	954	39
Groundnut	511	430	749	996	19
Red gram	636	186	565	806	242
Horse gram	535	574	527	NA	-7
Kurnool					
Paddy	4342	3670	3094	2462	18
Pearl millet	1565	1135	1663	1214	38
Sorghum	1874	2050	2247	954	-9
Groundnut	931	1016	749	996	-8
Cotton	1347	3335	3233	489	-60
Red gram	1070	418	565	806	156

In case of YSR Kadapa, paddy, groundnut and cotton are the major crops grown by sample farmers in the pilot site. But the productivity of paddy (2.52 t ha⁻¹) in the pilot site exhibited nearly 11% lower yields than the average district yield (2.84 t ha⁻¹). Groundnut (0.62 t ha⁻¹) in the pilot site also under-performed by 54% than the district average yield. Relatively, the average productivity levels in case of cotton (1.38 t ha⁻¹) are on par with the district average (1.47 t ha⁻¹). Huge scope and potential exists for enhancing productivity levels across crops in the pilot site.

Paddy, groundnut and red gram are major crops cultivated in the pilot site of Anantapur district. The productivity levels of paddy, sorghum, groundnut and red gram are higher than both district and state level averages. Groundnut being the major crop cultivated in the district, huge scope and potential exists for further enhancement of its productivity. The mean productivity levels were significantly lower in case of pearl millet, horse gram, castor and cotton than the district average yield, as reported by Directorate of Economics and Statistics.

In case of Kurnool pilot site, paddy, groundnut and cotton are the major crops cultivated by the sample farmers. The performance of paddy (4.34 t ha⁻¹) was good and it is better than both the district (3.67 t ha⁻¹) and state average (3.09 t ha⁻¹) yields. But the performance of groundnut, sorghum and cotton is lower than district average yields. Potential opportunities are available for enhancing both cotton and groundnut yields in the pilot site. All other crops showed at least 10-20% higher margin of yields in the pilot site than the 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 more market linkages.

9.2.6 Economics of crop enterprises

Details on the economics of major crop enterprises per ha across pilot site districts are summarized in Figures 12 to 14. Crop-wise details about performances of major crops in the Rayalaseema Region are discussed and summarized below.

In the four Rayalaseema districts, paddy and vegetables were the major crops on irrigated land while groundnut, cotton, horse gram and red gram were the major rainfed crops preferred in these study districts. The cultivation of paddy is quite economical across four districts, except in Anantapur district. Recurrent droughts and insufficient water during the crop period are the major problems,

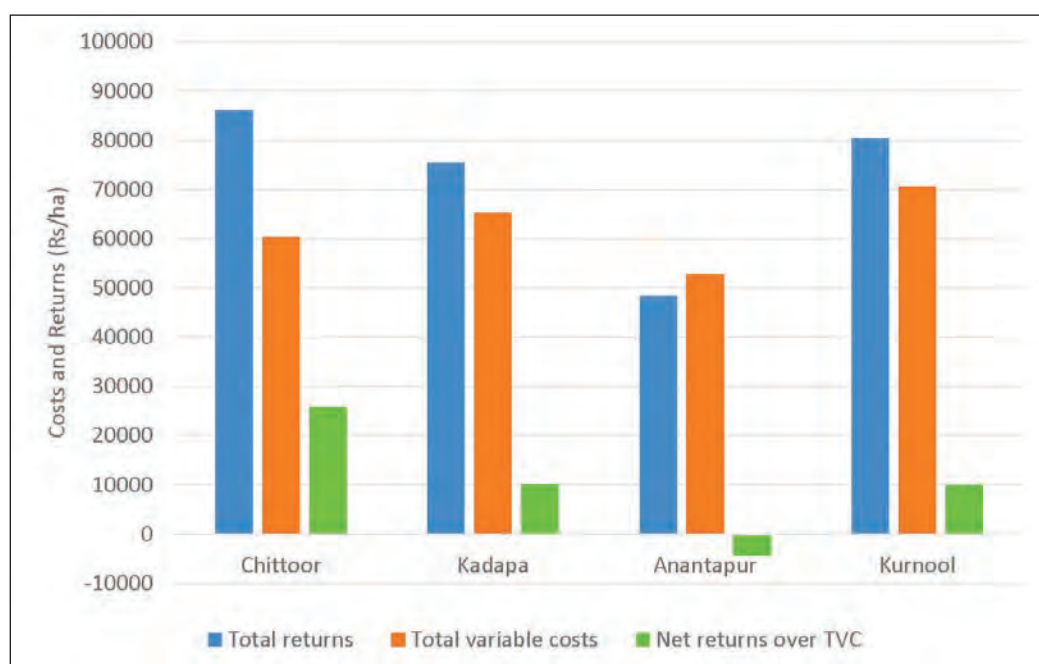


Figure 12. Performance of paddy in Rayalaseema Region.



Figure 13. Performance of groundnut in Rayalaseema Region.

stated the sample farmers from these districts. Groundnut, the dominant rainfed crop in the entire Rayalaseema Region, was unable to recover its total costs per ha. It barely earned 80-90% of its total costs across the four study districts. Similarly, the cultivation of cotton was also not economical in both Kadapa and Kurnool districts of Rayalaseema region. None of the sample crops grown in the region could recover its total costs per hectare.

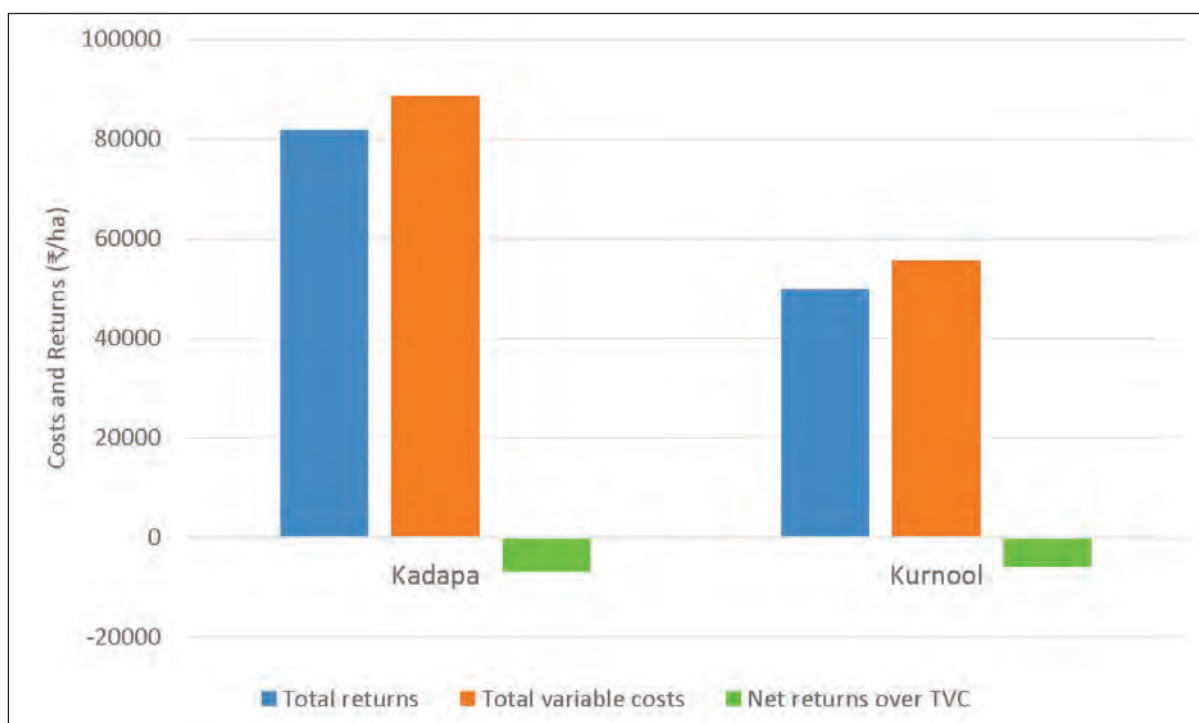


Figure 14. Performance of cotton in Rayalaseema Region.

For further details on costs and returns of various crops per ha across pilot sites refer to the district-specific Baseline Reports prepared under similar guidelines. Details about economics of fish cultivation were not available from the Rayalaseema Region because of non-coverage of baseline sample households from fishery villages in the region.

9.2.7 Pilot site GVA estimations across sub-sectors

The details about pilot site-wise Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Table 18 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 AP Primary Sector Mission baseline survey. However, the present section summarizes the results for the four major districts in the Rayalaseema Region.

Table 18. Primary Sector GVA estimations in Rayalaseema pilot sites (Base year: 2014-15).

District	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agril. including horticulture	Animal husbandry	Fisheries
Chittoor	14.24	11.17	0.00	25.41	56.04	43.96	0.00
Kadapa	22.06	23.73	0.00	45.79	48.18	51.82	0.00
Anantapur	4.30	21.85	0.00	26.15	16.44	83.56	0.00
Kurnool	26.60	10.80	0.00	37.40	71.12	28.88	0.00
Regional total	67.20	67.55	0.00	134.75	49.87	50.13	0.00

Overall, the total estimated GVA from AP Primary Sector Mission's four pilot sites in the Rayalaseema Region are ₹ 134.75 crores, out of which, 67.2 crores (49.87%) is contributed by the agriculture sub-sector including horticulture. Another 67.55 crores is contributed by animal husbandry which accounts for 50.13% share in total GVA of the AP Primary Sector Mission in the region. The fisheries sub-sector could not be added to the GVA because of its non-coverage in the four pilot sites of the region. Sector-wise contributions and corresponding share values are depicted in Figure 15.

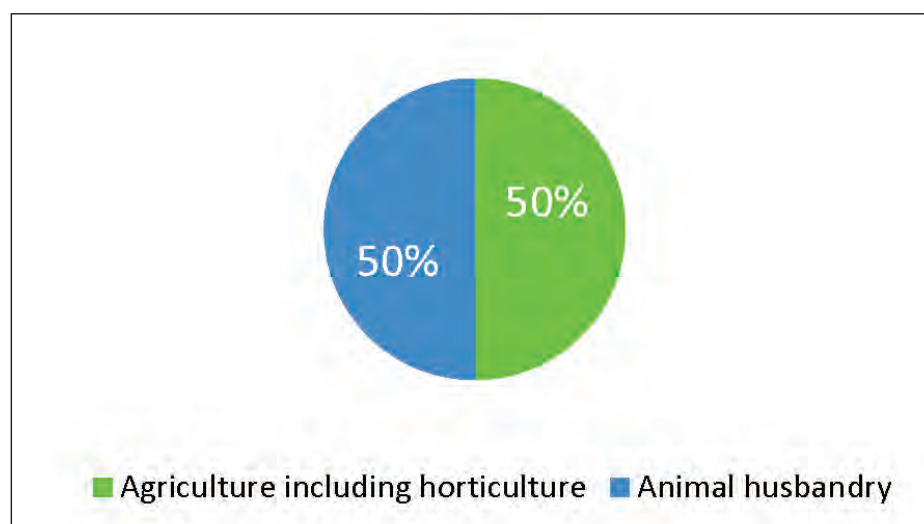


Figure 15. Sub-sector wise shares in the total GVA estimation.

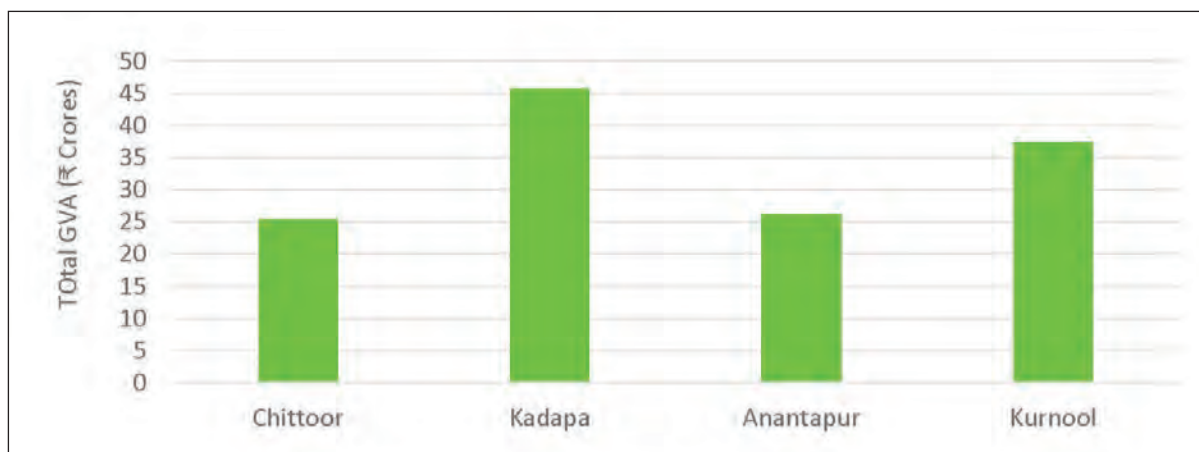


Figure 16. Total GVAs estimations by district pilot in the region.

Among all the four pilot sites, Kadapa district pilot site has contributed the highest value (45.79 crores) followed by Kurnool district pilot site (37.40 crores) and Anantapur district pilot site (26.15 crores). The lowest GVA value was recorded by Chittoor district pilot site (25.41 crores). The total GVA values by district pilot site in the region are presented in Figure 16.

The highest amount of GVA contributed to the agricultural sub-sector including horticulture was from Kurnool district pilot site (26.60 crores), followed by Kadapa district pilot site (22.06 crores) and Chittoor district pilot site (14.24 crores). The lowest value was contributed by Anantapur district pilot site (4.30 crores). In case of animal husbandry sub-sector, the highest value was contributed by Kadapa district pilot site (23.73 crores), followed by Anantapur district pilot site (21.85 crores) and Chittoor district pilot site (11.17 crores). It is good to see both Kadapa and Anantapur district pilot sites contributing significantly to the animal husbandry sub-sector even though they are relatively backward in the agriculture sub-sector. The lowest GVA from animal husbandry sub-sector in the region was contributed by Kurnool district (10.80 crores). The fisheries sub-sector did not contribute in the region due to its non-coverage in the four pilot sites. The composition of each pilot site GVA by sub-sector is summarized in Figure 17.

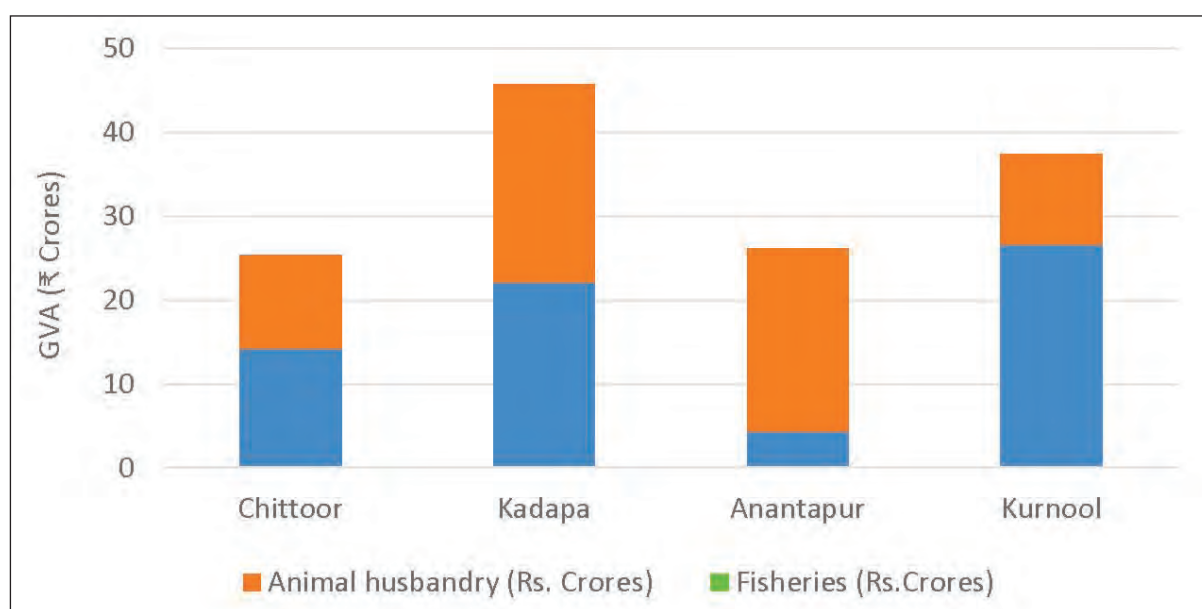


Figure 17. Composition of pilot site GVAs by sub-sector in the region.

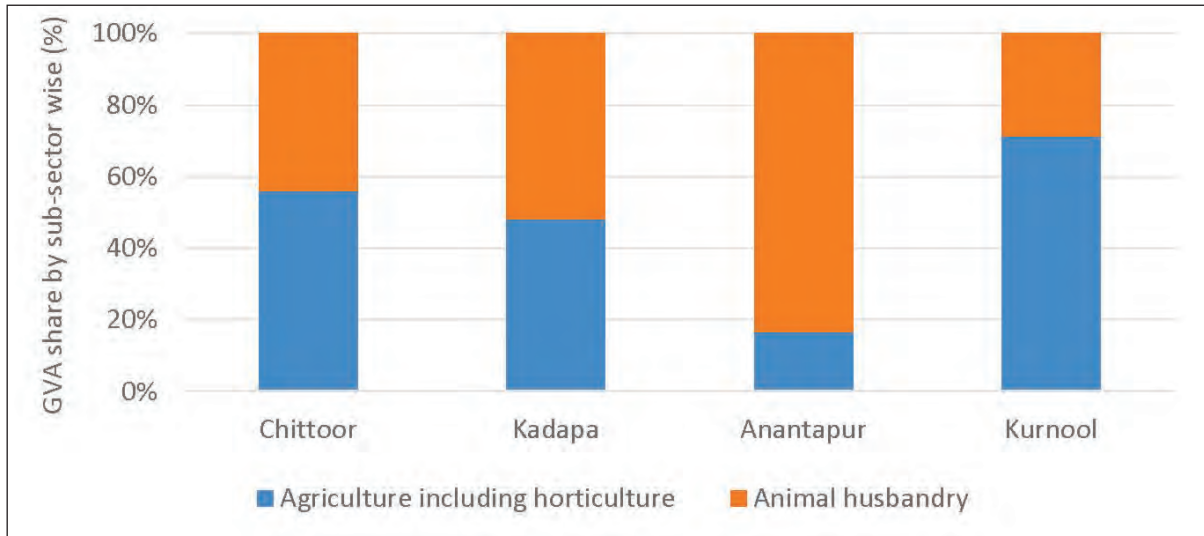


Figure 18. Shares of different sub-sectors in total GVA.

Overall, the dominance and significant share of contributions to different sub-sectors in each district's total pilot site GVA estimations in the Rayalaseema Region are presented in Figure 18. Nearly 84% share of total GVA in the Anantapur district pilot site is contributed by the animal husbandry sub-sector. In contrast to Anantapur, Kurnool district pilot site had the highest share (71.12%) from contribution of agriculture including horticulture. In the case of Chittoor and Kadapa, both agriculture (including horticulture) and animal husbandry played a significant role in the total GVA contributions.

The total district GVA value per pilot site village was estimated in order to understand the extent of potential contributed by each pilot village in the Rayalaseema Region. The district-wise estimations in the region are summarized in Figure 19. Per village contribution of GVA was the highest from Kurnool district pilot site, followed by Kadapa and Anantapur district pilot sites. The lowest contribution per district pilot site village was noticed from Chittoor district. It is very interesting to see that each district pilot site village in Kurnool is contributing nearly 2 to 3 times higher the GVA value than each 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 the Rayalaseema Region.

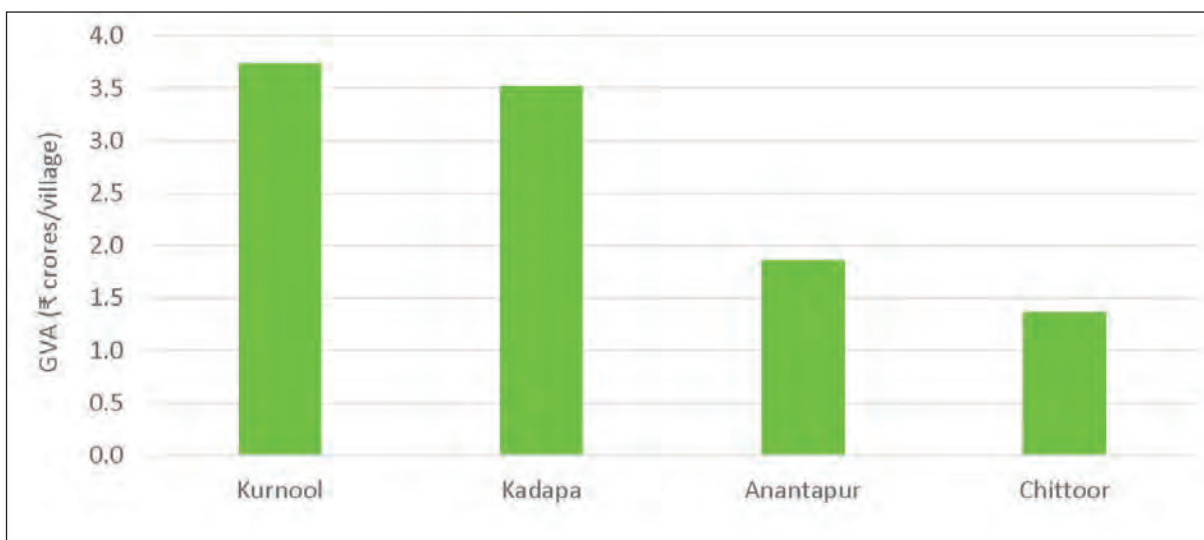


Figure 19. GVA value per pilot site village (₹ crores) in the region.

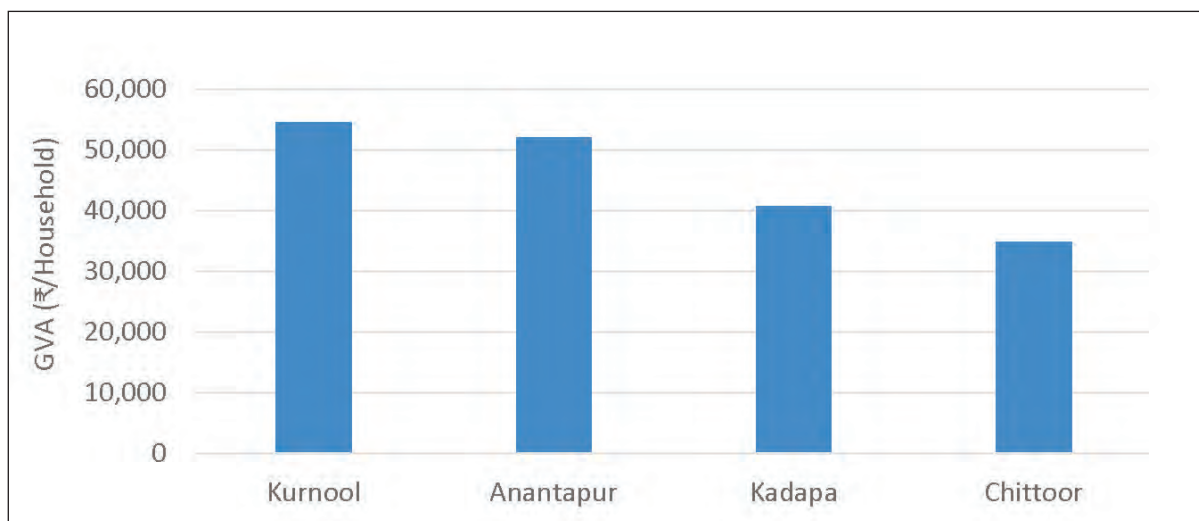


Figure 20. GVA value per district pilot site household (₹/household) in the region.

