



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



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Rythu Kosam: Andhra Pradesh Primary Sector Mission

Coastal Andhra Region Baseline Summary Report

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

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Executive Summary

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

With this background, the major objective of the present study is to document the current status of the three pilot sites covering 57 villages from 11 *mandals* (administrative divisions) in three districts (Nellore, Prakasam and Guntur) of Coastal Andhra Region in Andhra Pradesh. Purposive randomized sampling framework was used to select representative villages from all study *mandals* in the region. A primary household baseline survey was conducted from representative sample farmers (965 households) in the three district pilot sites. The present report also attempts 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 complemented to estimate the GVA values at village and pilot site level. The methodology developed by the Directorate of Economics and Statistics (DES) for district level estimation of GVA was modified and adapted to estimate GVA using household level data. These estimates can be used as 'benchmark values' for monitoring the project progress over a period of time. The project impact assessment studies if any could be undertaken in future using this baseline information. Overall, the Coastal Andhra region-level baseline report also helps in identifying major constraints and devising suitable strategies in the pilot sites and districts as a whole.

Small and marginal farmers dominated (66.3%) the total sample in the region. The average family size in the region is about 4.0. Nearly 54.4 % of total sample farmers are un-educated. About 55% of family members engage in their farm activities/operations. The pooled average operational land holding 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 house, access to television 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 ground water resources, the average productivity levels across major crops was on par with district average yields in Guntur and Nellore districts. However, the average productivity levels in case of Prakasam district was lower than district average yields across crops. Major crops like 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 economical and recovered most of their investments (especially in Guntur and Nellore districts). Even though prawn farming is a much dominated activity in the region, fish farming is more profitable per cycle. Agriculture including horticulture contributed around 59.5% share in the total GVA of the Coastal Andhra region. Fisheries sub-sector occupied the second position and contributed nearly 28.75 % of regional GVA value. Animal husbandry secured third place with 11.75 % share in total GVA value.

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

Key findings	Specific recommendations
<ul style="list-style-type: none"> • Extreme weather events (cyclones and floods) coupled with droughts are the common problems 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. • Escalated labor and input costs per hectare across crops are confining net returns per hectare. 	<ul style="list-style-type: none"> • High emphasis needs to be given on soil and water conservation measures to recharge ground-water levels. • Inter-linking of tanks with major irrigation canals would improve recharge of ground-water 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 for harnessing the potential of agriculture in the region. • Sustainable crop, water, nutrient management practices needs to be promoted and popularized. • Good scope exists for introduction and piloting of information and communication technology (ICT) based mechanization clusters. • Enormous scope exists to introduce crop-based management practices like integrated crop nutrition management and integrated pest management, so that costs of cultivation (COC) per hectare will go down and commodity competitiveness will go up.
<ul style="list-style-type: none"> • Un-organized markets exist for both field (rice, chillies, turmeric, papaya, yam and vegetables etc.,) and horticultural crops (like lemon, acid lime and batavia, cashew nut etc.,) 	<ul style="list-style-type: none"> • There is good scope to strengthen markets and value chains for both field and horticultural crops. • Immense potential for rice processing, grading and exporting (especially Nellore Sannalu brand) exists. • Huge potential exists for processing and value chain development for chillies, turmeric and chickpea crops.
<ul style="list-style-type: none"> • Despite resource availability there is a lack of interest to rear animals. • There is low milk productivity levels due to poor awareness on feeding practices. 	<ul style="list-style-type: none"> • Animal rearing needs promotion as a business model through incentives and subsidies. • Good scope exists for increasing milk productivity levels through trainings and community awareness camps in key villages.
<ul style="list-style-type: none"> • Access to poor quality seeds and lower productivity levels in case of prawn farming. 	<ul style="list-style-type: none"> • Supply of good quality seeds and regulation of output prices are crucial interventions required for strengthening prawn farming in the region. • Huge scope exists for prawn value addition and targeting export markets across the globe.
<ul style="list-style-type: none"> • Majority of sample farmers in the study districts clearly perceive the changes in climate (increase in day temperature, uneven distribution of rainfall, extreme climatic events etc.). It has significant impacts on major crop performances and productivity levels. 	<ul style="list-style-type: none"> • There is a need to introduce climate smart agricultural practices to minimize the negative consequences due to changes in climate.

1. Background and Objectives

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

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

The Government of Andhra Pradesh has recently published 'Achieving Double Digit Inclusive Growth – A Rolling Plan 2015-16' to achieve the status of a developed economy with per capita income likely to touch ₹0.662 million by the year 2029-30. If the economy grows consistently at the 10% level and in the event of growth rates crossing this critical threshold, the per capita income may even cross the ₹ 0.800 million mark. 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 five years period (2015-2020) under consortium approach by bringing state, national and international partners on board. Also, 13 pilot sites corresponding to 13 districts of the state are identified for introduction, testing and scaling-up of range of technologies over a period of time. Both supply and demand side interventions are aimed for improving the livelihoods of the farmers in the state.

With this background, the major objective of this study is to document the current status of the three pilot sites covering 57 villages from 11 *mandals* in three districts (Nellore, Prakasam and Guntur) of Coastal Andhra Region in Andhra Pradesh. A primary household baseline survey was conducted from representative sample farmers (965 households) in the three districts. This total sample is comprised of 778 agricultural sample households and 187 fishery sample households. 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 prior to implementing the project. The present report also attempts 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 complemented to estimate the GVA values at village and pilot level. These estimates will be used as 'benchmark values' for monitoring the project progress over a period of time. Project impact assessment studies if any, could be undertaken in future using this baseline information. This comprehensive Coastal Andhra region level baseline report also helps in identifying major constraints and devising suitable strategies in the pilot sites and districts.

2. Overview of Agriculture in Coastal Andhra Region

Coastal Andhra region in the Indian state of Andhra Pradesh 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 territory. It has a population of 11,248,818 (Census 2011), which is 22.7% of the state population. Guntur district is the most populous district (4.8 million) in the Coastal Andhra region with 2970 census villages and 37 (statutory and census) towns. The average density of the population is estimated at 283 persons per sq km. The highest population density in the region was observed in Guntur (429 persons per sq km) while the lowest in Prakasam district (193 persons per sq km). The average decadal growth of

population in the region was estimated at 10.52 %. However, among the districts in the region, the highest growth in decadal population growth was observed in Guntur and Nellore districts (11.05%). Based on the year 2011 census, the average literacy rate in the region was 66.46 %. Overall, urban population has higher levels (79.36%) of literacy rates 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 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 to 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 total cropped area is under food crops and the remaining is under non-food crops.

The spread of total area sown in the Coastal Andhra region under different crop groups are summarized in Figure 1. Total cereals and millets together contribute about 44.7 % of total cropped area, followed by other commercial crops (like cotton, tobacco including fruits and vegetables) accounting for 38 %. Total pulses group occupied the third place (13.7%) in total sown area in the region. Total oilseeds secured the fourth place in the region and have the coverage of about 3.7 %.

