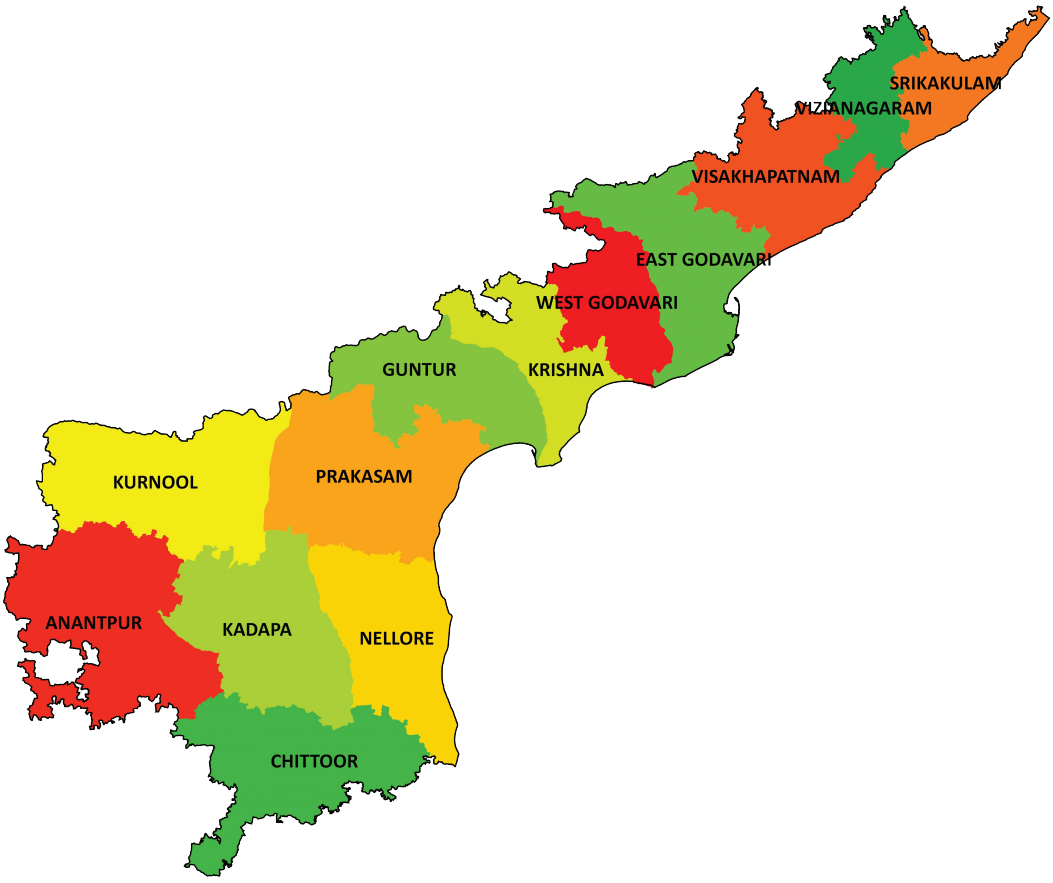
Doubling of Farmers' Income by 2022

Strategy Document for Andhra Pradesh



Indian Council of Agricultural Research
Department of Agricultural Research and Education
Ministry of Agriculture & Farmer's Welfare, New Delhi

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PREFACE

State Level Coordination Committees were constituted for developing state-wise documents for doubling farmers' income by 2022 in tune with the decision taken in the ICAR Directors Conference (14th -15th February, 2017) in which Dr. Ramesh Chand, Member, NITI Aayog made a presentation on Doubling Farmers' Income.

Secretary (DARE) & DG, ICAR constituted the State Coordination Committee for doubling farmer's income in Andhra Pradesh in March, 2017 with due representation of esteemed members from ICAR , SAU, Union Ministries, Central & State Departments, NGOs and farmers.

The approach adopted for doubling farmers' income focused on raising productivity, diversification into high-value agriculture, reduction in cost of cultivation and providing avenues for diversification of farm employment into non-farm high-income generating activities. The committee sourced data and inputs from publications and web resources and relied on the ICAR Policy document on Doubling Farmers' Income by NAIP (formerly NCAP). The strategy is broadly in line with the presentation made by Dr. M.S.Swaminathan to Hon'ble Prime Minister, documents and presentation of NITI Aayog, DAC & FW.

The first State Coordination Committee for Andhra Pradesh was convened by ICAR-ATARI, Hyderabad on 7th April, 2017 under the chairmanship of Vice-Chancellor, ANGRAU at Secretariat of Andhra Pradesh, Velagapudi, Guntur. The members discussed pathways and growth engine sectors for Andhra Pradesh and deliberated upon development of area specific technology modules for various agro-ecological zones. The initial report was developed further through several interactions and further discussed in subsequent meetings on 25th & 31st October, 2017.

The action plan for implementation is based on the contributions made by ANGRAU, Dr. YSRHU, SVVU, State departments of Agriculture, Horticulture, Animal Husbandry and Fisheries, Ministry of Food Processing, ICAR research institutes (CTRI, IIOPR, CRIDA, IIOR, IIMR, IIRR, DPR, NRC Meat), MANAGE, ICRISAT and NABARD which are duly acknowledged. Technical assistance provided by Ms Vanusha Baregal, Senior Research Fellow of ATARI is appreciated.

Place : Hyderabad
Date : 29.12.2017

Dr. Y.G.Prasad
Director, ICAR-ATARI
(Convener)

Dr. V. Damodara Naidu
Vice-Chancellor, ANGRAU
(Chairman)

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List of Abbreviations

AGRISNET	Agricultural Resources Information Systems NET work
AMC	Agriculture Market Committee
ANGRAU	Acharya NG Ranga Agricultural University
APEDA	Agriculture Products Export Development Authority
APLDA	Andhra Pradesh Livestock Development Agency
APMC	Agriculture Produce Market Committee
ATMA	Agricultural Technology Management Agency
BYP	Backyard Poultry
CAGR	Compound Annual Growth Rate
CEZ	Coastal Economic Zones
CRIDA	Central Research Institute for Dryland Agriculture
CRKs	Chandranna Rythu Kshetralu
CTRI	Central Tobacco Research Institute
DAC&FW	Department of Agriculture Cooperation & Farmers Welfare
DFI	Doubling Farmers' Income
DPR	Directorate of Poultry Research
e-NAM	Electronic National Agriculture Market
FPO	Farmer Producer Organization
FQCLs	Fertilizer Quality Control Laboratories
GAIS	Group Accident Insurance Scheme
GoI	Government of India
GSDP	Gross State Domestic Product
GVA	Gross Value Added
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IIMR	Indian Institute of Millets Research
IIOPR	Indian Institute of Oil Palm Research
IIOR	Indian Institute of Oilseeds Research
IIRR	Indian Institute of Rice Research
ITDA	Integrated Tribal Development Agency
KVK	Krishi Vigyan Kendra
KVIC	Khadi and Village Industries Commission

MANAGE	National Institute of Agricultural Extension Management
MEI	Marginal Efficiency of Investment
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Act
MIDH	Mission for Integrated Development of Horticulture
MPEDA	Marine Products Export Development Authority
NABARD	National Bank for Agriculture and Rural Development
NCAER	National Council of Applied Economic Research
NCDC	National Co-operative Development Corporation
NFSM	National Food Security Mission
NGO	Non Governmental Organisation
NLM	National Livestock Mission
NMAET	National Mission on Agricultural & Extension Technology
NMOOP	National Mission on Oilseeds and Oilpalm
NMSA	National Mission for Sustainable Agriculture
NRC	National Research Centre on Meat
NSSO	National Sample Survey Office
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhana Mantri Krishi Sinchayee Yojana
PTFCS	Primary Tribal Fishermen Cooperative Society
RBP	Ration Balancing Programme
RIDF	Rural Infrastructure Development Fund
RKVY	Rashtriya Krishi Vikas Yojana
SAU	State Agriculture University
SCC	State Coordination Committee
SFAC	Small Farmers' Agribusiness Consortium
SMAE	Sub Mission on Agricultural Extension
STLs	Soil Testing Labs
TMC	Thousand Million Cubic Feet
TMR	Total Mixed Ration
UPIS	Unified Package Insurance Scheme
WBCIS	Weather Based Crop Insurance Scheme
YMV	Yellow Mosaic Virus

1. Introduction

Background

Indian agriculture has made rapid strides since independence: From food shortages and import to self-sufficiency and exports. Today India is the front ranking producer of many crops in the world, ushered in through the green, white, blue and yellow revolutions. The past strategy for development of the agriculture sector for India focused primarily on raising agricultural output and improving food security. During the last half, a century (1965-2015), since the adoption of green revolution, India's food production multiplied 3.7 times while the population multiplied by 2.55 times. The net result has been a 45 per cent increase in per person food production, which has made India not only food self-sufficient at aggregate level, but also a net food exporting country. The strategy did not explicitly recognize the need to raise farmers' income and did not mention any direct measure to promote farmers' welfare. The experience shows that in some cases, growth in output brings similar increase in farmers' income but in many case farmers' income did not grow much with increase in output. The net result has been that farmers' income remained low, which is evidence from the incidence of poverty among farm households. The decline in the growth of agriculture has now led to a climate of despair among farmer families, policy makers and the general public. Some areas in the States of Maharashtra, Karnataka and Kerala have been affected by a serious agrarian crisis, leading occasionally to farmers' suicides. The time has therefore come when we should focus more on the economic well-being of the women and men feeding the nation than just on production.

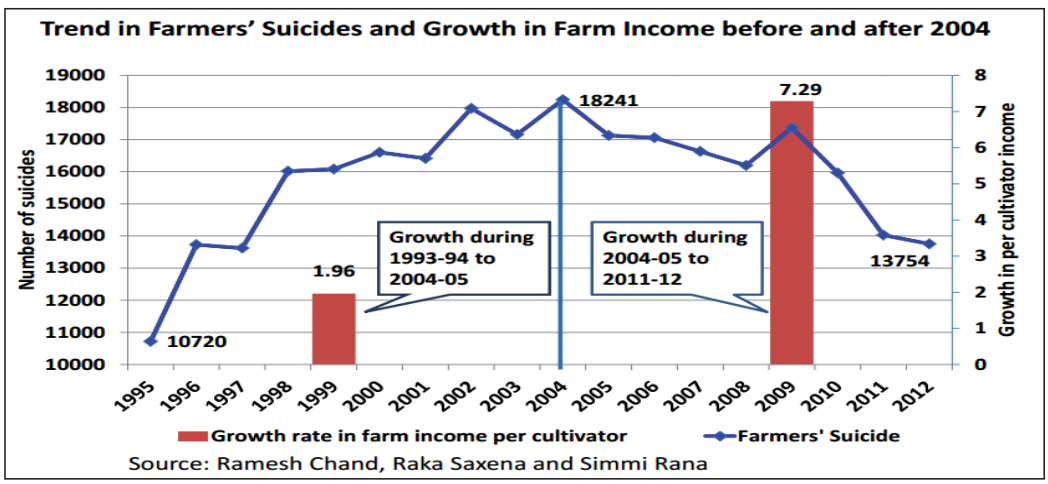


Figure 1. Farm income, agrarian stress and farm poverty

Source: NCAER, 2016.

Andhra Pradesh is predominantly an agrarian state. It is known for production of rice, maize, poultry and aquaculture. Horticulture has been identified as a growth engine in several districts. To address farmers' distress in the primary sector, the state government launched the primary sector mission to boost capital formation and growth rate in agriculture and allied sub-sectors. Similarly, the government initiated several irrigation projects and brought sizable area of horticulture under micro irrigation. However, the challenges to be addressed in the state of Andhra Pradesh are several. Declining average size of operational holdings (declined to 1.06 ha from 1.13 ha in 2005-06) and contrastingly increase in number of holdings by 4.05 lakhs in the same period (at 76.21 lakhs in 2010-11) poses a serious challenge. High dependency of a majority of the population (62%) on agriculture related activities for their livelihood coupled with low productivity is responsible for lower share of agriculture in State Gross Domestic Product (GSDP) (27.84%) and growth at 5.9% (2014-15). The productivity levels of major crops are below the national average in some crops. Yield gaps in case of oilseeds (Groundnut, Sunflower and Castor), pulses and millets are higher. Yield gaps in case of cash crops like sugarcane (25%), cotton (82%) and rice (20%) can also be bridged by appropriate interventions and policy support. For inclusive growth, farm households with income Below Poverty Line (BPL) which constitute 12.3 % of farm households need to be targeted. Occurrence of disasters due to natural calamities is another challenge faced by states in the semi-arid tropics. During the six year period of 2008-09 to 2013-14, 15.16 lakh ha under cultivation was affected.

Average monthly income per agricultural household in Andhra Pradesh is only one-third of the monthly income in Punjab. Net income from cultivation is about 33.8% while income from wages is 41.5% which is in contrast to all India average of 48% and 32.2%, respectively. Income from animal husbandry is twice that of the income from same source by an average agricultural household in Punjab.

Table 1.1: Average monthly income (Rs.) per agricultural household for the agricultural year July 2012-June, 2013

State/UTs	Income From Wages	Net Receipt From Cultivation	Net Receipt From Farming of Animals	Net Receipt From Non-Farm Business	Total Income
Andhra Pradesh	2482	2022	1075	400	5979
Punjab	4779	10862	1658	760	18059
West Bengal	2126	979	225	650	3980
All-India	2071	3081	763	512	6426

Source: NSSO (2014)

The doubling farmers' income committee of DAC & FW estimated the extent to which farm's income (income from crop agriculture, livestock, non-farm business and wages and salaries) would rise between the years 2015-16 to 2022-23. The estimates provided are both in real terms and in nominal terms assuming the inflation to be 5% per annum during the period 2015-16 to 2022-23.

Table 1.2: Targeted Farmers' Income

States/ UTs	Base Year: 2015-16			Terminal Year: 2022-23 At 2015-16 Prices			Terminal Year: 2022-23 At Current Prices		
	At 2015-16 Prices	Non-Farm	Total	Farm	Non-Farm	Total	Farm	Non-Farm	Total
Andhra Pradesh	54,135	49,957	1,04,092	97,010	69,202	1,66,212	1,36,503	97,374	2,33,876
Punjab	1,60,683	70,222	2,30,905	2,87,623	75,910	3,63,533	4,04,714	1,06,813	5,11,527
West Bengal	24,441	54,267	78,708	42,626	67,883	1,10,509	59,979	95,519	155,497
All India	58,246	38,457	96,703	1,08,045	48,108	1,56,154	1,52,031	67,693	2,19,724

Source: DFI Committee, DAC&FW, GoI

The above analysis calls for concerted efforts from all stakeholders in convergence mode to address the challenge of doubling farmers' income by 2022. ICAR is seized of this opportunity to work in close coordination with the central and state departments of agriculture. The state coordination committee formulated appropriate agro-ecology specific technology interventions and enabling steps through prioritization, diversification, post-harvest processing, value addition, value chain development, market and price policy support.

Origin, Concept and Time frame

Hon'ble Prime Minister while addressing a farmer's rally in Bareilly, Uttar Pradesh on 28th February, 2016 shared his vision on Doubling of Farmers Income by the time the nation celebrates 75 years of Independence in the year 2022. He has envisioned seven-point strategy to double the famers' income:

1) Focus on Irrigation with "Per Drop, More Crop"
2) Provision of quality seeds and Nutrients based on soil health cards of each field
3) Large investments in warehousing and cold chains to prevent/minimize Post-harvest crop losses.

4) Value addition through food processing.

5) Creation of a national agricultural market, removing distortions and e-platform across 585 markets.

6) New revolutionary crop insurance scheme to mitigate risks at affordable cost. New crop insurance schemes – Pradhan Mantri Fasal Bima Yojana-Minimum Premium and Maximum Security.

7) Promotion of ancillary activities- poultry, sericulture, beekeeping and fisheries.

The Inter-Ministerial Committee constituted under the Chairmanship of Additional Secretary (Policy) agreed on the time horizon to double the farmers' income is by the agricultural year 2022-23.

- The income to be doubled is the "REAL INCOME" and not just the "NOMINAL INCOME", implying that the expected inflation will be taken into account
- The base income of the farmers shall be taken as that at the beginning of the year 2015-16.
- The income to be doubled is "FARMERS INCOME" not just "FARM INCOME".