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 20 in descending order of merit. Kurnool district pilot site households retained their first rank followed by Anantapur and Kadapa districts pilot site households. The average household earnings per annum during 2014-15 in the Kurnool district pilot site was calculated at ₹54,487, while the lowest earning per pilot site household per annum (₹34,781) was observed in Chittoor district in the region. The average earnings from agriculture and allied sectors per household of Kurnool district was more than 1.57 times higher than average sample household earnings in Chittoor district pilot site.

In the same way, the average total GVA contributions from each hectare of landholdings in the district pilot site was calculated and compared among study districts in the Rayalaseema Region (see Figure 21). Each ha of agricultural land in YSR Kadapa district pilot site is contributing almost ₹44,396 per annum towards the total GVA of the district primary sector. The highest value was observed in the Rayalaseema Region among study districts. The average earnings from each ha of cultivated land was the lowest in Anantapur (₹26,150) district pilot site. Cultivation of more commercial crops in the district might have helped the YSR Kadapa district to earn 1.69 times higher income than a typical rainfed per ha cultivation in Anantapur district.

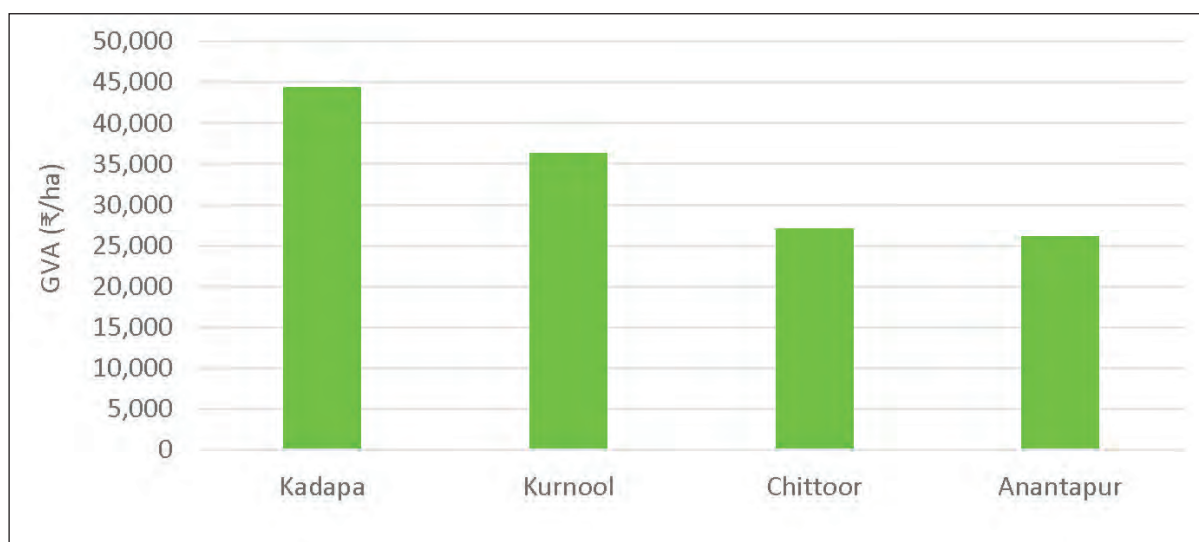


Figure 21. GVA value per district pilot site ha area (₹ per ha) in the region.

9.3 Summary and way forward

On the whole the comprehensive baseline survey conducted in the region has covered about 1471 sample HHs spread over 55 villages from 11 mandals in four districts (Chittoor, Kadapa, Anantapur and Kurnool) of Rayalaseema Region of Andhra Pradesh State. Specifically, the results are summarized from agricultural sample villages (nearly 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 the total sample are uneducated. About 55.5% of family members only participate in their farm activities/operations. The pooled average operational landholding 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 televisions 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 seen to limit the total agricultural potential realization in the region. Irrigated crops (only paddy) alone were able to recover its total costs while majority of rainfed crops (groundnut and cotton) experience negative net returns over total variable costs across the four study districts. Agriculture, including horticulture and animal husbandry, contributed almost equal share in the total GVA of Rayalaseema Region. The fisheries sub-sector did not contribute to regional GVA estimation because of its absence in the four district pilot sites.

The other major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below. Immediate steps are required to address these issues so as to enhance each sub-sector's contribution to the total primary sector GVA in the Rayalaseema Region.

Table 19. Summary of key findings and specific recommendations.

Key findings	Specific recommendations
1. Recurrent droughts, uneven distribution of rainfall and low groundwater potential are the major concerns in Chittoor, Kadapa, Anantapur and Kurnool district pilot sites.	1. High emphasis should be placed on <i>in-situ</i> and <i>ex-situ</i> water conservation technologies in the pilot site villages so that groundwater recharge and its efficient use can be realized quickly. Measures to enhance water-use-efficiency to increase productivity need to be identified and promoted. 2. The major tanks located in the pilot sites should be interconnected through major irrigation canals and thereby the groundwater recharge can be improved much faster and assured irrigation will be available.
2. The extent of adoption of improved cultivars (including drought and disease tolerant ones) are still low in major crops, such as groundnut, red gram, horse gram, mango, banana, etc., in selected pockets of pilot site villages.	3. Huge opportunities available for introduction of new improved cultivars both in field and horticultural crops so that productivity can be improved by at least 10-15% very quickly. Appropriate local alternate seed systems need to be developed and popularized.
3. Overall the soils are low- to medium-fertile and yield gaps exist for major crops in the region. These are discussed in detail, pilot site-wise, in comparison with district and national average yields.	4. Good scope for introduction of better management practices (including soil, water, crop, IPM practices and micro irrigation) to improve crop yields and minimize the per unit output costs. It will significantly improve the competitiveness of our commodities in international markets.

Continued.

Table 19. Continued.

Key findings	Specific recommendations
4. On the whole 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.	5. Enormous scope for introduction of cross-bred animals and creating awareness on feeding practices to increase average milk productivity across pilot site villages.
5. Majority of sample farmers are not happy with the milk pricing structure and adulteration practices followed by local dairy milk collection centers.	6. Good scope for strengthening of formal market channels in case of milk, meat and eggs trading so as to avoid the role of middlemen across all scales. The total output in this sector is marketed informally.
6. Nearly 50% of small ruminants in the state is being reared in this region. But there is no proper marketing channels and processing facilities in the region.	7. The surplus fodder producing districts (such as Krishna, West Godavari and East Godavari) should be inter-linked with fodder deficit districts (especially in Rayalaseema Region) in the lean period so that fodder scarcity can be mitigated partially.
7. Absence of commodity-based market clusters and value chains (especially in the case of horticultural crops) even though the district pilot sites are producing in huge quantities	8. Enormous potential for trading and scientific processing of meat from the small ruminants grown in the region.
8. Sericulture industry is almost disappearing in the region due to crashing prices of cocoons and frequent outbreaks of diseases.	9. Huge opportunities for piloting commodity specific value chains for targeting export markets. For example: Tomato, vegetables and mango – Chittoor Groundnut – Anantapur, Kurnool and Chittoor Paddy – Kurnool Banana – Kadapa
9. Unemployment is most common in the villages due to poor performance of agriculture and recurrent droughts in the region.	10. The domestic silk industry should be protected through support in the form of attractive remunerative output prices and controlling measures to make them competitive with cheap Chinese silk. This can be done through an appropriate duty and taxation regime.
	11. Huge opportunity for promotion of non-farm employment skill development in the region.

10. Baseline Survey Insights from Delta Region

10.1 Overview of Delta Region agriculture

Delta Region is a geographic region in the Indian state of Andhra Pradesh. It includes the southern districts of East Godavari, West Godavari and Krishna. With a total geographical area of 27,000 km², it occupies approximately 18.4% of the state territory. It has a population of 13,798,964 (2011 census), which is 27.83% of the state's population. East Godavari district is the most populous district (5.2 millions) in the state. The region is covered with 3547 census villages and 49 (statutory and census) towns. The average density of the population is estimated at 467 persons per km². The highest population density in the region was observed in Krishna (518 persons per km²) while the lowest was in East Godavari district (413 persons per km²). The average decadal growth of population in the region was estimated at 5.51%. But among the districts in the region, the highest growth in decadal population was observed in case of Krishna district (7.87%). Based on the 2011 census, the average literacy rate in the region was 73.12%. Overall, urban population has higher levels (81.92%) of literacy than the rural population in the region (69.49%). The annual normal rainfall in the region ranged between 1030-1216 mm. Out of three districts in the region, East Godavari (1216.9 mm) receives better annual rainfall followed by West Godavari (1153.0 mm) and Krishna (1033.5 mm).

Of the total geographical (2.73 million ha) area of the Delta Region, about 51.5% (1.40 million ha) is the net area sown (including fish and prawn culture) under different crops. Around 29.6% of the total geographical area (0.80 million ha) is sown more than once. The gross irrigated area in the region is estimated at only about 1.61 million ha (around 39.4% share of the total state). Agriculture, which is mostly irrigated, has been the main livelihood occupation of the farmers in the region. Nearly 85.2% of total cropped area is under food crops and the remaining is under non-food crops.

Total cereals and millets together contribute about 60.9% of the total cropped area (see Fig. 22). It was followed by other commercial crops, such as cotton and tobacco including fruits and vegetables, which accounted for 28.4%. The total pulses group occupied the third place (7.9%) in aggregate sown area in the region. Total oilseeds together secured the fourth place and have coverage of about 2.9% in the region.

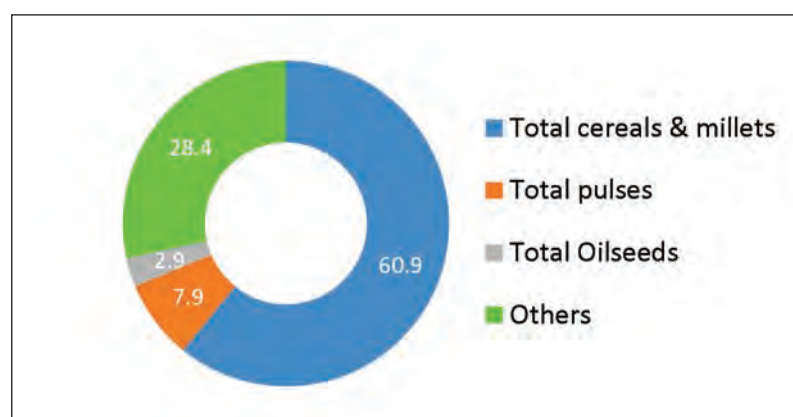


Figure 22. Share of total cropped area among crop groups.

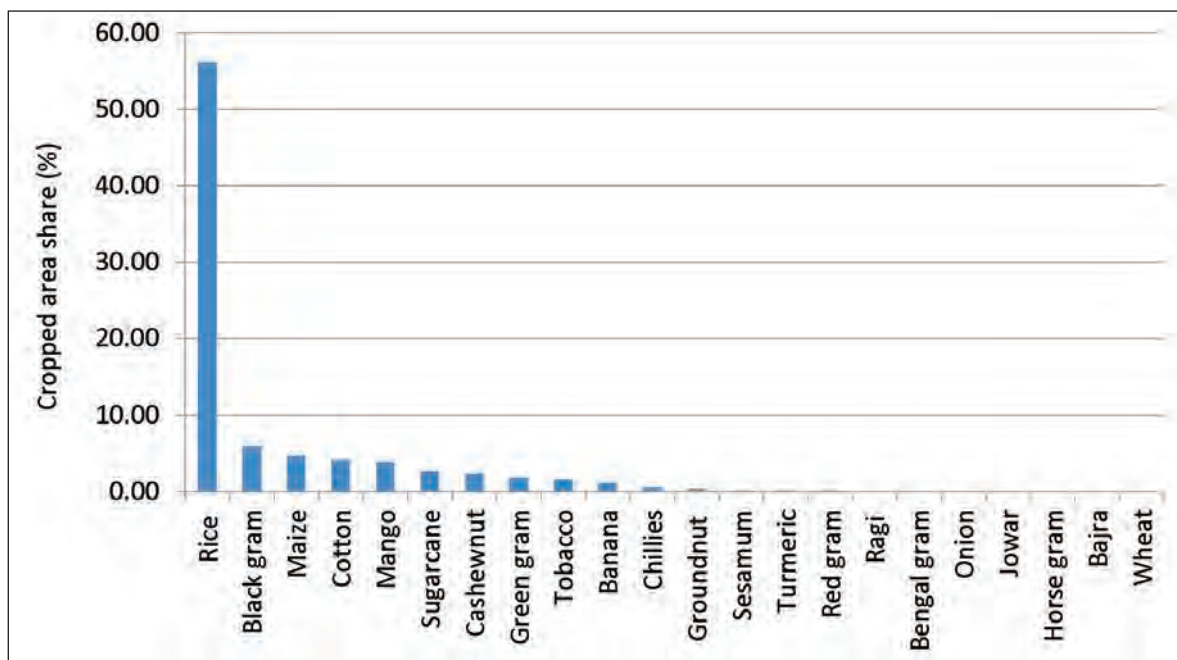


Figure 23. Crop-wise cropped area shares in the region (2014-15).

The individual crop area shares in total cropped area of the Delta Region during 2014-15 are depicted in Figure 23. More than 56% of total cropped area in the region is occupied by rice, and it was followed by black gram (5.9%), maize (4.6%), cotton (4.1%) and mango (3.8%). All these five crops together have a total share of nearly 74.5% in the total cropped area of the region during the study period. Among horticulture crops, mango is leading followed by cashewnut, banana, turmeric, and onion.

Similarly, the break-up given in the 12th livestock census conducted in the region are summarized here. Buffaloes are the single largest (43.3%) contributor to total livestock population in the region. It was followed by sheep (26.5%), cattle (14.8%) and goats (14.3%). Pigs and other livestock animals together had a share of only 1.2% in the 12th livestock census. Around 43.14 million poultry also existed in the region, which accounts for 52.7% of the total state poultry population.

Relatively, fisheries play a major role in the Delta Region of Andhra Pradesh. Both marine fish and prawn production contribute to the GVA in the region. Around 32.4% of total marine fish and prawn production in the state occurred in the Delta Region. Similarly, inland fish and prawn production is a significant activity in the region. This region has a share of nearly 84% in the state's total production of inland fish and prawn. Approximately 50% of the total brackish water prawn production in the state also takes place in this region. Overall, this region contributes significantly to the state GVA of fisheries sector. The comparative status of Delta Region beside the state and country has been summarized and presented in Table 20.

Table 20. Comparative status of Delta Region vs. Andhra Pradesh and India.

Parameter	India	Andhra Pradesh	Delta Region
Geographical area (000 km ²)	3287.5	163.0	27.0
Population (Crores 2011 census)	121.09	4.96	1.37
Males (crores)	62.32	2.48	0.69
Females (crores)	58.75	2.47	0.68
Urban (Crores 2011 census)	37.71	1.46	0.40
Males (crores)	19.54	0.72	0.20
Females (crores)	18.16	0.73	0.20
Rural (Crores 2011 census)	83.37	3.49	0.98
Males (crores)	42.77	1.75	0.49
Females (crores)	40.59	1.74	0.49
Literacy (% in 2011)	74.04	67.35	73.12
Males (%)	82.14	74.77	76.91
Females (%)	65.46	59.96	69.35
GDP (₹ Crores in current prices, 2014-15)	12498662	520030	160982
Agril. and allied sectors (₹ Crores)	2337249.8	143498	52259
Industry sector (₹ Crores)	3962075.8	107224	26910
Service sector (₹ Crores)	6199336.3	269307	81813
Shares of sub-sectors in GDP (%)			
Agril. and allied sectors	18	27.6	32.5
Crops	11.8	15.4	14.6
Livestock	3.9	7.1	8.5
Forestry and logging	1.4	1.0	0.8
Fishing	0.9	4.1	8.5

10.2 Findings from the baseline survey

The findings from baseline surveys conducted across three study districts in the Delta Region are summarized and discussed in the following sub-sections. 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 and fishery sample villages (nearly 37) covering about 1229 (1030 Agril. + 199 fishery) sample households in three pilot sites corresponding to the three study districts in the region. Due to dominance of fishery sector in the three study district pilot sites, the baseline has also captured about 199 fishery sample households in the total targeted. Overall a total of 1229 sample baseline farmers' household data have been analyzed and summarized in this report.

10.2.1 Distribution of sample across size groups and communities

The distribution of total baseline survey sample (*agricultural sample HHs only*) district-wise in the region is presented in Table 21. Totally 1030 sample households have been interviewed from 28 sample agricultural villages in the three pilot sites of the Delta Region. All the sample farmers are distributed and categorized under different size groups based on their total operational landholding during the 2014-15 cropping season. Out of the total 1030 sample, 583 sample households belonged to small size (<5 acres) farmers' category, followed by medium (between 5 and 10 acres) size (172 HH

representing 16.7%), and large (>10 acres) size (119 HH representing 11.5%) category. Nearly a total of 156 sample households belong to landless (operational landholding zero) category who are also covered in the baseline survey. They contribute approximately about 56.6%, 16.7%, 11.5% and 15.2% shares in the total baseline sample respectively, for small, medium, large, and landless categories. This allocation among size groups is truly representative of the 2011 census survey conducted on 'operational landholdings' at the state level.

The total baseline sample in the region was also categorized based on the community they belonged to, by district, and it is presented in Table 21. Majority in the sample (397 HHs) belong to open category (OC) community followed by Backward Caste (BC) community category (338 HHs), Scheduled Caste (SC) community category (151 HHs), and Scheduled Tribe (ST) community category (144 HHs). They contributed approximately 38.5%, 32.8%, 14.7% and 14.0% respectively, in OC, BC, SC, and ST communities. The pattern of distribution of sample community-wise varied from district to district.

Table 21. Size group and community-wise distribution of sample (agril.) in the region.

District	Total sample	Distribution by size group				Distribution by community				
		Small	Medium	Large	Landless	OC	BC	SC	ST	Others
Krishna	366	222	56	41	47	155	88	114	9	0
W. Godavari	310	149	61	44	56	123	164	22	1	0
E. Godavari	354	212	55	34	53	119	86	15	134	0
Total*	1030	583	172	119	156	397	338	151	144	0
	(100)	(56.6)	(16.7)	(11.5)	(15.2)	(38.5)	(32.8)	(14.7)	(14.0)	(0.0)

*Figures in parenthesis indicate their respective shares in total sample.

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

The details of average family size, extent of literacy and participation in labor market, etc., are analyzed and presented in Table 22. The average family size of the household for the total sampled farmers in the region is 3.8. The highest family size (4.1) was noticed in East Godavari district while the lowest (3.6) was observed in Krishna district. On the whole, only 40.8% of total sample in the region had literacy, out of which 11.4% had primary level of education while another 29.4% had upper primary and above level of education status in the region. Nearly 59.2% of the total sample were either uneducated or did not have access to education. The extent of illiteracy was much higher in East and West Godavari districts' sample farmers in the region. Special attention should be placed on promotion of education and other basic amenities in these districts. The highest literacy rate was noticed in Krishna district sample farmers than in any other district in the region. Majority of family members (47.4%) in the sample participate in their own farm work. The majority of sample districts

Table 22. Socio-economic details of sample in Delta Region.

District	Avg. family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Uneducated	Primary	Upper primary and above	Own farm* (no.)	Outside farm* (no.)
Krishna	3.6	55.2	8.7	36.1	1.7	1.1
W. Godavari	3.7	55.8	11.3	32.9	1.6	0.7
E. Godavari	4.1	66.7	14.1	19.2	2.0	1.4
Delta Region	3.8	59.2	11.4	29.4	1.8	1.1

*including children in the family

exhibited similar levels of own farm labor participation in the Delta Region. Another 28.9% of total family members were also participating in the outside labor market for their livelihood. Most of the sample districts in the region showed lower levels of participation in the outside labor market.

10.2.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details by district in the Delta Region are furnished in Table 23. The average total own landholding per household for the entire region sample was estimated at 1.69 ha, of which 1.24 ha of land was covered with irrigation access while another 0.45 ha was grown under rainfed situations. Specifically, in the Delta Region districts irrigated landholdings dominate in the total own landholding scenario. But in the case of Rayalaseema Region districts, rainfed landholdings hold the lion's share in the total own landholdings. The extent of average operational landholding for the total sample households in the region was calculated at 2.39 ha. A significant share of cropland (0.70 ha per HH) was also leased-in from outside land markets in the region. The extent of tenancy for the total sample households in the region was 35.7 % (excluding landless households).

Table 23. Landholding particulars in Delta Region pilot sites (ha).

District	Own landholding (ha)			Operational landholding (ha)			Extent of tenancy in the sample%
	I	R	T	I	R	T	
Krishna	1.30	0.20	1.50	2.27	0.28	2.55	45.1
W. Godavari	1.82	0.20	2.02	2.51	0.20	2.71	31.0
E. Godavari	0.61	0.93	1.54	0.85	1.05	1.90	31.0
Average	1.24	0.45	1.69	1.88	0.95	2.39	35.7

I: irrigated; R: Rainfed; T: Total

10.2.4 Household assets and livestock ownership

The details about owning of household assets and livestock for the total sample in the Delta Region are presented district-wise in Table 24. Nearly 96.2% of the total sample households stated that they possess a residential house. Around 19.4% sample households indicated that they also own a cattle shed for accommodating/rearing of buffaloes, cows and bullocks. Televisions (85.6%) and mobile phones (81.4%) are the most common consumer durables owned by many of the sample farmers across study districts in the region. Approximately, more than a quarter (43.1%) of total sample farmers also possessed two wheelers. Slight variation in ownership was observed from item to item and its possession among study districts in the region.

The details about average livestock ownership per sample household is also summarized in Table 24. On an average, every tenth sample HH in the region had one draft animal. Similarly, every fifth

Table 24. Household assets and livestock ownership in Delta Region pilot sites.

District	% sample households possess assets					Average no. per sample HH			
	Residential house	Cattle shed	Television	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total*
Krishna	98.4	12.8	92.3	83.9	44.8	0.0	0.1	0.4	0.7
W. Godavari	96.1	22.3	78.4	78.3	56.5	0.0	0.2	0.9	1.4
E. Godavari	94.0	23.0	86.0	82.0	28.0	0.2	0.2	0.4	1.1
Average	96.2	19.4	85.6	81.4	43.1	0.1	0.2	0.5	1.1

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

sample HH in the Delta Region owned one cow. Almost every alternate household also possessed one 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 1.1. The composition of different livestock animals varied significantly from district to district in the region. Overall, the highest number of livestock animals per household was in West Godavari (1.4) while the lowest observed was in the case of Krishna (0.7).

10.2.5 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 Table 25. The district and pilot site-wise productivity levels are discussed below.

Table 25. Productivity levels of major crops across pilot sites.