The individual crop area share in total cropped area of the Coastal Andhra region during the year 2014-15 are depicted in Figure 2. More than 35 % of total cropped area in the region is occupied by rice followed

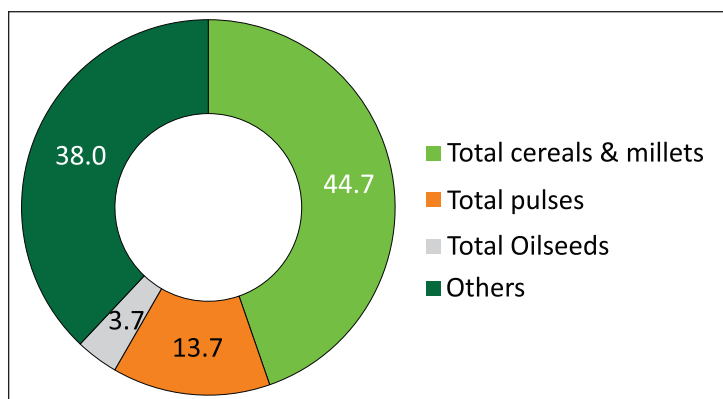


Figure 1. Share of total cropped area among crop groups.

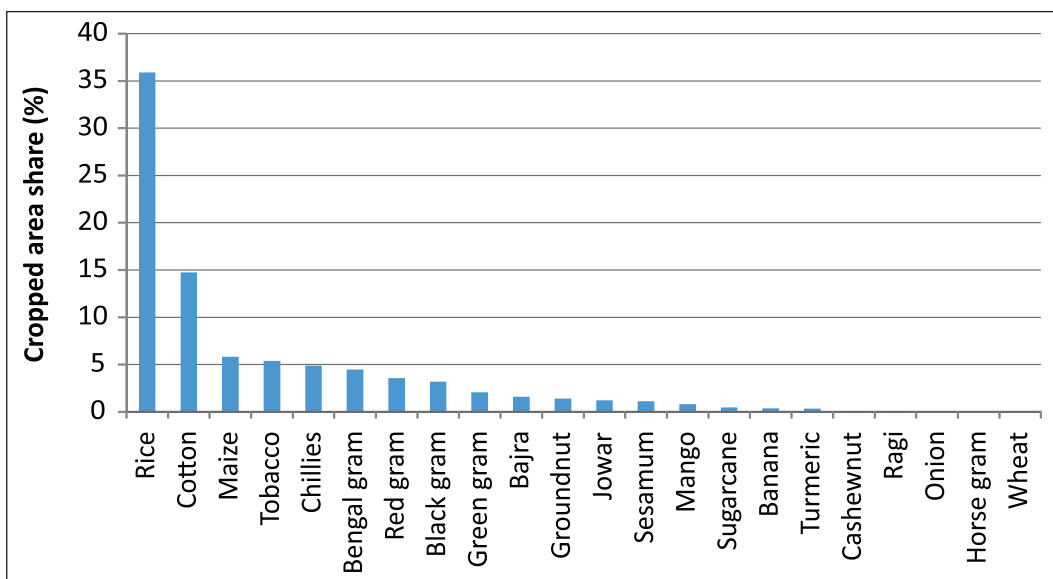


Figure 2. Cropped area shares by crop in the region (2014-15).

by cotton (15%), maize (5.8%), tobacco (5.4%) and chillies (4.9%). During the study period, all five crops together had a total share of nearly 67 % of the total cropped area in the region. Among horticulture crops, mango leads followed by banana, turmeric and cashew nut.

The break-up of 19th livestock census conducted in the region are summarized: sheep is the single largest (44.1%) contributor in total livestock population in the region, 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 % in the 19th livestock census. Around 9.7 million population of poultry also existed in the region which accounts for 11.87 % of total state poultry population.

Fisheries are important and both marine fish and prawn production contribute to the GVA in the region. Around 32.5 % of total marine fish and prawn production in the state happened in the Coastal Andhra region. Similarly, inland fish and prawn production is also a significant activity in the region with a share of nearly 10.5 % in total state inland fish and prawn production. Approximately 44.76 % of the total brackish water prawn production in the state also takes place in this region thus contributing significantly to the state GVA of fisheries sector. Overall, a comparative status of Coastal Andhra region along with the state and India has been summarized and presented in Table 1.

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

Parameter	India	Andhra Pradesh	Coastal Andhra region
Geographical area (000 km ²)	3287.5	163.0	42.1
Population (Million 2011 census)	1210.9	49.6	11.2
Males (Million)	623.2	24.8	5.6
Females (Million)	587.5	24.7	5.6
Urban (Million 2011 census)	377.1	14.6	3.2
Males (Million)	195.4	7.2	1.6
Females (Million)	181.6	7.3	1.6
Rural (Million 2011 census)	833.7	34.9	8.1
Males (Million)	427.7	17.5	4.1
Females (Million)	405.9	17.4	4.0
Literacy (% in 2011)	74.04	67.35	66.46
Males (%)	82.14	74.77	74.48
Females (%)	65.46	59.96	58.39
GDP (₹ Million in current prices, 2014-15)	124986620	5200300	1161650
Agriculture and allied sectors (₹ Million)	23372498	1434980	387140
Industry sector (₹ Million)	39620758	1072240	229870
Service sector (₹ Million)	61993363	2693070	544640
Shares of sub-sectors in GDP (%)			
Agriculture and allied sectors	18.0	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
Fisheries	0.9	4.1	4.6

3. Pilot Sites of Andhra Pradesh Primary Sector Mission

The Government of Andhra Pradesh in partnership with ICRISAT has designed a strategy to transform agriculture and allied sectors in the state. This strategy will be operationalized in a phased manner setting the standards for a new development paradigm. This massive effort was initially called as 'Primary Sector Mission' and was later renamed as 'Rythu Kosam' (pro farmer) Mission. The mission will be implemented by adopting the principles of 4 'I's: Innovate, Inclusive, Intensive and integrated approaches; 4 'C's: Convergence, Collective action, Consortium to build partnerships and Capacity building; and 4 'E's: Efficiency, Equity, Environment protection and Economic gain.

The mission in the state will broadly focus on:

- a. Increasing productivity of the primary sector comprising: agriculture, horticulture, livestock, fisheries and sericulture,
- b. Mitigating the impact of droughts through water conservation and micro-irrigation,
- c. Post-harvest management to reduce wastages, and
- d. Establishing processing, value addition capacity and supply chain of identified crops.

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

The general criterion followed for selecting 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 pilot site in each district was done in several iterations with consent from District Collector (chief administrator and planning officer), line department officials at district and *mandal* level, interactions with farmers, communities and discussions with NGOs. By following the above criterion and similar steps, the pilot sites in all 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 are covered in 267 villages (both agriculture and fishery) under 38 *mandals* in 13 districts of the state. Approximately 0.192 million farmer households are directly targeted for mission interventions across 13 pilot sites. A total population of 0.685 million are covered during the year 2015-16 cropping season. About 0.142 million ha of cropped area (including agriculture and horticultural crops) has been covered across 13 pilot sites corresponding to 13 districts in the state. Nearly 0.99 million population of livestock animals are also covered for wide range interventions in selected *mandals*. Roughly 8892 ha of fishery area (including both prawns and fish farming) are also covered under mission interventions. The cumulative pilot site area represents about 1.75 % of the total cropped area in the state and about 1.4 % of the total states' population is being covered in these pilot sites.