To achieve the target of DOUBLING THE FARMER'S INCOME by 2022-23 (base year 2014/15-16), we need to achieve the annual growth rate of 10.4% (as per the estimates).

Constitution of State Coordination Committee (SCC) for Andhra Pradesh

Members of SCC

- **Chairman:** Vice Chancellor, ANGRAU
- **Convener:** Director, Agricultural Technology Application Research Institute, Hyderabad
- **Members**
  - **ICAR Research Institutes: ICAR-**CRIDA, IIOR, IIMR, IIRR, CTRI, IIOPR, DPR, NRC (Meat)
  - **National Institutes-** ICRISAT, MANAGE, NABARD
  - **State Line Departments-** Department of Agriculture, Department of Horticulture, Department of Animal Husbandry, Dairying and Fisheries
  - **Nominees of Ministry of Agriculture & Food Processing Industries.**

Consultation Meetings of State Coordination Committee (SCC) for Andhra Pradesh

- First meeting held on 7 April 2017 at Secretariat, Amaravathi, Guntur under the chairmanship of Principal Secretary (Agriculture)

- A series of informal consultations and sharing of notes and presentations
- Second meeting of SCC on 25th Oct at IIOR, Hyderabad under the chairmanship of VC, ANGRAU
- Third consultation with SCC members on 30th Oct, 2017

First State Coordination Committee Meeting

Second State Coordination Committee Meeting

Documents referred

- Road map for Doubling Farmers Income (presentation) by Prof. M.S. Swaminathan
- Status of farmers' income: strategies for accelerated growth. Report of the Committee on Doubling Farmers Income, Aug, 2017, MoA & FW
- Chand Ramesh. Presentations on Doubling Farmers' Income: Strategy and Prospects. The Indian Society of Agricultural Economics, Assam. 21-23 Nov. 2016 & NAARM, 18 March 2017
- National Council of Applied Economic Research (NCAER). 2017. Doubling of Farmers' Income in India: Backdrop and Challenges.
- Strategy documents of Department of Agriculture, Horticulture & Animal Husbandry, Andhra Pradesh
- Research publications, reports, technical bulletins of ICAR Research Institutes, ICRISAT, MANAGE, SAUs (ANGRAU, Dr YSRHU, SVVU) & KVKs
- Strategy for Doubling Income of Farmers in India by 2022 – Approach paper by ICAR, New Delhi.
- Linking farmers to markets , 2015 by B.K. Paty
- State agriculture infrastructure development programme plan under RKVY by Department of Agriculture, AP.
- Potential for enhancing exports from Andhra Pradesh – Occasional paper 182 by EXIM Bank.

- Socio-economic survey, Planning department, Government of AP.
- e-nam website- **http://www.enam.gov.in/NAM/home/implemented_progress.html#**
- Research Report IDC-16, Farmer Producer Organization in Andhra Pradesh: A Scoping Study by ICRISAT Development Center. http://oar.icrisat.org/9870
- Strategy for Doubling Income farmers in India- Policy paper 31 by National Institute of Agricultural Economics and Policy Research
- Food processing policy (2015-2020) draft by Government of Andhra Pradesh
- The Associated Chambers of Commerce and Industry of India (ASSOCHAM) Study on post harvest losses in India, 2013

Broad Objectives

1. To prepare a strategy document for doubling of farmers income in real terms by 2022 over the baseline of 2015-16 by the State Coordination Committee for Andhra Pradesh constituted by Secretary DARE & DG, ICAR.
2. To prepare an Agro-ecology specific action plan for implementation of technology interventions in convergence with all stakeholders.
3. To outline an implementation and monitoring plan with defined roles and responsibilities

Structure of document

1. Presentation of state profile indicating prevailing agro-ecological situations, land use, cropping pattern, natural resource endowments and development indicators
2. Current level of agriculture infrastructure development and ongoing initiatives.
3. Analysis of productivity gaps and major constraints.
4. Potential for development of allied sectors
5. Pathways for doubling farmers' income with technology focus outlining strategy and detailed action plan.
6. Evidences for technology contribution to farmers' income and potential for scaling out – examples, success stories, case studies from demonstrations and adaptive trials.
7. Value chain development, market linkages and trade potential
8. Policy and investment requirements and role of the government
9. Implementation plan and institutional responsibilities
10. Summary recommendations

2. Andhra Pradesh State Profile

2.1 Agro-ecological Zones in the State

The Cropped areas in Andhra Pradesh are divided into six zones based on the agro-climatic conditions. The classification mainly concentrates on the range of rainfall received, type and topography of the soil.

1. **High altitude and tribal areas:** The area comprised of Northern borders of Srikakulam, Vizianagaram and Visakhapatnam. This zone receives a rainfall more than 1400 mm. Horticultural crops, millets, pulses, chillies, turmeric and pepper are the important crops grown.

2. **North Coastal Zone:** Covers Srikakulam, Vizianagaram and Visakhapatnam districts. This zone receives a rainfall of 1000-1100 mm mainly from South West Monsoon. Soil type is red soils with clay base, pockets of acidic soils, laterite soils. Soils with Ph.4-5. Main crop grown in these zones are Paddy, Groundnut, Jowar, Bajra, Mesta, Jute, Sun hemp, Sesame, Black gram and Horticulture crops.

3. **Godavari zone:** It covers East Godavari and West Godavari districts. The normal rainfall in the zone varies between 1050 to1100mm. Alluvial soils are predominant in the zone followed by red, sandy loam and sandy clay. The major crops grown in this zone are rice, pulses and millets.

4. **Krishna Zone:** It covers east Guntur, Krishna and Prakasam districts of Andhra Pradesh. The mean annual rainfall at the farm is 905 mm. The soils of the farm are deep black in nature with good moisture retentive capacity. Rice, groundnut, sorghum, pearlmillet, tobacco, cotton, chilli, sugarcane and horticulture crops.

5. **Southern Zone:** Districts in this zone are Chittoor, SPSR Nellore and Kadapa Districts. Rainfall received is about 700-1000 mm. Soil type is red loamy soils, shallow to moderately deep. Crops like paddy, groundnut, cotton, sugarcane, millets and horticulture crops are mainly grown.

6. **Scarce rainfall zone:** The districts covered are Kurnool and Anantapur. Receives a rainfall of 500-700 mm. Soil type is red with loamy soils (chalkas), red sandy soils and black cotton soils in pockets. Cotton, Korra, sorghum, millets, groundnut, pulses, paddy are the important crops.

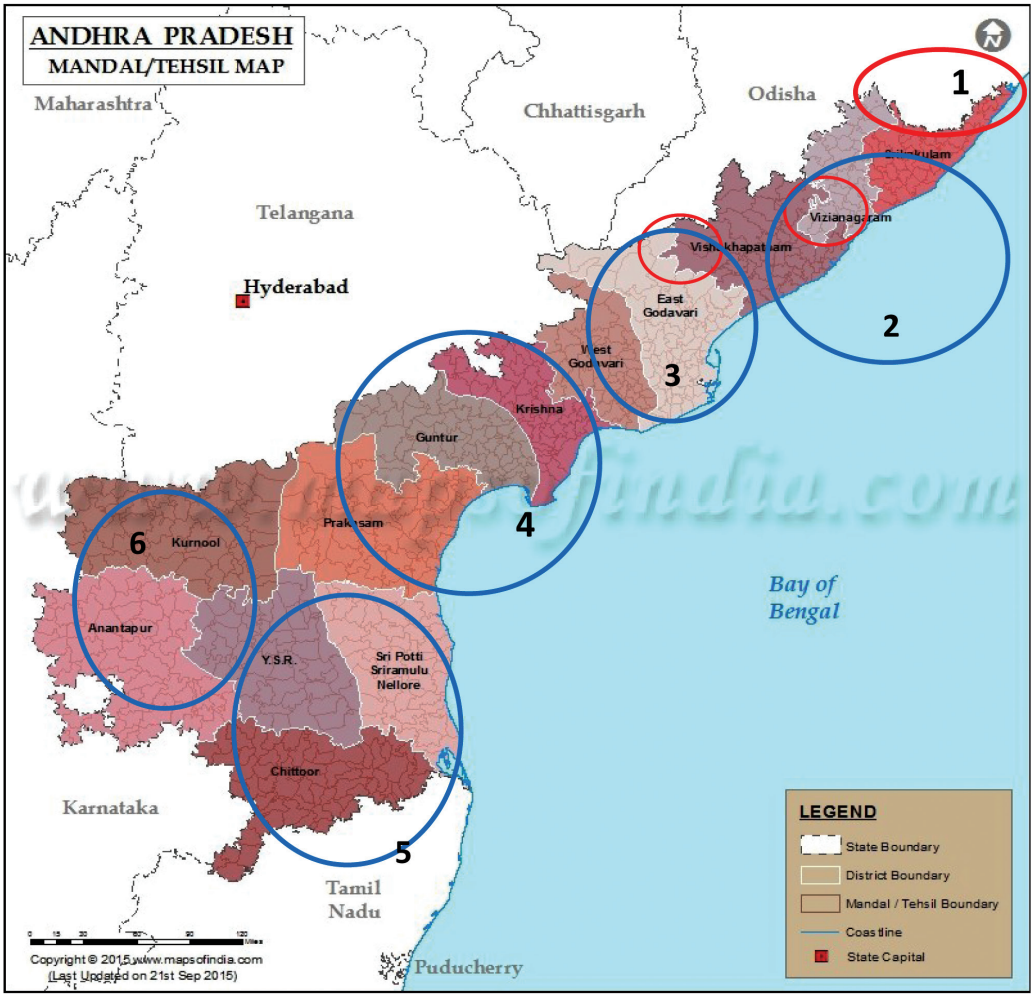


Figure 2.1: Map showing Agro ecological zones across the state

2.2. Land Utilization and Cropping pattern

Of the total geographical area of the state of **162.97 lakh hectares**, 38.09% is under net area sown (62.08 lakh hectares), 22.63% under forest (36.88 lakh hectares), 8.65% under current fallow lands (14.10 lakh hectares), 12.47% under land put non-agricultural uses (20.32 lakh hectares), 8.27% under barren and uncultivable land (13.47 lakh hectares), 7.63% (12.43 lakh hectares) is under other fallow, cultivable waste lands like permanent pastures and other grazing lands and the remaining land under miscellaneous tree crops and groves are counted for 2.26% (3.69 lakh hectares).

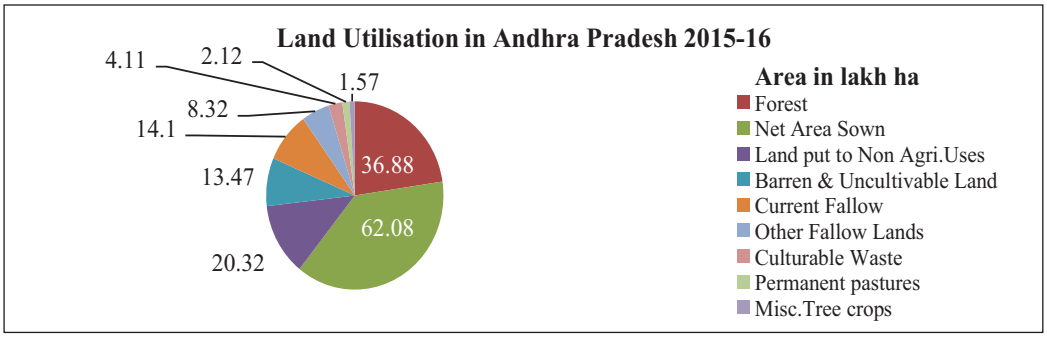


Figure 2.2: Land utilisation in Andhra Pradesh 2015-16

Source: Socio-Economic Survey, 2016-17 Andhra Pradesh.

Land Holdings

The average size of land holdings in the state of Andhra Pradesh has marginally declined to 1.06 hectares during 2010-11 from 1.13 hectares in 2005-06.The number of holdings has increased from 72.16 lakh in 2005-06 to 76.21 lakh in 2010-11.

Table 2.1: Average size of land holdings in Andhra Pradesh

S. No	Category	Number of Holdings	Area Operated (ha)	Number of Holdings (%)	Area Operated (%)
1	Marginal	4983611	2160351	65.39	26.68
2	Small	1591012	2250593	20.88	27.8
3	Semi- Medium	796198	2099810	10.45	25.93
4	Medium	230419	1282009	3.02	15.83
5	Large	19878	303674	0.26	3.75
Total		**7621118**	**8096437**	**100**	**100**

Source: Department of Agriculture, Andhra Pradesh.

Cropping Pattern

Andhra Pradesh grows 28 important crops; during both seasons put together an area of about 62.21 lakh ha has been covered (2015-16). The important crops grown are Rice (21.43 lakh ha), Maize (2.31 lakh ha), Pulses (4.42 lakh ha), Groundnut (7.75 lakh ha), Cotton (6.67 lakh ha), Chilies (1.56 lakh ha), Tobacco (0.96 lakh ha) and Sugarcane (1.22 lakh ha).

Cropping Intensity

The cropping intensity (the ratio of gross cropped area to net cropped area) is one of the

indicators of assessing efficiency of agriculture sector. The cropping intensity for the year 2015-16 was **124 %**.

Area and Production (Kharif and Rabi Season)

The total area under food grains is estimated at 41.34 lakh hectares in 2016-17 as against 41.36 lakh hectares in 2015- 16. However, despite decline in area, the total food grains production in 2016-17 is estimated to register an impressive increase of 9.09% from 143.78 lakh tonnes in 2015-16 to 156.85 lakh tonnes in 2016-17. Significant increase in the production of Paddy during Kharif season together with productivity improvement in some of the crops through adoption of best practices largely contributed to this improved production.

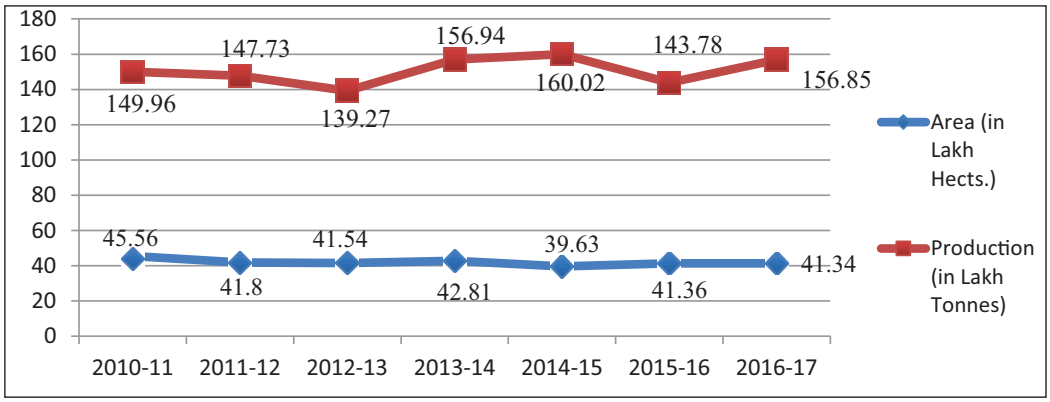


Figure 2.3: Area and production of foodgrains in Andhra Pradesh

Source: Socio-Economic Survey, 2016-17 Andhra Pradesh.

2. 3 Natural resource endowments

Soil: Of the 22 categories of soils adding to the total geographical area of the state, six types are predominant and together account for over 88% of the area.

Table 2.2 Soil types

S. No.	Soil Category	Area ('000 ha)	Percentage
1	Loamy to clayey skeletal deep reddish brown soils	3328	20.42
2	Clayey to gravelly clayey moderately deep dark brown soils	3040	18.65

S. No.	Soil Category	Area ('000 ha)	Percentage
3	Shallow gravelly red soils	1696	10.41
4	Moderately deep calcareous black soils	1559	9.57
5.	Others	6674	40.95
	Total	**16297**	**100.00**

Rainfall: The state receives normal average rainfall of 556 mm from the South West Monsoon and 296 mm from the North East Monsoon.

Groundwater: The state has been divided into 748 watersheds (which are also called groundwater basins or assessment units) for estimation of groundwater resources. The net groundwater irrigation potential created during 2015-16 was 11.93 lakh hectares and gross area irrigated was 16.43 lakh hectares with 15.09 lakh bore wells.