Crop	Avg. pilot site (1)	Avg. district (2)	Avg. state (3)	Avg. nation (4)	% change (1 over 2)
Krishna					
Paddy	4810	3230	3096	2460	49
Maize	6500	6920	6290	2360	-6
Sugarcane	61810	89000	60000	69120	-31
Green gram	1000	710	610	480	41
Black gram	1000	910	780	560	10
Cotton	2690	3790	3230	490	-29
West Godavari					
Paddy	5330	3190	3090	2460	67
Maize	6440	7090	6290	2360	-9
Oil palm	26870	NA	NA	NA	NA
Mango	8000	7920	7900	7020	1
East Godavari					
Paddy	4060	2,990	3090	2460	36
Sugarcane	67130	72000	60000	69120	-7
Tapioca	12900	20080	NA	NA	NA
Cotton	1570	1135	3230	460	38
Oil palm	7300	NA	12000	NA	NA
Sesame	410	260	350	NA	58

Paddy, maize and cotton are predominant crops grown in the Krishna district pilot site. Paddy (4.80 t ha⁻¹) and maize (6.50 t ha⁻¹) are performing better than district average yields (3.23 t ha⁻¹ for paddy; 6.92 t ha⁻¹ for maize). Good scope exists for further improvement of productivity in case of cotton (2.68 t ha⁻¹). The mean productivity levels were significantly lower in case of sugarcane and cotton than the district average yield reported the Directorate of Economics and Statistics. Issues, such as labor shortage and sustaining the long-term productivity levels of major cereal crops, are among the biggest challenges in the pilot site. More efforts need to be taken on strengthening markets and value chains.

In the case of West Godavari, paddy, maize and oil palm are major crops preferred by sample farmers in the pilot site. All three crops performed well in terms of productivity (5.33 t ha⁻¹ for paddy, 6.43 t ha⁻¹ for maize, and 26.8 t ha⁻¹ for oil palm) levels. However, huge scope still exists for introduction of mechanization, improving market access and value chains. Sustaining long-term productivity levels coupled with increasing the competitiveness of production through reduction in costs of cultivation per ha are the key concerns that need special focus in this district.

Paddy, tapioca and cotton are major crops grown in the East Godavari district pilot site. All the crops (4.06 t ha⁻¹ for paddy, 12.9 t ha⁻¹ for tapioca, and 1.57 t ha⁻¹ for cotton) are performing well

and except for tapioca the yields are above district average yields (2.99 t ha⁻¹ for paddy, and 1.13 t ha⁻¹ for cotton). The average yield of tapioca in the district is approximately 20.08 t ha⁻¹. The mean productivity levels were slightly lower in sugarcane than the district average yield reported by Directorate of Economics and Statistics. Introduction of mechanization and sustaining long-term productivity levels are two important issues that need immediate attention. Improved market access and strengthening of value chains are the major initiatives required for increasing the producer's share in the consumer rupee.

10.2.6 Economics of crop/fish enterprises

The details about economics of major crop enterprises per ha across pilot site districts are summarized in Figures 24 and 25. The details about pilot site-wise performance of major crops in the Delta Region are discussed and summarized below.

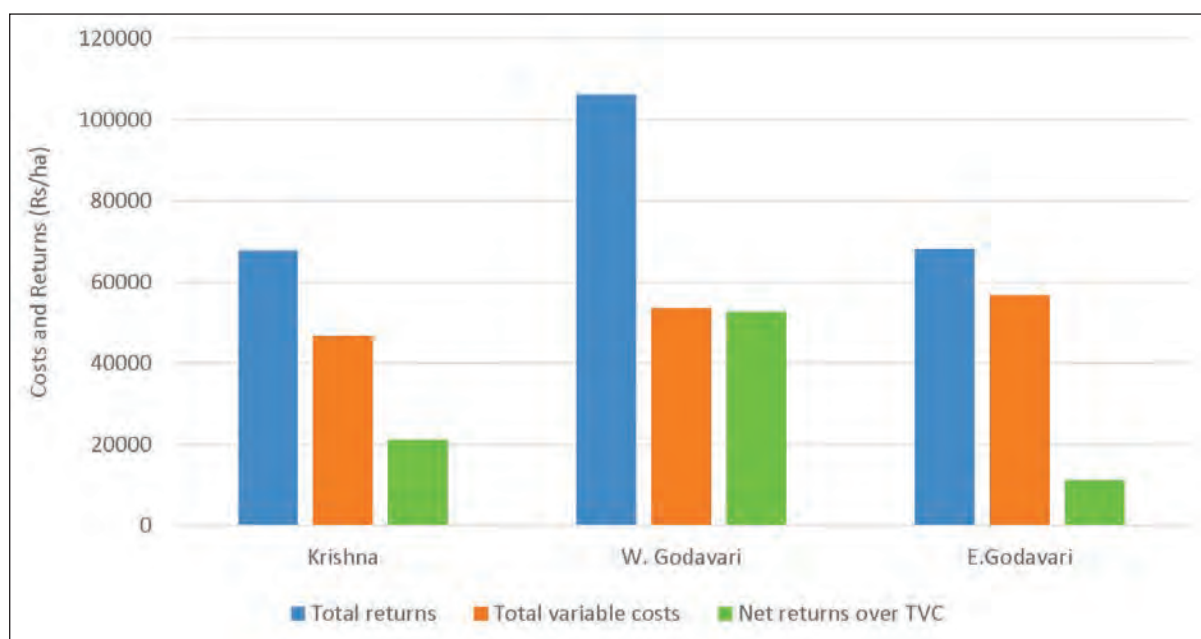


Figure 24. Performance of paddy in Delta Region.

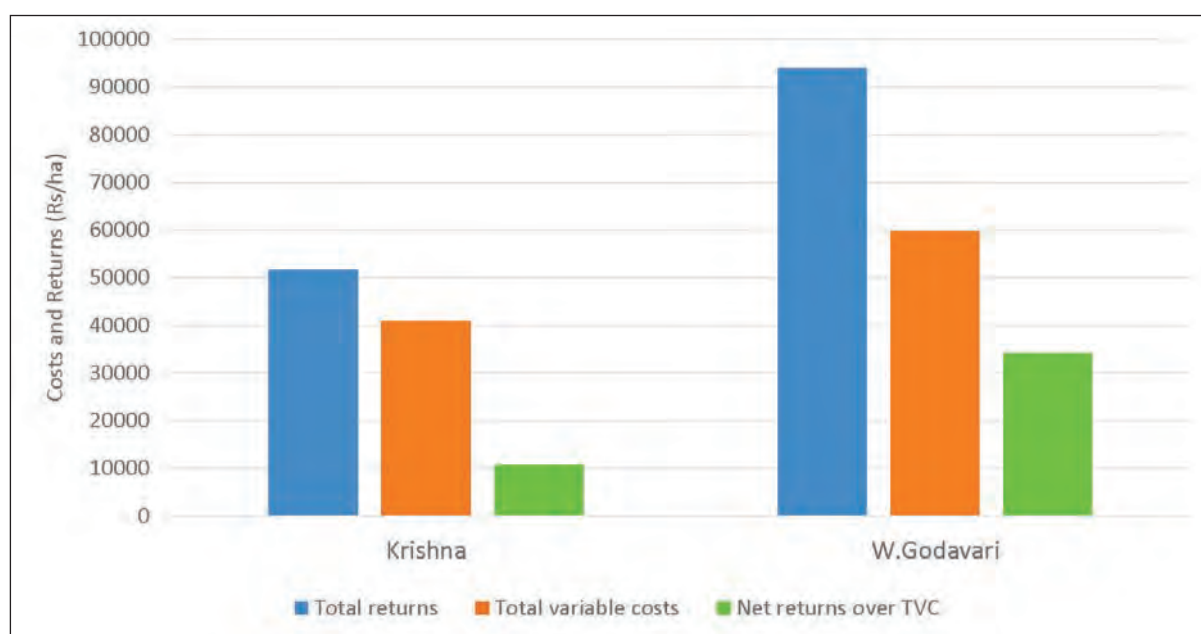


Figure 25. Performance of maize in Delta Region.

All the major crops cultivated in Krishna, West Godavari and East Godavari district pilot sites recovered their total variable costs and earned some marginal net returns per ha. Paddy performed quite well in all the three study districts. Similarly, maize also recovered its total variable costs in both Krishna and West Godavari districts. Commercial crops – cotton, oil palm, tapioca, and banana – did well and earned significant net returns per ha. Among all the crops, tapioca performed extremely well and earned significant returns (3.10 B:C ratio) on each rupee invested in its cultivation. Assured irrigation facilities in all the three study districts and reasonably good exposure of sample farmers to better management practices might have helped them to make agriculture a viable option or enterprise. However, enormous scope still exists for introduction or setting-up of scientific post-harvest handling facilities and value chains across commodities in these districts. For further details on costs and returns of various crops per ha across pilot sites refer to the district-specific Baseline Reports prepared under similar guidelines.

The details about economics of prawn/fish cultivation enterprises (per cycle per ha) across pilot sites in the region are furnished in Table 26. Around 428 fishery sample households in the state were also interviewed with a well-structured questionnaire. Specifically, 199 fishery sample households were interviewed from 14 sample villages in the three districts of Delta Region. These primary household surveys were also complemented with village-level focus-group discussions (FGDs). The details about socio-economic characteristics, average productivity levels and economics of fish/prawn cultivation were captured during the survey. The data were thoroughly analyzed and results are discussed district-wise below for the Delta Region.

The cultivation of both fish and prawns was a dominant activity in all the three district pilot sites in the Delta Region. Total variable costs (seed, feed, medicines, electricity and watch and ward) per cycle per ha and total returns (outputs plus by-products if any) per cycle per ha were elicited from one-fourth of the sample farmers across sample villages and districts. The net returns per cycle per ha were estimated after deducting the total variable costs from total returns per cycle per ha. Overall, the economics of prawn cultivation per cycle is only viable in Krishna and East Godavari districts. It is not economically viable in the West Godavari district as it did not recover its total variable costs per cycle per ha. Some of the major reasons for low total returns per cycle per ha in the prawn cultivation are as follows:

- a) Poor seed quality – private hatcheries dominate the supply and no monitoring by the govt.;
- b) Low success rate and susceptibility to diseases;
- c) Low productivity levels (hardly one ton per cycle per acre);
- d) High feed and medical costs – No monitoring or regulation from govt. side;
- e) High electricity costs per unit;
- f) Fluctuating outprices (₹260 per 40 count of prawns) – No regulation or source of information in the entire state.

The economics of fish cultivation per cycle per ha across sample districts are also summarized in Table 26. The cultivation of fish is also a dominant economic activity mainly in the three study districts of Delta Region. Just as in the case of prawns, the costs and returns from sample fish farmers were collected during primary household survey. Overall, fish rearing is more profitable than prawns cultivation in these districts. All the three sample districts indicated good economic returns over total variable costs per ha per cycle in the region. The average productivity levels in case of fish are good and relative feed prices are lower in fish cultivation. There is good domestic demand and very stable market prices for the fish market in the region. However, very slight fluctuations were observed mainly due to traders or middlemen in fish marketing or trading. The region has very good scope to further enhance production in the near future. Introduction of scientific post-harvest handling measures, value and supply chains etc., will further propel this industry in the region.

Table 26. Economics of prawn/fish enterprises in Delta pilot sites (₹ per cycle).

District	Prawn/fish	Total returns (₹ per ha)	Total variable costs (₹ per ha)	Net returns over TVC (₹ per ha)	B:C Ratio
Krishna	Prawns	954756	791593	163163	1.21
	Fish	613360	456194	157166	1.34
West Godavari	Prawns	1078303	1180262	-101959	0.91
	Fish	683039	278495	404546	2.45
East Godavari	Prawns	1163610	986399	177210	1.18
	Fish	810958	390969	419989	2.07

10.2.7 Pilot site GVA estimations across sub-sectors

Details about pilot site-wise Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Table 27 for the Delta 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 AP Primary Sector Mission baseline survey. The present section summarizes the results for the three major districts in the Delta Region. The results generated from primary household data analysis are discussed in detail sub-sector-wise below.

Table 27. Primary Sector GVA estimations in Delta pilot sites (Base year: 2014-15).

District	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agril. including horticulture	Animal husbandry	Fisheries
Krishna	63.20	57.03	23.38	143.61	44.01	39.71	16.28
W. Godavari	163.50	8.48	96.40	268.38	60.92	3.16	35.92
E. Godavari	57.71	6.58	32.10	96.39	59.87	6.83	33.30
Regional total	284.41	72.09	151.88	508.38	55.94	14.18	29.88

Overall, the total estimated GVA from AP Primary Sector Mission's three pilot sites in the Delta Region is ₹508.38 crores, out of which, ₹284.41 crores (55.94%) is contributed by the agriculture sub-sector including horticulture. Another ₹72.09 crores is contributed by animal husbandry which accounts for 14.18% share in total GVA of the AP Primary Sector Mission in the region. The fisheries sub-sector contributed an amount of ₹ 151.88 crores towards total GVA value in the region. The sector-wise contributions and corresponding share value are depicted in Figure 26.

Among all the three pilot sites, West Godavari district pilot site has contributed the highest value (268.38 crores), followed by Krishna district pilot site (143.61 crores), and East Godavari district pilot site (96.39 crores). The lowest GVA value was recorded in East Godavari district pilot site. The total GVA values by district pilot site in the region are presented in Figure 27.

The highest value of GVA contributed by the agricultural sub-sector including horticulture was observed in the West Godavari district pilot site (₹163.50 crores) followed by Krishna district pilot site (63.20 crores). The lowest value was contributed by East Godavari district pilot site (57.71 crores). In the case of animal husbandry sub-sector, the highest value was contributed by Krishna district pilot site (₹57.03 crores) followed by West Godavari district pilot site (8.48 crores). It is good to see Krishna district pilot site contributing significantly to the animal husbandry sub-sector even

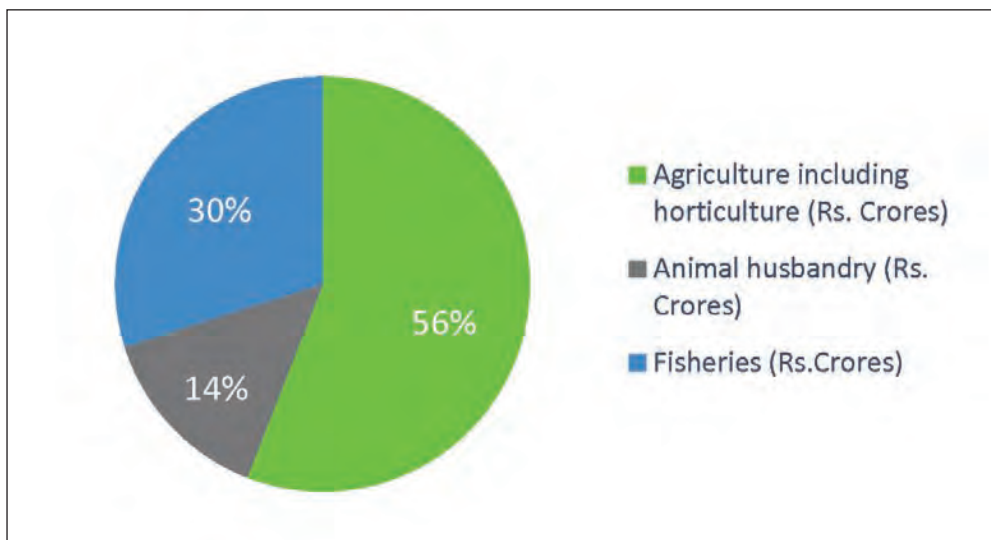


Figure 26. Sub-sector wise shares in the total GVA estimation.

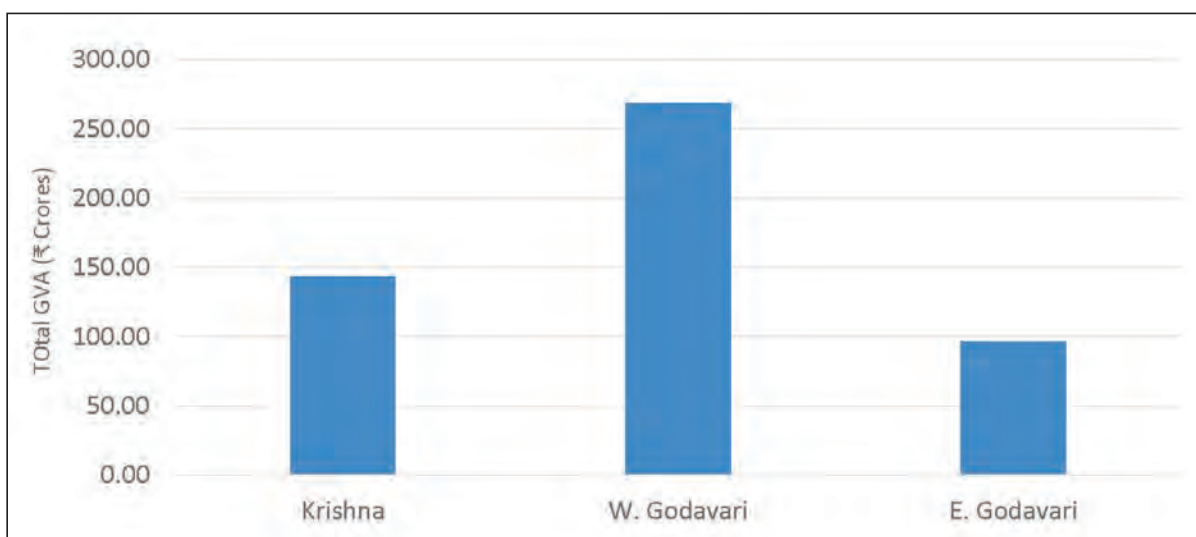


Figure 27. Total GVAs estimations by district pilot site in the region.

though it was relatively backward in the agriculture sub-sector in the region. The lowest value GVA from animal husbandry sub-sector in the region was contributed by East Godavari district (6.58 crores). But the fisheries sub-sector contributed significantly in the West Godavari district pilot site (96.40 crores), followed by East Godavari (32.10 crores) and Krishna (23.38 crores). The composition of each pilot site GVA by sub-sector is summarized in Figure 28.

The overall dominance and significant share contributions of different sub-sectors in each district's total pilot site GVA estimations in the Delta Region are presented in Figure 29. Nearly 61% share of total GVA in the West Godavari district pilot site is contributed by the agriculture (including horticulture) sub-sector. In contrast to Godavari districts, Krishna district pilot site had the highest share (39.71%) from contribution made by animal husbandry. In case of Krishna, agriculture including horticulture, animal husbandry and fisheries sub-sectors played a significant role in the total GVA contributions.

The total district GVA value per pilot site village was estimated in order to understand the extent of potential contributed by each pilot village in the Delta Region. The district-wise estimations in the

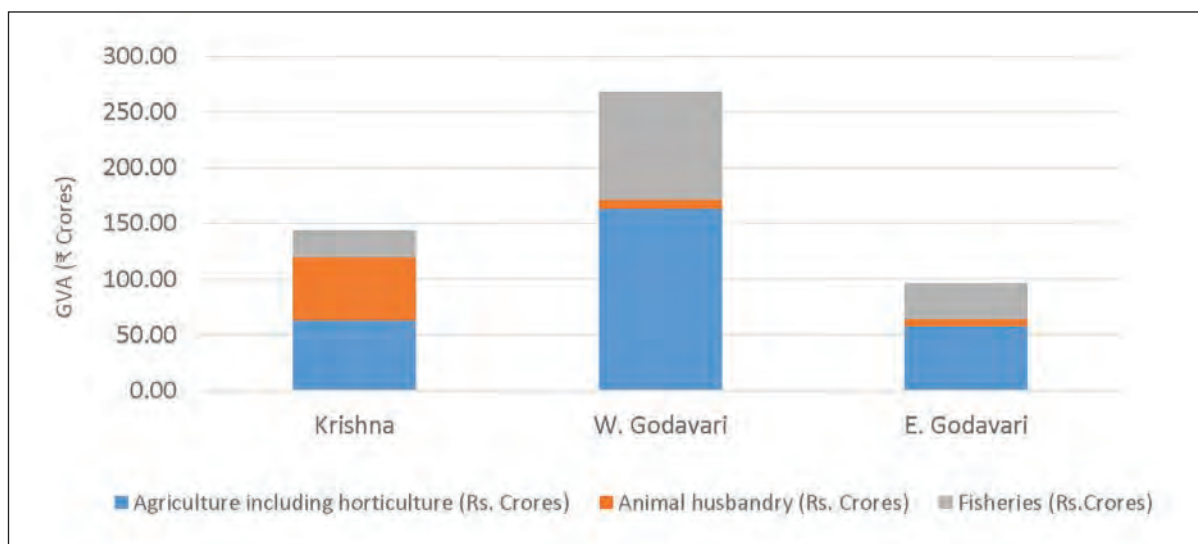


Figure 28. Composition of pilot site GVAs by sub-sector in the region.

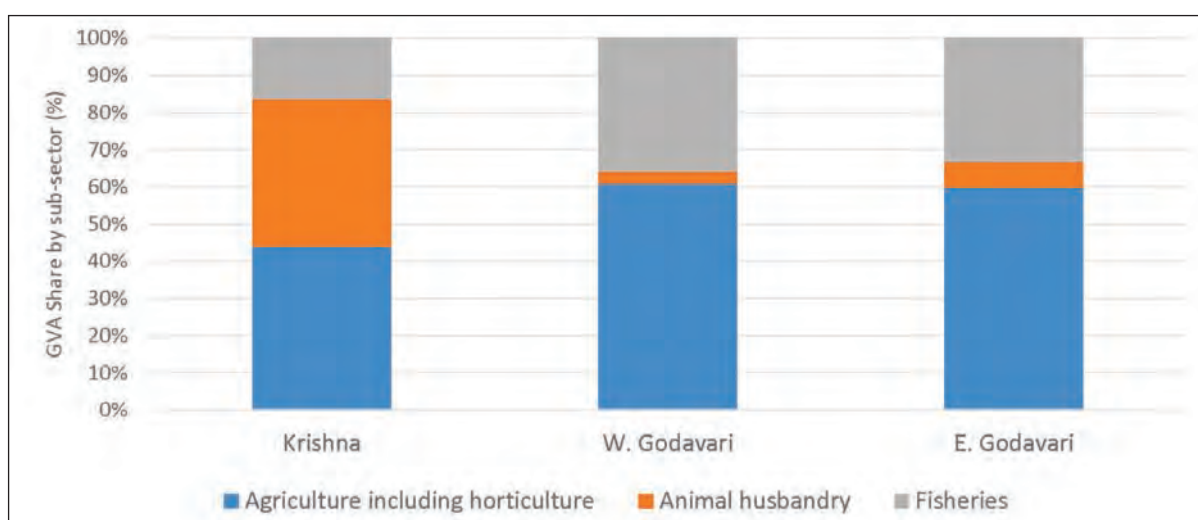


Figure 29. Shares of different sub-sectors in total GVA.

region are summarized in Figure 30. The per village contribution of GVA was the highest in case of West Godavari district pilot site, followed by Krishna and East Godavari district pilot sites. It is very interesting to understand that each district pilot site village in West Godavari is contributing nearly six times higher the GVA value than each of the district pilot site villages in East Godavari. There is a clear disparity among these villages in terms of potential to contribute to total GVA in the pilot site of the Delta Region.

Similarly, the GVA values per district pilot site household was estimated and compared across study districts in the Delta Region. The details are furnished in Figure 31 in descending order of merit. West Godavari district pilot site households retained their first rank, followed by Krishna and East Godavari districts' pilot site households. The average household earnings per annum during 2014-15 in the West Godavari district pilot site was calculated at ₹116,338, while the lowest earning per pilot site household per annum (₹55,120) was observed in case of East Godavari district in the region. The average earnings from agriculture and allied sectors of West Godavari district per household was more than 2.11 times higher than the average sample household earnings in East Godavari district pilot site.