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

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

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

one *mandal* commonly covered under both agriculture and fishery sub-sectors

* minor changes carried out during baseline survey

4. Sampling Framework

The sampling framework has been designed for the entire 'Rythu Kosam Mission' which includes 13 pilot sites across 13 targeted districts in the state by considering the extent of diversity among study villages. Each pilot site has been identified with an approximate cropped area coverage of 10,000 ha. Pilot site in a district is comprised of both agricultural (predominantly growing agriculture and horticulture crops) villages and few fishery (mainly farming fish and prawns) villages. The 13 pilot sites from 13 districts together have been distributed in 30 *mandals* and 227 villages in case of agricultural villages while another 47 fishery villages were covered in 11 *mandals*. As shown in Table 2, there are three common *mandals* and seven common villages across the pilot sites. Excluding these common pilot sites, the actual *mandals* and villages covered under the Rythu Kosam mission are 13 districts, 38 *mandals* and 267 villages. These sample villages together represent the state of Andhra Pradesh and its geographical diversity among three regions (Rayalaseema, Coastal Andhra and North Coastal) and four AEZs. A systematic sampling framework has been developed to cover this diversity by undergoing the following steps:

1. Characterization of all sample villages using information on type of agriculture (irrigated/rainfed), major crops cultivated both in rainy and post-rainy season, major horticultural crops grown, sericulture, fish, prawn farming and finally extent of forest area available.
2. Based on dominance of each sub-sector (agriculture, horticulture, sericulture, fisheries and forestry) in the sample villages, a scale of 1 to 3 (3 for significant area and 1 for low presence) was provided for better categorization of study villages. A total of six diversity categories of sample villages were identified.
3. A cumulative diversity scale for each sample village was calculated by adding the respective scales given for each sub-sector. This value has been ranged from a minimum of '4' to a maximum of '9'.
4. To minimize the cost of survey and time, a sub-sample of 150 villages (covering 119 agriculture and 31 fishery villages) were identified using randomization procedure without losing their representativeness and by covering all the *mandals* in the study. Roughly 55% of sample villages have been covered from 40 *mandals*.

5. The total cumulative area covered in the primary sector mission (13 pilot sites of 10,000 ha each) was estimated to be 1,30,000 ha while the average operational landholding per household in the state was calculated to 1.08 ha based on the year 2011 landholding census survey. The estimated households covered by the mission would be 120,370. In case of large scale representative household surveys, a reasonable coverage of 5% of the total population is adequate to minimize marginal error. Thus, the present baseline survey has used this thumb rule and targeted an approximate sample of 6500 households (5% of 130,000 households) across 13 districts.
6. As per 2011 census data nearly 73% of total households are small (less than 2 ha of operational landholding), 9% medium (having operational landholding of above 2 ha and less than 4 ha) and 3% sample are large (> 4 ha). Nearly 15% of the total households fall under landless category. These category farmers are highly dependent on primary sector for their livelihood. Hence their representation in the household survey is critical for understanding the direct and indirect impact of different interventions in the pilot sites. A minimum of six landless farmers per village (150 x 6 = 900) were accommodated in the household survey to represent this category.
7. The classification of fishery farmers' operational landholding details are not available at the state level. The household data collected in the fishery villages will be post-stratified to deeply understand the economics of scale and cultivation. However to keep their representation in the household survey, a minimum of 30 farm households per village were surveyed. Thus, a total of 930 households have been targeted to cover from 31 fishery villages in 10 *mandals*.
8. The left over sample of 4670 households (6500-900 landless + 930 fishery households) have been distributed among 119 agricultural villages using sampling weights (see Table 3). Majority of the sample villages exhibited the medium to high levels of diversity scale (6 to 8) in their distribution. Thus, majority sample has been allocated to this category of villages.
9. Using the above sampling framework, a sub-sample of 55 % sample villages have been identified for primary household survey. 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, fisheries and forestry in the study villages. 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-sector etc, are furnished in Appendix-2. However, below sampling strategy was planned for collecting the primary household data from targeted sample of 6462 households. The primary household survey was conducted during June 2015 with structured questionnaires and trained field investigators. About 5222 sample households were interviewed for data collection 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, risk coping mechanisms etc. A difference of 1240 households of targeted sample, were not covered during baseline surveys because of higher homogeneity in population and non-cooperation in few sample villages (especially in fishery sample villages). The complete break-up by pilot site are summarized in Table 4. Eighty one percent of total targeted sample households were covered during the household survey. Out of the total sample interviewed (5222), nearly 4794 households were covered in agricultural sample villages while the rest (428 households) administered in case of fishery sample villages.

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

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

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

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

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

5. Methodology

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

For estimation of Gross Value Added (GVA) in primary sector from pilot site in each district, 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 addition in primary sector. Income approach is normally applied for industry sector and expenditure approach is applied in case of service sector.

As per standard definitions, the primary sector includes agriculture, horticulture, animal husbandry, fisheries, sericulture, forestry and logging and mining and quarrying. Nevertheless, in the present study context, the primary sector is confined to agriculture, horticulture, animal husbandry and fisheries. The standard methodology defined by Directorate of Economics Statistics (DES)¹ was adapted with suitable modifications to estimate GVA from different sectors in the pilot site using data derived from household survey. The methodology followed for estimation of 'Gross Product' by sector is summarized below:

Agriculture, horticulture and floriculture

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

¹. Central Statistical Organization. 2008. National Account Statistics: Manual on Estimation of State and District Income, 2008

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

Livestock

This sector includes milk production from cows, buffaloes and goat. Wool production from sheep and goats: egg production from poultry, and meat production from poultry, sheep, goat and donkeys. The sector also includes by-products such as dung from milch animals. The incremental livestock value is also be considered in the estimation of GVA.

Fisheries

Value of inland fish, marine fish and prawns by village is estimated by multiplying the production with corresponding output prices. Fish sold as salted, dried and frozen etc, were also accounted. The average productivity level and various input material costs per ha 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.

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

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 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.

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

Sources of data across sub-sectors

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

6. Findings from Baseline Survey

The findings from baseline surveys conducted across 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. The results presented are summarized from agricultural and fishery sample villages (nearly 29) covering 965 (778 Agriculture + 187 fishery) sample households in 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. Overall a total of 965 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 (agricultural sample households only) by district is presented in Appendix-1 Table 1. 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 land holding size during the year 2014-15 cropping season. Out of the total 778 sample, 516 sample households belonged to small size (< 2 ha) farmers' category followed by medium (between 2 and 4 ha) size (101 households representing 13.0%) and large (> 4 ha) size (69 households representing 8.87%) category. A total of 92 sample households belong to landless (operational landholding zero) category. 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 representative to the year 2011 census survey conducted on 'operational landholdings' at state level. The pattern of distribution of sample among study districts was also closely representative to the district-level situation generated in the year 2011 census survey.