Irrigation: Andhra Pradesh is called a "**River State**" and blessed with major river systems like the Godavari, Krishna, Pennar, Vamsadhara and other rivulets. The state government is giving utmost importance for Irrigation development as well as its management. The State of Andhra Pradesh is allocated 512.040 TMC of Krishna Waters under the existing Projects. The existing utilization under Godavari is to the extent of 308.703 TMC.

Gross and Net Area Irrigated

The gross area irrigated in the State is 35.47 lakh hectares in 2015-16 and the net area irrigated in the state is registered 27.43 lakh hectares in 2015-16.

Table 2.3: Source-wise, district-wise net area irrigated 2015-16 (area in lakh hectares)

District	Canals	Tanks	Others	Wells	Total
Srikakulam	1.14	0.57	0.05	0.11	1.87
Vizianagaram	0.39	0.81	0.02	0.37	1.59
Visakhapatnam	0.47	0.30	0.21	0.19	1.17
East Godavari	1.80	0.21	0.16	0.66	2.83
West Godavari	1.63	0.13	0.10	1.83	3.69
Krishna	1.69	0.16	0.09	0.70	2.64
Guntur	1.51	0.02	0.13	1.20	2.86
Prakasam	0.18	0.08	0.03	1.19	1.48
SPS Nellore	1.30	0.80	0.05	0.93	3.08

District	Canals	Tanks	Others	Wells	Total
YSR Kadapa	0.01	0.09	0.02	1.21	1.33
Kurnool	0.52	0.06	0.18	0.99	1.75
Anantapur	0.14	0.03	0.02	1.20	1.39
Chittoor	0.03	0.37	0.00	1.35	1.75
Andhra Pradesh	10.81	3.63	1.06	11.93	27.43

Source: Directorate of Economics and Statistics, 2016-17

2.4 Important development indicators

Gross State Domestic Product (GSDP) is an important indicator to measure the growth and economic development in a State, and gauge the structural changes in a State economy. The GSDP of Andhra Pradesh at constant (2011-12) prices registered a growth rate of 11.0 percent in 2015-16 to reach Rs. 4,90,134 Cr, reflecting positive economic progress in the State. In fact, the State has consistently been among the top performing states of India. The growth in Andhra Pradesh's GSDP has been higher than the growth in the Gross Domestic Product (GDP) of India over the past three years as shown in the table given below:

Table 2.4: Gross State Domestic Product of Andhra Pradesh (Rs. Cr.)

Year	Andhra Pradesh				India			
	GSDP at Current Prices	Growth %	GSDP at Constant (2011-12) Prices	Growth %	GSDP at Current Prices	Growth %	GSDP at Constant (2011-12) Prices	Growth %
2014-15	526470	13.40	441741	8.51	12433749	10.65	10522686	7.18
2015-16	609934	15.85	490134	10.95	13675331	9.99	11357529	7.93
2016-17	699307	14.65	547021	11.61	15251028	11.52	12165481	7.1

Source: Socio Economic Survey 20156-17, Planning Department, Government of Andhra Pradesh

Sectoral Composition: In the sectoral composition of Gross Value Added (GVA) in 2016-17, the share of Agriculture in the GVA at Current prices was 31.77%, Industry 22.23% and Services sector 46.00%. The Sectoral Composition in 2016-17 of Andhra Pradesh is presented below.

Table 2.5: Sector-wise Gross Value Added (GVA) ^ for Andhra Pradesh (Rs. Cr.)

Sectors	2011-12	2012-13	2013-14	2014-15	2015-16	CAGR (FY12-FY16)
Agriculture and Allied Activities	94751	98572	109204	112465	121915	6.5
Industry	111867	96363	100131	109045	121178	2.0
Services	142963	155108	170944	190678	212391	10.4
Total GVA	349581	350043	380279	412188	455484	6.8

^GVA at constant (2011-12) prices

Note: GSDP = GVA at Basic Prices+ Product Taxes-Product Subsidies

CAGR: Compound Annual Growth Rate

Source: Socio Economic Survey 2015-16, Planning Department, Government of Andhra Pradesh

Key Economic Activities

Agriculture Sector

The noteworthy feature of the growth pattern in Agriculture & Allied Sectors is that this key sector which is supporting about 62% of the population, is consistently maintaining an ascending trend during the last three years, especially marked by an encouraging growth rate of 14.03% in 2016-17 at Constant (2011-12) prices with a GVA of Rs. 1,38,833 crores. Agriculture proper (Agri.+Horti.) has registered a growth rate of 9.19 percent during 2016-17. Agriculture sub sector alone, despite a deficit rainfall of 28% and depleted ground water levels, registered a growth rate of 2.03%, bouncing back from a dismal (-) 9.94% growth rate in 2015-16.

Fillip to Horticulture Sector

The agrarian state of Andhra Pradesh is heading towards a value addition platform from the conventional production approach. 'Horticulture' sub sector, recognized by the government as is an essential component for food and nutritional security in the State, continued its ascendency, showing an impressive growth of 16.79 per cent, a reflection of initiatives of the government such as Sprinkler /Drip Irrigation, Poly house/ Shade nets, *Panta Sanjeevini, Panta Raksha*. These initiatives augur well for the state to realize its goal of making Rayalaseema as a Horticulture hub. It is pertinent to note that horticulture, no longer a sub sector to agriculture sector, has crossed agriculture in terms of value addition.

Enlivening the Livestock sector

The livestock sector has emerged as an alternative and dependable source of income generation even during the times of severe drought. Increase in the production of Milk (12.58%), Meat (13.63%) & Egg (11.66%) resulted in an encouraging growth rate of 12.18% in the livestock sector. The fodder policy and timely interventions have helped the livestock sector, alone accounting for more than 28 per cent of the total Agriculture sector GVA, to bypass all the other sub sectors in the Agri. Allied group.

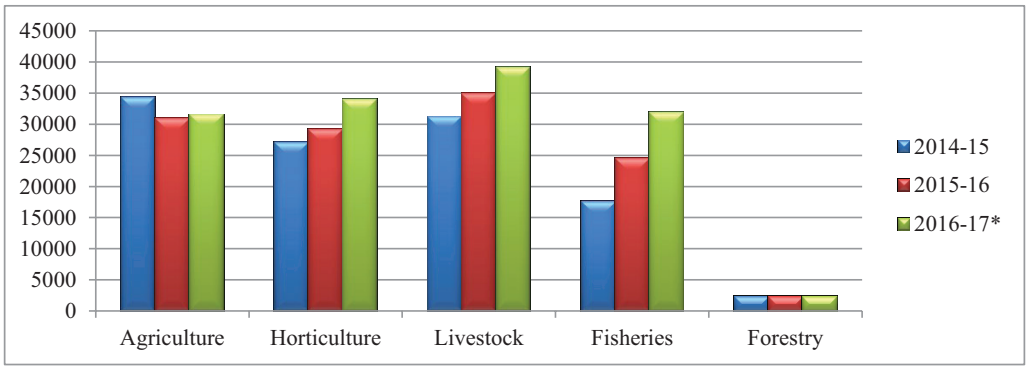


Figure 2.4: GVA estimates (in rs. Crores) at constant prices (2011-12) for agriculture, horticulture, livestock, fisheries and forestry (2014-15 to 2016-17 period)

Source: Socio Economic Survey 2016-17, Planning Department, Government of Andhra Pradesh

Phenomenal growth in Fisheries

Fisheries sector showed phenomenal growth rate of 30.09% and maintained an uptrend with the increase in the production of marine fish (2.26%), inland fish (13.23%) and prawns/ shrimps (42.34%).

Per capita income: The per capita income of Andhra Pradesh at current prices increased to Rs.122376 from Rs.108163 in 2015-16 registering a growth of 13.14 percent. The per capita income at constant (2011-12) prices, has also gone up from Rs.86118 in 2015-16 to Rs.95566 in 2016 registering a growth rate of 10.97 per cent.

Literacy: The literacy rate of the State is 67.35 percent in 2011 as against 62.07 percent in 2001. The literacy rate of the State is lower than the all India literacy rate at 72.98% percent. Literacy in Andhra Pradesh increased over 37 percentage points from 29.94 percent in 1981 to 67.35 percent in 2011. In spite of this fast rate of growth in the last three decades, the literacy rate in Andhra Pradesh is still lower than the all India average. West Godavari is at the top with 74.32 percent and Vizianagaram is at the lowest with 58.89 percent in 2011 among the districts.

3. Infrastructure for Agriculture and Government Programmes

Infrastructure for agriculture and marketing sector

Agriculture: The infrastructure available for agriculture sector in the state of Andhra Pradesh is presented in table

Table 3.1: Infrastructure available for Agriculture in the State

S.No.	Particulars	Number
1.	Labs for production of bio-control agents	8
2.	State Pesticide Testing Labs	4
3.	Setting up of new soil testing laboratories	9
4.	Soil test laboratories	16
5.	Fertilizer Quality Control Laboratories (FQCLs)	4
6.	Bio-fertilizer Production Units	441
7.	Seed Testing Labs	3
8.	Seed Processing Facilities	85
9.	Seed Multiplication Farms	34
10.	Custom Hiring Centers for Agricultural Equipment	1551
11.	Agriculture Machines Testing Centers	1
12.	Fruit/Vegetables waste, compost production units	2127
13.	ATMA Infrastructure	366
14.	State Pesticide Residue Testing Labs	2
15.	Seed Treatment drums & chemicals	700
16.	Seed Storage Godowns including Dehumidifies Refrigerated Seed Storage Godowns	50
17.	Seed Certification Agencies and Certification Infrastructure	1
18.	Kisan Call Centers	2

Source: State Agriculture Infrastructure Development Plan, Department of Agriculture, Andhra Pradesh, 2015.

Marketing Sector: The state of Andhra Pradesh has 190 Agricultural Market Committees including 10 for commercial crops, 19 for fruit markets, 22 for vegetable markets and 29 for cattle markets.

Table 3.2 : Infrastructure available for Marketing sector in the State

S.No	Particulars	Number
1	Fruit markets	19
2	Vegetable markets/Rythu Bazar	22
3	Cattle markets	29
4	Agriculture Market Yards	170
5	Godowns (APMC)	1055
6	Farmers Service Centers	2
7	Food Grain Procurement Centers	51

Source: State Agriculture Infrastructure Development Plan, Department of Agriculture, Andhra Pradesh, 2015.

Electronic National Agriculture Market (e-NAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities. The NAM Portal provides a single window service for all APMC related information and services**. e-NAM** is being deployed in selected **22 regulated markets** in the state. Small Farmers' Agribusiness Consortium (SFAC) is operating the NAM as the implementing agency with technical support from the Strategic Partner (SP). To facilitate assaying of commodities for trading on NAM, common tradable parameters have been developed for 90 commodities.

Table 3.3: Commodities traded in e-NAM linked markets in Andhra Pradesh

S. No.	Mandi	Parent Commodity	Variety
1	Adoni	Castor Seed	Castor Seed
		Cotton	Cotton
		Groundnut	Groundnut
2	Anakapalli	Jaggery	Jaggery , Jaggery Brown , Jaggery Black , Jaggery Gold , Jaggery Broken
3	Anantapur	Sweet Lemon (Mosambi)	Sweet Lemon (Mosambi)
		Water Melon	Water Melon
4	Dachepalli Pidugural	Chilli	Chilli-Teja , Chilli-334 , Red Chilli-Dry
5	Dendulur	Lemon	Lemon
6	Duggirala	Turmeric	Turmeric Bulb , Turmeric Finger , Turmeric Chura

S. No.	Mandi	Parent Commodity	Variety
7	Eluru	Lemon	Lemon
8	Gopalapuram	Lemon	Lemon
9	Guntur	Chilli	Chilli-Thaalu , Chilli-334
10	Gurramkonda	Tomato	Tomato
11	Hindupur	Chilli	Red Chilli-Dry
		Tamarind Fruit	Tamarind Karpuli , Tamarind Flower , Tamarind Botu
		Tamarind	Tamarind
12	Kadapa	Groundnut	Groundnut
		Sunflower Seeds	Sunflower Seeds
		Turmeric	Turmeric Finger , Turmeric Bulb
13	Kalikiri	Tomato	Tomato
14	Kalyandurg	Tamarind	Tamarind
15	Kurnool	Ajwan	Ajwain
		Castor Seed	Castor Seed
		Chana	Chana (Bengal Gram)
		Groundnut	Groundnut
		Maize	Maize
		Red Gram	Redgram-White
		Sunflower Seeds	Sunflower Seeds
16	Madanapalli	Tomato	Tomato
17	Palamaner	Beetroot	Beetroot
		Bitter Gourd	Bitter Gourd
		Bottle Gourd	Bottle Gourd
		Brinjal	Brinjal
		Cabbage	Cabbage
		Carrot	Carrot
		Cauliflower	Cauliflower
		Cluster Beans	Beans - Cluster
		Cucumber (Kheera)	Cucumber
		Green Chilli	Green Chilli
		Ladies Finger	Lady Finger
		Mango	Mango Raw

S. No.	Mandi	Parent Commodity	Variety
		Potato	Potato
		Raddish	Raddish
		Ridge Gourd	Ridge Gourd
		Sweet Corn	Sweet Corn
		Tomato	Tomato
18	Pattikonda	Tomato	Tomato
19	PodalakurRapur	Lemon	Lemon
20	Punganur	Tomato	Tomato
21	Tenali	Lemon	Lemon
22	Yemmiganur	Arhar Whole / Tur (Red Gram)	Tur/Arhar
		Castor Seed	Castor Seed
		Chana	Chana (Bengal Gram)
		Cotton	Cotton
		Groundnut	Groundnut
		Maize	Maize

Source: http://www.enam.gov.in/NAM/home/implemented_progress.html#

Government Programmes

Government programmes for Agriculture sector

i. **Primary Sector Mission inclusive Double Digit Growth:** Primary sector mission is launched by the state government. The targets increased productivity in the primary sector, mitigating the impact of droughts through water conservation and micro-irrigation, post-harvest management. It aims to reduce the wastage and establishment of processing, value addition capacity. Action plans have been prepared in collaboration with ICRISAT, keeping in view of double digit growth.

ii. **Chandranna Rythu Kshetralu (CRKs):** Chandranna Rythu Kshetralu is the new on farm demonstration programme implemented in the farmers field itself to promote best agronomic and farm management practices for achieving increase in productivity and reducing cost of cultivation. CRK is an on farm demonstrations of 10 Ha each cluster at field level with a subsidy of Rs 5000/- per Ha. CRK demonstration will be selected based on the major crop grown in the village/ Mandal and division. It is

proposed to organize a total of 5500 CRKs in all the 13 districts in the State in all the major crops i.e., Rice, Groundnut, Pulses, Maize, Cotton and Sunflower.

iii. **Soil samples analysis and soil health cards:** Soil sampling and soil testing program is organized in a systematic manner to evaluate the fertility status, identify soil problems and for facilitating optimal soil productivity, improving fertility and reclaiming problematic soils. 16 Soil Testing Labs (STLs), 1 Regional Soil Testing Lab at Bapatla, Guntur district, 9 Mobile Soil Testing Labs and 30 Mini Soil Testing Labs in AMCs are functioning at in the State. During 2015-16 and 2016-17, 10.43 lakh soil samples were analyzed and 42.38 lakh soil health cards were distributed to the farmers. 3rd phase of soil sample collection and analysis is in progress. So far 50,764 samples were collected & 34,309 samples were analyzed during 3rd phase. Eventually, every farm holding (76 Lakhs) in the State will be provided with Soil Health Card.

iv. **Soil Health Management - National Mission for Sustainable Agriculture (NMSA):** Soil Health Management in a sub mission under NMSA, which aims to increase soil nutrient status and thus enhance crop productivity for ensuring food security and sustaining rural development. Integrated Nutrient Management Techniques have been found to be useful to increase nutrient use efficiency by integrating and balancing the nutrient dose in relation to nutrient status and crop requirements

v. **Information and Communication Technology:** Agriculture Department ranked **number one position** under Farm Mechanization transactions in India. The Government has promulgated the Agricultural Resources Information Systems NET work. (AGRISNET) in the country. AGRISNET envisages promotion of e-Governance by use of Information & Technology. Efforts are being made to this portal (AGRISNET www.apagrisnet.gov.in) to link to Dash Board with real time data base:

   a) Online soil health card generation system (http://45.127.101.32:8080/OLMS)

   b) Online input license management system of seeds, fertilizers & pesticides (http://137.59.201.87:8080/OLMS)

   c) e- Seed Distribution (D-Krishi)

   d) Village Action Plan Software (www.agrivap.com)

   e) e-Agriculture- Crop Booking- Android Application (http://45.114.143.89/E-Agriculture)

vi. **Crop Insurance**: Presently 3 crop insurance programmes are under implementation in the State

a) **Pradhan Mantri Fasal Bima Yojana (PMFBY):** Farmer's premium contribution in Kharif 2% and in Rabi 1.5% for Food Crops and Oilseed Crops. Annual Commercial & Horticulture crops – farmer premium share will be maximum of 5%. Premium subsidy will be paid by the Central and State Governments on equal proportion (50:50). Cover for inundation apart from Hail storm and Postharvest crop damage.