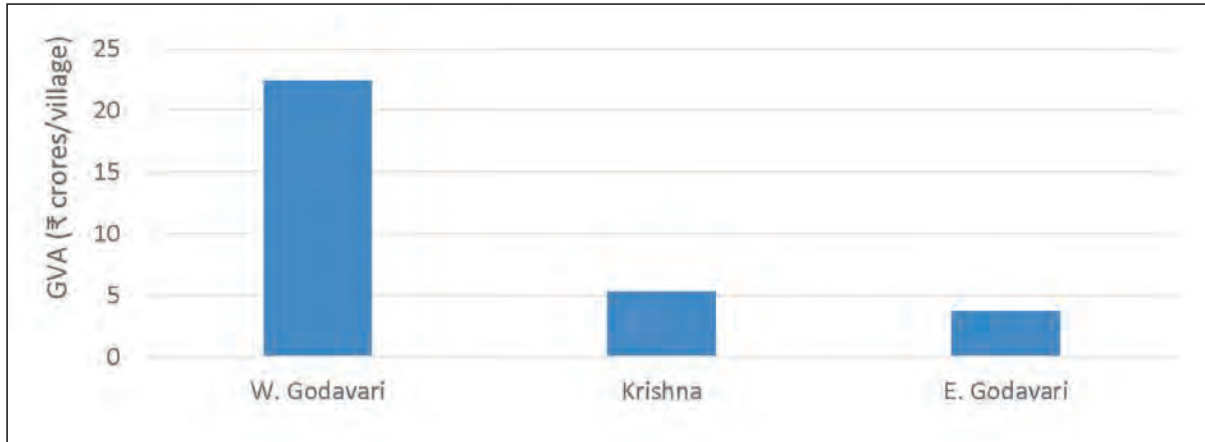


Figure 30. GVA value per pilot site village (₹ crores) in the region.

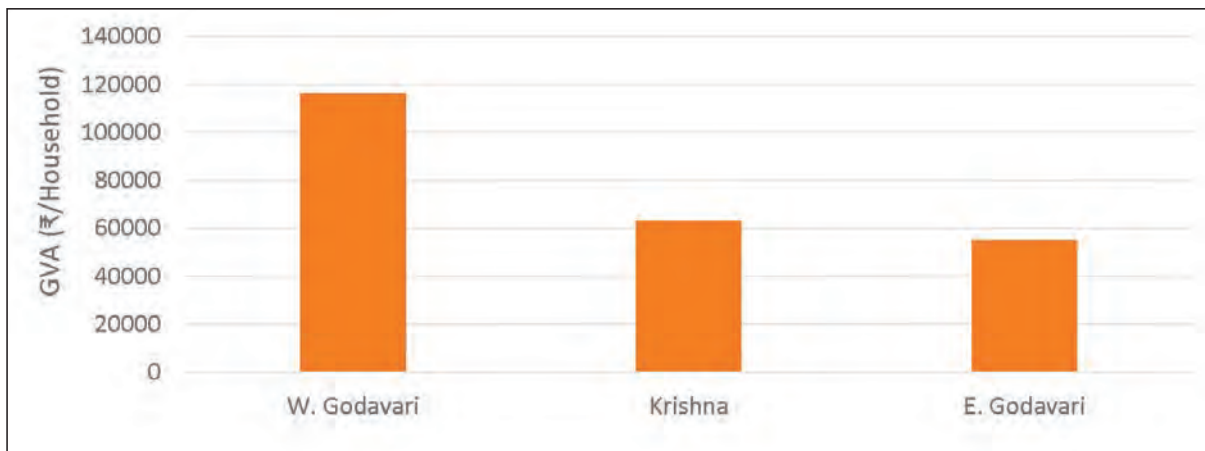


Figure 31. GVA value per district pilot site household (₹/household) in the region.

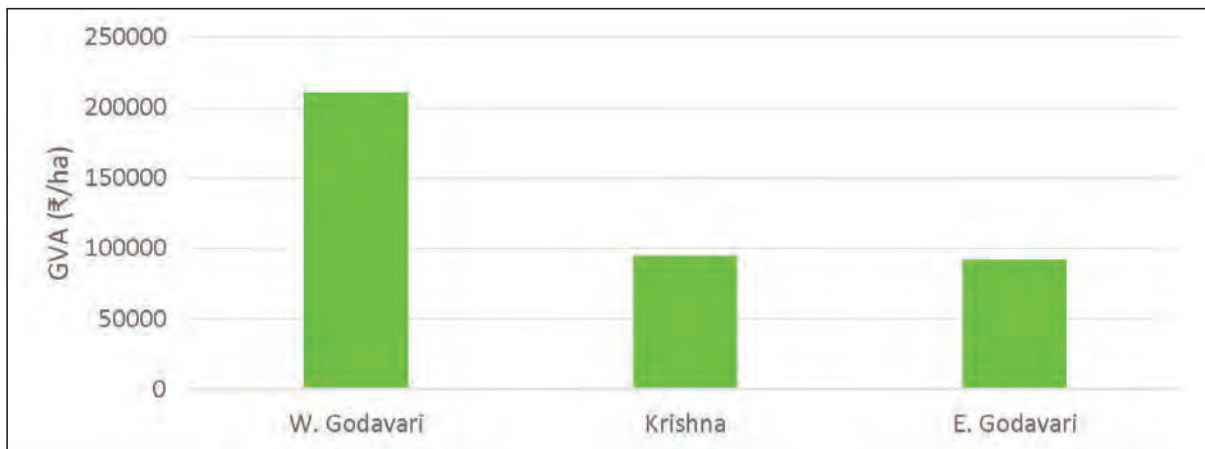


Figure 32. GVA value per district pilot site ha area (₹ per ha) in the region.

In the same manner the average total GVA contributions from per ha landholding in the district pilot site was also calculated and compared among study districts in the Delta Region (see Figure 32). Per ha of agricultural land in West Godavari district pilot site is contributing almost ₹210,404 per annum towards total GVA of the district primary sector. It was the highest value among study districts observed in the Delta Region. The average earnings from each ha cultivated land was the lowest in East Godavari (₹92,063) district pilot site. Good access to irrigation facilities and intensive cultivation of crops in the district may have helped the West Godavari district to earn 2.28 times higher income than irrigated-dry per ha cultivation in East Godavari district.

10.3 Summary and way forward

The comprehensive baseline survey conducted in the region has, in total, covered about 1229 sample HHs spread over 65 villages from eight mandals in three districts (Krishna, West Godavari and East Godavari) of Delta Region of Andhra Pradesh. Specifically, the results are summarized from agricultural and fishery sample villages (nearly 37) covering about 1229 (1030 Agril. + 199 fishery) sample households in three pilot sites corresponding to three study districts in the region. Small and marginal farmers dominated (56.6%) the total baseline sample in the region. The average family size in the region is about 3.8. Nearly 59.2% of the total sample are uneducated. About 47.4% of family members participate in their own farm activities/operations. The pooled average operational landholding per household was estimated at 2.39 ha. The extent of land tenancy in the total region sample was calculated at 35.7%. More than 80% of sample households have a residential house, access to television sets and mobile phones. The average number of livestock animals owned per household was only 1.1 in the region. Due to good access to canal irrigation facilities, the average productivity levels across major crops was on par with district average yields. Commercial crops, such as oil palm, tapioca and cotton are performing extremely well and realizing good net returns per ha. Overall, crops cultivation in the Delta Region is more economical wherein most of their investments were recovered. The cultivation of fish is more profitable per cycle than prawns in the region. Agriculture, including horticulture, contributed around 56% share in the total GVA of the Delta Region. The fisheries sub-sector occupied the second position and contributed nearly 30% of regional GVA value. Animal husbandry came in at third place with 14% share in total GVA value in the Delta Region.

The other major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below. Immediate steps are required to address these issues so as to enhance each sub-sector's contribution to the total primary sector GVA of the Delta Region.

Table 28. Summary of key findings and specific recommendations.

Key findings	Specific recommendations
<ul style="list-style-type: none"> Absence of proper infrastructure for efficient management of both supply and value chains across commodities limit realization of full potential in the region. 	<ul style="list-style-type: none"> Huge opportunities are available with ever-growing peri-urban demand for vegetables, fruits, milk and meat in the region. Potential opportunities also available for strengthening market linkages and value chains for oil palm, coconut, cocoa, mango, banana, tapioca, cashewnut, etc.
<ul style="list-style-type: none"> Overall, high input cereal intensification cropping systems were observed in the region. There is need for long-term sustainable practices to sustain crop productivity across districts. 	<ul style="list-style-type: none"> Need to diversify cropping pattern using legumes in rotation Good scope for introduction and piloting of sustainable crop management practices including ICNM/IPM etc., to minimize the costs per ha and increase competitiveness across crops. Huge export potential for both field and horticultural crops in the region.

Continued.

Table 28. Continued.

Key findings	Specific recommendations
<ul style="list-style-type: none"> Lack of time/interest in livestock rearing is the biggest limitation in the region. Even though the region has surplus fodder, per household owned livestock population is very low. 	<ul style="list-style-type: none"> Animal rearing as a business model should be promoted in the region for efficient utilization of available fodder and water. Huge opportunities are there for expansion of livestock rearing and processing in the region. An integrated fodder grid should be established with an aim to move the surplus fodder availability from Delta Region to Rayalaseema Region.
<ul style="list-style-type: none"> Labor shortage is the biggest problem in the region. Due to high intensification of both field and horticultural crops, the availability of labor force per ha is low. Farmers are incurring huge expenditure on labor which is squeezing the net returns per ha. 	<ul style="list-style-type: none"> Good potential for introduction and piloting of ICT-based mechanization clusters in the region to minimize the labor problem. Lot of opportunities for introduction of mango/coconut harvesters; and small-scale processors for efficient post-harvest handling operations and value enhancement through good grading practices etc.
<ul style="list-style-type: none"> Low productivity levels coupled with frequent failure of prawn cultivation in the region 	<ul style="list-style-type: none"> Provision of good quality seed is the need of the hour for productivity enhancement of prawns in the region. Regulation of output prices is critical to protect the prawn growers' interest in the state. Enormous potential for development of fish and prawn industry needs to be harnessed.
<ul style="list-style-type: none"> Minimization of post-harvest losses in fruits and vegetable cultivation is critical not only to enhance production but also to increase its quality. 	<ul style="list-style-type: none"> Enormous scope for introduction of scientific post-harvesting technologies across field and horticultural crops. Promote value-chains and farm-based industries to engage human resource gainfully.

11. Baseline Survey Insights from Coastal Andhra Region

11.1 Overview of Coastal Andhra Region agriculture

Coastal Andhra Region is a geographic region in the Indian state of Andhra Pradesh. It includes the southern districts of Nellore, Prakasam and Guntur. With a total geographical area of 42,100 km², it occupies approximately 25.8% of the state's territory. It has a population of 11,248,818 (2011 census), which is 22.7% of the state's population. Guntur district is the most populous district (4.8 millions) in the Coastal Andhra Region. It contains 2970 census villages and 37 (statutory and census) towns. The average density of the population is estimated at 283 persons per km². The highest population density in the region was observed in Guntur (429 persons per km²) while the lowest was noticed in Prakasam district (193 persons per km²). The average decadal growth of population in the region was estimated at 10.52%. But among the districts in the region, the highest growth in decadal population growth was observed in both Guntur and Nellore districts (11.05%). Based on the 2011 census, the average literacy rate in the region was 66.46%. Generally the urban population has higher levels (79.36%) of literacy than the rural population in the region (61.63%). The annual normal rainfall in the region ranged between 853-1080 mm. Out of three districts in the region, Nellore (1080 mm) receives better annual normal rainfall, followed by Prakasam (872.0 mm) and Guntur (853 mm).

Of the total geographical (4.2 million ha) area of the Coastal Andhra Region, about 38.6% (1.6 million ha) is the net area sown (including fish and prawn culture) under different crops. Around 7.5% of the total geographical area (0.3 million ha) is sown more than once. The gross irrigated area in the region is estimated at only about 1.1 million ha (around 26.2% share in the state). Agriculture, which is mostly irrigated-dry, has been the main livelihood occupation of the farmers in the region. Nearly 69.6% of the total cropped area is under food crops and the remaining under non-food crops.

The spread of total area sown in the Coastal Andhra Region under different crop groups are summarized in Figure 33. Total cereals and millets together contribute about 44.7% of total cropped area (see Figure 33). It was followed by other commercial crops (cotton, tobacco, as well as fruits and vegetables) which accounted for 38%. The total pulses group occupied third place (13.7%) in the total sown area in the region. Total oilseeds only secured the fourth place in the region and have a coverage of about 3.7%.

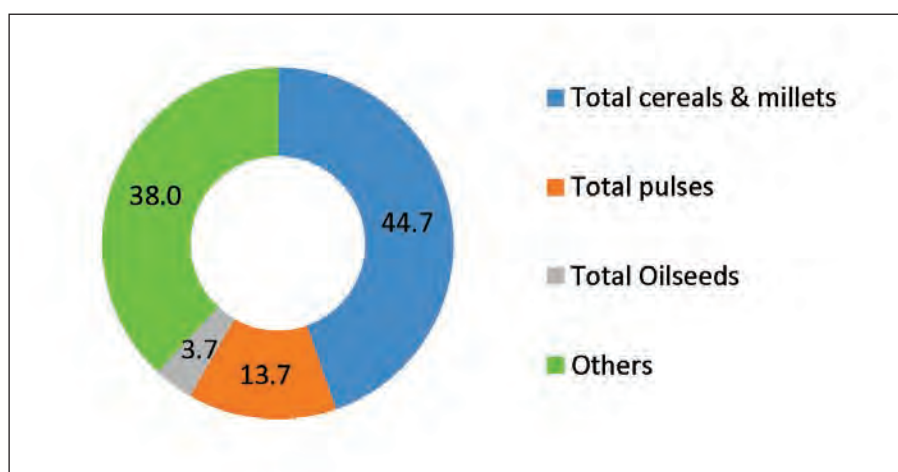


Figure 33. Share of total cropped area among crop groups.

The individual crop area share in total cropped area of the Coastal Andhra Region during 2014-15 is depicted in Figure 34. More than 35% of the total cropped area in the region is occupied by rice. It was followed by cotton (15%), maize (5.8%), tobacco (5.4%), and chilies (4.9%). All these five crops together have a total share of nearly 67% of the total cropped area in the region during the study period. Among horticulture crops, mango leads followed by banana, turmeric and cashewnut.

Similarly, the break-up from the 12th livestock census conducted in the region is summarized below. Sheep are the single largest (44.1%) contributor in the total livestock population of the region. It was followed by buffaloes (37.3%), goats (13.9%), and cattle (4.3%). Pigs and other livestock animals together had a share of only 0.4% according to the 12th livestock census. Around 9.7 million poultry also existed in the region which accounts for 11.87% of the total state poultry population.

Relatively, fisheries play a major role in the Coastal Andhra Region of Andhra Pradesh. Both marine fish and prawn production contribute to the GVA of the region. Around 32.5% of total marine fish and prawn production in the state happens in the Coastal Andhra Region. Similarly, inland fish and prawn production is also a significant activity in the region. This region has a share of nearly 10.5% in the state's total inland fish and prawn production. Approximately 44.76% of the total brackish water prawn production in the state also takes place in this region. Overall, this region contributes significantly to the state GVA in the fisheries sector. The comparative status of Coastal Andhra Region beside the state and country has been summarized and presented in Table 29.

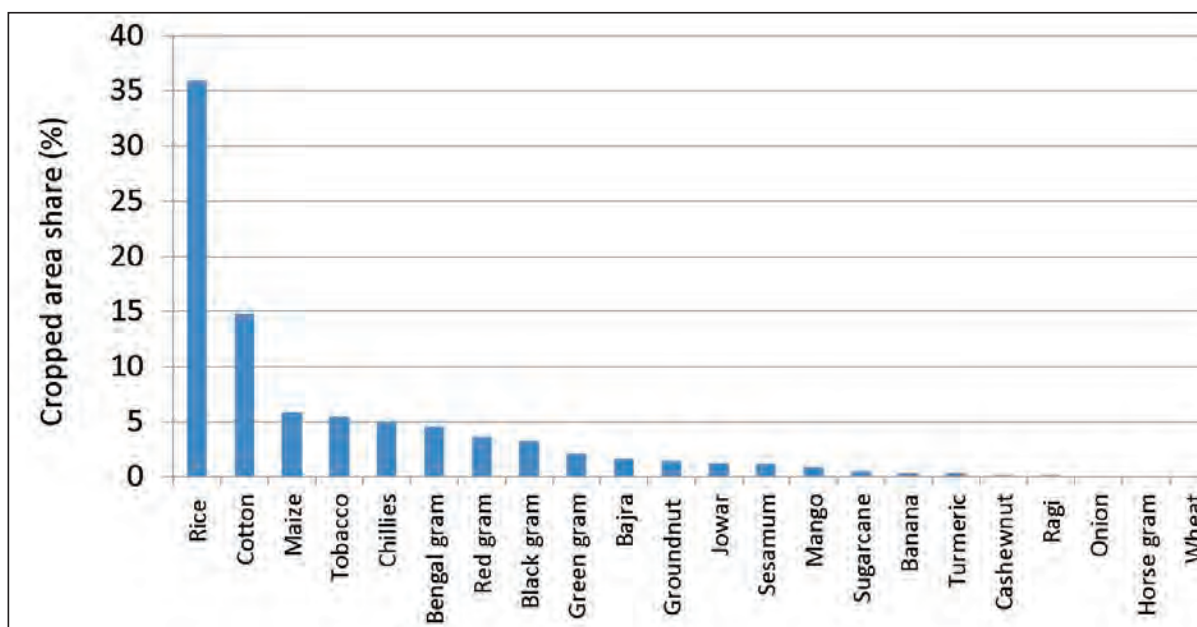


Figure 34. Crop-wise cropped area shares in the region (2014-15).

Table 29. Comparative status of Coastal Andhra Region vs. Andhra Pradesh and India.

Parameter	India	Andhra Pradesh	Coastal Andhra region
Geographical area (000 km ²)	3287.5	163.0	42.1
Population (Crores 2011 census)	121.09	4.96	1.12
Males (crores)	62.32	2.48	0.56
Females (crores)	58.75	2.47	0.56
Urban (Crores 2011 census)	37.71	1.46	0.32
Males (crores)	19.54	0.72	0.16
Females (crores)	18.16	0.73	0.16
Rural (Crores 2011 census)	83.37	3.49	0.81
Males (crores)	42.77	1.75	0.41
Females (crores)	40.59	1.74	0.40
Literacy (% in 2011)	74.04	67.35	66.46
Males (%)	82.14	74.77	74.48
Females (%)	65.46	59.96	58.39
GDP (₹ Crores in current prices, 2014-15)	12498662	520030	116165
Agril. and allied sectors (₹ Crores)	2337249.8	143498	38714
Industry sector (₹ Crores)	3962075.8	107224	22987
Service sector (₹ Crores)	6199336.3	269307	54464
Shares of sub-sectors in GDP (%)			
Agril. and allied sectors	18	27.6	33.3
Crops	11.8	15.4	19.6
Livestock	3.9	7.1	8.2
Forestry and logging	1.4	1.0	1.0
Fishing	0.9	4.1	4.6

11.2 Findings from the baseline survey

Findings from baseline surveys conducted across three study districts in the Coastal Andhra Region are summarized and discussed in the following sub-sections. 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 and fishery sample villages (nearly 29) covering about 965 (778 Agril. + 187 fishery) sample households in the three pilot sites corresponding to three study districts in the region. Due to dominance of fishery sector in the three study district pilot sites, the baseline has also captured about 187 fishery sample households in the total targeted. Overall a total of 965 sample baseline farmers' household data have been analyzed and summarized in this report.

11.2.1 Distribution of sample across size groups and communities

The distribution of total baseline survey sample (*agricultural sample HHs only*) by district in the region is presented in Table 30. Overall, 778 sample households were interviewed from 21 sample agricultural villages in the three pilot sites of the Coastal Andhra Region. All the sample farmers are distributed and categorized under different size groups based on their total operational landholding size during 2014-15 cropping season. Out of the total 778 sample, 516 sample households belonged to small size (<5 acres) farmers' category, followed by medium (between 5 and 10 acres) size (101 HH representing 13.0%), and large (>10 acres) size (69 HH which denote 8.87%) category. Nearly a total of 92 sample households belong to landless (operational landholding zero) category and these are also covered in the baseline survey. They contribute approximately 66.3%, 13.0%, 8.87% and 11.83% shares in the total baseline sample respectively, for small, medium, large, and landless categories. This allocation among size groups is truly representative of the 2011 census survey conducted on 'operational landholdings' at the state level.

Table 30. Group size and community-wise distribution of sample (agril.) in the region.

District	Total sample	Distribution by group size				Distribution community-wise				
		Small	Medium	Large	Landless	OC	BC	SC	ST	Others
Nellore	216	148	27	15	26	111	70	35	0	0
Prakasam	251	155	32	36	28	104	95	49	3	0
Guntur	311	213	42	18	38	184	38	84	5	0
Coastal Andhra Region*	778 (100)	516 (66.3)	101 (13.0)	69 (8.87)	92 (11.83)	399 (51.3)	203 (26.0)	168 (21.7)	08 (1.0)	0 (0.0)

*Figures in parenthesis indicate their respective share in total sample.

The total baseline sample in the region was also categorized based on the community they belonged to district-wise as shown in Table 30. Majority of the sample HHs (399) belong to open category (OC) community, followed by Backward Caste (BC) community category (203 HHs), Scheduled Caste (SC) community category (168 HHs), and Scheduled Tribe (ST) community category (08 HHs). They contributed approximately 51.3%, 26.1%, 21.6% and 1.0% respectively, to OC, BC, SC and ST communities. The pattern of distribution of sample community-wise varied from district to district.

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

The details of average family size, extent of literacy and participation in labor market, etc., are analyzed and presented in Table 31. The average family size of the household for the total sampled farmers in the region is 4.0. The highest family size (4.6) was noticed in Prakasam district while the lowest (3.7) was observed in both Nellore and Guntur districts. On the whole, only 45.6% of total

Table 31. Socio-economic details of sample in Coastal Andhra Region.

District	Avg. family size*	Sample farmers' educational status (%)			Extent of labor participation	
		Uneducated	Primary	Upper primary and above	Own farm* (no.)	Outside farm* (no.)
Nellore	3.7	51.4	14.4	34.3	2.0	1.9
Prakasam	4.6	62.9	10.4	26.7	2.6	2.4
Guntur	3.7	49.0	15.0	35.0	2.1	1.6
CA Region	4.0	54.4	13.3	32.0	2.2	2.0

*including children in the family.

sample in the region had literacy, out of which 13.3% had primary level of education while another 32.0% had upper primary and above level of educational status in the region. Nearly 54.4% of the total sample were uneducated or did not have access to education. The extent of illiteracy was much higher in Prakasam district sample farmers followed by Nellore district in the region. Special attention should be placed on promotion of education and other basic amenities in Prakasam district. The highest literacy rate was noticed in Guntur district sample farmers as compared to any other district in the region. The majority of family members (55%) in the sample participate in their own farm's work. Majority of sample districts exhibited similar levels of own farm labor participation in the Coastal Andhra Region. Another 50% of total family members were also participating in the outside labor market for their livelihoods. Most of the sample districts in the region showed relatively higher levels of outside labor market participation.

11.2.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details, district-wise, in the Coastal Andhra Region are furnished in Table 32. The average total own landholding per household for the entire region sample was estimated at 1.48 ha, out of which 0.56 ha of land was covered with irrigation access while another 0.92 ha was grown under rainfed conditions. Specifically in the Coastal Andhra Region districts, rainfed landholdings dominate in the total own landholding category. Similarly, in the case of Rayalaseema Region districts also rainfed landholdings hold the lion's share in the total own landholdings. The average operational landholding for the total sample households in the region was calculated at 2.10 ha. A significant share of cropland (0.62 ha per HH) was also leased-in from outside land markets in the region. The extent of tenancy for the total sample households in the region was 29.3% (excluding landless households). The tenancy system was very prominent in Guntur district (43%), followed by Prakasam and Nellore districts.