The total baseline sample was also categorized based on the community they belonged by district and is presented in Appendix-1 Table 1. Majority of sample (399 households) belong to Open Community (OC) followed by Backward Caste (BC) community category (203 households), Scheduled Caste (SC) community category (168 households) and Scheduled Tribe (ST) community category (08 households). They contributed approximately 51.3%, 26.1%, 21.6% and 1.0% respectively for OC, BC, SC and ST communities. The pattern of distribution by community varied for each district.

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

The details of average family size, extent of literacy and participation in labor market are analyzed and presented in Appendix-1 Table 2. The average family size of the household for the total sampled farmers in the region is 4.0. The highest family size (4.6) was noticed in case of Prakasam district while the lowest (3.7) was observed in both Nellore and Guntur districts. On the whole, only 45.6 % of total sample in the region were literate. Out of which, 13.3 % had primary level of education while 32 % had upper primary and above level of education. Nearly 54.4 % of the total sample were un-educated or did not have access to education. The extent of illiteracy was much higher in case of Prakasam district sample farmers followed by Nellore district. Special attention should be placed to promote education and basic amenities in Prakasam district. The highest literacy rate was noticed in case of Guntur district sample farmers. Majority of family members (55%) in the sample are engaged in their own farm. Majority of sample districts exhibited similar levels of own farm labor participation while 50 % of total family members participated in the outside labor market for livelihood. Most of the sample districts in the region showed relatively higher levels of outside labor market participation.

6.3 Landholdings and extent of tenancy

The particulars of landholdings and extent of tenancy details by district in the Coastal Andhra region are furnished in Appendix-1 Table 3. 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 had irrigation access while 0.92 ha was grown under rainfed situations. Specifically in the Coastal Andhra region districts, rainfed landholdings dominate in the total own landholding. Similarly districts of Rayalaseema region rainfed landholdings occupy a major share in the total own land holdings. The extent of average operational landholding for the total sample households in the region were calculated at 2.10 ha. Significant share of crop land (0.62 ha per household) 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). Tenancy is prominent in Guntur district (43%) followed by Prakasam and Nellore districts.

6.4 Household assets and livestock ownership

The details of ownership over household assets and livestock for the total sample are presented by district in Appendix-1 Table 4. Nearly 99% of the total sample households expressed that they possess a residential house. About 9.7 % sample households indicated that they also own cattle shed for rearing animals. Television (94.4%) and mobile (91.5%) are common consumer durables owned by many of the sample farmers across study districts. More than a quarter (27.5%) of total sample farmers also possessed two wheelers. Slight variation in ownership was observed for each item and its possession pattern.

The details about average livestock ownership per sample household is summarized in Appendix-1 Table 4. On an average, every tenth sample household in the region had one draft animal. Similarly, every sample household owned at least one buffalo while possession of cows per sample household was almost negligible. Apart from these animals, many sample households also own young stock, sheep, goats

and poultry in a significant manner. Thus, the total number of livestock animals owned by each sample household was estimated at 2.2. The composition of different livestock animals varied significantly across districts. The highest number of livestock animals per household was observed in Prakasam (3.3) while the lowest was in Guntur (1.2).

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 Appendix-1 Table 5. Productivity levels by district and pilot site are discussed below:

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

In case of Prakasam pilot site, paddy, cotton and chickpea are identified as major crops grown by sample farmers. Productivity level of paddy in the pilot site is better than district average yields, but, cotton and chickpea productivity levels are much lower. The mean productivity levels were significantly lower in case of pearl millet, cotton, red gram, cowpea and black gram compared to their district average yield as reported by Directorate of Economics and Statistics. This indicates the huge potential of the Prakasam pilot site to prosper in future through introduction of improved cultivars, better management practices and market linkages.

In Guntur pilot site, sample farmers mainly cultivated paddy, maize and black gram crops. Paddy followed by maize is the dominant cropping pattern. The productivity levels of pilot sites are on par with district average yields except in case of maize crop. 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 of concern to farmers. The mean productivity levels were lower in case of sorghum, black gram, maize and cotton compared to district average yield reported by Directorate of Economics and Statistics. This indicates the potential opportunities of Guntur pilot site to prosper after introduction of better management practices including integrated pest management practices and formal market linkages.

6.6 Economics of crop and fish enterprises

The economics of major crop enterprises per ha across pilot site districts are summarized in Appendix-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 was elicited and complemented through village-level focus group discussions (FGDs) conducted at each sample village in the baseline survey. This information was collected on one year recall basis and pertained to the 2014-15 cropping year. While calculating the economics of crops cultivation, only total variable costs (paid out costs across each operation like seeds, fertilizers, pesticides, machinery, labor and irrigation costs if any) were considered for deduction from total returns (includes 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. Performances of major crops by pilot site in the Coastal Andhra region are discussed and summarized over leaf.

The cultivation of crops is quite economical in Coastal Andhra Pradesh districts (Nellore, Prakasam and Guntur) when compared with four districts of Rayalaseema. The cultivation of paddy performed extremely well across three study districts (see Figure 3) because of better access to irrigation water in these districts, the paddy crop performed relatively better than Rayalaseema districts. Occurrence of extreme weather situations like cyclones, floods etc, are common during crop period, which devastates 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 district is quite economical, the long-term sustainability of soil and productivity in pilot site is of primary concern because of cereal-cereal rotations with high input use and intensive cultivation. Black gram is highly recommended pulse crop in rice-fallows that has good performance in Nellore and Guntur districts (see Figure 4). 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 in-sufficient rain during crop period. Considering the total costs per hectare, paddy and maize are the only crops with potential to recover from its total returns. All other rainfed crops across study districts could not recover their total costs per hectare.

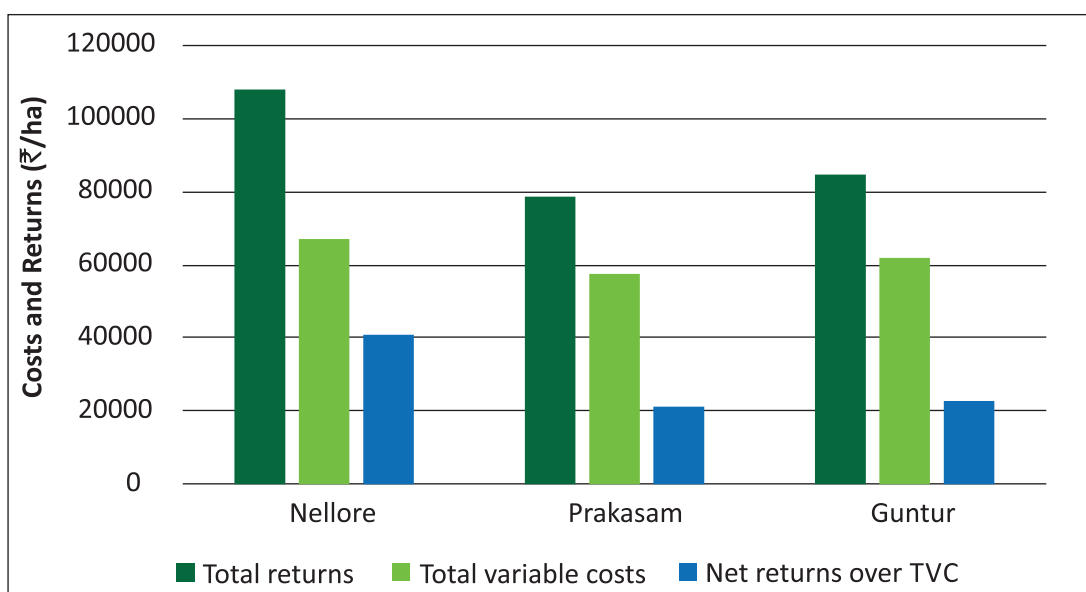


Figure 3. Performance of paddy in Coastal Andhra region.