b) **Weather Based Crop Insurance Scheme (WBCIS)**: As the proposed crops under WBCIS are limited in the selected districts, one cluster is formed under this scheme. The structure of farmer's premium under WBCIS will be at par with the proposed PMFBY i.e., 2 % for kharif crops & 1.5 for rabi Crops. (Horticulture/ Comml. Crops - farmers share is up to 5% only).

c) **Unified Package Insurance Scheme (UPIS) (Pilot scheme):** Anantapur district is selected to implement UPIS during 2016-17 on pilot basis. The pilot scheme includes seven sections viz., 1. Crop Insurance (PMFBY/WBCIS), 2. Personal Accident Insurance (PMSBY), 3. Life Insurance (PMJJBY) 4.Building& Contents Insurance (fire and allied perils), 5.Agriculture Pump Sets Insurance (Upto10 HP), 6.Student Safety Insurance, 7. Agriculture Tractor Insurance. Out of these seven sections Crop Insurance (PMFBY / WBCIS) is compulsory. However, farmer can choose at least two sections from remaining six to avail applicable premium subsidy under PMFBY/WBCIS.

vii. **Issue of "Certificate of cultivation" to tenant farmers:** The certificate of cultivators will facilitate more number of tenant farmers in getting bank loans. The certificate of cultivator's details will be issued by the Agriculture Department. The SLBC sub-committee on "Tenant Farmers & suicides" has resolved that the banks can extend the finance to "Certificate of Cultivator" (tenant farmers) up to Rs.1.00 lakh on hypothecation of crop and without insisting on collateral security as per the existing norms, basing on the certificate of cultivator details provided by the Agriculture department. So far 38,401 Certificates were issued to the tenant farmers and loaning started. Till date, an amount of Rs 6.26 Crores was disbursed to 1846 no. of farmers.

viii. **Vaddileni Runalu and Pavala Vaddi Scheme on Crop Loans:** To mitigate the financial burden of the farmers, the Government disbursed crop loans under Rythu Sri (vaddilenipantarunalu/ pavala vaddi) scheme. The Government has announced

Interest free crop loans to all the farmers up to Rs.1.00 lakh and pavala vaddi for crop loans from Rs.1.00 lakh to Rs.3.00 lakhs if repaid in time (maximum period of one year).

ix. **Horticulture Debt Redemption:** Under this scheme, horticulture crop loans are redeemed @ Rs.10,000/- per acre up to maximum of Rs.50,000 covering 5 acres per family, with in the overall ceiling of Rs.1.50 lakhs which is applicable in the agricultural crop loans, subject to the limit of outstanding loan balance as on 31.12.2013. An amount of Rs 384.47 crores has been released and 2.22 lakh farmer accounts are redeemed.

x. **Rashtriya Krishi Vikas Yojana – A GoI Initiative:** Rashtriya Krishi Vikas Yojana (RKVY) is one of the flagship programme of Govt. of India with Central and State sharing 60:40. The scheme is being implemented by departments of Agriculture and Allied sectors. The State Level Sanction Committee (SLSC) has sanctioned projects worth of Rs.416.02 crores during 2016-17, of which Rs.158.12 crores has been sanctioned to Agriculture Sector.

The state government is also implementing several initiatives as follows:

Organic Farming/Natural Farming: The Programme is in implementation in 131 clusters @ 10 or 11 clusters per district. In each cluster, 300 farmers are identified to adopt exclusively organic/natural farming. In each cluster 1MPEO, 1CA, 2CRPs & 30 Master farmers will act as a team to promote natural farming. 231 Farmer experts who are the best practicing farmers work for 18 - 21 days in each round and train farmers on need based inputs i.e., Preparation of botanical extracts, Ghana/Drava Jeevamrutham etc. & promote NADEPs, SRI cultivation, Rainfed farming sustainable agriculture (RFSA) methods etc. To meet the immediate requirement of farmers, the 300 farmers in the cluster are provided assistance. In Kharif 2016, 33422 farmers have adopted Organic/Natural farming.

National Food Security Mission: The National Food Security Mission is under implementation in the State. Maize and Commercial Crops (Cotton, Jute and Sugarcane) is part of NFSM from 2014-15. 5 districts are identified for implementation of NFSM Rice, 7 districts for coarse cereals and all the districts for pulses and certain districts are identified for commercial crops during 2016-17.

Extension Reforms - Agriculture Technology Management Agency: Under the scheme "Support to State Extension Programmes for Extension Reforms" (ATMA), the entire state of Andhra Pradesh is covered with 60:40 central and state share. The Extension

Reforms (ATMA) component has been included in the National Mission on Agricultural & Extension Technology (NMAET) as Sub Mission on Agricultural Extension (SMAE).

Government programmes for Horticulture

Schemes are being implemented by the Department include: Pradhana Mantri Krishi Sinchayee Yojana (PMKSY) APMIP, Mission for Integrated Development of Horticulture (MIDH), Rashtriya Krishi Vikas Yojana (RKVY), National Mission on Oilseeds and Oilpalm Program under Mini Mission-II (NMOOP) and Promotion of Horticulture Activities.

i. **Pradhana Mantri Krishi Sinchai Yojana (PMKSY) APMIP:** AP Micro Irrigation Project (APMIP) is a first comprehensive and unique project being implemented in a big way in Andhra Pradesh for enhancing crop productivity by improving water use efficiency through Micro-irrigation systems to benefit the farmers. It is an ongoing project and 6.93 lakh ha has been covered under Micro irrigation in all the districts in the State, benefiting 6.25 lakh farmers.

ii. **Mission for Integrated Development of Horticulture (MIDH):** Mission for Integrated Development of Horticulture (MIDH) is a Government of India scheme being implemented by subsuming six schemes on Horticulture development including NHM as per the revised cost norms and pattern of assistance. MIDH is being implemented with an outlay of Rs.106.72 crore with the GoI and GoAP share in the ratio of 60:40 basis during the year 2016-17.

    The major components covered under MIDH are:

    a. Area expansion (Perennial and Non-Perennial crops),
    b. Rejuvenation of senile orchards,
    c. Protected Cultivation,
    d. Post Harvest Management,
    e. Creation of Water Resources (Farm Ponds),
    f. Farm Mechanisation and
    g. Capacity Building.

iii. **State Horticulture Mission**: A Centrally Sponsored Scheme – the Horticulture Mission, is being implemented in the State by the State Horticulture Mission. The Mission was launched to promote holistic growth of horticulture sector through an area based regionally differentiated strategies. The focus of the programme is to provide comprehensive development of all the sub-sectors of horticulture so as to provide

additional income to horticulture growers. This programme is under implementation in 9 districts (Srikakulam, West Godavari, Guntur, Prakasam, SPS Nellore, Chittoor, YSR, Ananathapuramu, and Kurnool) and two tribal areas of Rampachodavaram of East Godavari and Paderu of Visakhapatnam districts. Andhra Pradesh, with its high growth trajectory, a large population, significant dependence on agriculture and horticulture and an extensive coastline is likely to become a significant player in production and marketing of Horticultural produce.

iv. **Production of Quality Plant Material:** Quality plant material plays a vital role in sustainability of gardens especially perennial fruit crops. Small and model nurseries were encouraged to produce quality plant material by providing assistance for infrastructure under NHM to cater to the requirement of plant material for bringing additional areas with improved varieties and rejuvenation programmes. Fifteen Horticulture farms were established producing around 10.00 lakhs of quality plant material. Nursery Act was introduced for regulation of supply of quality plant material to farmers.

v. **Post- Harvest Management:** Horticulture crops are highly perishable and require special attention on harvesting, handling, packaging, storage and processing operations. The focus was on providing preharvest tools and development of post-harvest infrastructure facilities like pack houses, cold storages, refer vans, ripening chambers etc. During 2016-17 (up to October, 2016), assistance was provided for 8 cold storage units, 4 ripening chamber, 8 low cost ripening chambers and 336 pack houses. Post-harvest management activities like reduction of losses and improvement of the quality of horticultural produce is important for enhancing value of the produce.

vi. **Rashtriya Krishi Vikas Yojana:** RKVY scheme in Andhra Pradesh is proposed to implement major activity in non-SHM districts viz., Krishna, east godavari, visakhapatnam and vizianagaram while the projects under integrated vegetable production which are not covered in SHM are being implemented in all the districts. Production and distribution of good quality plant material to meet the requirement for bringing new area under fruit plantation. Encouragement of structures like pandals and trellis for quality production in case of gourds and tomato. Encouragement of nurseries and cultivation of high cost intensive cultivation of summer vegetables in shade net houses to overcome the high temperatures. Encouragement of post-harvest structures and implements to reduce post-harvest losses and promote new technologies to ensure continuous supply of horticulture produce. Conservation of natural resources by adopting good agricultural practices in production of horticultural crops.

vii. **National Mission on Oilseeds and Oilpalm Programme:** Andhra Pradesh ranks 1st in cultivation of Oilpalm with 1.49 lakh Ha with 1.04 lakh farmers in 8 districts of the state and spreading over in 225 mandals. 13 Processing units were established by Oil Palm Companies with Capacity of 240 MT/Hr., which are working with Government under this programme. The companies have buy-back arrangements for purchase of Fresh Fruit Bunches (FFB's) from farmers in the factory zones allotted to them at the rate fixed by the Government.

Government programmes for Animal Husbandry

i) Cattle & Buffalo Breed Development

a) New Artificial Insemination Centers: This is a new scheme meant for expansion of breeding operations involving NGOs with experience in implementation of livestock projects. The Integrated Livestock Development Centers will be established in uncovered areas where there are no established facilities for breeding operations by the Department. 1000 breedable cattle will be covered per each centre which may increase or decrease marginally as per ground feasibility. This will be implemented through MOU approved by the Government. An amount of Rs.200.00 lakh is allocated for this purpose.

b) Promotion of Indigenous Breeds: This is an existing scheme under which breed improvement activity will be taken up for conservation of Desi / Indigenous cows and promotion of sustainable Organic farming will be promoted in a big way. An amount of Rs.10000/- per animal is provided towards transportation and insurance premium for Indigenous Animals (GIR, Shahiwal etc.) purchased by the farmers. The financial outlay for this component is Rs.200.00 Lakh.

c) Interest Subsidy for Dairy farms: This is a new scheme designed to promote entrepreneurs in dairy farming for establishment of new Dairy farms / expansion of existing Dairy farms in the State. Interest subsidy will be provided over and above 3% interest charged by the banks. The Financial Out lay for this component is Rs.50.00 Lakh.

d) Sexed Semen/Sexed semen Lab/ ET lab: This is a new scheme to be implemented in selected pockets of the State involving AP livestock Development Agency (APLDA). 5000 doses of sexed semen will be procured and piloted to produce additional female calves. Subsidy on each dose of sexed semen is 75% and the remaining 25% of the cost of sexed semen will be borne by the concerned beneficiary. Sexed Semen will be supplied to farmers on first cum first serve

basis. The funds allocated to this activity are also meant for training the staff within or outside the state for implementation of the activity. The funds can also be utilized for import of superior quality embryos (HF, Jersey etc.) and also for Establishment of Sexed semen lab/ Embryo Transfer Technology (ET) lab. The implementing agency is Andhra Pradesh Livestock Development Agency (APLDA) with financial outlay of Rs.50.00 Lakh.

ii) **Feed and fodder Development Programme:** The Fodder security policy, which is first of its kind in the country, having various components to provide quality feed and fodder to the Livestock, will be implemented.

a) **Promotion of Silage**: This is an ongoing scheme with the objective to make availability of nutritious green fodder to the livestock throughout the year. Through this activity, the department will promote silage production activity in the form of bales / pit silage / tower silo / Bunkers etc., The activity will be implemented through involvement of farmers / entrepreneurs / NGO / SERP / PPP partners/any other agency. To increase the scope of activity, the programme will be implemented in convergence with other schemes. It will be promoted in PPP mode wherever possible. The existing subsidy pattern will be followed and the beneficiary contribution @ Rs.2/- per kg silage will be borne by the beneficiary.

b) **Hydroponics & Azolla**: This is an ongoing scheme. The Hydroponics technology will be promoted to enable the farmers to produce green fodder where there is constraint for land to grow fodder. Azolla, an alga will be promoted as an alternative to replace oiled cakes in the concentrate feed to some extent to reduce cost of production in the Livestock Production. 75% subsidy for Hydroponics units and 90% subsidy for Azolla units will be extended to the beneficiaries as per the provisions of Fodder Security Policy and the remaining non-subsidy component will be borne by the beneficiaries.

c) **Total Mixed Ration (TMR) Fodder blocks:** This is an ongoing scheme. It enables farmers to get access to the balanced / complete ration to their animals in the form of blocks, particularly those farmers who do not own land (for fodder production) to enable them confidently take up dairying activity. The concept is known to reduce production costs. This will be promoted in PPP mode. The existing subsidy pattern will be followed and the beneficiary contribution @ Rs.3.50 Ps per kg of TMR Fodder block will be borne by the beneficiary

d) **Convergence with MGNREGS to match for material cost:** The scheme is meant to promote large scale fodder production in convergence with Rural Development Department. The AH department will provide matching funds of material component over and above the 40% material cost involved under MGNREGS.

e) **Ration Balancing Programme (RBP)**: This will be promoted to create awareness amongst the milk producers for optimization of milk production by efficient utilization of locally available feeding resources. This will be implemented involving entrepreneurs / Gopalamitras / Department staff /NGO/ any other agency.

f) **Fodder Seed Supply**: Improved fodder seed will be supplied to the farmers to take up large scale fodder production to meet the fodder requirement of high yielding animals. The fodder seed will be supplied on 75% subsidy to the farmers. The Financial Out lay is Rs.500.00 Lakh.

g) **Fodder Banks:** Storage facilities for fodder will be created in strategic location to supply fodder to livestock farmers in scarcity periods. Infrastructure facilities will be provided by the Department through RIDF / MGNREGS in convergence with Rural Development Department) under State Development Plan. The financial outlay is Rs.200.00 Lakh.

h) **Feed and fodder supply**: Under this program, feed and fodder of different categories will be supplied to the farmers / Goshalas on subsidy basis @Rs.2/- per kg of Silage @Rs.3/- per kg of dry fodder and @ Rs.3.50/- per kg of TMR fodder blocks and Rs.4/per kg of concentrate feed irrespective of their procurement cost throughout the year / critical period as part of initiative to achieve Double Digit Inclusive Growth in Livestock Sector. Preference will be given for supply of silage bale / TMR fodder block / Silage bales / TMR blocks / Concentrated Feed / Dry fodder to Livestock Farmers / Goshalas on subsidized cost to prevent distress and also to Government Livestock Farms on reimbursement basis during critical periods. The financial outlay is Rs.1613.00 Lakh.

iii) Implementation of Livestock Development Programmes Management / Health Care

a) **Pregnant and Lactating Animal care (Ksheerasaagar):** This is an ongoing scheme, designed to reduce Inter Calving Period in milch animals and to increase the life time milk production. The feed & fodder, healthcare and insurance support including other logistics will be given for a period of six months (Last

3 months of pregnancy and first 3 months of lactation). Implementation of this scheme will result in an additional 360 litres of milk and one extra calf can be obtained from each animal in its life time. The scheme will be implemented on 75% subsidy. The logistics including data entry will be on 100% subsidy. Financial Out lay for this program is Rs.1000.00 Lakh.

b) **Animal Hostel**: Common infrastructure facilities required for animal management, dung & urine management will be provided free of cost, working capital in the form of revolving fund will also be provided. This will be implemented in convergence mode with RD department involving SHGs/ unemployed youth/ Dairies/ NGOs, etc., The Financial Out lay for this component is Rs.50.00 Lakh.