Table 32. Landholding particulars in Coastal Andhra Region pilot sites (ha).

District	Own landholding (ha)			Operational landholding (ha)			Extent of tenancy in the sample%
	I	R	T	I	R	T	
Nellore	0.62	0.57	1.19	1.06	0.57	1.63	16.0
Prakasam	0.16	1.82	1.98	0.20	2.83	3.04	29.0
Guntur	0.89	0.36	1.26	1.17	0.45	1.62	43.0
Average	0.56	0.92	1.48	0.81	1.28	2.10	29.3

I: irrigated; R: Rainfed; T: Total

11.2.4 Household assets and livestock ownership

Details about the ownership of household assets and livestock for the total sample in the Coastal Andhra Region are presented by district in Table 33. Nearly 99% of the total sample households said that they possess a residential house. Only about 9.7% sample households indicated that they also own a cattle shed for accommodating/rearing their buffaloes, cows, and bullocks. Television sets (94.4%) and mobile phones (91.5%) are the most common consumer durables owned by many of the sample farmers across study districts in the region. Slightly more than a quarter (27.5%) of total sample farmers also possessed two wheelers. Slight variation in ownership was observed from item to item and its possession pattern among study districts in the region.

Details about average livestock ownership per sample household is also summarized in Table 33. On an average, every tenth sample HH in the region had one draft animal. Similarly, every sample HH in the Coastal Andhra Region owned at least one buffalo. But the possession of cows per sample HH was almost negligible. 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 2.2. The composition of different livestock animals varied significantly from district to district in the region. Overall, the highest number of livestock animals per household was held in Prakasam (3.3) while the lowest was observed in Guntur (1.2).

Table 33. Household assets and livestock ownership in Coastal Andhra Region pilot sites.

District	% sample households possess assets					Average no. per sample HH			
	Residential house	Cattle shed	Television	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total*
Nellore	98.6	10.2	90.7	89.4	29.2	0.0	0.0	1.0	2.1
Prakasam	100.0	13.6	96.0	93.2	25.1	0.1	0.0	1.4	3.3
Guntur	99.0	5.5	96.5	92.0	28.3	0.1	0.0	0.6	1.2
Average	99.2	9.7	94.4	91.5	27.5	0.1	0.0	1.0	2.2

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

11.2.5 Major crops and their productivity levels

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 Table 34. The district and crop-wise productivity levels are discussed below.

Paddy, black gram and green gram are the major crops cultivated in the Nellore district pilot site. The average productivity levels of paddy was good and it is higher than district and state average yields. But natural calamities during harvesting time is the biggest challenge to securing the bountiful harvest from the crop. The productivity levels of green gram and black gram is highly influenced by the onset of monsoon and subsequent rainfall distribution in the district. Mean productivity levels were significantly lower in case of sorghum, red gram, green gram and black gram than the district average yield reported by Directorate of Economics and Statistics. There is huge scope for further increase of productivity for black gram and green gram crops in the pilot site when compared with district average yields. This indicates the huge potential for the Nellore pilot site to prosper in the future through introduction of improved cultivars, better management practices, and market linkages.

With regard to Prakasam pilot site, paddy, cotton, and chickpea are identified as major crops grown by sample farmers. The paddy productivity level in the pilot site is better than district average yields. But cotton and chickpea productivity levels are much lower than district average yields. The mean productivity levels were also significantly lower in the case of pearl millet, sorghum, red gram,

Table 34. Productivity levels of major crops across pilot sites.

Crop	Avg. pilot site (1)	Avg. district (2)	Avg. state (3)	Avg. nation (4)	% change (1 over 2)
Nellore					
Paddy	5578	4051	3094	2462	38
Sorghum	1482	4592	2247	954	-68
Red gram	618	960	565	806	-36
Black gram	569	824	781	555	-31
Green gram	815	883	610	475	-8
Lemon	14450	NA	NA	NA	NA
Prakasam					
Paddy	4519	3841	3094	2462	18
Pearl millet	357	1809	1663	1214	-80
Sorghum	1667	2101	2247	954	-21
Cowpea	522	906	731	NA	-42
Red gram	420	913	565	806	-54
Black gram	558	800	781	555	-30
Guntur					
Paddy	5729	3340	3094	2462	72
Sorghum	5321	5987	2247	954	-11
Black gram	1791	1087	781	555	65
Turmeric	6504	6986	8524	5057	-7
Banana	8067	37986	31144	35110	-79
Chilies (dry)	6317	5127	4584	1645	23

cowpea and black gram than the district average yield reported by Directorate of Economics and Statistics. This indicates that there is huge potential for the Prakasam pilot site to prosper in future through introduction of improved cultivars, better management practices, and market linkages.

Paddy, maize and black gram are major crops cultivated by sample farmers in the Guntur pilot site. Paddy followed by maize is the dominant cropping pattern in the pilot site villages. The pilot site productivity levels are on par with district average yields except in the case of maize and banana crops. Substitution of cereal-cereal cropping system with cereal-legume system is the biggest challenge in the pilot site. The long-term sustainability of productivity levels among crops is a concern among farmers. The mean productivity levels were lower in the case of sorghum, maize and cotton when compared to the district average yield reported by Directorate of Economics and Statistics. This indicates that there is great potential for the Guntur pilot site to prosper in future through introduction of better management practices including IPM practices, and formal market linkages.

11.2.6 Economics of crop/fish enterprises

Details about the economics of major crop enterprises per ha across pilot site districts are summarized in Figures 35 and 36. Crop-wise performances of major crops in the Coastal Andhra Region are discussed and summarized below.

The cultivation of crops is quite economical in Coastal Andhra Pradesh districts (Nellore, Prakasam and Guntur) when compared with Rayalaseema's four districts. The cultivation of paddy performed extremely well across three study districts. With relatively better access to irrigation water in these districts, the paddy crop performed somewhat better here than in Rayalaseema districts. But, occurrence of extreme weather events such as cyclones, floods, and so on are quite common during crop period, which devastates the entire paddy output in these districts. Maize and black gram are highly preferred options in rice-fallow situation. Even though the cultivation of maize in Guntur

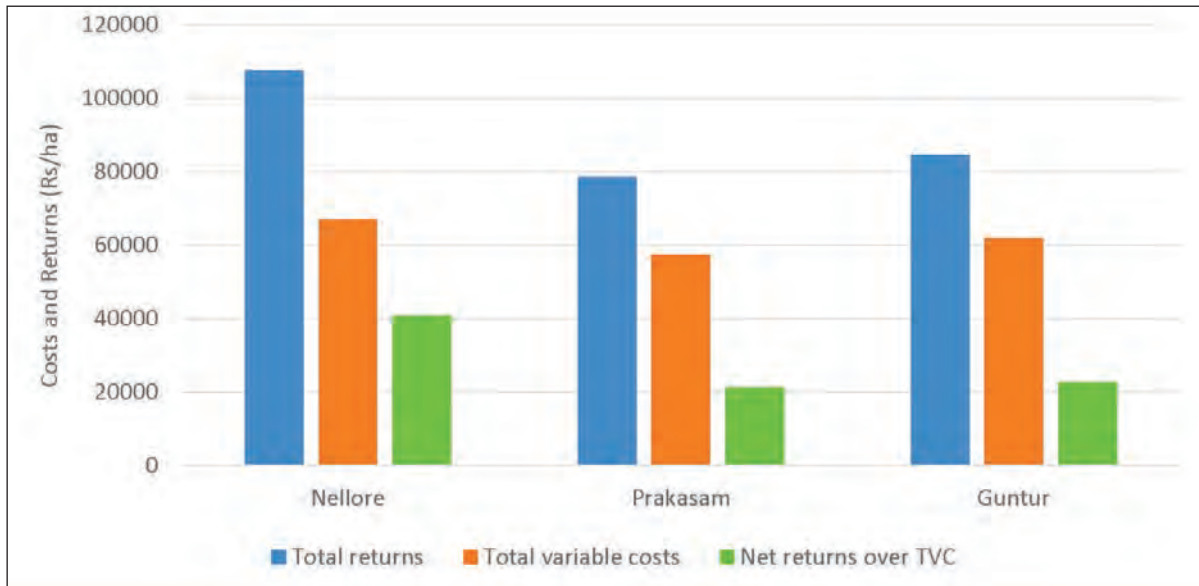


Figure 35. Performance of paddy in Coastal Andhra Region.



Figure 36. Performance of black gram in Coastal Andhra Region.

district is quite economical, yet in the long term sustainability of soils and productivity in pilot site are the biggest concerns because cereal-cereal rotations call for high input use/intensive cultivation. Black gram is a highly recommended pulse crop in rice-fallows and it is performing well in both Nellore and Guntur districts. Green gram is another rainy season pulse crop which is quite profitable in Nellore district. The cultivation of cowpea and cotton was not profitable in Prakasam district because of recurrent droughts and insufficient rains during the crop period. If we consider the total costs per ha, paddy and maize are the only crops which could at least recover its total returns. All other rainfed crops across these study districts were not able to recover their total costs per ha.

Details about the economics of prawn/fish cultivation enterprises (per cycle per ha) across pilot sites in the region are furnished in Table 35. In general 428 fishery sample households were interviewed with a well-structured questionnaire in the state. Specifically, 187 fishery sample households were interviewed from eight sample villages in the three districts of Coastal Andhra Region. These primary

household surveys were also complemented with village-level focus-group discussions (FGDs). The details about socio-economic characteristics, average productivity levels and economics of fish/prawn cultivation were captured during the survey. Data were thoroughly analyzed and results are discussed district-wise for the Coastal Andhra Region (below).

Table 35. Economics of prawn enterprises in Coastal Andhra pilot sites (₹ per cycle).

District	Prawn/fish	Total returns (₹ per ha)	Total variable costs (₹ per ha)	Net returns over TVC (₹ per ha)	B:C Ratio
Nellore	Prawns	1287814	968687	319129	1.33
Prakasam	Prawns	1289802	1305761	-15959	0.99
Guntur	Prawns	1092879	1256012	-163134	0.87

The cultivation of prawns was a dominant activity in all the three district pilot sites in the Coastal Andhra Region. Total variable costs (seed, feed, medicines, electricity, and watch and ward) per cycle per ha and total returns (outputs plus by-products if any) per cycle per ha were elicited from one-fourth of the sample farmers across sample villages and districts. The net returns per cycle per ha was estimated after deducting the total variable costs from total returns per cycle per ha. Overall, the economics of cultivation of prawns per cycle is only viable in Nellore district. It is not economically viable in Prakasam and Guntur districts as it did not recover its total variable costs per cycle per ha. Some of the major reasons for low total returns per cycle per ha in prawn cultivation are as follows:

- a) Poor seed quality – private hatcheries dominate the supply and no monitoring by government;
- b) Low success rate and susceptibility to diseases;
- c) Low productivity levels (hardly one ton per cycle per acre);
- d) High feed and medicinal costs – No monitoring or regulation from govt. side;
- e) High electricity costs per unit;
- f) Fluctuating outprices (₹260 per 40 count of prawns) – No regulation or source of information in the entire state.

The cultivation of fish is not a dominant economic activity in the three study districts of Coastal Andhra region. The costs and returns from sample fish farmers were also collected during the primary household survey. Overall, fish rearing is a more profitable enterprise than the cultivation of prawns in these districts. On the whole, the region has very good scope to further enhance prawn production in the near future. Introduction of scientific post-harvest handling measures, value and supply chains etc., will further boost this industry in the region.

11.2.7 Pilot site GVA estimations across sub-sectors

Details about pilot site-wise Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Table 36 for the Coastal Andhra 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 AP Primary Sector Mission baseline survey. However, the present report summarizes the results for the three major districts in the Coastal Andhra Region. The results generated from primary household data analysis are discussed in detail by sub-sector below.

Overall, the total estimated GVA from AP Primary Sector Mission's three pilot sites in the Coastal Andhra Region are ₹412.90 crores, of which ₹245.67 crores (59.50%) is contributed by the agriculture sub-sector including horticulture. Another ₹48.53 crores is contributed by animal husbandry which

Table 36. Primary Sector GVA estimations in Coastal Andhra pilot sites (Base year: 2014-15).

District	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agril. including horticulture	Animal husbandry	Fisheries
Nellore	65.62	10.65	26.80	103.07	63.67	10.33	26.00
Prakasam	16.69	18.17	78.00	112.86	14.79	16.10	69.11
Guntur	163.36	19.71	13.90	196.97	82.94	10.01	7.06
Regional total	245.67	48.53	118.70	412.90	59.50	11.75	28.75

accounts for 11.75% share in total GVA of the AP Primary Sector Mission in the region. The fisheries sub-sector contributed an amount of ₹118.70 crores towards total GVA value in the region. The sector-wise contributions and corresponding share values are depicted in Figure 37.

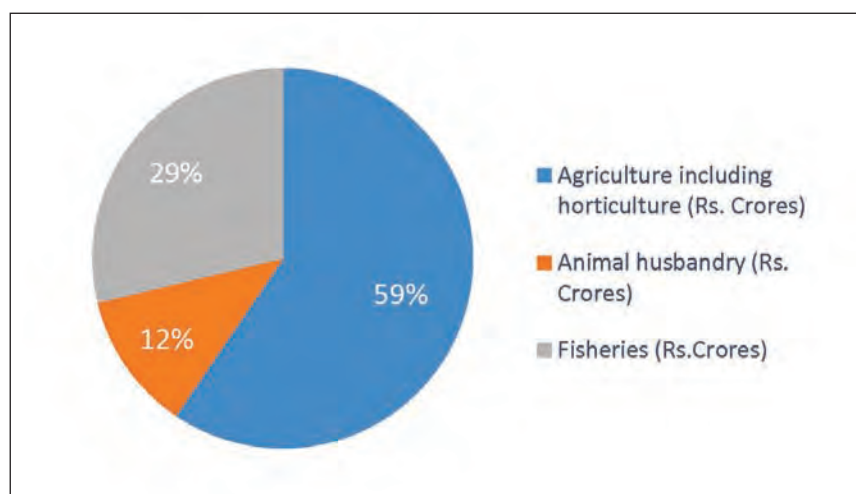


Figure 37. Sub-sector wise shares in the total GVA estimation.

Among all the three pilot sites, Guntur district pilot site has contributed the highest value (₹196.97 crores) followed by Prakasam district pilot site (112.86 crores), and Nellore district pilot site (103.07 crores). The lowest GVA value was recorded in Nellore district pilot site. The total GVA values by district pilot site in the region are presented in Figure 38.

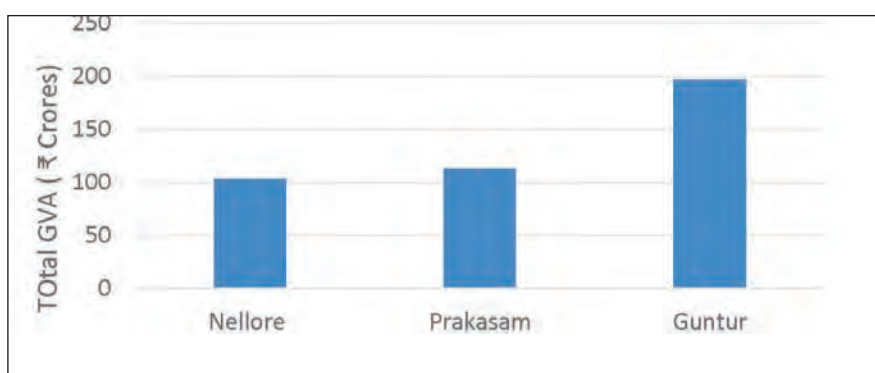


Figure 38. Total GVAs estimations by district pilot site in the region.

The highest value of GVA contributed by the agricultural sub-sector including horticulture was observed in Guntur district pilot site (₹163.36 crores), followed by Nellore district pilot site (₹65.62 crores). The lowest value was contributed by Prakasam district pilot site (₹16.69 crores). In case of animal husbandry sub-sector, the highest value was also contributed by Guntur district pilot site (₹19.71 crores) followed by Prakasam district pilot site (₹18.17 crores). It is good to see Guntur district pilot site again contributing significantly to the animal husbandry sub-sector even though it was relatively behind in the fishery sub-sector in the region. The lowest value GVA from animal husbandry sub-sector in the region was contributed by Nellore district (₹10.65 crores). But the fisheries sub-sector contributed significantly in the Prakasam district pilot site (₹78.0 crores), followed by Nellore (26.80 crores) and Guntur (13.90 crores). The composition of each pilot site GVA by sub-sector is summarized in Figure 39.

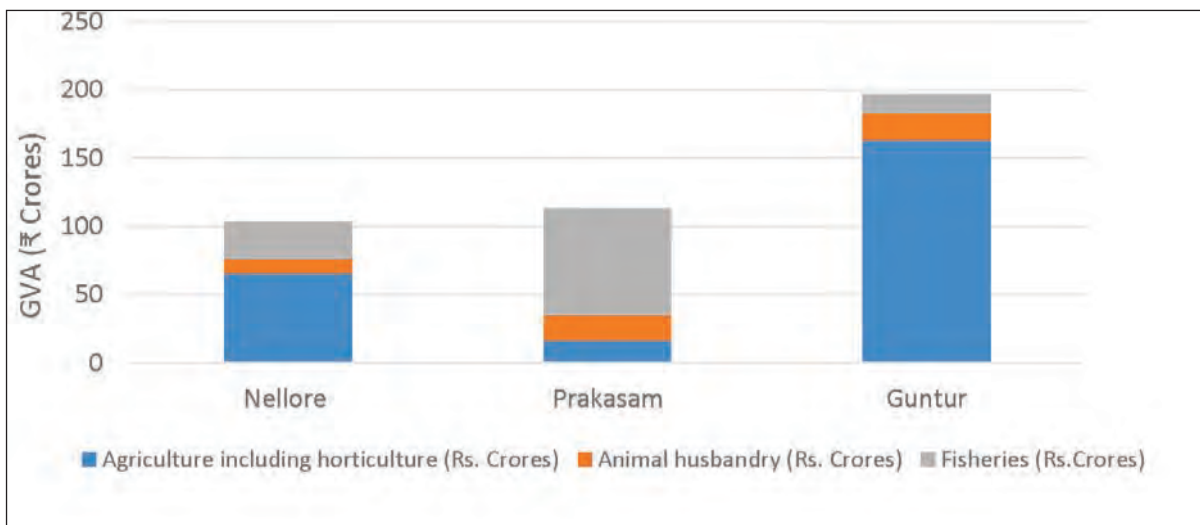


Figure 39. Composition of pilot site GVAs by sub-sector in the region.

Overall, the dominance and significant share contributions of different sub-sectors in each district's total pilot site GVA estimations in the Coastal Andhra Region are presented in Figure 40. Nearly 82.94% share of total GVA in the Guntur district pilot site is contributed by agriculture including horticulture sub-sector. In contrast to Guntur district, Prakasam district pilot site had the highest share (69.11%) contribution from the fisheries sub-sector. In case of Nellore, both agriculture (including horticulture) and fisheries sub-sectors played a significant role in the total GVA contributions.

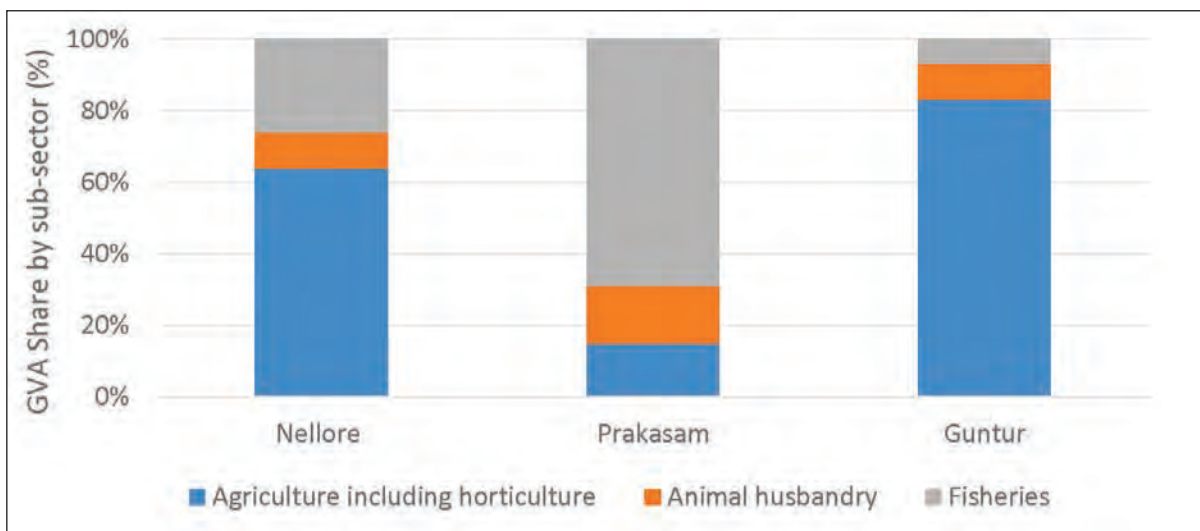


Figure 40. Shares of different sub-sectors in total GVA.

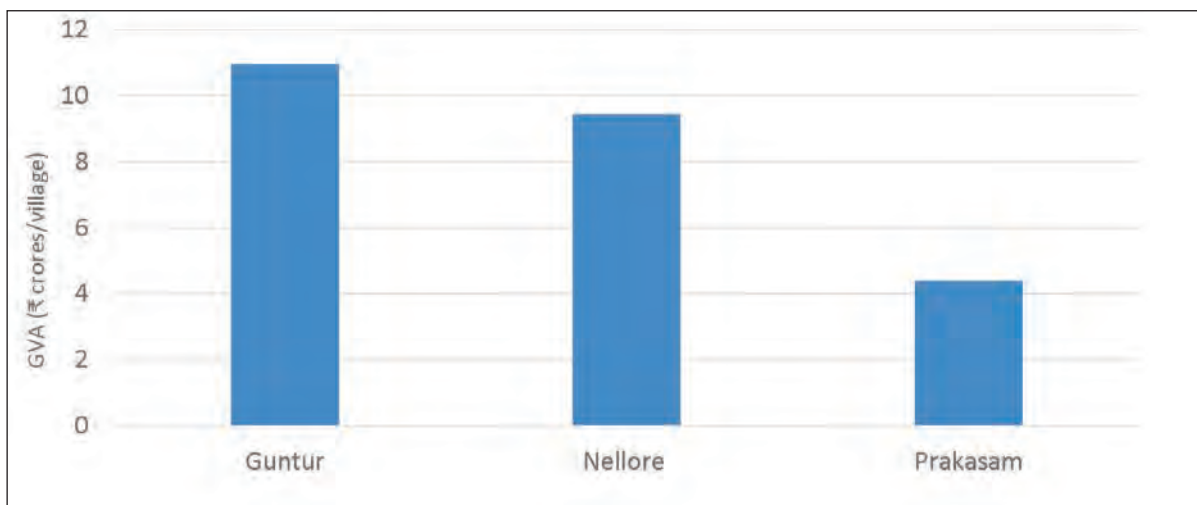


Figure 41. GVA value per pilot site village (₹ crores) in the region.

The total district GVA value per pilot site village was estimated in order to understand the extent of potential contributed by each pilot village in the Coastal Andhra Region. The district-wise estimations in the region are summarized in Figure 41. Per village contribution to GVA was the highest in Guntur district pilot site, followed by Nellore and Prakasam district pilot sites. It is very interesting to understand that each district pilot site village in Guntur is contributing nearly 2.5 times higher GVA value than each district pilot site village in Prakasam. There is clear disparity among these villages in terms of potential to contribute to total GVA in the pilot site of the Coastal Andhra Region.