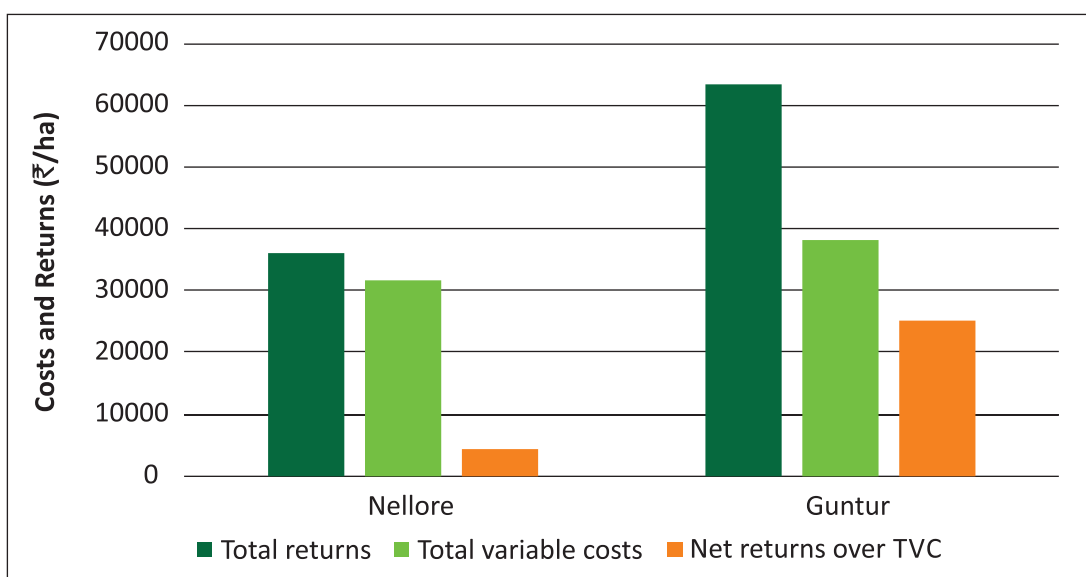


Figure 4. Performance of black gram in Coastal Andhra region.

The economics of prawn and fish farming enterprises (per cycle per ha) across pilot sites in are furnished in Appendix-1 Table 7. As indicated in the earlier sections, the cumulative area covered under fish and prawn farming in the 13 district pilot sites is 8892 ha (refer Table 2). This total area is spread over 47 fishery villages covered in 11 *mandals* of the 13 study districts. Care was taken to accommodate significant number of fishery sample households in the representative baseline survey conducted for Andhra Pradesh primary sector mission. Around 428 fishery sample households were interviewed with well-structured questionnaire. Specifically, 187 fishery sample households were interviewed from 8 sample villages. These primary household surveys were also complemented with village-level focus-group discussions. Socio-economic characteristics, average productivity levels and economics of fish and prawn farming were captured during the survey and results are discussed below:

Prawns farming was a dominant activity in all the three district pilot sites. Total variable costs (seed, feed, medicines, electricity, 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 sample farmers across sample villages. The net return per cycle per ha was estimated after deducting the total variable costs from total returns per cycle per ha. Economics of prawns farming 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 the prawn cultivation are as follows:

- a. Poor seed quality – private hatcheries dominate the supply and no monitoring from Government,
- b. Low success rate and susceptibility to diseases,
- c. Low productivity levels (hardly one ton per cycle per 0.4 hectare),
- d. High feed and medicinal costs – No monitoring or regulation from Government ,
- 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.

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

7. Pilot Site GVA Estimations across Sub-sectors

Gross Value Addition (GVA) estimations across sub-sectors by pilot site in the primary sector are furnished in Appendix-1 Table 8. As described in the earlier sections, estimation of current GVA in the 13 pilot sites corresponding to 13 districts of Andhra Pradesh state is one of the major objectives of the Andhra Pradesh primary sector mission baseline survey. However, the present report summarizes the results for three major districts in the Coastal Andhra region.

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

The total estimated GVA from three pilot sites are ₹4129 million. Out of which, ₹2456.7 million (59.5%) are contributed by agriculture sub-sector including horticulture. Rupees 485.3 million is contributed by animal husbandry which accounts for 11.75 % share in total GVA. The fisheries sub-sector contributed an amount of ₹1187 million towards total GVA value in the region. Contributions and corresponding share value by sector are depicted in Figure 5.

Among all the three pilot sites, Guntur district pilot site has contributed the highest value (1969.7 million) followed by Prakasam district pilot site (1128.6 million) and Nellore district pilot site contributed the lowest value (1030.7 million). The total GVA values by district pilot site in the region are presented in Figure 6.

The highest value of GVA contributed by the agricultural sub-sector including horticulture was observed in Guntur district pilot site (₹1633.6 million) followed by Nellore (₹656.2 million) and the lowest value was contributed by Prakasam (₹166.9 million). In case of animal husbandry sub-sector, the highest value was observed in Guntur district pilot site (₹197.1 million) followed by Prakasam (₹181.7 million).

Guntur district pilot site once again contributed significantly in the animal husbandry sub-sector even though it was relatively backward in fishery sub-sector. The lowest value GVA from animal husbandry was contributed by Nellore district (₹106.5 million). The fisheries sub-sector contributed significantly in Prakasam district (₹780 million) followed by Nellore (₹268 million) and Guntur (₹139 million). The composition of each pilot site GVA by sub-sector are summarized in Figure 7.

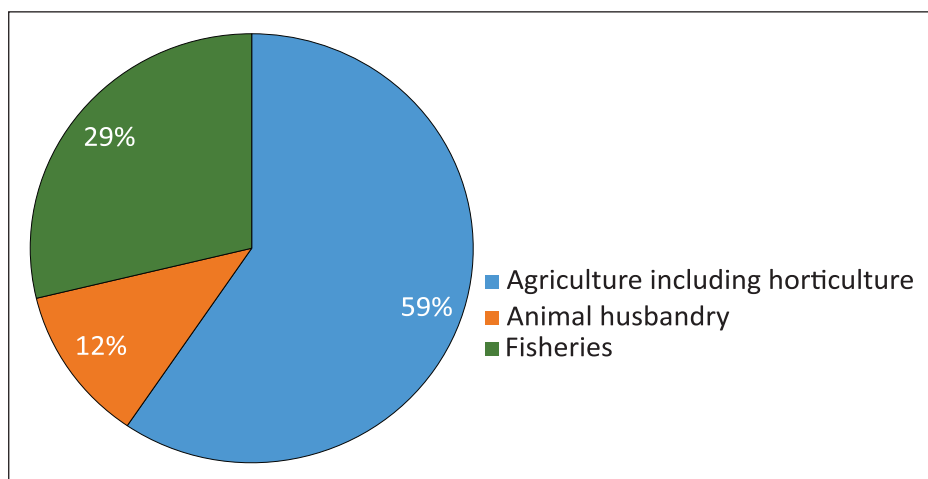


Figure 5. Sub-sector wise shares in the total GVA estimation.