c) **Suphalam:** The objective of the program is to get one calf once in 15-18 months from milch animals /heifers through fertility Management of infertile animals. The provision available under this sub-component can also be utilised to tie-up medicines required for the animals covered under Ksheerasaagar scheme and to meet logistics. All infertile animals available in the target villages will be identified through screening of animals and appropriate treatment package will be given under the supervision of a graduate Veterinarian till the animal is conceived or advised for culling.

d) **Organization of Janmabhoomi – Mavooru programme**: Animal Health Camps will be conducted in all the Gram Panchayats / Wards of the State. The activities will be deworming, vaccinations, fertility management, treatment of sick animals, technology transfer, capacity building, and plantation of fodder trees in all possible locations under neeru-chettu / Polam Pilustondi etc.

e) **Mobile Veterinary Services (NTR Sanchara Pashu Vydya Sevalu)**:The Mobile Veterinary Services (NTR SPS) will provide service to the farmers in the state, at the rate of one each per Animal Husbandry division for 45 divisions in the first phase. This number can gradually be extended to (180) erstwhile blocks based on the feedback on the utility of the scheme. This innovative program will be implemented involving entrepreneurs/ NGO/ any other agency in PPP mode. The amount earmarked for this activity will also be used to assist NGO/ PPP partner as grants-in- aid to operate the scheme.

iv) **Infrastructure support to Dairy/Sheep/Poultry Sector:** The government is assisting the large population under livestock sector in a big way and is supporting them through implementation of various schemes including infrastructure support to dairy/sheep/poultry activities. The key schemes being implemented are:

- BMCU in potential villages,
- Milk processing units/equipment, •
- Support to Farmer Producer Organisation (FPO),
- Milk Market Outlets Breeding rams production/ replacement and exchange,
- Avikabandhu,
- Sheep Shelters,
- Interest subsidy for setting up of new Sheep / Goat farms,
- Feeding support to pregnant ewes,
- Meat Market Outlets/ Meat Processing Unit/ Mobile Sheep Health Care Units,
- Interest Subsidy for setting up of big Poultry farms,
- Ultra-Modern Laboratory for Disease Diagnosis,
- Support to small vendors and EDEG,
- RBP Hatchery (Rural Backyard Poultry),
- Power Tariff,
- Cold storage facilities/egg powder/Chicken breast processing units/Establishment of modern slaughter house / Export facilities,
- Support to other activities,
- Calf Rearing Programme (NSP), Vaccine production /purchase/testing/disease diagnosis and control,
- Strengthening of Hospitals & Dispensaries,
- Strengthening of data base and networking of all the Veterinary Institutions through outsourcing of the data entry work/software development & ministerial assistance,
- Capacity Building–Training of farmers/Field staff, Support to Training centres,
- Establishment of Para Veterinary and Allied Board/ Council, Infrastructure support to Field Veterinary Institutions.

Sheep and Goat Development Activities

i. **Implementation of NCDC Scheme:** The National Co-operative Development Corporation has sanctioned Financial Assistance of Rs.35.74 crores under Integrated Small Ruminants Development (ISRD) to be implemented by the Federation in Prakasam and Chittoor Districts through the District Unions. 146 shepherd families of

Prakasam district and 115 of Chittoor district were benefited with the 1st installment of NCDC amount of Rs.265.20 lakhs.

ii. **Distribution of Mini-Sheep & Goat units** Government is of the view to develop the state as a prominent State for meat production in the country through ensuring sustainable growth in small ruminant sector for economic prosperity and nutritional security. Distribution of Sheep & Goat units is identified as one of the major components. 593 units (NSP-441 and TSP-152) were distributed with a subsidy of Rs.96.55 lakhs upto Nov, 2016.

iii. **Supply of Total Mixed Ration (TMR)**: TMR is a worldwide accepted best practice in feeding livestock. The practice of mixing green fodder or silage with dry fodder and concentrates along with all other nutrients enables a complete ration that increases digestibility and enable utilization of nutrients at optimum level. The product of TMR is to be supplied to the eligible farmers on subsidy basis @ Rs.3.50/- per Kg as against full cost of Rs.9.99/-per Kg under State Development plan 201617. 1739.68 MTs supplied up to November, 2016 with a subsidy of Rs.112.90 lakhs.

iv. **Sheep & Goat Deworming**: The departments conducted 1st round Mass Sheep & Goat deworming from 5.8.2016 to 12.8.2016 covering about 180 lakh sheep & Goat present in the state by spending Rs.4.52 cr.

Poultry Development Activities: The Government is implementing centrally sponsored scheme "Rural Back Yard Poultry Development" under National Livestock Mission-2016-17. The budget allocation is from NLM. The scheme is implemented in convergence with SERP.

Under this programme:

- The state government encourages Rural Livestock holds to adopt Low input technology backyard poultry like Vanaraja/ Gramapriya birds for supplementing the income as well as to improve the nutrition standards.
- 4 week old chicks were purchased from GoI approved firms and supplied with proper vaccination were handed over to the beneficiaries of BPL families. Each beneficiary will be provided with 45 chicks, @ 25 and 20 chicks at an interval of 10 weeks. Each beneficiary gets a subsidy @ Rs.50/-chick and a night shelter with an amount of Rs.1500/- on 100 % subsidy.
- 10,000units are allocated in 13 Districts of APRIGP/ DPMU Mandals in Andhra Pradesh. Out of which so far 3,311 units have been grounded. Remaining are in progress.

- Farmer will contribute Rs.810/- per unit as beneficiary contribution. This amount will be collected by APM's, CC's of DRDA.

Government Programmes for Fisheries

Fisheries Development schemes

i. **Chandranna Bima:** Previously, active fishers in the State were covered under Group Accident Insurance Scheme (GAIS) of Centrally Sponsored Scheme. Now, the Department of Fisheries is enrolling the fishers under the Chandranna Bima Scheme, which is more beneficial compared to GAIS.Chandranna Bima Scheme as the insurance amount is Rs 5.00 lakhs for Accidental Death; Rs 3.62 lakhs for Partial/ Permanent Disability, for Rs 0.30 lakhs for natural death provision for Scholarships for Education.

ii. **Blue Revolution:** Integrated Development and Management of Fisheries" in which all the sectors of fisheries – inland, marine, welfare, post harvest fisheries etc., are covered. GOI assistance is restricted to 50% of the unit / project cost. Under this CSS scheme, GOI have sanctioned Rs.13.97 crores during 2016-17 to the State. The important schemes being implemented during 2016-17 are establishment of feed mills of both large and small, fish landing centres in inland sector, ice plants, supply of crafts and gear, installation of green energy based solar wind hybrid freezing plants and drying unit etc.

iii. **Under RKVY:** Under RKVY 2016-17, Rs.37.52 crores was sanctioned for fisheries sector in the state. The schemes implemented under RKVY are fish seed stocking in tanks and reservoirs by providing assistance to FCSs, establishment of fish brood bank at Kovvali, West Godavari dist., establishment of AQF, BMC for *L. vannamei* in Visakhapatnam district, mud crab and sea bass hatcheries in Guntur district, establishment of mobile / stationery diagnostic aqua labs, construction of fish markets in GPs and municipalities, assistance to fish vendors for setting up kiosks etc.

iv. **Infrastructure projects under RIDF:** Governments have sanctioned 67.29 crores under RIDF XX Tranche for taking 47 works in the state. The works of fish seed farms, shore based facilities, fish landing centers, labs, approach roads etc. are taken up by the engineering wings of the PR dept, APEWIDC. Some of the works are completed and the remaining projects are under various process of execution Stage.

v. **MGNREGS:** Infrastructure and community assets building activities are proposed under this scheme. The initiatives planned through MGNREGS in fisheries sector for

2016-17 include: Construction of shrimp ponds for SCs , STs in 100 ha, Desilting & deepening of earthen ponds in 50 department Fish seed farms, De-silting of drains and creeks in aquaculture areas, Fish Drying Platforms in coastal villages, excavation in Seasonal water bodies for Development of fisheries (Captive seed nurseries), Fish landing centers in 100 reservoirs / tanks, gravel roads to fishermen habitations, inputs in farm ponds for raising fish culture , and labour component in construction of fish market earth work.

Government Programmes

i. **Relief to Marine fishermen during ban period:** Every year, fishing in the marine waters is banned from April 15th to June 14th (61 days) under MFR Act as a conservation of fishery wealth in the sea and also for promoting responsible fisheries. During ban period, the crew members of the mechanized and motorized fishing boats are provided relief @ Rs.4000/- to each crew member by Direct Cash Transfer. About 75000 fishermen are covered under this scheme during 2016-17.

ii. **Dissemination of cyclone warning and PFZ information to coastal fishers:** The Department has developed strong communication network and disseminating the cyclone warnings through voice message with the support of Reliance Foundation and Dr. M. S. Swaminathan Foundation to all coastal fishers. The Department with the support of INCOIS is also communicating Potential Fishery Zone Information through voice messages and Digital Display Boards in the coastal Districts.

iii. **Supply of Sea Safety and Navigational Equipment:** Sea Safety and Navigational equipment like Life Jackets, Life buoys, G.P.S., Echo sounder, VHF Sets and DATs are providing on 75% Subsidy for all categories of sea going fishing vessels so as to promote safety at sea for fishers and facilitative to catch more fish with aid of navigational equipment.

iv. **Supply of Marine Fishing Inputs:** About only1/5th of coastal fishermen are possessing their own fishing inputs in the state. Hence, the fishing inputs consisting of FRP boat, engine and nets with the unit cost of Rs.5.00 Lakhs are supplying to Individual / Group of Fishermen belonging to BPL families on 50% Subsidy for their better livelihood.

v. **Establishment of Infrastructure facilities to Marine Fishermen:** Marine infrastructure facilities like fishing harbours, fish landing centers, dry platforms, additional Shore based facilities, markets, are providing to Marine Fishermen

community for promoting Hygienic handling of fish and shrimp and to reduce post harvest fishery losses.

vi. **Housing Scheme for fishers:** Under National Scheme of Welfare of Fishermen of GOI and NTR Rural Housing Programme of GOAP, the fishers are providing with pucca houses with unit cost of Rs.1,87,500/- in the State.

vii. **Tribal Sub-Plan:** An amount of Rs. 2041.00 lakhs is allocated under this plan for the year 2016-17. The important activities proposed under this scheme are supply of three / four wheelers for fish marketing, supply of Boats/FRP boats and nets cycles with nets or nets to reservoir / riverine/ tank fishermen, supply ice boxes to fishers, supply of Reefer vans and establishment of fish retail kiosks.

viii. **Promotion of Deep Sea Fishing:** The objective of the scheme is to promote deep sea fishing particularly Tuna fishery which is under exploited and scope for potential catches through mechanized and motorized boats. Tuna longlines and gill nets are provided on 50% subsidy on the unit cost of Rs.4.00 lakhs and 1.00 lakh respectively.

Recent Initiatives taken by department for development of fisheries

- Networking of Aqua laboratories are in progress
- Permitting Aquaculture in assigned lands
- Task Force Committee was constituted to promote aquaculture and to position AP as Hub of Aqua Production and processing in India
- Implementing orders issued imposing ban on usage of slaughter waste in aquaculture
- Allowing Aquaculture in DKT lands
- Regulation of shrimp hatcheries for quality seed production
- Implementing Coastal Security measures by covering left over fishers of 77250 for issuance of MFID cards and 65 card readers supplied by GOI for authentication of biometrics
- Preparation of DPRs for new fishing harbours at Juvaladinne, Nellore district, Vodarevu, Prakasam district Uppada, East Godavari district and PhaseII Development at Nizampatnam, Guntur district, Machilipatnam, Krishna district and released Rs.5.04 crore as mobilization advance.

4. Productivity Gaps and Major Constraints

Table 4.1. Productivity of major crops across various districts in the state

Crop	State average (kg/ha)	Highest (Kg/ha)	Lowest (Kg/ha)
Rice	3532	3969 (West Godavari)	1687(Visakhapatnam)
Jowar	2435	6884 (Guntur)	304 (Anantapur)
Bajra	1366	2674 (SPS Nellore)	587 (Anantapur)
Maize	6390	7691 (Prakasam)	2731(Visakhapatnam)
Red gram	503	1558 (Guntur)	129 (Anantapur)
Bengal gram	1144	2303 (Guntur)	568 (Anantapur)
Groundnut	564	4538 (Guntur)	306 (Anantapur)
Sunflower	803	1125 (SPS Nellore)	334 (Anantapur)
Castor	575	1432 (Guntur)	440 (Prakasam)
Sugarcane	71847	116794 (Kurnool)	48330 (Visakhapatnam)
Cotton	570	886 (Guntur)	239 (Anantapur)
Tobacco	2565	6245 (Krishna)	1904 (Anantapur)

• Low productivity in districts of North coastal & Scare rainfall Zones

Table 4.2 : Productivity gap in major pulses and oilseed crops across various districts in Andhra Pradesh

Crop	District	District yield (q/ha)	Demonstration yield (q/ha)	Productivity gap (q/ha)
Groundnut (Rabi)	Chittoor	33.45	41.7	8.25
	Guntur	34.34	52	17.66
	Kurnool	20.64	30.2	9.56
	Srikakulam	23.18	26.5	3.32
	West Godavari	37.68	40	2.32
Sesame	East Godavari	1.8	5.25	3.45
	West Godavari	2.86	8.7	5.84
	Srikakulam	2.34	6.51	4.17
	Kurnool	3.19	8.65	5.46
	Visakhapatnam	2.88	9.25	6.37
Sunflower	Kurnool	8.14	15.45	7.31
	Kadapa	14.17	16.25	2.08
	Chittoor	12.87	23	10.13

Crop	District	District yield (q/ha)	Demonstration yield (q/ha)	Productivity gap (q/ha)
Redgram	Guntur	10.01	14.65	4.64
	Chittoor	1.13	6.63	5.5
	East Godavari	3.05	9.7	6.65
	Krishna	10	17.5	7.5
	West Godavari	5.83	10	4.17
	Kurnool	3.53	7.2	3.67
	Srikakulam	4.74	9.5	4.76
Blackgram	Vizianagaram	4.72	12.56	7.84
	EastGodavari	6.54	10.9	4.36
	Guntur	5.33	12.85	7.52
	Kadapa	6.39	8.32	1.93
	Kurnool	15.28	23	7.72
	Krishna	7.7	9.75	2.05
	West Godavari	1.98	9.97	7.99
Greengram	Prakasam	5.4	13.75	8.35
	Nellore	5.26	7.79	2.53
	Srikakulam	4.37	5.51	1.14
	Vizianagaram	4.62	12.8	8.18
	Chittoor	4.11	16	11.89
Bengalgram	Kurnool	9.33	13.5	4.17
	Prakasam	14.9	25	10.1

Major constraints

Rice

- Major biotic stresses like BPH, Stem borer, BLB, Stem rot, sheath blight, red stripe and leaf & neck blast.
- Abiotic stresses like frequent floods during vegetative to flowering stage, increased salinity levels in the soil and stress due to heat and cold.
- Damage due to natural calamities like cyclones and heavy rains coinciding with harvest and prolonged cloudy weather during Kharif season.
- Lack of small scale farm machinery for various operations including post harvest handling suitable for small and marginal farmers.
- Lack of efficient or proper spraying equipment.
- Acute shortage of labour during peak operations leading to delay in timely operation and escalation of cost of production.
- Wide spread cultivation of non climate resilient rice varieties

- Deterioration of soil fertility and productivity.
- Indiscriminate / imbalanced use of fertilizers and pesticides
- Improper drainage in low lying areas of rice cultivation.
- Lack of assured irrigation for timely sowing in certain areas.
- Lack of proper threshing, drying and storage facilities.

Jowar

- Non adoption of recommended high yielding varieties/hybrids to realize the potential yield in place of local varieties which are poor yielding types especially under rainfed conditions.
- Lack of awareness on application of recommended doses of fertilizers both under rainfed as well as irrigated conditions.
- Lack of need based plant protection for important pests and diseases.
- Most of the crop is grown under rainfed and residual moisture conditions. Periodical drought of varying intensities and lack of irrigation facilities reduces the productivity levels.
- Variation in soil types.
- Lack of timely and adequate seed supply.
- Shoot fly and grain molds in kharif and shoot fly and charcoal rot in rabi are the major limiting factors.