Similarly, the GVA values per district pilot site household was estimated and compared across study districts in the Coastal Andhra Region. Details are furnished in Figure 42 in descending order of merit. Guntur district pilot site households retained their first rank followed by Nellore and Prakasam districts pilot site households. The average household earnings per annum during 2014-15 in the Guntur district pilot site was calculated at ₹111,699. Nellore district closely follows Guntur district in terms of GVA value per HH in the region, while the lowest earning per pilot site household per annum (₹58,788) was observed in the case of Prakasam district. The average earnings from agriculture and allied sectors of Guntur district per household was close to two times higher than the average sample household earnings in Prakasam district pilot site.

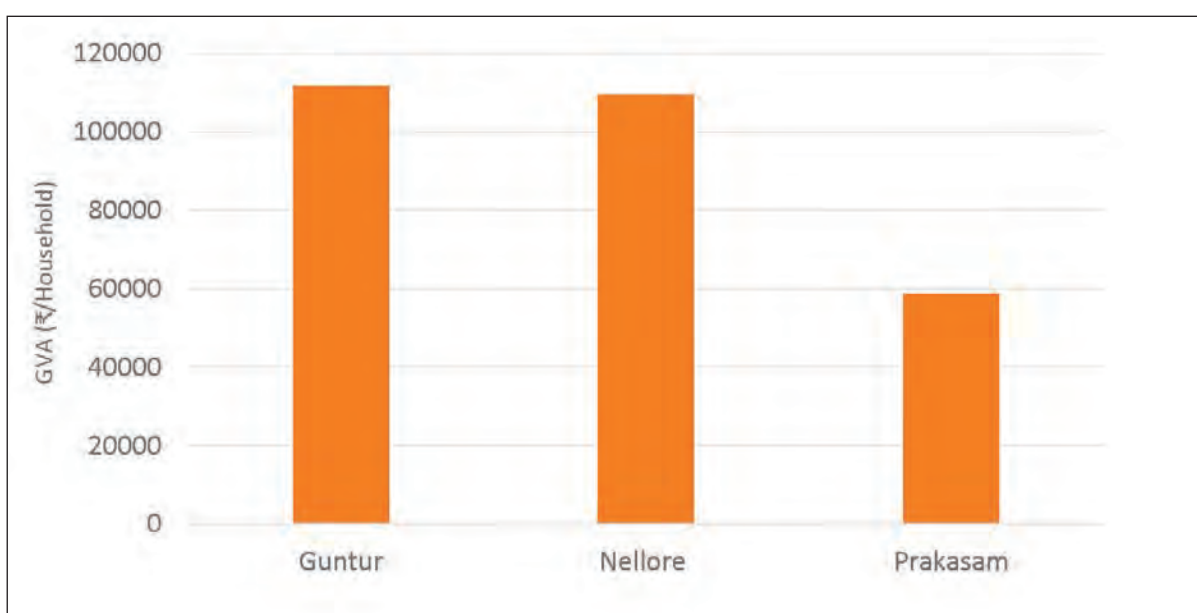


Figure 42. GVA value per district pilot site household (₹/household) in the region.

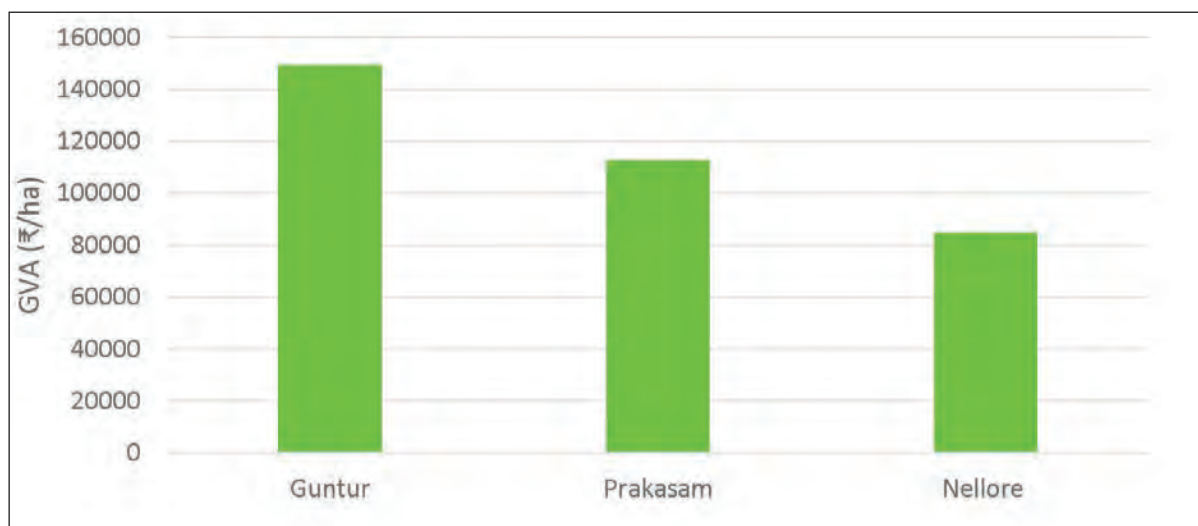


Figure 43. GVA value per district pilot site ha area (₹ per ha) in the region.

In the same fashion, the average total GVA contributions from each ha landholding in the district pilot site was also calculated and compared among study districts in the Coastal Andhra Region (see Figure 43). Per ha of agricultural land in Guntur district pilot site is contributing almost ₹149,174 per annum towards total GVA of the district primary sector. It was the highest value observed in the Coastal Andhra Region among study districts. The average earnings from each ha cultivated land was the lowest in Nellore (₹84,852) district pilot site. Good access to irrigation facilities and intensive cultivation of crops in the district might have helped Guntur district to earn 1.75 times higher income than irrigated-dry per ha cultivation in Nellore district.

11.3 Summary and way forward

Totally the comprehensive baseline survey conducted in the region has covered about 965 sample HHs spread over 57 villages from 11 mandals in three districts (Nellore, Prakasam and Guntur) of Coastal Andhra Region of Andhra Pradesh. Specifically, the results are summarized from agricultural and fishery sample villages (nearly 29) covering about 965 (778 Agril. + 187 fishery) sample households in three pilot sites corresponding to 3 study districts in the region. Small and marginal farmers dominated (66.3%) the total baseline sample in the region. The average family size in the region is about 4.0. Nearly 54.4% of total sample farmers are uneducated. About 55% of family members are engaged, or participate, in their farm activities/operations. The pooled average operational landholding per household was estimated at 2.10 ha. The extent of land tenancy in the total region sample was calculated at 29.3%. More than 90% of sample households have residential houses, and access to television sets and mobile phones. The average number of livestock animals owned per household was 2.2 in the region. Due to reasonably good access to canal irrigation facilities or groundwater resources, the average productivity levels across major crops was on par with district average yields in Guntur and Nellore districts. But the average productivity levels in case of Prakasam district was lower than district average yields across crops. Major crops, such as paddy, maize, black gram and green gram performed well and realized marginal net returns per ha. Overall, the cultivation of crops in the Coastal Andhra Region is more economical and recovered most of its investments (especially in Guntur and Nellore districts). The cultivation of fish is more profitable per cycle than prawns in the region. But the cultivation of prawns is a much more dominant activity in the region. Agriculture, including horticulture, contributed around 59.5% share in the total GVA of the Coastal Andhra Region. The fisheries sub-sector occupied second position and contributed nearly 28.75% of regional GVA value. Animal husbandry secured third place with 11.75% share in total GVA value in the Coastal Andhra Region.

The other major findings of the baseline survey along with corresponding recommendations across sub-sectors are summarized below (Table 37). Immediate steps are required to address these issues in order to enhance each sub-sector's contribution to the total primary sector GVA of the Coastal Andhra Region.

Table 37. Summary of key findings and specific recommendations.

Key findings	Specific recommendations
<ul style="list-style-type: none"> • Extreme weather events (cyclones and floods) coupled with droughts is the common problem during cropping season for agriculture. • Low productivity levels in major commercial crops (like cotton and maize) due to moisture stress and intensive cultivation. • Reasonably higher levels of tenancy leading to higher levels of rental value per ha. 	<ul style="list-style-type: none"> • High importance should be given to soil and water conservation measures and recharge of groundwater levels. • Inter-linking of tanks with major irrigation canals will ensure minimum recharge of groundwater during drought years. • Risks due to natural calamities such as cyclones, flooding etc., need to be covered for the farmers through crop insurance. • Need to formulate a policy for tenancy without affecting land rights in order to harness the potential of agriculture in the region. • Sustainable crop, water, nutrient management practices need to be promoted and popularized.
<ul style="list-style-type: none"> • Escalated labor and input costs per ha across crops, which is squeezing the net returns per ha. 	<ul style="list-style-type: none"> • Good scope for introduction and piloting of ICT-based mechanization clusters. • Lot of scope for introduction of crop-based management practices, such as ICNM/IPM, so that the cost of cultivation (COC) per ha will go down and commodity competitiveness will go up.
<ul style="list-style-type: none"> • Unorganized markets for both field (rice, chilies, turmeric, papaya, yam and vegetables, etc.) and horticultural crops (lemon, acid lime and Batavia fruit, cashewnut, etc.) 	<ul style="list-style-type: none"> • Good scope for strengthening markets and value chains for both field and horticultural crops. • Huge potential for rice processing, grading and exporting (especially Nellore Sannalu brand) • Huge potential for processing and value chain development of chilies, turmeric, and chickpea crops
<ul style="list-style-type: none"> • Lack of interest in animal rearing even though enough resources are available • Low milk productivity levels due to poor awareness on feeding practices, etc. 	<ul style="list-style-type: none"> • Animal rearing should be promoted as a business model through some incentives and subsidies. • Good scope for increasing milk productivity levels through trainings and community awareness camps in key villages.
<ul style="list-style-type: none"> • Access to poor quality seed and lower productivity levels in prawn cultivation 	<ul style="list-style-type: none"> • Supply of good quality seed and regulation of output prices are major interventions required for strengthening prawn cultivation in the region. • Huge scope for prawn value addition and targeting to export markets across the globe.
<ul style="list-style-type: none"> • Many of the sample farmers in the study districts clearly perceive the changes in climate (increase in day temperature, uneven distribution of rainfall, extreme climatic events, etc.). This has a significant impact on major crop performances and productivity levels. 	<ul style="list-style-type: none"> • There is need for introduction of climate smart agricultural practices to minimize the negative consequences arising from changes in climate in the region.

12. Baseline Survey Insights from North Coastal Region

12.1 Overview of North Coastal Region agriculture

North Coastal Region is a geographic region in the Indian state of Andhra Pradesh. It includes the northern coastal districts of Visakhapatnam, Srikakulam and Vizianagaram. With a total geographical area of 23,500 km², it occupies approximately 14.4% of the state territory. It has a population of 9,338,177 (2011 census), which is 18.8% of the state population. Visakhapatnam district is the most populous district (4.2 millions) in the North Coastal Region. The region holds 6587 census villages and 41 (statutory and census) towns. The average density of the population is estimated at 402 persons per km². The highest population density in the region was observed in Srikakulam (463 persons per km²) while the lowest was noticed in Vizianagaram district (359 persons per km²). The average decadal growth of population in the region was estimated at 7.57%. But among the districts in the region, the highest decadal population growth was observed in Visakhapatnam district (11.96%). Based on the 2011 census, the average literacy rate in the region was 62.51%. Overall, the urban population has higher levels (79.20%) of literacy rates than the rural population in the region (55.33%). The annual normal rainfall in the region ranged between 1130-1200 mm. Out of the three districts in the region, Visakhapatnam (1202 mm) receives better annual normal rainfall, followed by Srikakulam (1162.0 mm) and Vizianagaram (1131 mm).

Of the total geographical (2.3 million ha) area of the North Coastal Region, about 36.2% (0.8 million ha) is the net area sown (including fish and prawn culture) under different crops. Around 12.3% of the total geographical area (0.28 million ha) is sown more than once. The gross irrigated area in the region is estimated at only about 0.53 million ha (around 13.1% share in the state). Agriculture, which is mostly irrigated-dry, is the main livelihood occupation of the farmers in the region. Nearly 83.9% of the total cropped area is under food crops and the remaining under non-food crops.

The spread of total area sown in the North Coastal Region under different crop groups are summarized in Figure 44. Total cereals and millets together contribute about 45.3% of total cropped area (see Figure 44). It was followed by other commercial crops (such as cotton and tobacco, as well as fruits and vegetables) which accounted for 35.2%. The total pulses group occupied third place (13.1%) in the total cropped area sown in the region. Total oilseeds came in at the fourth place in the region and have a coverage of about 6.4% in total area sown.

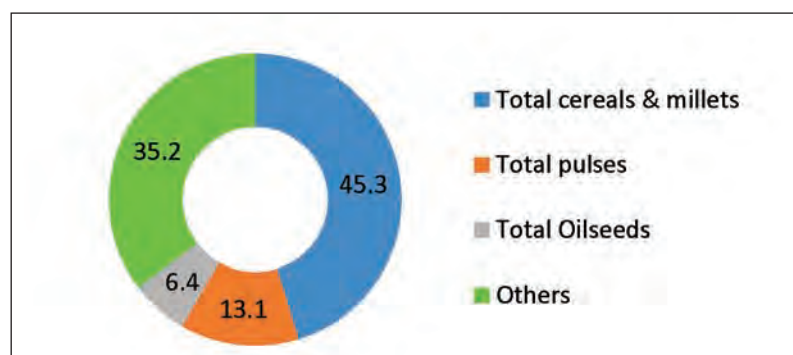


Figure 44. Share of total cropped area among crop groups.

The individual crop area share in total cropped area of the North Coastal Region during 2014-15 is available in Figure 45. More than 37% of the total cropped area in the region is occupied by rice. It was followed by cashewnut (6.1%), black gram (6.1%), sugarcane (5.3%), and mango (5.3%). All these five crops together have a total share of nearly 61% of the total cropped area in the region during the study period. Among horticulture crops, cashewnut is leading followed by mango, banana, and turmeric.

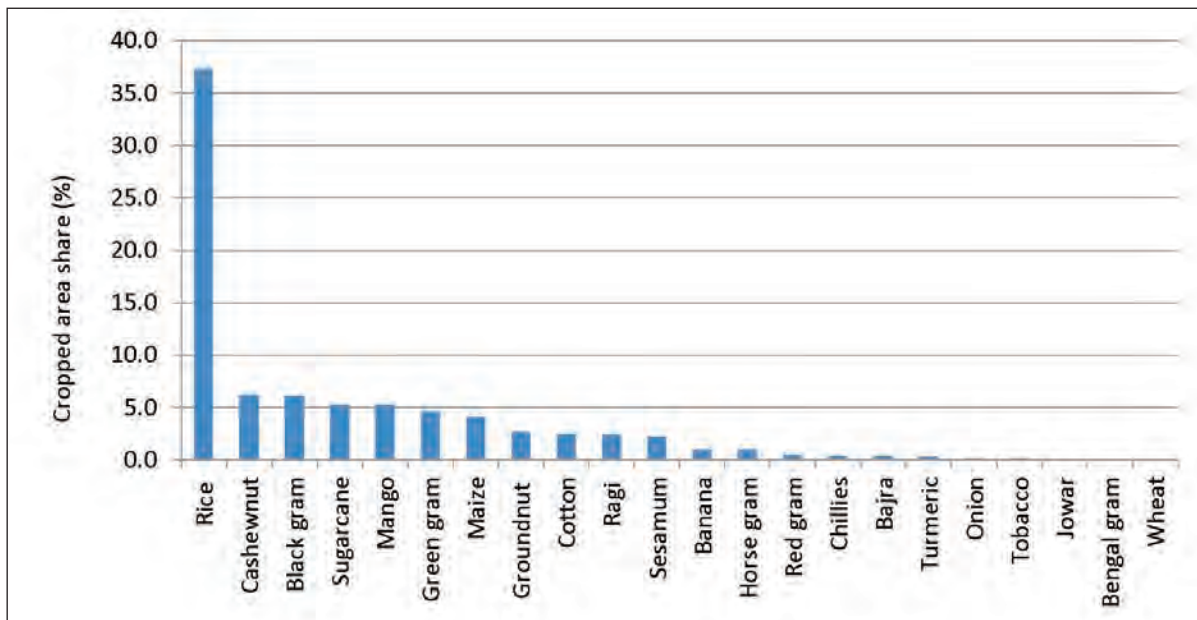


Figure 45. Crop-wise cropped area shares in the region (2014-15).

Similarly, the break-up from the 12th livestock census conducted in the North Coastal Region is summarized here. Cattle is the single largest (39.7%) contributor in the total livestock population of the region. It was followed by sheep (29.6%), goats (16.8%), and buffaloes (13.4%). Pigs and other livestock animals together had a share of only 0.6% in the 12th livestock census. Around 11.9 million poultry also existed in the region which accounts for 14.6% of the total state poultry population.

Noticeably, fisheries play a major role in the North Coastal Region of Andhra Pradesh State. Both marine fish and prawn production contribute to the GVA in the region. Around 35% of total marine fish and prawn production in the state happened in the North Coastal Region. Similarly, inland fish and prawn production is also a minor activity in the region. This region has a share of nearly 2.8% in the state's total inland fish and prawn production. A negligible share of brackish water prawn production in the state also takes place in this region. Overall, this region contributes to the state GVA in the fisheries sector. Overall, the status of North Coastal Region in comparison with the state and country has been summarized and presented in Table 38.

12.2 Findings from the baseline survey

The findings from baseline surveys conducted across the three study districts in the North Coastal Region are summarized and discussed in the following sub-sections. Simple tabular analysis was used to analyze primary household survey data collected during the baseline survey referring to the cropping year 2014-15. Specifically, the results presented below are summarized from agricultural and fishery sample villages (nearly 42) covering about 1557 (1515 Agril. + 42 fishery) sample households in three pilot sites corresponding to the three study districts in the region. Due to limited presence of fishery sector in a few villages in the three study district pilot sites, the baseline has only captured about 42 fishery sample households in the total targeted. Overall a total of 1557 sample baseline farmers' household data have been analyzed and summarized in this report.

12.2.1 Distribution of sample across size groups and communities

The distribution of total baseline survey sample (*agricultural sample HHs only*) district-wise in the region is presented in Table 39. Overall, 1515 sample households were interviewed from 38 sample agricultural villages in the three pilot sites of the North Coastal Region. All the sample farmers were distributed and categorized according to different size groups based on their total operational landholding during the 2014-15 cropping season. Out of the total 1515 sample, 1187 sample

Table 38. Comparative status of North Coastal Region vs. Andhra Pradesh and India.

Parameter	India	Andhra Pradesh	North-Coastal Region
Geographical area (000 Km ²)	3287.5	163.0	23.5
Population (Crores 2011 census)	121.09	4.96	0.93
Males (crores)	62.32	2.48	0.46
Females (crores)	58.75	2.47	0.47
Urban (Crores 2011 census)	37.71	1.46	0.30
Males (crores)	19.54	0.72	0.15
Females (crores)	18.16	0.73	0.15
Rural (Crores 2011 census)	83.37	3.49	0.64
Males (crores)	42.77	1.75	0.32
Females (crores)	40.59	1.74	0.32
Literacy (% in 2011)	74.04	67.35	62.51
Males (%)	82.14	74.77	71.44
Females (%)	65.46	59.96	53.76
GDP (₹ Crores in current prices, 2014-15)	12498662	520030	111597
Agril. and allied sectors (₹ Crores)	2337249.8	143498	16115
Industry sector (₹ Crores)	3962075.8	107224	28916
Service sector (₹ Crores)	6199336.3	269307	66566
Shares of sub-sectors in GDP (%)			
Agril. and allied sectors	18	27.6	14.4
Crops	11.8	15.4	8.1
Livestock	3.9	7.1	3.5
Forestry and logging	1.4	1.0	1.1
Fishing	0.9	4.1	1.8

households belonged to small size (<5 acres) farmers' category, followed by medium (between 5 and 10 acres) size (156 HH representing 10.3%), and large (>10 acres) size (26 HH representing 1.7%) category. Nearly a total of 146 sample households belongs to landless (operational landholding zero) category, which is also covered in the baseline survey. They contribute about 78.3%, 10.3%, 1.7%, and 9.7% shares in the total baseline sample respectively, for small, medium, large, and landless categories. This allocation among size groups is truly representative of the 2011 census survey

Table 39. Size group and community-wise distribution of sample (agril.) in the region.

District	Total sample	Distribution by group size				Distribution community-wise				
		Small	Medium	Large	Landless	OC	BC	SC	ST	Others
Visakhapatnam	423	338	47	8	30	115	178	27	101	2
Vizianagaram	442	327	38	7	70	99	242	24	77	0
Srikakulam	650	522	71	11	46	91	280	63	216	0
North Coastal Region*	1515	1187	156	26	146	305	700	114	394	2
	(100.00)	(78.30)	(10.30)	(1.74)	(9.66)	(20.13)	(46.20)	(7.53)	(26.00)	(0.14)

*Figures in parenthesis indicate their respective shares in total sample

conducted on ‘operational landholdings’ at the state level.

The total baseline sample in the region is also categorized based on the community they belong to district-wise (see Table 39). Majority in the sample (700 HHs) belong to Backward Caste (BC) community followed by Scheduled Tribe (ST) community (394 HHs), open category (OC) community (305 HHs), Scheduled Caste (SC) community category (114 HHs) and Others (2 HHs). They contributed approximately 46.2%, 26.0%, 20.2% and 7.6% respectively, to BC, ST, OC, and SC communities. The pattern of distribution of sample by community varied from district to district.

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

The details of average family size, extent of literacy and participation in labor market, etc., are analyzed and presented in Table 40. The average family size of the household for the total sampled farmers in the region is 3.8. The highest family size (4.0) was noticed in case of Srikakulam district while the lowest (3.5) was observed in Vizianagaram district. On the whole, only 27.0% of total sample in the region had literacy, out of which 11.3% had primary level of education while another 15.7% had upper primary and above level of education status in the region. Nearly 73.0% of the total sample were either uneducated or did not have access to education. The extent of illiteracy was higher in Srikakulam district sample farmers, followed by Visakhapatnam district in the region. Special effort should be taken for promotion of education and other basic amenities in Srikakulam and Visakhapatnam districts. The highest literacy rate was noticed in Vizianagaram district sample farmers than in any other district in the region. The majority of family members (63%) in the sample participate in their own farm work. Almost all of the sample districts exhibited similar levels of own farm labor participation in the North Coastal Region. Another 57.8% of total family members also participate in the outside labor market for their livelihoods. Most of the sample districts in the region

Table 40. Socio-economic details of sample in North Coastal Region.

District	Avg. family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Uneducated	Primary	Upper primary and above	Own farm* (no.)	Outside farm* (no.)
Visakhapatnam	3.9	72.8	11.8	15.4	2.4	2.3
Vizianagaram	3.5	67.0	18.8	14.3	2.4	2.0
Srikakulam	4.0	79.1	3.2	17.7	2.4	2.3
NC Region	3.8	73.0	11.3	15.7	2.4	2.2

*including children in the family.

showed relatively higher levels of outside labor market participation.

12.2.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details by district in the North Coastal Region are furnished in Table 41. The average total own landholding per household for the entire region sample was estimated at 1.26 ha, of which 0.62 ha of land was covered with irrigation access while another 0.64 ha was grown under rainfed conditions. Remarkably, in the North Coastal Region districts, both rainfed and irrigated landholdings are almost equally distributed in the total own landholdings category. But in the case of Rayalaseema Region districts, rainfed landholdings hold the lion's share in the total own landholdings group. The extent of average operational landholding for the total sample households in the region were calculated at 1.34 ha. A marginal share of crop land (0.08 ha per HH) was also leased-in from outside land markets in the region. The extent of tenancy

Table 41. Landholding particulars in North Coastal Region pilot sites (ha).