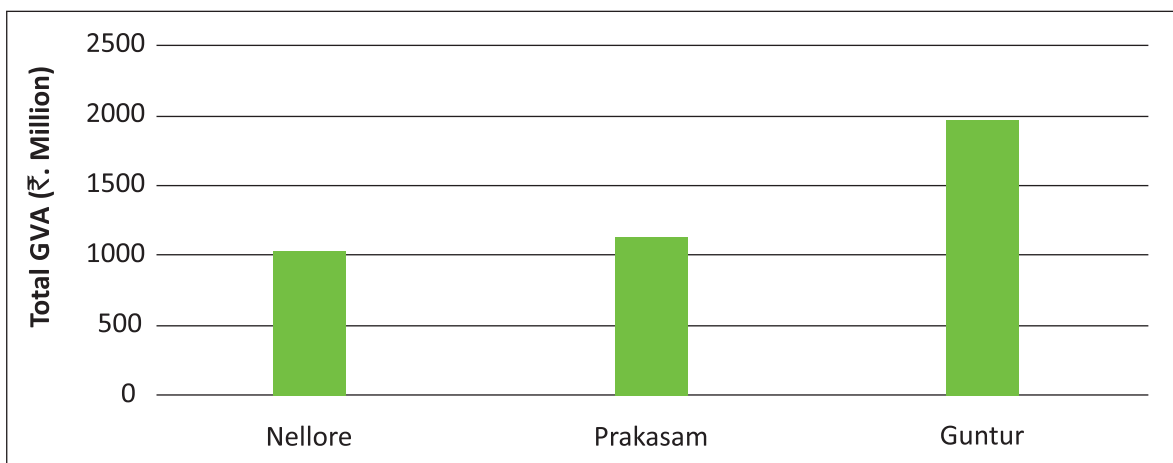


Figure 6. Total GVAs estimations by district pilot in the region.

The dominance and significant share contributions of different sub-sectors in each district total pilot site GVA estimations are presented in Figure 8. Nearly 82.94 % share of total GVA in the Guntur district pilot site is contributed by agriculture including horticulture sub-sector. Contrary to Guntur district, Prakasam district pilot site had the highest share (69.11 %) contribution from fisheries sub-sector. In case of Nellore, agriculture including horticulture and fisheries sub-sectors played a significant role in the total GVA contributions.

The district-wise estimations in the region are summarized in Figure 9. The contribution of GVA per village was the highest in case of Guntur district pilot site followed by Nellore and Prakasam. An interesting observation is 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 a 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. The details are furnished in Figure 10 in a descending order of merit. Guntur district pilot site households retained first rank followed by Nellore and Prakasam districts pilot site households. The average household earnings per annum during the year 2014-15 in the Guntur district pilot site were calculated at ₹ 111,699. Nellore district closely followed Guntur district in terms

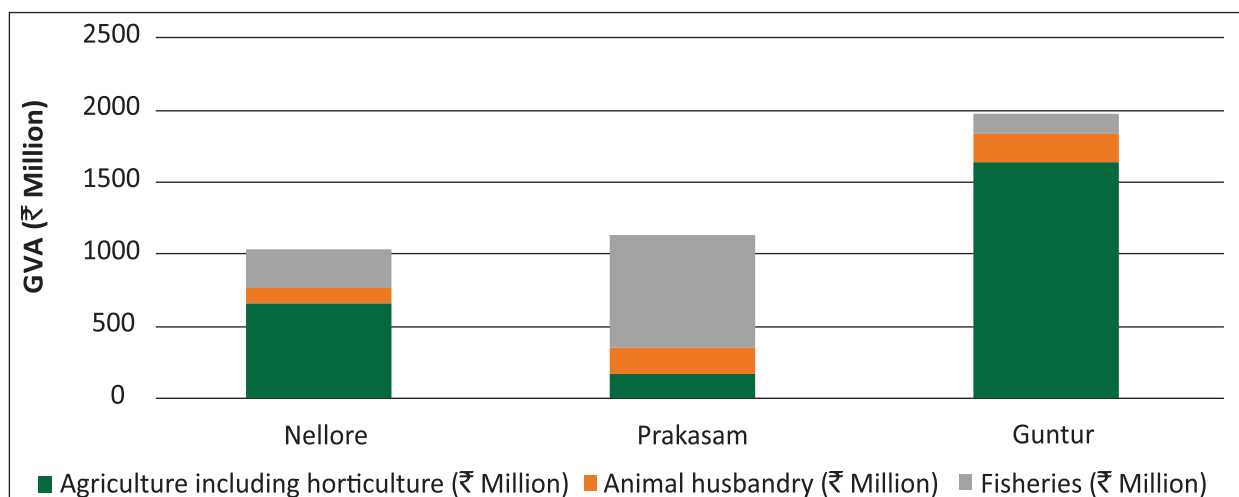


Figure 7. Composition of pilot site GVAs by sub-sector in the region.

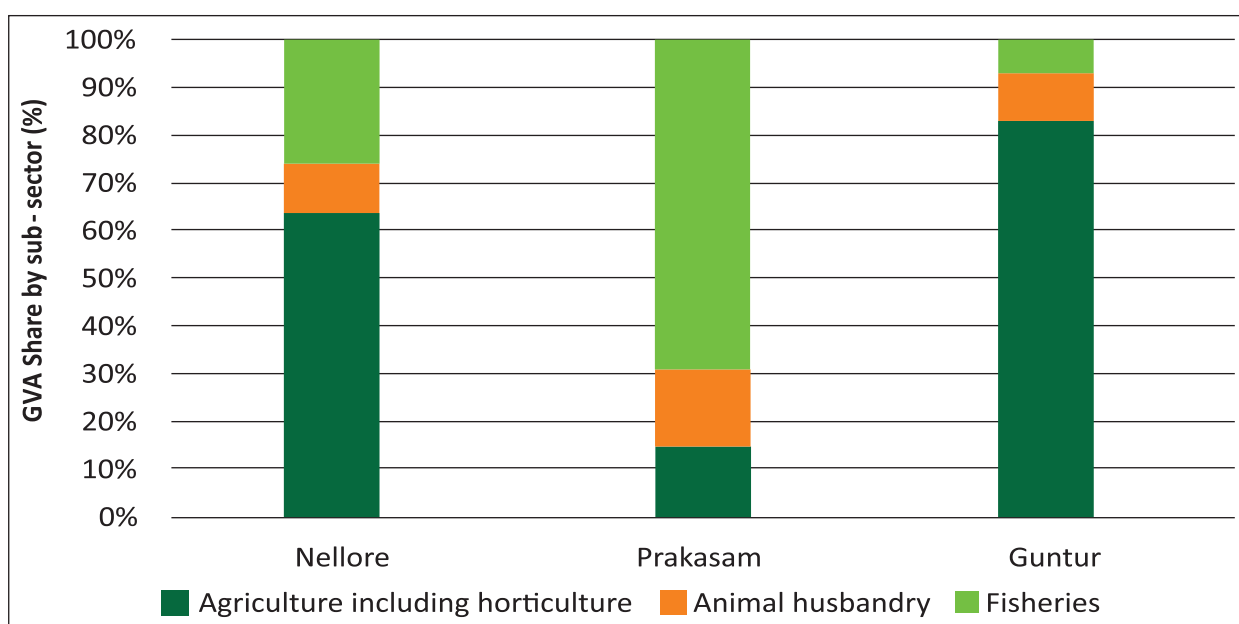


Figure 8. Shares of different sub-sectors in total GVA.