Maize

- High incidence of biotic and abiotic stresses during the two growing seasons is influencing yields of maize.
- Non availability of climate resilient maize cultivars.
- Lower price compared to cereals.
- Institutional and economic constraints.
- Lack of proper storage facilities in market yards.
- Lack of infrastructure for post harvest processing and value addition.
- Fading organic carbon in the soil is declining crop productivity and profitability is being reduced besides escalating costs of inputs and cost of cultivation.
- Lack of varieties suitable for late sown condition.

Oilseeds

- Non-availability of quality seed
- The non-availability of water at different intervals was also a major constraint in getting the adequate production from oilseed crops
- Incidence of pest and diseases
- Inadequate Knowledge about disease and pest management
- The economic constraints relate to high input costs, shortage of human labour, low and fluctuating prices etc
- Inadequate storage
- Lack of Processing Facilities
- Poor Marketing System and Access to Markets
- Lack of Information about the price and Markets

Pulses

Blackgram

- Pre harvesting sprouting during *kharif* season
- Plant establishment in Rice-fallows
- Weed menace & *cuscuta* in Rice-fallows
- Terminal moisture stress
- Seriousness of
    * Diseases: leaf curl, MYMV, leaf crinkle, PM, *Corynespora*, rust, wilt and *Macrophomina*
    * Insect pests: Thrips, whitefly, *maruca* pod borer, stem-fly and *spodoptera*

Greengram

- Pre harvest sprouting during *kharif* season
- Intermittent moisture stress
- Plant establishment in Rice-fallows
- Weed menace & *cuscuta* in Rice-fallows
- Susceptibility to
    * Diseases : Leaf curl, leaf crinkle, MYMV, powdery mildew, ABLS
    * Insect pests : Thrips, whitefly, *maruca* pod borer, *spodoptera litura*

Redgram

- Terminal moistures stress
- Cultivation as an intercrop under neglected management.
- Indeterminate, tall habit of the present day cultivars making plant protection operations difficult.
- Incidence of
    * Diseases : Wilt and Sterility mosaic diseases
    * Insect pests : *Maruca, Heliothis* and pod fly

Bengalgram

- Short and warm winters
- Drought
- Incidence of
    * Diseases : Dry root rot, collar rot and wilt
    * Insect pests : *Helicoverpa* pod borer, *Spodoptera exigua*

Livestock

- Low productivity of local breeds
- Poor adaptability of cross bred animals
- Inadequate knowledge about Feeding
- Non Availability of fodder round the year
- High costs on feeding & Storage of feed
- Lack of Grazing land
- Low availability of dry fodder

Fisheries

- Availability of quality fish seed in required quantity and time
- Farmers depending on single type of culture practices (Inland sector: carp culture, Brackish water : Vennami culture)
- Non availability of sufficient seed and artificial feed in Sea bass culture, crab culture
- Low productivity due to poor growth rate
- Traditional methods of fish cultivation in community and panchyat tanks resulting less yields (Average fish production 500kg /ha)
- Lack of awareness on pond environment and water quality management

5. Potential for Development of Horticulture, Livestock, Fisheries, Agro-forestry and Post-harvest processing etc.

Potential for development of Horticulture sector

Horticulture sector has been recognized as an essential component for food and nutritional security in the State. Efforts are being made to make Andhra Pradesh maintain its supremacy in the production of Oilpalm, Papaya, Citrus and Chilies, Mango and Tomato. Micro irrigation through drip and sprinkler mechanisms has proved effective both in terms of cost and output. The government is implementing strategies to make Rayalaseema as a Horticulture hub.15.86 Lakh Ha. area is under Horticulture with production of 202.50 lakhs MTs. The area under fruits is 5.76 lakhs Ha, Vegetables 2.28 lakh Ha, Spices 2.37 lakh Ha and Plantation crops 4.58 lakh Ha.

Table 5.1: Projected potential area for horticulture in Andhra Pradesh

S. No.	District	Total Gross Sown Area (ha)	Area under Horticul-ture (ha)	% of area under Horticulture against Gross Sown Area	Projected area (ha)	% of increase by the Projected Area
1	East Godavari	683859	177292	26	273471	40
2	Anantapur	942309	174014	18	568619	60
3	West Godavari	691109	166928	24	323960	47
4	Visakhapatnam	362847	163549	45	208606	57
5	Chittoor	378839	160384	42	227350	60
6	Kadapa	354737	113562	32	194000	55
7	Guntur	809674	110926	14	406153	50
8	Krishna	676999	110873	16	340408	50
9	Kurnool	997959	103537	10	487184	49
10	Vizianagaram	372693	96228	26	216656	58
11	Prakasam	605169	92185	15	313085	52
12	Srikakulam	419064	72053	17	212368	51
13	Nellore	394565	45269	11	228140	58
	Total	**7689825**	**1586801**		**4000000**	

Source : Deparment of Horticulture, Government of Andhra Pradesh

Table 5.2: Crop-wise projected potential area for horticulture in Andhra Pradesh

S.No	Crop	Projected Potential area
1	Fruits	1626418
2	Vegetables	993112
3	Plantation Crops	750050
4	Spices	580923
5	Flowers	47080
6	Medicinal & Aromatic Plants	2418

Source : Deparment of Horticulture, Government of Andhra Pradesh

Potential for development of Livestock sector

Andhra Pradesh takes pride in the country in having world renowned Livestock breeds like Ongole and Punganur in cattle, Godavari Buffaloes, Nellore in sheep and Aseel in poultry. The Livestock resources in the state include 47.16 lakh Cattle, 64.62 lakh Buffaloes, 135.60 lakh Sheep (1st in country), 44.96 lakh Goats, 1.57 lakh pigs, 0.13 lakh other Livestock, 294.03 lakh total Livestock & 805.83 lakh poultry (3rd in country).

The livestock sector has high inclusive growth potential. However, further growth of the sector is as much dependent upon the availability of fodder as it is dependent upon the breed improvement. About 63.54 lakh hectares of arable land in the state is cultivated under different crops, of which crop residue useful as fodder comes from 31.45 lakh hectares. Although majority of the crop residue is used as fodder to the livestock, its availability and requirement doesn't match with the reality when district as unit is taken into consideration due to the distribution pattern of livestock in the state. The animals require green, dry fodder and concentrate feed to exploit its genetic potential of higher productivity.

However, there is 41% shortage in green fodder, 42% shortage in feed concentrates and 20% shortage in dry fodder in the State. Despite the state's favorable agro-climatic conditions and availability of resources, one of the major challenges is huge shortage of fodder, more so during drought situations and summer. The fodder being critical input in livestock production systems, the government has considered it necessary to undertake a comprehensive fodder policy to increase production and to ensure faster growth of the livestock sector. The major objectives of the fodder policy are to ensure the availability of fodder during drought and summer, enhancement of production and preservation of

fodder by adoption of appropriate technologies, post-harvest management to optimally utilize suitable agro-ecological conditions in the state, creation of fodder banks / storage facilities in partnership with user groups and private players and reduction of production costs. The tangible outcomes will be doubling the milk production from the present 96.50 Lakh Metric Tons (LMT) to 160.00 LMT and meat production from 5.28 LMT to 9.60 LMT in next 5 years.

Potential for development of Fisheries sector

Fisheries, occupies an important place in the Socio-economic development of sunrise Andhra Pradesh State. Fisheries, as one of the vibrant sub-sectors of the Primary Sector, are identified as one of the growth engines. It is a significant employment generator and a source of proteinous food and foreign exchange earner for the State. AP ranks 1st in total fish and shrimp production and contributes more than 70% of cultured shrimp produced in the country. AP ranks 3rd in Global shrimp production (0.3 million tons), 6th in aquaculture production (1.57 million tons) (FAO Report 2012). AP is contributing 1.19% of global and 20.77% of national fish production (2014-15). Fisheries sector is supporting employment to 14.5 lakh persons. The state government has initiated plans to make Andhra Pradesh the 'Aqua Hub' of the World. About 1.40 million people are directly or indirectly employed in the State in this sector. The A.P. Fisheries Policy, 2015 envisages 42 lakh tonnes of fish production with GVA of Rs.80,000 Crore by 2019-20.

Growth drivers for Fisheries Sector

- Liberalization and growth of Organized retail
- Rising youth population likely to increase convenience food consumption
- Rising income levels. Affluence and growing middle class group
- Increase desire for branded products and increase in spending power
- Consumption is drawn towards packaged and ready to eat foods.

Agro-forestry

Agriculture in recent times is facing diverse challenges due to growing demographic pressure, increasing food, feed, fuel, and fodder needs, natural resource degradation and climate change. Diversification of land use with agro-forestry can address some of these challenges. Clonal seed orchards for a number of important tree species have been established for Eucalyptus and Leucaena based agro-forestry in Andhra Pradesh.

Post-harvest processing

The gross capital formation in Agro and Food Processing Industry in AP was 2340.9 crores in 2011-12. Andhra Pradesh incurs post-harvest fruits and vegetable losses worth over Rs.5,600 crores annually (ASSOCHAM India Study, Nov 2013). It has been proposed to set up Food Parks based on raw material availability, market connectivity, labour availability and logistic facilities either on PPP basis or as private investment.

1. Integrated Food Park (minimum area of each food park will be 30 acres)
2. Mega Food Park (minimum area of each food park will be 50 Acres)
3. Ultra Mega Food Park.

Table 5.3: Proposed Food parks in the state

Food Park	District	Status	Commodities handed
Srini Food Park Ltd	Chittoor	Operational	Mango, guava, papaya, tomato
Godavari Mega Aqua Park Limited	West Godavari	Under construction	Fish and Prawn
Krishna Mega Food Park	Krishna	In principally approved project	Mango, tomato, cashew, banana, sweet orange, oil palm
Spices Park	Guntur	Under construction	Chilli

Source: Food processing policy (2015-2020) draft by Government of Andhra Pradesh

District wise Post-harvest potential in Andhra Pradesh

There are diverse agricultural and horticultural crops grown in all the 13 districts of AP. The district wise potential agro-based industries and export has been mapped below

Table 5.4: District wise potential agro-based industries and export potential agriculture products

District	Agri products	Potential Industries	Export potential
Srikakulam	Paddy, Pulses (greengram, redgram, blackgram) Forest products (tamarind, timber, turmeric, hill-brooms, gum) cashew, pineapple, custard apple, beedi leaves, coconut, jackfruit, vegetables	Rice milling (fine rice, boiled rice)	Paddy, cashew nuts, cashew kernels, kernel skin, cashew nut shell, processed marine foods (fish, prawn) mango and mango jelly

District	Agri products	Potential Industries	Export potential
Vizianagaram	Paddy, groundnut, mesta, greengram, sugarcane, blackgram, sesamum, maize, cotton, ragi, Fruits-Mango, cashew, Vegetables-brinjal, Plantation crops-arecanuts, oilpalm, coconut	Sugarcane, cashew, oilseeds, jaggery	Cashewnuts, organic jiggery, sesame seed
Visakhapatnam	Paddy, sugarcane, ragi, maize, groundnut, fruits- cashew, mango, guava, vegetables- beans, brinjal, tomato, chilli, gourds, coconut, arecanuts, turmeric,	Sugarcane, millets, cashew	Sea foods, spices, cashew nut, coffee, coconut vbased products
East Godavari	paddy, coconut, banana, teak, bamboo, tamarind, medicinal plants, timber, beedi leaves	Rice mills, rice bran oil, rice flour, coir related items, leaf plates	Maize, sorghum, rice bran extraction, organic manure, crude palm oil, soybean meal extraction, coir products, marine products
West Godavari	Paddy, coconut, lemon, aquaculture, palm, tobacco, chilli, sugarcane, maize, cashew, mango, banana, eucalyptus, teak	Rice mill, rice bran oil, rice flakes, jute based	Sea foods
Krishna	Paddy, blackgram, maize, cotton, greengram, sugarcane, chilly, groundnut, tobacco,redgram, Mango, banana, guava, papaya, sapota, cashhewnut, chilli, okra, tomato, gourd, cucumber, leafy vegetables, turmeric, ginger, onion, eucalyptus	Ricemill, Ricebran oil, vegetable oil refinery, energy foods, oilmill, spice powder, turmeric oil	Fish & Prawn, edibleoil
Guntur	Paddy, Jowar, Bajra, blackgram, Bengalgram, Redgram, Sugrance, cotton, tobacco, chilly, turmeric, castor, sunflower, groundnut, lemon, mango, banana, coconut, sapota, vegetables	Rice/pohamill,oilmill,-confectionery,bakery,milkproducts,bananachips,packingoffreshvegetables,papad,pickle,turmericfruitjuices,mangojellyandjam	Tobacco leaf & products, rice, red chillies, spices, mangoes, vegetables, marine products
Prakasam	Chickpea, paddy, redgram, tobacco, sunflower, bajra, groundnut, orange, mango, sapota, lemon, papaya, chilli, tomato, coriander	Oil extraction, rice flakes, rava, fried gram, dalmill, fishfeed, ricebranoil, cahew nut processing	Seafood, processed tobacco

District	Agri products	Potential Industries	Export potential
Nellore	Paddy, blackgram, sugarcane, groundnut, bengalgram, sunflower, tobacco, cotton, sesamum, greengram, chilli, redgram, maize, lemon, mango, organe, cashew, banana, okra, brinjal, marigold, oilpalm, coconkut, betelvine	Palm, fibre extraction, oilfrommango, Kemel, jams, jellies, fruit concentrates, mangojelly, magopulp, vegetable preservation and canning, readymade mixes, spices & condiments, egg products	Aqua products (processed fish, prawns, lobsters, seafood items), dairy products
Chittoor	Groundnut, rice, sugarcane, redgram, sunflower, mango, banana, tomato, brinjal, chilli, potato, beans, spices, turmeric, coconut	Jams, jellies, fruitpulp, concentrate & purees, seed processing, vermicelli, confectionery, dalmill, papad, chikki, potato wafers, bread, mushroom, honeybee keeping, hatchery, turmeric polishing and grinding, boards from ricehusk, mango kemel oil, rice flakes)	Mango & mangopulp, processed vegetables, dairy products
Kadapa	Groundnut, bengalgram, sunflower, rice, redgram, sorghum, maize, ragi, sweet organge, mango, papaya, banana, tomato, chilli, mari gold	Iceplant, mango & lime pickles, rice bran oil, oilmills, dalmills	Cut flowers, rice bran oil, pulses, processed mango
Anantapur	Groundnut, bengalgram, sunflower, rice, redgram, sorghum, maize, ragi, sweet orange, mango, papaya, banana, tomato, chilli, mari gold	Processing units for groundnut, sunflower, redgram, oil expellers, oilrefining, ricemills	Groundnut
Kurnool	Bengalgram, groundnut, sunflower, rice, sorghum, redgram, cotton, castor, maize, greengram, bajra, mango, banana, orange and bata via, onion, tomato, chillies, okra, brinjal, jasmine, coriander, turmeric	Coldstorage, seed processing, castoroil, flourmilling, fuelfromagro-waste, fibre-boards from magro waste, comflakes, dehydration of vegetables, oleoresins, groundnut husk powder, tobacco products	Rice

Source: Agriculture-Post Harvest Processing & Value chain, Sector paper 2016.

6. Role of Technology

6.1 Strategy and agro-ecology specific action plan/ interventions for enhancing production, cost reduction, quality improvement and generation of additional income

6.2 Evidences of successful technologies/ practices for scaling out

A. North Coastal Zone & High Altitude and Tribal areas (Srikakulam, Vizianagaram, Visakhapatnam districts)

B. Godavari Zone (East Godavari, West Godavari)

C. Krishna Zone (Krishna, Guntur, Prakasam)

D. Southern Zone (Chittoor, Kadapa, Nellore)

E. Scarce Rainfall Zone (Anantapur, Kurnool)

A. North Coastal Zone & High Altitude and Tribal areas (Srikakulam, Vizianagaram, Visakhapatnam districts)

The North Coastal Zone is spread over 1.19 M ha comprising of three districts i.e., Srikakulam, Vizianagaram and Visakhapatnam covering 6592 villages in 101 mandals of 11 revenue divisions. Red loams with clay base is the predominant soil type in the zone which occupy 42.0 % of the area followed by red sandy loams (32.0 %), alluvial soils (20.0 %) and coastal sands (6.0 %). Most of the soils are normal in pH & EC, low in OC, nitrogen medium in available phosphorus and high in potassium. The normal rainfall of the zone is about 1165 mm, out of which 61% (711 mm) is recorded during SW monsoon, 26% (303 mm) during NE monsoon and remaining 13% (151 mm) during winter and summer months by intermittent showers and cyclones.