District	Own landholding (ha)			Operational landholding (ha)			Extent of tenancy in the sample%
	I	R	T	I	R	T	
Visakhapatnam	0.49	0.73	1.21	0.49	0.77	1.26	6.0
Vizianagaram	0.57	0.61	1.17	0.61	0.65	1.26	9.8
Srikakulam	0.81	0.57	1.38	0.89	0.61	1.50	9.0
Average	0.62	0.63	1.26	0.66	0.67	1.34	8.3

I: irrigated; R: Rainfed; T: Total

for the total sample households in the region was 8.3% (excluding landless households). Relatively, the tenancy was considerably prominent in Vizianagaram district, followed by Srikakulam and Visakhapatnam districts.

12.2.4 Household assets and livestock ownership

The details about owning of household assets and livestock for the total sample in the North Coastal Region are presented district-wise in Table 42. Nearly 90% of the total sample households specified that they possess a residential house. Only about 13.8% of sample households indicated that they also own a cattle shed for accommodating/rearing of buffaloes, cows, and bullocks. Televisions

Table 42. Household assets and livestock ownership in North Coastal Region pilot sites

District	% sample households possess assets					Average no. per sample HH			
	Residential house	Cattle shed	Television	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total*
Visakhapatnam	93.0	17.0	72.0	59.0	11.0	0.1	0.2	0.4	1.7
Vizianagaram	80.1	11.3	75.8	68.3	19.7	0.1	0.4	0.1	1.3
Srikakulam	97.7	13.2	79.0	69.0	17.0	0.1	0.3	0.1	0.5
Average	90.3	13.8	75.6	65.4	15.9	0.1	0.3	0.2	1.1

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

(75.6%) and mobile phones (65.4%) are the most common consumer durables owned by many of the sample farmers across study districts in the region. Approximately less than a quarter (15.9%) of total sample farmers also possessed two wheelers. Slight variations in ownership was observed from item to item and its possession among study districts in the region.

The details about average livestock ownership per sample household is also summarized in Table 42. On an average, every tenth sample HH in the region had one draft animal. Every third sample HH in the North Coastal Region also owned at least one cow. Similarly, every fifth sample HH in the region also possessed one 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 1.1. The composition of different livestock animals varied significantly from district to district in the region. Overall, the highest number of livestock animals per household was in Visakhapatnam (1.7) while the lowest was observed in the case of Srikakulam (0.5).

Table 43. Productivity levels of major crops across pilot sites.

Crop	Avg. pilot site (1)	Avg. district (2)	Avg. state (3)	Avg. nation (4)	% change (1 over 2)
Visakhapatnam					
Paddy	3504	1,752	3094	2462	100
Maize	4968	2,366	6287	2361	110
Sugarcane	25754	36000	60000	69118	-28
Green gram	768	583	610	475	32
Black gram	494	753	781	555	-34
Finger millet	683	855	1,045	NA	-20
Vizianagaram					
Paddy	3438	2,491	3094	2462	38
Maize	4229	4,415	6287	2361	-4
Black gram	371	542	781	555	-32
Sesame	317	203	NA	NA	56
Groundnut	1220	1,232	749	1274	-1
Srikakulam					
Paddy	3340	1,749	3094	2462	91
Maize	4322	5,159	6287	2361	-16
Sugarcane	31000	55,000	60000	69118	-44
Green gram	707	572	610	475	24
Black gram	629	564	781	555	12
Finger millet	464	1,265	1,045	NA	-63

12.2.5 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 Table 43 below.

The Visakhapatnam pilot site productivity levels were on par with the district average yields except in the case of sugarcane, black gram and finger millet crops. But the relative productivity levels in the pilot site are much higher than the district average in case of paddy, maize and green gram. So there is huge potential for contribution to pilot site GVA from major crops. The mean productivity levels were significantly lower in the case of sugarcane and black gram than the district average yield as reported by Directorate of Economics and Statistics.

The Vizianagaram pilot site productivity levels were on par with the district average yields only in case of paddy and sesame crops. But the relative productivity levels in the pilot site are lower than the district average for maize, black gram and groundnut. So, there is huge potential for contribution to pilot site GVA from major crops. The mean productivity levels were significantly lower in black gram than the district average yield as reported by Directorate of Economics and Statistics. Huge potential exists in the Vizianagaram pilot site for future prosperity through better management practices, scientific post-harvest handling and market linkages.

The Srikakulam pilot site productivity levels were lower than the district average yields except in the case of paddy, black gram and green gram crops. But the relative productivity levels in the pilot site are much lower than the district average in maize, sugarcane and finger millet. So, there is huge potential for contribution to pilot site GVA from major crops. The mean productivity levels were significantly lower in case of finger millet and sugarcane than the district average yield as per Directorate of Economics and Statistics.

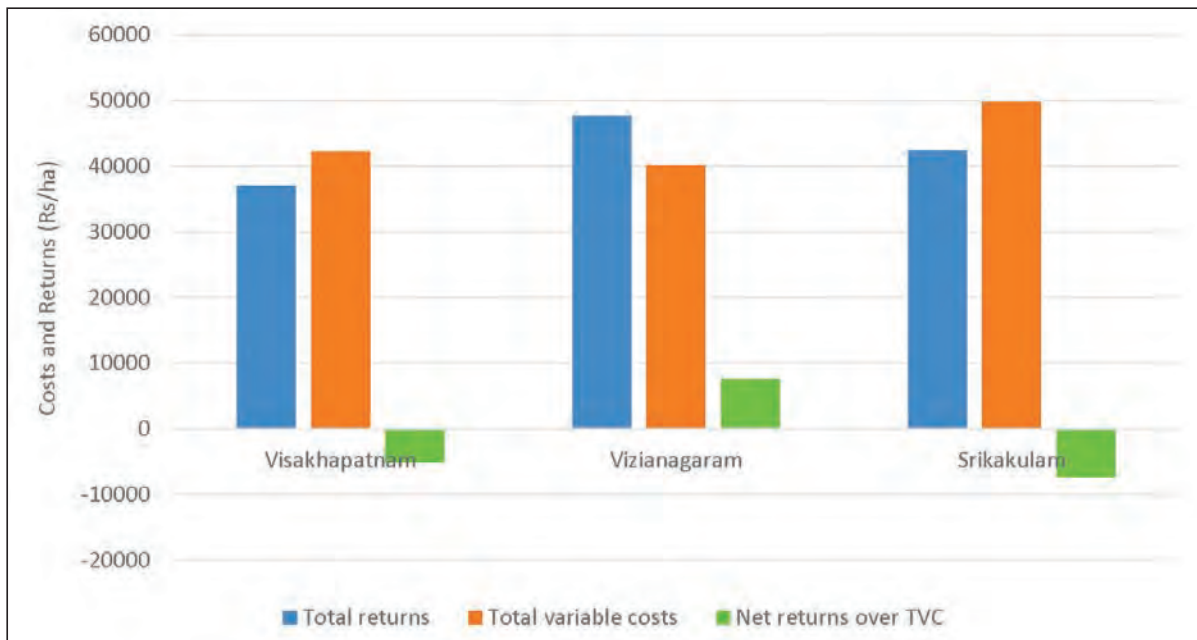


Figure 46. Performance of paddy in North Coastal Region.



Figure 47. Performance of maize in North Coastal Region.

12.2.6 Economics of crop enterprises

The details about economics of major crop enterprises per ha across pilot site districts are summarized in Figures 46 and 47. Details about crop-wise performances of major crops in the North Coastal Region are discussed and summarized below.

The performance of agriculture in the three North Coastal districts' (Visakhapatnam, Vizianagaram and Srikakulam) pilot sites are mixed. Paddy, the major irrigated crop in these districts, could not recover its total variable costs in both Visakhapatnam and Srikakulam districts. It recovered its total variable costs only in Vizianagaram district. Maize performed well in both Vizianagaram and Srikakulam district pilot sites. But it did not recover its total variable costs in case of Visakhapatnam district pilot site. Sugarcane is another major irrigated crop grown in Visakhapatnam district that recovered its total variable costs and earned significant profits per ha. Sesame in Vizianagaram and black gram in Srikakulam districts exhibited better recovery of total variable costs per ha. If we

consider the total costs per ha, all the rainfed crops across districts were unable to recover them. For further details on costs and returns of various crops per ha across pilot sites in the district refer to specific Baseline Reports prepared under similar guidelines.

Since cultivation of fisheries is a very minor economic activity in the region, the detailed costs and returns on them were not analyzed and presented. However, huge marine fish and prawn cultivation potential is available in the North Coastal Region. But this industry is still at an infant stage in the region.

Table 44. Primary Sector GVA estimations in Coastal Andhra pilot sites (Base year: 2014-15).

District	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agril. including horticulture	Animal husbandry	Fisheries
Visakhapatnam	102.71	5.93	0.00	108.64	94.54	5.46	0.00
Vizianagaram	31.52	3.14	0.00	34.66	90.94	9.06	0.00
Srikakulam	29.70	9.91	2.33	41.94	70.82	23.63	5.56
Regional total	163.93	18.98	2.33	185.24	88.50	10.25	1.26

12.2.7 Pilot site GVA estimations across sub-sectors

The details about pilot site-wise Gross Value Addition (GVA) estimations across sub-sectors in the primary sector are furnished in Table 44 for the North Coastal 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 AP Primary Sector Mission baseline survey. Here, the report summarizes the results for the three major districts in the North Coastal Region. The results generated from primary household data analysis are discussed in detail by sub-sector below.

Overall the total estimated GVA from AP Primary Sector Mission's three pilot sites in the North Coastal Region are ₹185.24 crores, of which ₹163.93 crores (88.50%) is contributed by the agriculture

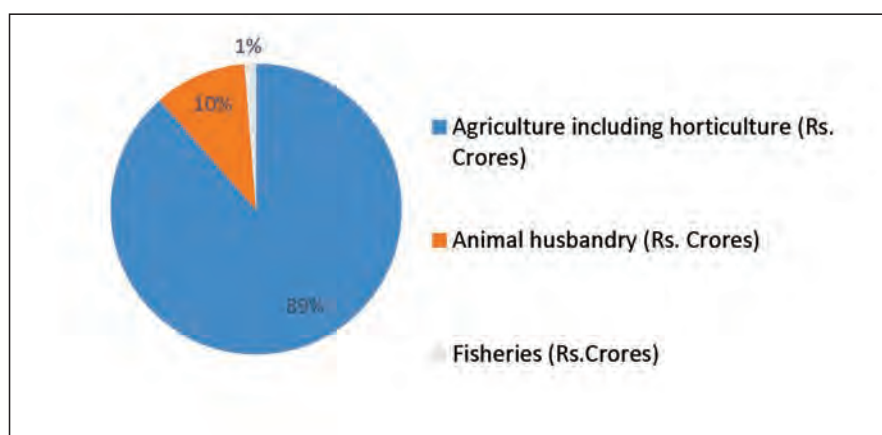


Figure 48. Sub-sector wise shares in the total GVA estimation.

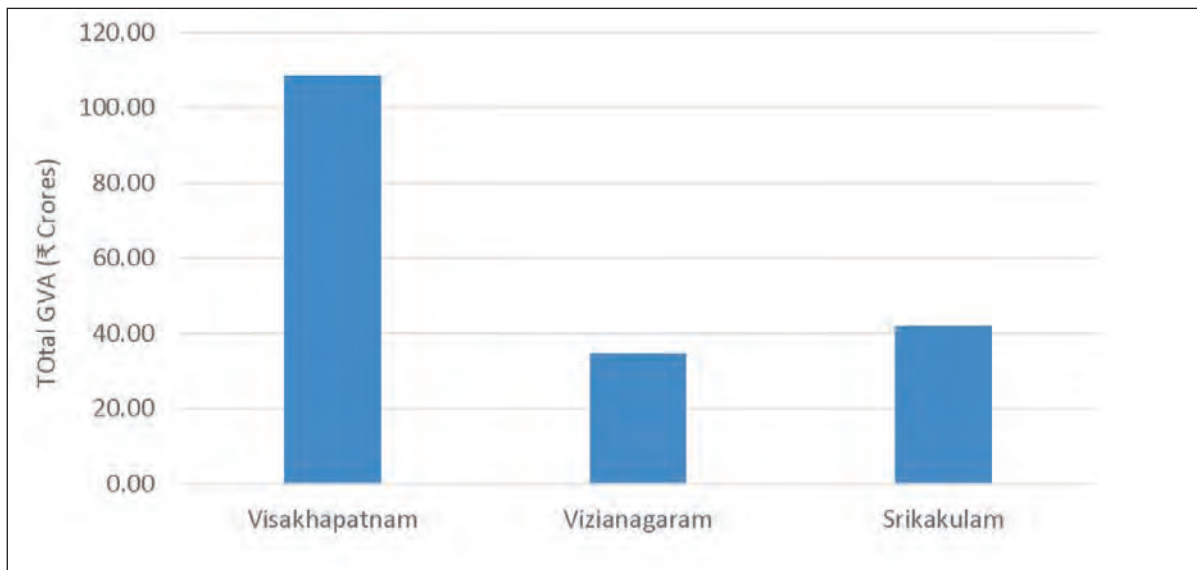


Figure 49. Total GVAs estimations by district pilot site in the region.

sub-sector including horticulture. Another ₹18.98 crores is contributed by animal husbandry which accounts for 10.25% share in total GVA of the AP Primary Sector Mission in the region. The fisheries sub-sector contributes an amount of ₹2.33 crores towards total GVA value in the region. Sector-wise contributions and corresponding share value are depicted in Figure 48.

Among all the three pilot sites, Visakhapatnam district pilot site contributed the highest value (108.64 crores), followed by Srikakulam district pilot site (41.94 crores) and Vizianagaram district pilot site (34.66 crores). The lowest GVA value was recorded in Vizianagaram district pilot site. The total GVA values by district pilot site in the region are presented in Figure 49.

The highest value of GVA contributed by the agricultural sub-sector (including horticulture) was observed in Visakhapatnam district pilot site (₹102.71 crores) followed by Vizianagaram district

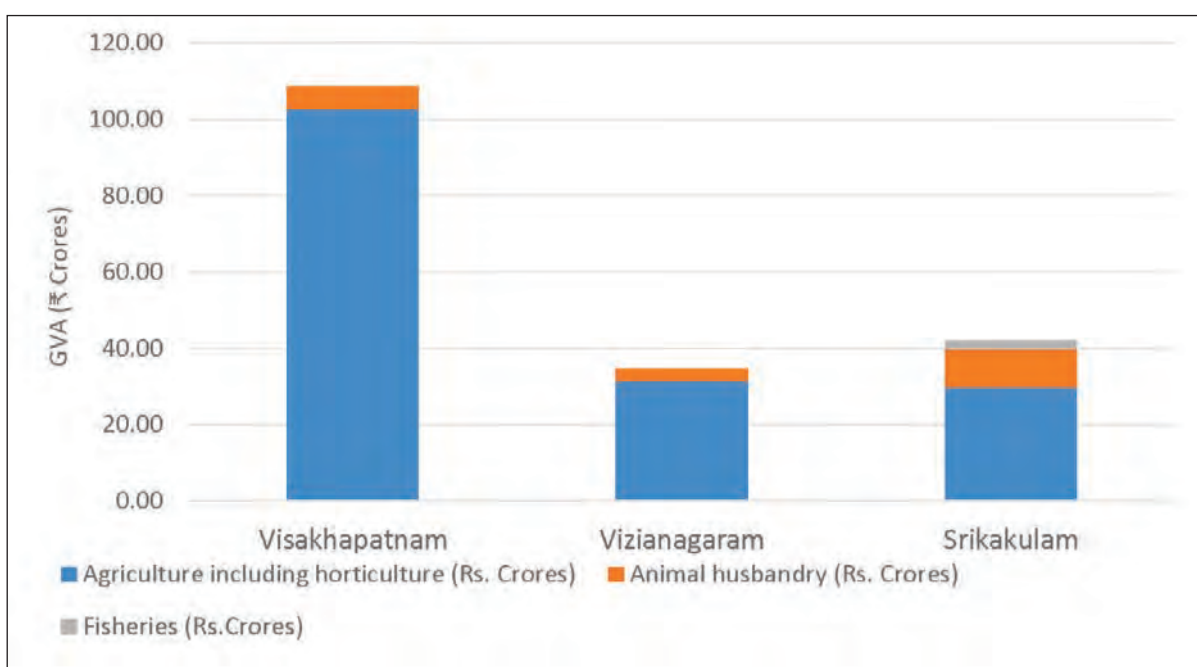


Figure 50. Composition of pilot site GVAs by sub-sector in the region.

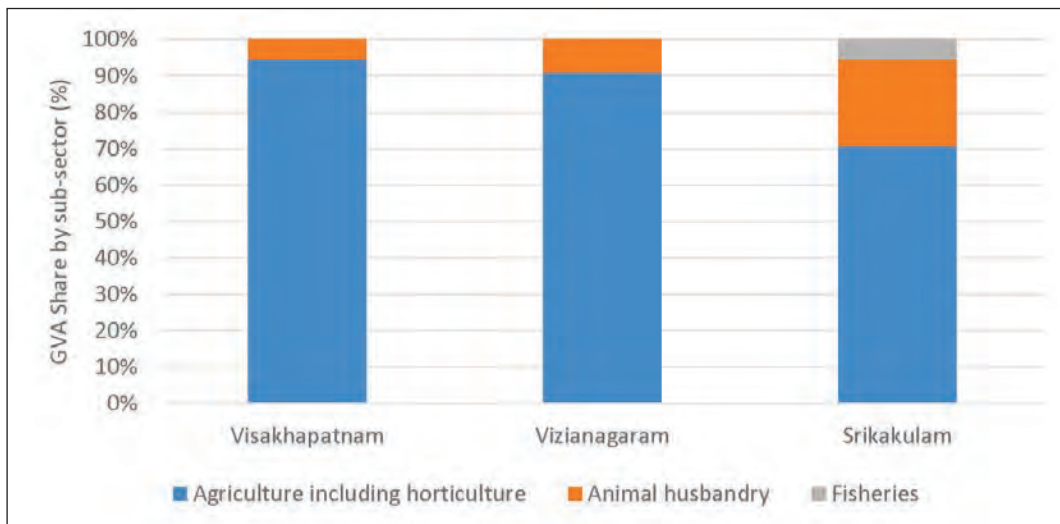


Figure 51. Shares of different sub-sectors in total GVA.

pilot site (₹31.52 crores). The lowest value was contributed by Srikakulam district pilot site (₹29.70 crores). In the case of animal husbandry sub-sector, the highest value was contributed by Srikakulam district pilot site (₹ 9.91 crores) followed by Visakhapatnam district pilot site (₹5.93 crores). It is good to see Srikakulam district pilot site contributing significantly to the animal husbandry sub-sector even though it was relatively backward in the agriculture and horticulture sub-sector in the region.

The lowest value GVA from animal husbandry sub-sector in the region was contributed by Vizianagaram district (₹3.14 crores). The fisheries sub-sector contributed marginally only in the Srikakulam district pilot site (₹2.33 crores). The other two districts in the region did not contribute to fisheries GVA value in the region. The composition of each pilot site GVA by sub-sector are summarized in Figure 50.

Overall the dominance and significant share contributions of different sub-sectors in each district's total pilot site GVA estimations in the North Coastal Region are presented in Figure 51. Nearly 94.54% share of total GVA in the Visakhapatnam district pilot site is contributed by agriculture including horticulture sub-sector. In contrast to Visakhapatnam district, Srikakulam district pilot site had the lowest share (23.63%) contribution from animal husbandry sub-sector. In the case of Vizianagaram, both agriculture including horticulture and fisheries sub-sectors played a significant role in the total

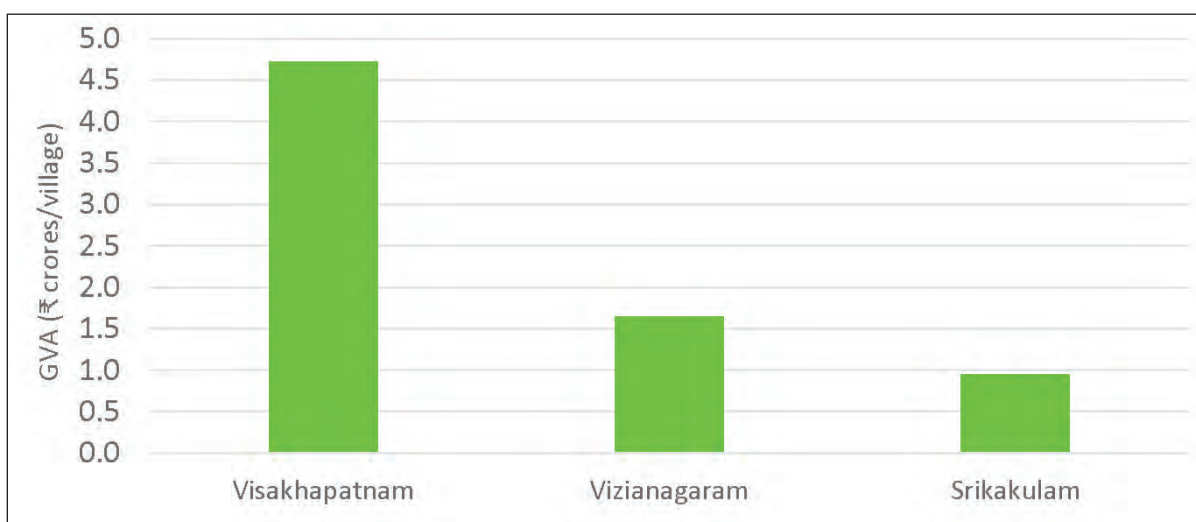


Figure 52. GVA value per pilot site village (₹ crores) in the region.

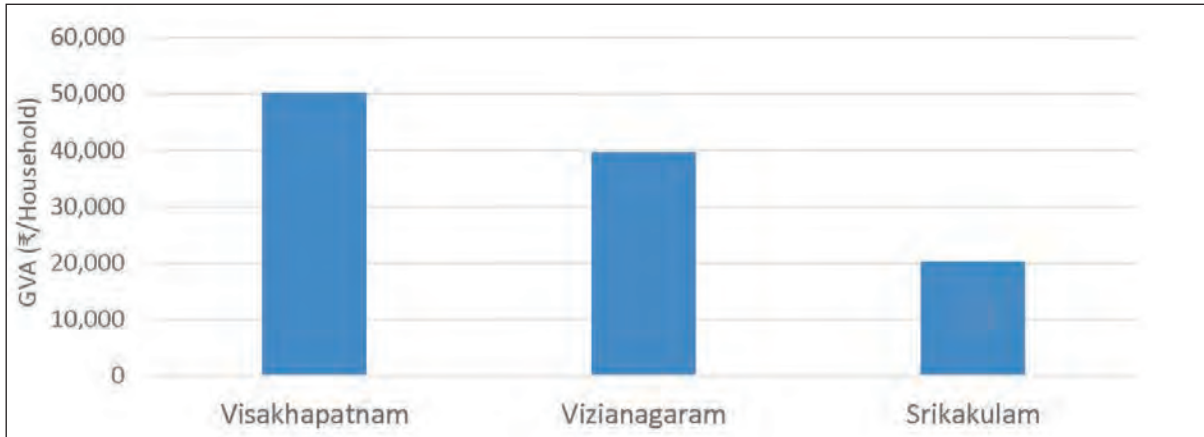


Figure 53. GVA value per district pilot site household (₹/household) in the region.