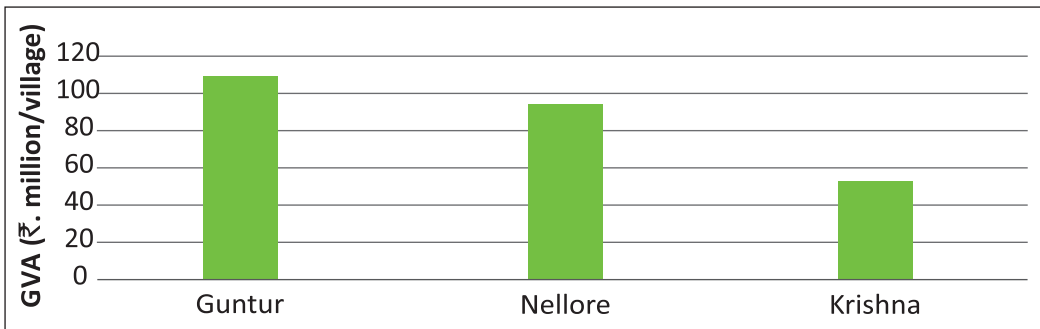


Figure 9. GVA value per each pilot site village (₹ million) in the region.

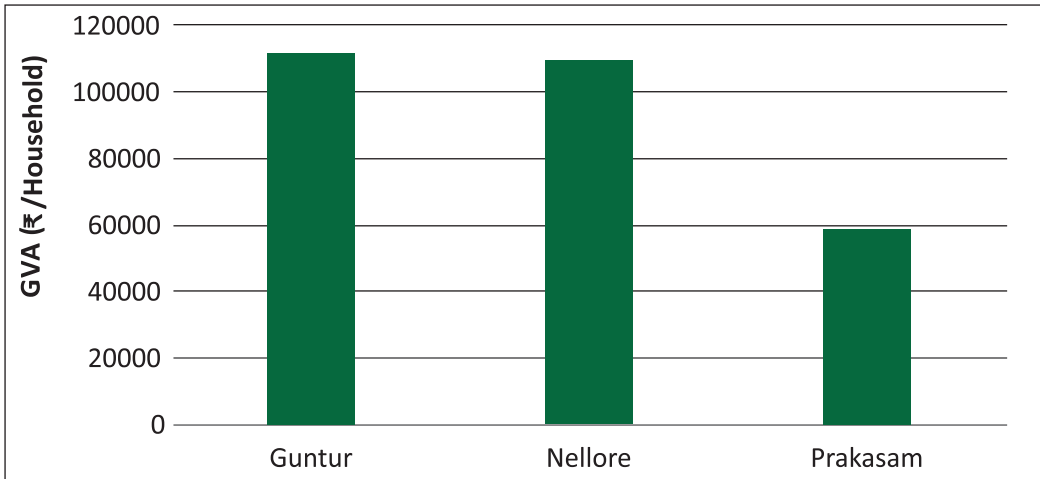


Figure 10. GVA value per district pilot site household (₹/household) in the region.

of GVA value per household in the region. While the lowest earning per pilot site household per annum (₹58,788) was observed in Prakasam district. The average earnings from agriculture and allied sectors of Guntur district per household was nearly two times higher than an average sample household earning in Prakasam district pilot site.

The average total GVA contributions from per ha landholdings in district pilot site was calculated and compared among study districts (see Figure 11). Agricultural land per ha in Guntur district pilot site contributes ₹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 cultivated land per ha 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. Further detailed break-up of GVA values across three pilot sites in the region are summarized in Appendix-1 Table 9.

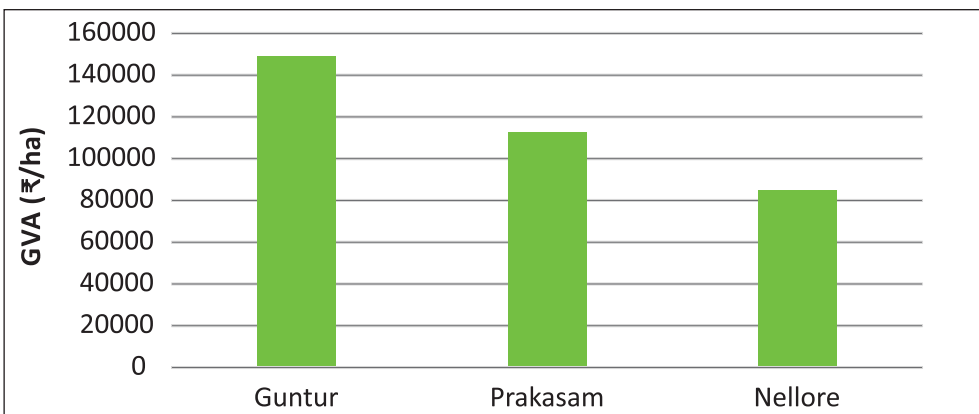


Figure 11. GVA value per district pilot site ha area (₹ per ha) in the region.

8. Major Constraints and Potential Opportunities

All the district pilot sites have enormous potential to grow and contribute to the region and state GVA of Primary sector. The sample farmers across pilot sites are highly determined and have a strong interest to continue in agriculture and allied activities provided it becomes highly remunerative. There are few constraints observed across pilot site locations which are hindering agriculture and allied activities growth and development in the respective districts and pilot sites. To harness fullest potential or growth across sub-sectors, the state has to undertake certain immediate measures to lift these constraints. There is also a need for proactive policies and institutional reforms to achieve the targeted 'double digit growth'. The constraints and potential opportunities by district pilot site across sub-sectors of Coastal Andhra region primary sector are listed below