Out of total Geographical area of 23.7 lakh ha in the zone, the net area sown is 9.34 lakh ha which accounts for 39.4% of the Geographical area. The remaining 14.38 lakh ha is occupied by forests (28.1%), barren and uncultivable land (11.5%), land put to non agricultural use (11.1%), permanent pastures and grazing lands (2.3%) and fallow lands (3.5%).

Out of total cultivable area of 11.51 lakh hectares, 82.6% is rainfed and rest (17.4%) is from assured irrigation sources. There are no perennial rivers or permanent irrigation sources in the zone. Mostly irrigation is by canals (44.2%) and tanks (38.8%) whereas 4.8% is from tube well and rest (12.2%) is from other wells. Since there are no major irrigation sources the cropping system in the zone is dependent on seasonal rain fall and availability of water in irrigation sources like tanks and bore wells.

Table 6.1: Productivity (kg/ha) of major crops in North Coastal Zone (2016-17)

Crop	Visakhapatnam	Vizianagaram	Srikakulam	Andhra Pradesh
Paddy	3365	4556	4459	5702
Maize	2637	5625	4242	6604
Ragi	1025	1204	1584	1077
Sugarcane (t/ha)	58.9	66.8	78.7	76.2
Sesamum	240	234	229	257
Groundnut	1420	1382	1859	595
Mesta	-	1941	1386	1703
Greengram	666	461	440	493
Black gram	785	477	499	659

In North coastal districts, rice is the predominant crop occupying 4.20 lakh ha followed by sugarcane (60,000 ha), ragi (23,926 ha), maize (26,734 ha) and sesame (15,657 ha). In general the productivity is low in north coastal districts due to low fertility status of soils in adequate irrigation and poor facilities, adoption of improved varieties and management practices.

High altitude tribal areas: The area comprises of Northern borders of Srikakulam, Vizianagaram and Visakhapatnam. This zone receives a rainfall more than 1400 mm. Horticultural crops, millets, pulses, chillies, turmeric and pepper are the important crops grown.

North Costal Zone and High altitude tribal areas: Strategy and Interventions

Strategy 1: Productivity Enhancement	• Flood tolerant MTU & RGL paddy varieties • Reviving rice fallow pulses with introduction of disease tolerant varieties in blackgram and greengram. Establishment of seed hub for pulses in Srikakulam for production of 1000q/year • Promotion of sugarcane clones for rainfed situations in Visakhapatnam district with productivity of >75 tonnes/ha • Introduction of high yielding varieties of sesame with a productivity of >1 ton/ha e.g., YLM-136 • Replacement of seedling orchards with grafts in Cashew & rejuvenation of aged orchards of mango, cashew, guava
Strategy 2: Cost reduction	• Paddy + Fish IFS model • Direct sowing of paddy using drum seeder in uplands to reduce costs • Zero till cultivation of rabi maize

	• Green manuring and organic production of paddy • Soil test based nutrient application in paddy, maize, sugarcane • Integrated pest management practices in paddy, pulses, sugarcane and oilseeds • Establishment of nurseries for pro- tray production and supply of vegetable seedlings • Farm mechanization - Power tillers, Power weeders, Paddy threshers, Maize Sheller, power operated paddy reapers and harvesters
Strategy 3: Quality Improvement / Processing/ value addition/ niche markets	• Millets – primary processing & value addition • Good agricultural practice of trellising in vegetable crops (tomato, brinjal, cucumber, capsicum) for increasing good quality marketable produce yield upto 80% and quality by 20% • Cultivation of open pollinated chilli varieties (LCA-625) to reduce costs and increase profitability • Organic jaggery production • Organic coffee in high altitude tribal areas • Value added products from Palmyrah
Strategy 4: Generation of additional income	• Mother units / small hatchery units for backyard Poultry improved breeds of Srinidhi, Rajeshwari, Gramapriya etc. • Efficient feed management utilizing crop residues like maize stover, straws of legume crops etc for dairy • Cluster farming @500-1000 broiler birds by 8-10 youth in low cost housing • Year round fodder production with hybrid napier and guinea grass • Semi-intensive sheep production in Horti-pastoral system (mango)
	• Intercropping/ multi-storied cropping in coconut and oilpalm with banana, pineapple, black pepper, turmeric, yam, colocasia, cocoa, long pepper, heliconia, red ginger with a cost benefit ratio ranging between 2.18 to 2.67 • Adoption of casuarina & eucalyptus clones for paper industry • Skill training in bee-keeping for income generation • Mushroom production

Promotion of flood tolerant paddy varieties in flood prone areas of Andhra Pradesh

About 1.39 m ha area is flood prone in Andhra Pradesh. Paddy is mainly affected due to inundation or transient water logging. Under the National Initiative on Climate Resilient Agriculture (NICRA) project, KVKs in Srikakulam and West Godavari performed on-farm testing of flood tolerant paddy varieties exposed to different flooding conditions. Among various varieties tested MTU-1061 gave a yield advantage of 28.6 to 59.1% over check (MTU-7029) and 40 to 65% increase in net income.

Flood tolerant paddy variety MTU-1061

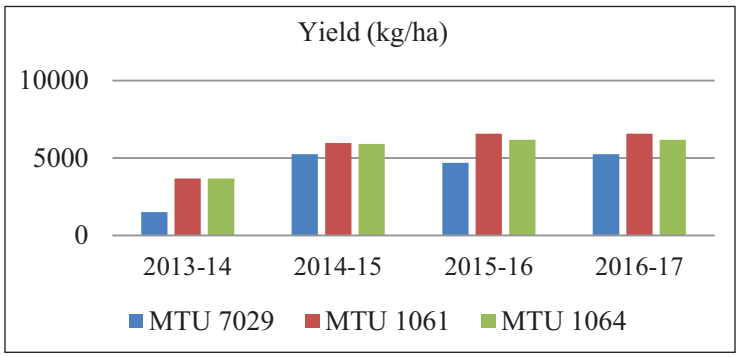


Figure 6.1: Graph showing yield advantage of MTU-1061 over other varieties

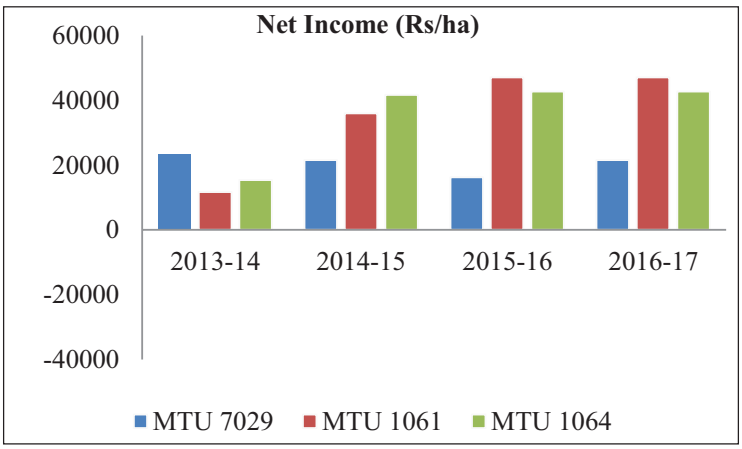


Figure 6.2: Graph showing increased net returns of MTU-1061 over other varieties

Reviving cultivation of rice fallow pulses with the introduction of disease tolerant varieties

A significant decline in rice fallow pulse area was witnessed in Andhra Pradesh due to severe incidence of Yellow Mosaic Virus (YMV) disease in short duration pulse crops (blackgram and greengram). In 2012-13 area under blackgram stood at 3.7 lakh ha during rabi. The area came down by about 1.2 lakh ha due to reluctance of farmers to cultivate pulses because of YMV disease. Under National Food Security Mission (NFSM), KVKs in Andhra Pradesh demonstrated YMV tolerant blackgram and greengram varieties in rice fallows during rabi 2015-16 and 2016-17. The area under rice fallow blackgram in 2016-17 increased to 4.4 lakh ha. Demonstration of YMV tolerant cultivars such as TBG-104, PU-31,MASH-338 and LBG-752 in participatory cluster frontline demonstrations indicated a bridgeable yield gap of 2-10 q/ha and additional net returns of Rs. 17,000 - 58,000/ha.

Black gram- TBG-104 at KVK-Darsi

Black gram TBG-104 at KVK -RASS

Table 6.2: Results of rice fallow blackgram– YMV tolerant variety + technology

Zone	District	Variety	Bridgeable Yield gap		Additional Net Returns (Rs./ha)
			Yield gap (q/ha)	Yield gap (%)	
North Coastal	Vizianagaram	LBG-752	6.16	49.04	46200
Godavari	East Godavari	MASH-338	5.60	51.38	28000
	West Godavari	TBG-104	4.67	46.84	21312
Krishna	Krishna	TBG-104	1.99	13.64	17008
	Guntur	TBG-104	0.25	1.95	1550
	Prakasam	TBG-104	10.05	61.85	45457
Southern	Chittoor	TBG-104	6.90	46.62	58137
	Nellore	TBG-104	2.95	41.26	17707
Scarce Rainfall	Kurnool	LBG-752	0.90	9.09	7454
	Kurnool	TBG-104	9.84	45.18	57124

Intercropping in Sugarcane enhances profitability in Vizianagaram district of North Coastal Zone

Sugarcane is cultivated as a rainfed crop in North coastal zone especially in Vizianagaram district in an area of 1.3 lakh ha.However, the productivity of sugarcane is very low at 58.9 t/ha against the state averageof 76.2 t/ha.The reasons for low productivity are several which include its cultivation under rainfed conditions in poor soils by resource poor farmers in marginal and sub-marginal land holdings.Non adaption of improved sugarcane production technologies, poor ratoon cane management, water logging and lodging of cane during north east monsoon season, moisture stress during formative phase (March to June) and incidence of major pests like borers and diseases like red rot.

The major strategies for increasing the productivity of sugarcane include: Use of quality planting material of suitable varieties, promoting single node seedling technology with recommended package of practices to reduce seed and planting cost, adoption of drip irrigation for judicious use of irrigation water, soil health management through liberal application of organic manures, growing green manures crops, mechanization to overcome labour problem, adoption of integrated pest and disease management practices for management of pests and diseases. Promotion of intercropping with short duration legumes / vegetables has the potential of generating additional income leading to investments in sugarcane cultivation for productivity enhancement and increased profitability. A number of intercrops in sugarcane were evaluated by RARS, Anakapalle by adopting paired row planting method (120 x 60 cm). Few intercrops that showed promise and potential for up scaling are given in table below along with net returns and BC ratio.

Table 6.3: Additional income through intercropping in sugarcane

Intervention	Cane yield (t/ha)	Sucrose %	Yield of intercrops (q/ha)	Sugarcane equivalent yields (t/ha)	Gross Returns (Rs/ha)	Net Returns (Rs/ha)	BC ratio
Sugarcane + Bhendi	91.4	16.5	29.7	118.2	243,887	128,940	2.12
S'cane + Cluster bean	91.0	16.4	41.7	119.1	245,217	129,919	2.14
Sugarcane + Spinach	94.9	16.4	24.7	105.1	215,887	102,420	1.90
Sugarcane (Sole)	98.2	17.3	-	98.2	202,147	95,913	1.89

Paddy cum fish culture

Srikakulam district is mainly known for paddy cultivation with an area 2.0 lakh ha.Out of this area, 13% of area is being frequently affected with floods and inundation every

year due to unexpected rains/ floods leading to yield loss of paddy crop in an extent up to 20-60%. The low lying unproductive land can be converted to productive units through proper land shaping and integration of paddy with fish culture. Pond dykes can be utilised for growing horticulture crops like banana, papaya, vegetable crops and the retained water in reserve pond and trenches can be utilised for life saving irrigation to rabi crops after harvesting of fish.

IFS: Paddy cum fish culture

Horticulture crops on embankment

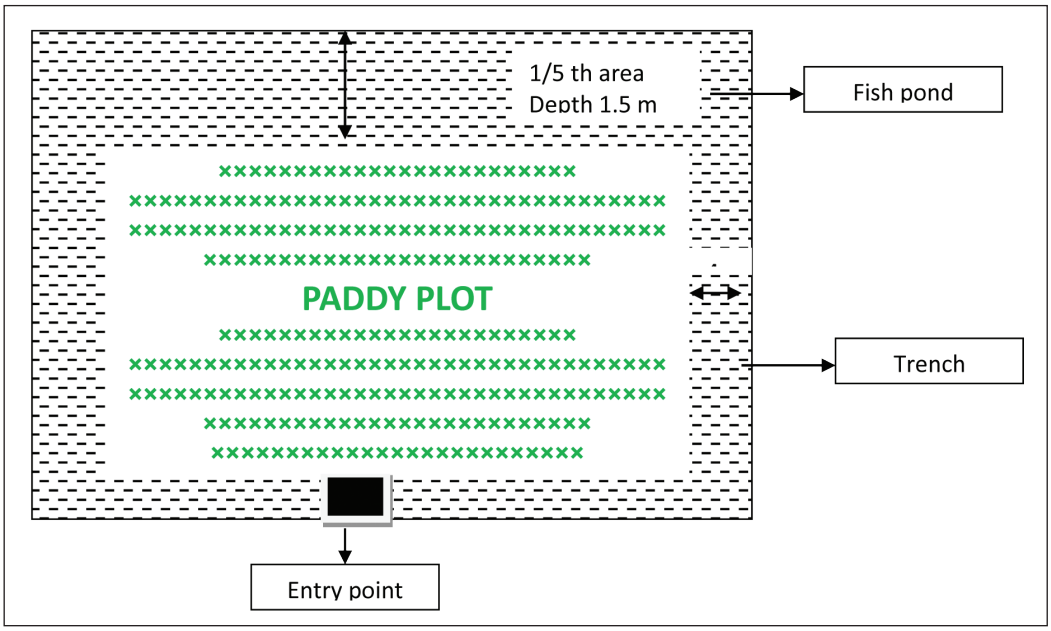


Fig 6.3. Design of paddy–cum-fish culture system

Table 6.4 Potential of paddy cum fish culture for generating additional income in flood prone areas in Srikakulam district

Intervention	Yield per acre	Cost of cultivation (Rs)	Gross returns (Rs)	Net returns (Rs /Ha)	B:C Ratio
IFS paddy cum fish (0.7 ac paddy,0.3 ac fish culture)	Paddy :11.34 q Fish :4.20 q	Paddy: 10000 Fish : 15000 Total : 25000	Paddy: 20160 Fish : 33600 Total : 53760	28760	2.15
Sole paddy crop in flood prone area	Paddy 13.77 q	Paddy :14000	24480	10480	1.74

Zero tillage maize cultivation in rice fallow situations – a cost reduction and resource conservation technology

Zero tillage maize cultivation

Maize is the second major crop grown in Srikakulam district after paddy, occupying 5314 ha area and plays a major role in the income levels of farmers. In rabi season farmers usually grow green gram and black gram in rice fallows and in some of the years pulses yields were low because of YMV disease, low temperatures and fog during crop growth. Due to this situation, cultivation of rice fallow crops became less remunerative and farmers started keeping the lands fallow after harvesting paddy crop. Farmers were interested in cultivation of maize because maize is a remunerative crop and marketing is also easy. Maize is cultivated without any preparatory tillage under no tillage situation, seed is sown immediately harvesting of paddy with available residual soil moisture. As per the field condition 3 - 4 irrigation are required, two irrigations will be saved compared to normal method of maize cultivation. The yield obtained was about 7 per cent higher than conventionally cultivated maize. After the successful demonstration of technology in farmers field, 1850 farmers and presently around 2500 acres of area is under zero tillage maize.