GVA contributions.

The total district GVA value per pilot site village was estimated in order to understand the extent of potential contributed by each pilot village in the North Coastal Region. The district-wise estimations in the region are summarized in Figure 52. Per village contribution of GVA was the highest in case of Visakhapatnam district pilot site followed by Vizianagaram and Srikakulam district pilot sites. It is very interesting to note that each district pilot site village in Visakhapatnam is contributing nearly 4.9 times higher GVA value than each of the district pilot site villages in Srikakulam. There is a clear disparity among these villages in terms of potential to contribute to total GVA in the pilot site of the North Coastal Region.

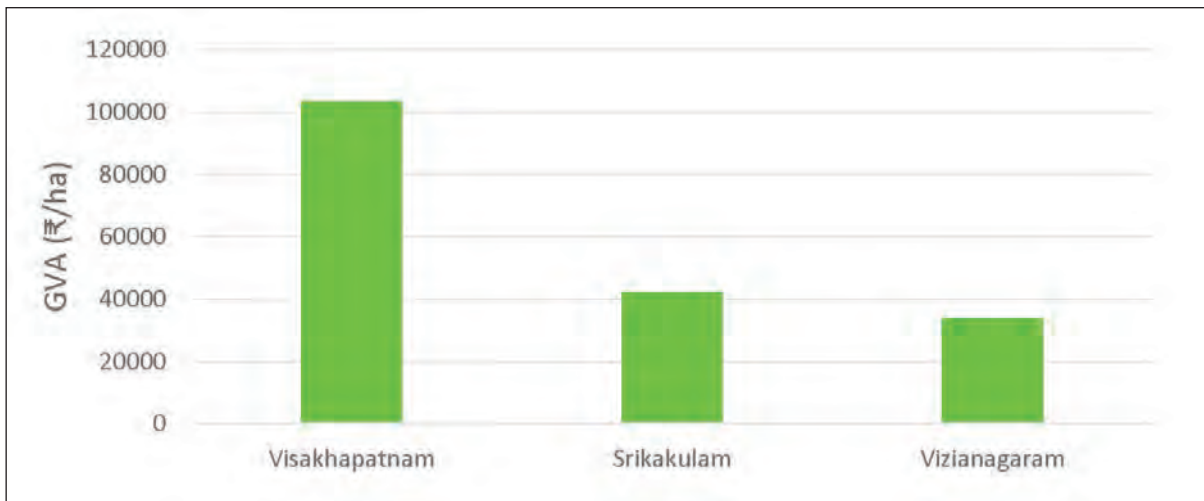


Figure 54. GVA value per district pilot site ha area (₹ per ha) in the region.

Similarly, the GVA values per district pilot site household was estimated and compared across study districts in the North Coastal Region. Details are furnished in Figure 53 in descending order of merit. Visakhapatnam district pilot site households retained their first rank followed by Vizianagaram and Srikakulam districts pilot site households. The average household earnings per annum during 2014-15 in the Visakhapatnam district pilot site was calculated at ₹50,127. Vizianagaram district closely

follows Visakhapatnam district in terms of GVA value per HH in the region, while the lowest earning per pilot site household per annum (₹20,240) was observed in Srikakulam district in the region. The average earnings from agriculture and allied sectors of Visakhapatnam district's per household tally was close to 2.5 times higher than the average sample household earnings in Srikakulam district's pilot site.

In the same manner, the average total GVA contributions from each ha landholding in district pilot site was also calculated and compared among study districts in the North Coastal Region (see Figure 54). Per ha of agricultural land in Visakhapatnam district pilot site contributes almost ₹103,309 per annum towards total GVA of the district's primary sector. It was the highest value observed among the North Coastal Region's study districts. The average earnings from each hectare of cultivated land was the lowest in Vizianagaram (₹33,739) district pilot site. Good access to irrigation facilities and intensive cultivation of high value crops in the district may have helped Visakhapatnam district to earn three times higher income than irrigated-dry per hectare cultivation in Vizianagaram district.

12.3 Summary and way forward

Overall, the comprehensive baseline survey conducted in the region has covered about 1557 sample HHs spread over 90 villages from eight mandals in three districts (Visakhapatnam, Vizianagaram and Srikakulam) of North Coastal Region of Andhra Pradesh State. Specifically, the results are summarized from agricultural and fishery sample villages covering about 1557 (1515 Agril. + 42 fishery) sample households in three pilot sites corresponding to three study districts in the region. Small and marginal farmers dominated (78.3%) the total sample in the region. The socio-economic status of the farmers in the region is poor when compared with other regions. The average family size in the region is about 3.8. Nearly 73.0% of the total sample are uneducated. About 63.15% of family members are engaged or participate in their own farm activities/operations. The pooled average operational landholding per household was estimated at 1.34 ha. The extent of land tenancy in the total region sample was calculated at 8.3%. More than 80% of sample households have a residential house, access to television and mobile phones. The average number of livestock animals owned per household was 1.1 in the region. Agriculture in general is low input-based with poor productivity levels among both field and horticultural crops. Due to partial access to canal irrigation facilities or groundwater resources, the average paddy productivity levels was on par with district average yields in the three study districts. But the average productivity levels in case of maize was lower than district average yields. The performance of agriculture in the three North Coastal districts' pilot sites are mixed. Paddy, the major irrigated crop in these districts, could not recover its total variable costs in case of both Visakhapatnam and Srikakulam districts. The cultivation of fish and prawns is not a major activity in the region. Agriculture including horticulture contributed around 88.5% share in the total GVA of the North Coastal Region. The animal husbandry sub-sector occupied the second position and contributed nearly 10.25% of regional GVA value. Fisheries secured third place with 1.26% share in total GVA value in the North Coastal Region.

The other major findings of the baseline survey and corresponding recommendations across sub-sectors are summarized below. Immediate steps are required to address these issues so that each sub-sector's contribution to the total primary sector GVA of the North Coastal Region can be enhanced.

Table 45. Summary of key findings and specific recommendations.

Key findings	Specific recommendations
<ul style="list-style-type: none"> In the region majority are small and marginal farmers with low economic capacity. In general, agriculture is low input-based, plus lack of awareness in most of the tribal areas. Low adoption of technologies and poor productivity levels across both field and horticultural crops. 	<ul style="list-style-type: none"> Good scope for further increase of productivity levels through creation of awareness and introduction of new technologies. Potential opportunity for increasing cropping intensity through efficient use of available rainfall and groundwater. Ample scope for converting the existing low input cultivated area into organic clusters, branding and marketing, etc. Linking small and marginal farmers to proper institutional credit facilities will empower them to invest more in agriculture in general and crops cultivation in particular.
<ul style="list-style-type: none"> Low per capita consumption of milk in the region leading to susceptibility to diseases and malnutrition Animal rearing is not a preferred major economic activity in region Low productivity levels of milk per animal due to poor awareness about fodder practices 	<ul style="list-style-type: none"> Animal rearing should be promoted as a business model with suitable incentives and subsidies Immediate need for creation of awareness about both consumption and production of milk in the region Good scope for introduction of cross-breeds and small ruminants in large-scale rearing to make use of available resources
<ul style="list-style-type: none"> Large tracts of suitably cultivated lands are ideal with good quantum of annual rainfall, congenial climate, reasonably good soils and natural landscape 	<ul style="list-style-type: none"> Enormous potential for introduction of new commercial crops, such as coffee, lemon grass, flax seed, and floriculture, etc. Potential scope for introduction of commercial cultivation of plantation crops (Eucalyptus, Casuarina etc.) in the region
<ul style="list-style-type: none"> Poor market linkages due to poor road connectivity and lack of awareness. Traders play a major role in business transactions. 	<ul style="list-style-type: none"> Untapped potential for setting up of horticultural value chains, specifically in coffee, mango, banana, cashewnut, pineapple, jackfruit, etc. Huge opportunities for setting up of proper marketing channels for major and minor forest products.
<ul style="list-style-type: none"> Agriculture in the region is highly prone to climatic aberrations and cyclones (Hudhud cyclone devastated all crop yields during 2014-15) 	<ul style="list-style-type: none"> Immediate need for introduction and piloting of climate smart agriculture studies in the region Weather-based insurance coverage should be promoted and scaled up in the region
<ul style="list-style-type: none"> Untapped potential for mechanized marine fish and prawn capturing in the region. 	<ul style="list-style-type: none"> The region has enormous potential for commercial capturing of marine fisheries and brackish prawns due to the presence of a long coastline in the state. This sub-sector could contribute significantly to the Primary Sector GVA of the region.
<ul style="list-style-type: none"> Huge scope for promotion of non-farm employment in region 	<ul style="list-style-type: none"> Non-farm skills and employment promotion activities should be initiated for increasing the per capita income in the region.

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Anantapur District Pilot Site Baseline Report

Chittoor District Pilot Site Baseline Report

East Godavari District Pilot Site Baseline Report

Guntur District Pilot Site Baseline Report

Kadapa District Pilot Site Baseline Report

Krishna District Pilot Site Baseline Report

Kurnool District Pilot Site Baseline Report

Nellore District Pilot Site Baseline Report

Prakasam District Pilot Site Baseline Report

Srikakulam District Pilot Site Baseline Report

Visakhapatnam District Pilot Site Baseline Report

Vizianagaram District Pilot Site Baseline Report

West Godavari District Pilot Site Baseline Report

Annexure-1

Table 1. Distribution of sample (agril.) across pilot sites.

District	Total sample	Distribution by group size				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
Nellore	216	148	27	15	26	111	70	35	0	0
Prakasam	251	155	32	36	28	104	95	49	3	0
Guntur	311	213	42	18	38	184	38	84	5	0
Krishna	366	222	56	41	47	155	88	114	9	0
W. Godavari	310	149	61	44	56	123	164	22	1	0
E. Godavari	354	212	55	34	53	119	86	15	134	0
Visakhapatnam	423	338	47	8	30	115	178	27	101	2
Vizianagaram	442	327	38	7	70	99	242	24	77	0
Srikakulam	650	522	71	11	46	91	280	63	216	0
TOTAL*	4794	3371	581	264	578	1605	1881	676	621	11
	(100)	(70.3)	(12.1)	(5.5)	(12.1)	(33.5)	(39.2)	(14.1)	(13.0)	(0.2)

*Figures in parenthesis indicate their respective shares in total sample

Table 2. Socio-economic details across pilot sites.

District	Avg. family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Uneducated	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
Nellore	3.7	51.4	14.4	34.3	2.0	1.9
Prakasam	4.6	62.9	10.4	26.7	2.6	2.4
Guntur	3.7	49.0	15.0	35.0	2.1	1.6
Krishna	3.6	55.2	8.7	36.1	1.7	1.1
W. Godavari	3.7	55.8	11.3	32.9	1.6	0.7
E. Godavari	4.1	66.7	14.1	19.2	2.0	1.4
Visakhapatnam	3.9	72.8	11.8	15.4	2.4	2.3
Vizianagaram	3.5	67.0	18.8	14.3	2.4	2.0
Srikakulam	4.0	79.1	3.2	17.7	2.4	2.3
Average	4.0	59.0	13.4	27.6	2.2	1.9

*including children in the family

Table 3. Landholding particulars across 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
Nellore	0.62	0.57	1.19	1.06	0.57	1.63	16.0
Prakasam	0.16	1.82	1.98	0.20	2.83	3.04	29.0
Guntur	0.89	0.36	1.26	1.17	0.45	1.62	43.0
Krishna	1.30	0.20	1.50	2.27	0.28	2.51	45.1
W. Godavari	1.98	0.20	2.02	2.51	0.20	2.71	31.0
E. Godavari	0.61	0.93	1.54	0.85	1.05	1.90	31.0
Visakhapatnam	0.49	0.73	1.21	0.49	0.77	1.26	6.0
Vizianagaram	0.57	0.61	1.17	0.61	0.65	1.26	9.8
Srikakulam	0.81	0.57	1.38	0.89	0.61	1.50	9.0
Average	0.71	0.75	1.45	0.92	0.86	1.78	18.6

I: irrigated; R: Rainfed; T: Total

Table 4. Household assets and livestock ownership among pilot sites.

District	% sample households possess assets					Average no. per sample HH			
	Residential house	Cattle shed	Television	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
Nellore	98.6	10.2	90.7	89.4	29.2	0.0	0.0	1.0	2.1
Prakasam	100.0	13.6	96.0	93.2	25.1	0.1	0.0	1.4	3.3
Guntur	99.0	5.5	96.5	92.0	28.3	0.1	0.0	0.6	1.2
Krishna	98.4	12.8	92.3	83.9	44.8	0.0	0.1	0.4	0.7
W. Godavari	96.1	22.3	78.4	78.3	56.5	0.0	0.2	0.9	1.4
E. Godavari	94.0	23.0	86.0	82.0	28.0	0.2	0.2	0.4	1.1
Visakhapatnam	93.0	17.0	72.0	59.0	11.0	0.1	0.2	0.4	1.7
Vizianagaram	80.1	11.3	75.8	68.3	19.7	0.1	0.4	0.1	1.3
Srikakulam	97.7	13.2	79.0	69.0	17.0	0.1	0.3	0.1	0.5
Average	96.2	13.5	86.6	83.9	27.2	0.1	0.2	0.5	2.4

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

Table 5. Pilot site-wise major crops and their average productivity levels.

District	Major crops	Productivity during BL (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
Nellore	Paddy	5578	4051	3094	2462
	Black gram	569	824	781	555
	Green gram	815	883	610	475
Prakasam	Paddy	4519	3841	3094	2462
	Cotton	656	3330	3234	491
	Chickpea	1126	1945	1372	960
Guntur	Paddy	5729	3340	3094	2462
	Maize	6661	7446	6286	2476
	Black gram	1791	1087	781	555
Krishna	Paddy	4807	3235	3094	2462
	Maize	6504	6921	6287	2361
	Cotton	2689	3788	3233	489
W. Godavari	Paddy	5333	3191	3094	2462
	Maize	6435	7086	6287	2361
	Oil palm	26874	NA	NA	NA
E. Godavari	Paddy	4061	2994	3094	2462
	Tapioca	12895	NA	NA	NA
	Cotton	1570	1135	3234	456
Visakhapatnam	Paddy	3504	1752	3094	2462
	Sugarcane	25754	36000	60000	69118
	Maize	4968	2366	6287	2361
Vizianagaram	Paddy	3438	2491	3094	2462
	Maize	4229	4415	6287	2361
	Sesame	317	203	NA	NA
Srikakulam	Paddy	3340	1749	3094	2462
	Maize	4322	5159	6287	2361
	Black gram	629	564	781	555

Table 6. Economics of crop enterprises across 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
Nellore	Paddy	107791	67001	40790	1.61
	Black gram	36087	31658	4429	1.14
	Green gram	39342	32594	6748	1.21
Prakasam	Paddy	78563	57415	21148	1.37
	Cotton	38856	43072	-4216	0.90
	Cowpea	24250	30112	-5861	0.81
Guntur	Paddy	84541	61794	22746	1.40
	Maize	90155	49756	40399	1.80
	Black gram	63397	38223	25174	1.70
Krishna	Paddy	67757	46782	20975	1.40
	Maize	51687	40891	10796	1.30
	Cotton	88663	48748	39915	1.80
W. Godavari	Paddy	106259	53624	52636	1.98
	Maize	93887	59789	34098	1.57
	Oil palm	168543	135850	32693	1.24
E. Godavari	Paddy	68172	56810	11362	1.20
	Tapioca	130742	41990	88752	3.10
	Banana	142188	103740	38448	1.40
Visakhapatnam	Paddy	37025	42222	-5197	0.88
	Sugarcane	120647	61459	59189	1.96
	Maize	27281	28361	-1079	0.96
Vizianagaram	Paddy	47659	40130	7529	1.20
	Maize	61545	54466	7079	1.10
	Sesame	28454	21946	6508	1.30
Srikakulam	Paddy	42356	49788	-7432	0.85
	Maize	63958	39797	24162	1.61
	Black gram	32611	17448	15163	1.87

Table 7. Economics of prawn/fish enterprises across pilot sites (₹ per cycle only).

District	Prawn/fish	Total returns (₹ per ha)	Total variable costs (₹ per ha)	Net returns over TVC (₹ per ha)	B:C Ratio
Chittoor	-	-	-	-	-
Kadapa	-	-	-	-	-
Anantapur	-	-	-	-	-
Kurnool	-	-	-	-	-
Nellore	Prawns	1287814	968687	319129	1.33
Prakasam	Prawns	1289802	1305761	-15959	0.99
Guntur	Prawns	1092879	1256012	-163134	0.87
Krishna	Prawns	954756	791593	163163	1.21
	Fish	613360	456194	157166	1.34
West Godavari	Prawns	1078303	1180262	-101959	0.91
	Fish	683039	278495	404546	2.45
East Godavari	Prawns	1163610	986399	177210	1.18
	Fish	810958	390969	419989	2.07
Visakhapatnam	-	-	-	-	-
Vizianagaram	-	-	-	-	-
Srikakulam	-	-	-	-	-

Table 8. Primary Sector GVA estimations across pilot sites (Base year: 2014-15).

District	Sub-sector wise			Total GVA Estimation (₹ Crores)	Sub-sector wise share		
	Agriculture including horticulture (₹ Crores)	Animal husbandry (₹ Crores)	Fisheries (₹ Crores)		Agril. including horticulture	Animal husbandry	Fisheries
Chittoor	14.24	11.17	0.00	25.41	56.04	43.96	0.00
Kadapa	22.06	23.73	0.00	45.79	48.18	51.82	0.00
Anantapur	4.30	21.85	0.00	26.15	16.44	83.56	0.00
Kurnool	26.60	10.80	0.00	37.40	71.12	28.88	0.00
Nellore	65.62	10.65	26.80	103.07	63.67	10.33	26.00
Prakasam	16.69	18.17	78.00	112.86	14.79	16.10	69.11
Guntur	163.36	19.71	13.90	196.97	82.94	10.01	7.06
Krishna	63.20	57.03	23.38	143.61	44.01	39.71	16.28
W. Godavari	163.50	8.48	96.40	268.38	60.92	3.16	35.92
E. Godavari	57.71	6.58	32.10	96.39	59.87	6.83	33.30
Visakhapatnam	102.71	5.93	0.00	108.64	94.54	5.46	0.00
Vizianagaram	31.52	3.14	0.00	34.66	90.94	9.06	0.00
Srikakulam	29.70	9.91	2.33	41.94	70.82	23.63	5.56
TOTAL	761.21	207.15	272.91	1241.27	61.33	16.69	21.99

Table 9. District-wise pilot site GVA by unit values.

District	GVA/pilot site village (₹ Crores)	GVA/pilot site HH (₹/HH)	GVA/pilot site cropped area (₹/ha)
Chittoor	1.36	34,781	27,122
Kadapa	3.52	40,717	44,396
Anantapur	1.86	52,102	26,150
Kurnool	3.74	54,487	36,314
Nellore	9.43	1,09,515	84,852
Prakasam	4.39	58,788	112,736
Guntur	10.94	1,11,699	1,49,174
Krishna	5.30	62,973	94,592
W. Godavari	22.44	1,16,338	2,10,404
E. Godavari	3.70	55,120	92,063
Visakhapatnam	4.72	50,127	1,03,309
Vizianagaram	1.65	39,598	33,739
Srikakulam	0.95	20,240	42,304
Average	5.69	46893.30	59426.80

Table 10. Projected district GVA values from baseline survey data (Base year: 2014-15).

District	GVA per ha from BL survey (₹ Crores)	Total district gross cropped area (ha)	Projected GVA at district level using BL data (₹ Crores)
Chittoor	0.0027	417066	1131.17
Kadapa	0.0044	418871	1859.62
Anantapur	0.0026	1106371	2893.16
Kurnool	0.0036	1001697	3637.56
Nellore	0.0085	374181	3175.00
Prakasam	0.0113	688818	7765.46
Guntur	0.0149	862903	12872.27
Krishna	0.0095	728495	6890.98
W. Godavari	0.0210	696992	14664.99
E. Godavari	0.0092	691552	6366.64
Visakhapatnam	0.0103	368902	3811.09
Vizianagaram	0.0034	357894	1207.50
Srikakulam	0.0042	414006	1751.41
Grand total		8127748	68026.84

Annexure-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	Visakhapatnam	3	23	0	0
12	Vizianagaram	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 agril./hort. 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 agril./hort. 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	Agril. 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

*a few landless households also covered in fishery sample

Annexure-3. Monitoring Indicators

There is need for setting up a robust Monitoring & Evaluation (M&E) system for the implementation of Primary Sector Mission across sub-sectors in Andhra Pradesh State for the next five years (2015-2020). This will allow a review of the performance of the respective missions (concerned departments) and will help in addressing the bottlenecks and concerns of the departments in a timely manner. Each department has prepared their rolling action plans for achieving double digit growth under the project during the next five-year period. An efficient monitoring framework will allow review of both progress and achievements periodically across benchmark values generated in the baseline survey. The process will also allow the team/departments to carry out any mid-term corrections or maintain the revised targets over the project period. Periodical monitoring can define achievable target levels across sub-sectors much better than arbitrary or imaginary targets. This entire mechanism allows the state to refine achievable or realistic targets by end-of-project period. Building a good M&E framework and its implementation is critical for any successful project. Identification of certain monitoring indicators across sub-sectors and their periodical review will allow the implementing agency to keep track of progress made in the project from time to time against the baseline survey data. The sub-sector-wise possible monitoring indicators are listed in the table below.

Sub-sector	Indicator	Periodicity	Method of monitoring	Agencies to be involved
Agriculture including horticulture	Soil health and availability of micro-nutrients	Annual	Soil sampling	Agril. Department/ICRISAT/Private agency
	Access to improved seed	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Groundwater level	Annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	No. of new technologies/ management practices piloted and their coverage	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Crop-wise productivity levels	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	COC per ha	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Per unit output prices	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	No. of value chains piloted	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Improved market access and formal credit facilities	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Access to quality inputs and their prices	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency

Continued.

Sub-sector	Indicator	Periodicity	Method of monitoring	Agencies to be involved
	Quantity of rainwater conserved through water harvesting structures	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Absolute cropped area coverage under micro-irrigation systems	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Quality of climate advisories	Bi-annual	FGDs/short-HH survey	Agril. Department/ICRISAT/Private agency
	Sub-sector-wise GVA estimates	Annual	HH survey	Agril. Department/ICRISAT/Private agency
Animal Husbandry sub-sector	No. of cross-bred animals introduced	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	Average milk yield per day	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	No. of new methods of breeding techniques used	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	Access of quality fodder (Qtl. per animal)	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	Health coverage to a number of small ruminants	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	Unit price of milk, meat and eggs	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	No. of milk and meat value chains piloted	Bi-annual	FGDs/short-HH survey	A & H Department/ICRISAT/Private agency
	Sub-sector-wise GVA estimates	Annual	HH survey	A & H Department/ICRISAT/Private agency
Fisheries sub-sector	Access to quality seed and its monitoring	Bi-annual	FGDs/short-HH survey	Fisheries Department /ICRISAT/ Private agency
	Monitoring the quality and unit prices of feeds and medicines	Bi-annual	FGDs/short-HH survey	Fisheries Department /ICRISAT/ Private agency
	Productivity levels of prawns/fish culture	Annual	HH survey	Fisheries Department /ICRISAT/ Private agency
	Open and transparent source of output price information	Bi-annual	FGDs/short-HH survey	Fisheries Department /ICRISAT/ Private agency
	Sub-sector wise GVA estimates	Annual	HH survey	Fisheries Department /ICRISAT/ Private agency

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