District	Major constraints	Potential opportunities
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 despite sufficient fodder availability • Low productivity levels in prawn farming • 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 conservation of soil and water along with improving groundwater levels • Huge potential for rice processing, grading and exporting • Good scope to strengthen market linkages and value chains of lemon, acid lime and batavia Need for climate-smart studies and technologies • Creating awareness among farmers' is the key for increasing productivity levels • Access to quality seeds and output price regulation are key initiatives required for prawn farming • 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 a big concern • Low productivity levels of prawn farming • 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"> • Investments should focus on soil and water conservation technologies for immediate recharge of groundwater • Good scope to introduce climate smart cultivars to minimize yield losses • Good potential to introduce cross-bred buffaloes and small ruminants to generate additional incomes • Supply of quality seeds and regulation of output prices are major interventions required to strengthen prawn farming • Enormous potential exists for scientific post-harvest handling of prawns and fish production • Huge scope for insurance industries with appropriate 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 in rearing the milch animals • High labor and inputs costs across crops narrows net returns per hectare • Poor productivity levels of milk yields • Low average productivity levels in prawn farming • 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 exists to introduce integrated pest management and sustainable management practices for long-term sustainability of crop yields and to increase their competitiveness in the international market • Crop diversification and balanced application of fertilizers needs to be promoted and scaled-up • Ample opportunities for scientific post-harvest handling of chillies, turmeric and banana crops • Good scope exists to introduce value chains for yam, papaya and other vegetable crops • Good potential exists to introduce cross-bred buffaloes as there is abundant fodder availability in the pilot site • Supply of quality seed and price regulation of output prices are critical steps to strengthen prawn farming • Huge scope for insurance industries with suitable insurance products

9. Summary and Way Forward

The comprehensive baseline survey has covered about 965 sample households spread over 57 villages from 11 *mandals* in three districts (Nellore, Prakasam and Guntur) of Coastal Andhra region in Andhra Pradesh. The results are summarized from agricultural and fishery sample villages (nearly 29) covering about 965 (778 Agricultural + 187 fishery) sample households in three pilot sites corresponding to three 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 un-educated. About 55.0 % of family members engaged in their farm activities/operations. The pooled average operational land holding 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 house, access to television and mobile phones. The average number of livestock animals owned per household was 2.2. Due to reasonably good access to canal irrigation facilities or ground water resources, the average productivity levels across major crops was on par with district average yields in Guntur and Nellore districts. The average productivity levels in case of Prakasam district was lower than district average yields across crops. Major crops like paddy, maize, black gram and green gram performed well and realized marginal net returns per ha. Cultivation of crops in the Coastal Andhra region is economical and farmers recovered most of their investments (especially in Guntur and Nellore districts). Fish farming is more profitable per cycle than prawns in the region. However, farming of prawns is a dominated activity in the region. Agriculture including horticulture contributed around 59.5% share in the total GVA of the Coastal Andhra region. Fisheries sub-sector occupied the second position and contributed nearly 28.75 % of regional GVA value. Animal husbandry secured the third place with 11.75 % share in total GVA value in the Coastal Andhra region.

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 contributions of each sub-sector in the total primary sector GVA of the Coastal Andhra region.

Key findings	Specific recommendations
<ul style="list-style-type: none"> • Extreme weather events (cyclones and floods) coupled with droughts is a 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 emphasis is required on conserving soil, water and recharge of ground-water levels. • Inter-linking of tanks with major irrigation canals will ensure recharge of ground-water during drought years. • Risks borne by farmers due to natural calamities such as cyclones, flooding etc, need to be covered through crop insurance. • Need to formulate a policy for tenancy without affecting land rights to harnessing the potential of agriculture. • Sustainable crop, water, nutrient management practices need to be promoted and popularized.
<ul style="list-style-type: none"> • Escalated labor and input costs per hectare across crops restricts net returns per hectare. 	<ul style="list-style-type: none"> • Good scope for introduction and piloting of information and communication technology (ICT) based mechanization clusters. • Good scope exists to introduce crop-based management practices like integrated crop nutrient management and integrated pest management, so that the costs of cultivation per hectare will go down and commodity competitiveness will go up.
<ul style="list-style-type: none"> • Un-organized markets for both field (rice, chillies, turmeric, papaya, yam, vegetables etc.) and horticultural crops (lemon, acid lime, batavia, cashew nut etc.) 	<ul style="list-style-type: none"> • Good scope to strengthen markets and value chains for both field and horticultural crops. • Huge potential exists for rice processing, grading and exporting (especially Nellore Sannalu brand). • Immense potential for processing and value chain development in case of chillies, turmeric and chickpea crops.
<ul style="list-style-type: none"> • Despite availability of adequate resources, there is lack of interest in rearing animals. • Low milk productivity levels due to poor awareness on feeding practices. 	<ul style="list-style-type: none"> • Animal rearing should be promoted as a business model through 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 case of prawn farming. 	<ul style="list-style-type: none"> • Supply of good quality seed and regulation of output prices are major interventions required to strengthen prawn farming. • Huge scope for prawn value addition and targeting export markets across the globe.
<ul style="list-style-type: none"> • Majority of sample farmers in the study districts clearly perceive the changes in climate (increase in day temperature, uneven distribution of rainfall, extreme climatic events etc.). It has significant impact on major crop performances and productivity levels. 	<ul style="list-style-type: none"> • There is a need to introduce climate smart agricultural practices to minimize negative consequences due to changes in climate.

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Appendix-1

Table 1. Distribution of sample (agriculture) in Coastal Andhra region.

District	Total sample	Distribution by size group				Distribution by community				
		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	516	101	69	92	399	203	168	8	0
	(100)	(66.3)	(13.0)	(8.87)	(11.83)	(51.3)	(26.0)	(21.7)	(1.0)	(0.0)

* Figures in parenthesis indicates their respective shares to total sample

Table 2. Socio-economic details of sample in Coastal Andhra region.

District	Average family size* (no.)	Sample farmers' educational status (%)			Extent of labor participation	
		Un-educated	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

Table 3. 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

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

District	% sample households possess assets					Average no. per sample household			
	Residential house	Cattle shed	Television	Mobile	Two wheelers	Draft animals	Cows	Buffaloes	Total livestock animals*
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

Table 5. Major crops and their average productivity (pdty) levels by pilot site.

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)
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

Table 6. Economics of crop enterprises in Coastal Andhra region pilot sites.

District	Crop	Total returns (₹ per ha)	Total variable costs (₹ per ha)	Net returns over TVC (₹ per ha)	B:C Ratio
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

Table 7. Economics of prawn enterprises in Coastal Andhra 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
Nellore	Prawns	1287814	968687	319129	1.33
Prakasam	Prawns	1289802	1305761	-15959	0.99
Guntur	Prawns	1092879	1256012	-163134	0.87

Table 8. Primary sector GVA estimations in Coastal Andhra pilot sites (base year: 2014-15).

District	Sub-sector wise			Total GVA estimation (₹ million)	Sub-sector wise share		
	Agriculture including horticulture (₹ million)	Animal husbandry (₹ million)	Fisheries (₹ million)		Agriculture including horticulture	Animal husbandry	Fisheries
Nellore	656.2	106.5	268	1030.7	63.67	10.33	26.00
Prakasam	166.9	181.7	780	1128.6	14.79	16.10	69.11
Guntur	1633.6	197.1	139	1969.7	82.94	10.01	7.06
Regional total	2456.7	485.3	1187	4129	59.50	11.75	28.75

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

District	GVA/pilot site village (₹ million)	GVA/pilot site HH (₹/HH)	GVA/pilot site cropped area (₹/ha)
Nellore	94.3	1,09,515	84,852
Prakasam	43.9	58,788	112,736
Guntur	109.4	1,11,699	1,49,174

Appendix-2 (Sampling Details)

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

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

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

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

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

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

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

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

* few landless households also covered in fishery sample

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