Table 6.5 . Results of demonstration of zero till maize in Srikakulam district (Average of three years)

S. No	Particulars	No of locations	Yield Q/ha	Cost of cultivation Rs/ha	Gross returns Rs/ha	Increase in Net returns Rs	B: C Ratio
1	Zero tillage maize	27	80.7	33300	98142	64842	2.93
2	Normal cultivation of maize	27	75.5	33750	91450	53533	2.41

Economic impact of the zero till maize technology

Particulars	Unit	Area under zero tillage maize (Ac)	Savings and net returns for 260 acres (Rs)
Water management	2 irrigations @ 580/-	1600	9,28,000
Field preparation	1500/- per acre	1600	24,00,000
Yield advantage	2 Q @ Rs 1200/-	1600	28,80,000
Total			**62,08,000**

Direct seeding of paddy with drum seeder – a cost reduction and yield enhancing technology

Direct seeding of paddy with drum seeder

Paddy is the major crop grown in Srikakulam district during kharif to an extent of 2.0 lakh ha. Majority of farmers cultivate paddy crop by transplanting method by engaging 10 women labour for transplanting and 8-10 men labour for nursery pulling. Transplanting window is 15 to 20 days only, so that labour availability becomes the critical issue to complete the transplanting in time. The cost of labour is also high during peak transplantation period, which is one of the major contributing factors for escalating the cost of cultivation in paddy. Direct seeding of paddy with drum seeder in paddled soil is the technology to reduce the cost of cultivation without compromising the yield.Drum seeder technology is very much effective because it saves time, labour and cost of cultivation due to skipping of nursery raising, nursery pulling and transplanting. In this method the yield increase is by 4.1% and cost of cultivation is reduced by an amount of Rs 4000-5500 per/acre.

Table 6.6: Results of drum seeder technology in paddy

S. No	Particulars	No of Locations	Yield (Kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Increase in Net returns (Rs/ha)	B: c ratio
1.	Drum seeder technology	25	6020	38250	86688	48438	2.20
2.	Transplanting method	25	5770	43750	83088	39338	1.89

Mushroom cultivation as livelihood option in tribal villages of Visakhapatnam district

Training on Mushroom cultivation during 2015-2016 under Tribal Sub Plan (TSP) programme was given to 60 farmers and youth from 6 tribal mandals on chemical treatment of paddy straw, preparation of beds, spawning and casing of mushroom beds etc. On completion of training mushroom cultivation was taken up by one SHG with the technical support by the staff KVKEach member of the group is earning additional income of Rs. 2750-00 per month and the total family income per month rose to Rs. 11,950-00. The group plans to scale up the business to make available mushrooms throughout the year in Araku valley as it is a well known tourist place and the village is only 6 km away from the Araku valley mandalhead quarters. The valley being situated at an altitude of 1000 MSL has a cool climate which is very congenial for the cultivation of mushrooms.

Milky mushrooms produced by the SHG in Araku valley

Pro-tray nursery for ginger cultivation

The tribal farmers in Araku Mandal of Visakhapatnam district cultivate ginger as a major cash crop besides paddy and pulses. They are facing many problems while cultivating ginger due to unavailability of quality seed material, high seed cost and low yields. An amount of Rs. Rs.45000/acre has been spent solely on seed during peak season. With the intervention of Pro-tray nursery for Ginger cultivation, the cost on seed was brought down by Rs. 44000 per acre because of which an addition net income of Rs. 54,400 could be obtained with B:C ratio of 4.0 compared to 1.92 in the conventional method.

Ginger nursery ready for transplanting

Demonstration plot of ginger in a tribal village

Table 6.7: Economics of pro-tray production of ginger seedlings

S.No.	Component	Costs / Returns (Rs/acre)	
		Pro-tray method	Conventional
1	Land preparation	5000	5000
2	Nursery	5000	0
3	Seed/ Seedlings	14500	58500
4	Sowing/ transplanting	5000	5000
5	Inter-culture	4200	5000
6	Harvesting cost	8200	7800
	Variable costs	41900	81300
7	Yield/acre	5.9 t	5.4 t
8	Gross returns	177000	161300
9	Net returns	135100	80700

B. Godavari Zone (East and West Godavari)

The Godavari Zone comprises of two districts i.e., East Godavari and West Godavari. Red soils with clay base, pockets of acidic soils, alluvial soils, soils with pH 4-5. The normal rainfall of the zone is about1050-1100 mm.

Out of total Geographical area of 21.32 lakh ha in the zone, the net area sown is 8.82 lakh ha which accounts for 41.36 % of the Geographical area. The remaining 12.5 lakh ha is occupied by forests (28.09%), barren and uncultivable land (5.76%) land put to non agricultural use (13.60%), permanent pastures and grazing lands (1.59%) and fallow lands (4.08%).

Godavari Zone : Strategy and Interventions

Strategy 1: Productivity Enhancement	• Adoption of multiple stress tolerant high yielding paddy cultivars • Reviving rice fallow pulses with introduction of disease tolerant varieties in blackgram and greengram. • Intercropping in oil palm with Cocoa, pepper, heliconia, red ginger • Replacement of seedling orchards with cashew grafts in tribal areas • High density planting of guava • Pro-tray vegetable seedling production and supply
Strategy 2: Cost reduction	• Direct seeding of paddy along with weed management • Disease free tissue culture banana plants for planting • Establishment of pro-tray nursery under insect proof nets to get uniform, healthy seedlings to ensure better establishment and to reduce seed rate (20%). • Adopt drip & fertigation to save water and fertilizers (20-30%) with increased water and nutrient use efficiency. • Soil health based nutrient recommendations • Adopt mulching (preferably silver and black) to get early and healthy crop along with weed control there by reducing the cost for weeding. • Agri-biomass briquettes for tobacco curing and use of solar energy to reduce dependency on wood fuel for increasing fuel efficiency in tobacco curing • Solar dryer technology - time taken for drying of fish reduced by 60-70% & post harvest wastage reduced by 20%

Strategy 3: Quality Improvement / Processing/ value addition/ niche markets	• Palmyrah value added products • Jaggery powder production at village level • Rubber extraction & processing • Processing & value added fisheries products • Millets – primary processing & value addition through establishment of minimal processing units and skill training, product development, branding, certification and market linkage • Promotion of Farmers clubs/ FPOs/FPCs for value chains and market linkages
Strategy 4: Generation of additional income	• Multi-storied cropping in coconut (banana, pineapple, black pepper, turmeric, yam & colocasia) • Protected cultivation high value vegetables • Fodder production+ Mini dairy+Composting+ Protected cultivation • Good agricultural practices in aquaculture • Promotion of apiculture for small and landless farmers • Sericulture (mulberry) production • Open field/ Protected floriculture • Cage culture of fisheries in reservoirs

Tobacco farmer switches to horticulture

Sri. Muppena Ramana Reddy, a tobacco farmer switched to cashew in his 4 acres of land located in Gopalapuram area of West Godavari district due to fluctuation of in market prices and delays in payment. Cashew grafts of BPP-8 and BPP-9 were planted along with adoption of irrigation, fertilizer application, and pest and disease management and pruning. Income from tobacco in Godavari area is about Rs. 1 lakh /ha/year (@2000 kg/ha yield) whereas the income from Cashew was 2.5 lakhs (3rd to 5th year) and additional

Cashew orchard

income was obtained from intercrop of Maize during 1st two years. M. Ramana Reddy's 4 ac garden motivated other farmers to switch to cashew in 500 ha area in surrounding villages.

Table 6.8: Yield and economics of production technology in cashew

(Date of Planting: January, 2013)

Year	Harvest number	Yield/plant (kg)	Yield/ha (kg)	Net returns (Rs)*
2015	1 (3rd yr)	1.2	200	20,000
2016	2	6.0	750	75,000
2017	3	12.8	1600	1,60,000

Sale price of raw nuts @ Rs 100 / kg

Direct seeding of paddy with drum seeder in West Godavari district

Paddy is the predominant crop grown in Matsyapuri village of West Godavari during kharif and rabi seasons.The preferred varieties of paddy were MTU-7029 (Swarna) and MTU-1010. Due to poor release of canal water at critical stages i.e during panicle initiation stage to flowering stage, grain shattering due to low temperatures at the time of harvesting and heavy rains during threshing affected the paddy yield to an extent of 50 percent. Further the rabi sowings were also delayed forcing the farmers to forego the summer pulse cultivation which is the common practice in this area in the earlier times. During Rabi 2011-12 under NICRA, demonstrations on paddy direct sowing with drum seeder was taken up.the direct sown paddy matured 15 days earlier compared to manual transplanted crop facilitating to escape from the rains at the time of threshing. The yield was 15.4 percent more than transplanted paddy and the cost of cultivation was reduced by 6250 Rs/ha.

Sowing with drum seeder

Early maturity in DSR rice compared to transplanted rice

Table 6.9: Yield and economics of direct seeded rice in West Godavari district

Intervention	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C ratio
2011-12					
Manual transplanting	84.37	24000	90000	66000	3.75
Direct sowing with drum seeder	73.13	30250	78000	47750	2.57
2012-13					
Manual transplanting	7631	44283	109752	65469	2.48
Direct sowing with drum seeder	7413	56850	106337	49487	1.87
2013-14					
Manual transplanting	9125	45000	127300	82300	2.83
Direct sowing with drum seeder	9500	55000	122275	67275	2.22
2014-15					
Manual transplanting	8090	69500	113260	43760	1.62
Direct sowing with drum seeder	8800	55000	123200	68200	2.24
2015-16					
Manual transplanting	7437	43682	91233	47551	2.09
Direct sowing with drum seeder	8135	39260	99820	60560	2.54

Millet processing - a group approach for livelihood enhancement of tribal woman in West Godavari

The tribal population in West Godavari district is mostly dependent on agriculture for livelihood. The yields of the crops are low because of low awareness and skill gaps related to improved crop production and protection technologies. The women in these villages are mostly dependent on agriculture as farm labour and the availability of work is seasonal. Alternative sources of livelihood are also lacking because of which net family income and living standards of the people are poor. Training programmes on millet processing were conducted by KVK, Venkataramannagudem, Andhra Pradesh to tribal Self Help Groups (SHGs) under TSP. Two Self Help Groups viz., Girivanitha and Giriposhana were formed which established their own millet processing units with the financial assistance of ITDA. Both the groups supply approximately 800kg (400 kg each) of millet products to schools every week and each group is earning an amount of Rs.2,00,000 per month.. After deducting the expenses, net profit is shared among the members of the group. The millet products are also supplied to nearby super markets in Eluru, Koyyalagudem,

Rajahmundry and local shandies in the villages. ITDA is encouraging by giving orders as per their requirement for official meetings and functions. Recently an outlet in EluruRythu Bazar was also started and the sales are encouraging with a turnover of about Rs. 30,000/- to 50,000/- per month.

Millet processing unit established in ITDA (E.Godavari) office

Millet based bakery unit by a tribal SHG

Enhancing income of tribal fishermen through reservoir fisheries in East Godavari

The agency area of East Godavari district has vast potential for development of fisheries as there are many perennial hill streams and rivers like Godavari and Sileru flowing through the area.Bhupathipalem Reservoir project 3 villages namely Gandhinagaram, Kothapakalu, Suddagommu in which 147 tribal families are residing were affected with flood and inundation.To improve the socio – economic condition and livelihood of the affected tribal families, KrishiVigyan Kendra Pandirimamidi has taken initiative to create awareness among tribal farmers on reservoir management and were able to motivate 147 tribal families to take up fisheries activity. During December, 2012, two lakhs fish fingerlings were released in Bhupathipalem Reservoir with the financial support from Project Officer, ITDA, Rampachodavaram and Department of Fisheries, East Godavari District.The tribal fisher men started harvesting fish in the reservoir with the grill nets and teppas since October, 2014. The average size of the harvested fish ranged from 3 to 5 kg., and the fish were sold at Rs.100/kg at the reservoir site. The members of the society harvested 5 to 6 quintals of fish per day which was marketed through Primary Tribal Fishermen Co-operative Society (PTFCS). The profit thus obtained was distributed equally among the tribal fishermen families after completion of the fish harvesting. The intervention of the KrishiVigyan Kendra, Pandirimamidi which was initiated with two lakh fish fingerlings in the Bhupatipalem reservoir ensured 147 tribal families an income of Rs. 20,000 to 25,000 per family over a period of eight months and gave livelihood security to these rehabilitated tribal families.

Fish marketing through tribal fisher men

Cleaning of the fish through Tribal Women Cooperative Society (TFCS)

Goatery breed for higher income in East Godavari

Black Bengal Goat

Black Bengal breed of goat which is found in West Bengal, Bihar, Odisha and Bangladesh, are prolific i.e., quick population build up, high disease tolerance ability and can adapt to local environment easily. These goats are usually black in colour, but also found in brown or white or grey colour. It is very suitable for meat, milk and skin production. The milk and meat of this goat is very tasty and nutritious than any other goat breed. These breeds gave high net returns due to kidding at least twice in a year with low mortality and these breeds are easy for rearing as this doesn't have any feed preference. KrishiVigyan Kendra, Kalvacharla, East Godavari, first conducted one farm trial with Black Bengal breed of goat with 3 farmers as well as on campus at KVK. The rearing of black Bengal goat there was an additional income of about Rs.13,0000/- per goat. With the successful demonstration at present there are around 700 beneficiaries (250 through ATMA and 350 through state animal husbandry and dairy department and progressive farmers) have started backyard rearing of goat in about 32 villages.

Table 6.10: Improved breeds of goatery in East Godavari district

Particulars	Black Bengal goat	Local goat
Kidding	Kidding twice in a year. Two kids (avg.) per kidding	One kidding in a year. One kid per kidding.
Population build up	8 number (average) (Avg. body weight 18 kg)	4 number (average) (Avg. body weight 20 kg)

Particulars	Black Bengal goat	Local goat
Cost of pair of kids (approx. 10 kg body weight each)	Rs. 5, 000/-	Rs. 5, 000/-
Cost of rearing (@ Rs. 125 per goat per month)	Rs. 7, 500/-	Rs. 4,500/-
Gross income (approx) Based on the Price @ Rs. 250/- per kg live body weight	Rs. 36, 000/-	Rs. 20, 000/-
Net income	Rs. 23, 500/-	Rs. 10, 500/-
BCR	2.88	2.1

Integrated management of cashew orchards in West Godavari

Demonstration on INM of cashew

Cashew is the main horticultural crop and provides livelihood to tribal adivasi families. The cashew orchards in this area are much neglected without any management except collection of nuts at the end of the season. The training programmes and demonstrations given on the INM and IPM of cashew and on canopy management by KVK brought down injudicious use of fertilizers and pesticides and encouraged the tribal farmers to take up ecologically safe plant protection measures like spray of neem oil and neem and pongamia soap when the pest load is low in the beginning of the flowering season. A total of 57.8 (12% increase over previous year) tonnes of cashew nuts were marketed by these 223 farmers with an average price of Rs. 123.5 per kg of nuts. The collaborative activity of KVK and NGOs helped the cashew farmers realize better price to their produce and overcome exploitation by the middle men and traders in terms of weighment, price fixing *etc.* Each farmer on an average got an amount of Rs. 31,251 per acre at the end of the season.

Enhanced yields due to improved variety and best management practices in Sorghum cultivation

Farming in agency areas of East Godavari district of A.P has been characterized as a subsistence activity with farmers producing a wide array of crops (including multiple

cultivars of the same crop) for their own consumption, using few purchased inputs. The productivity level of these crops is very low resulting in poor economic status of these tribal farmers. Sorghum seed (improved variety CSV-15) along with package of improved practices including seed treatment, line sowing, raising of nursery, transplanting in line, adoption of recommended dose of fertilizers and timely plant protection measures resulted in higher productivity of 7-8q/acre compared to 1-2 q/acre by their traditional practices. An average net income of Rs.10,000/- was achieved by the tribal farmers who followed the improved practices and realized an average benefit cost ratio of 5.99. This benefit was realized in a short span of 3 months compared to 6 months that a traditional variety used to take. Superior quality traits of the newly introduced CSV-15variety fetched premium price of Rs. 1500/q in the local market compared to the Rs.1100/- per quintal of local varieties.

Apiculture – A successful skill based intervention for improved livelihood of rural and tribal families of West Godavari

Most of area is covered with horticultural crops like cashew, mango, oilpalm and vegetables apart from paddy and maize. New plantations are also taken up with guava and oilpalm. Collection of honey from wild bee colonies is one of the income sources for rural/tribal families during lean periods of employment i.e. during November to February in tribal areas of west Godavari district. This activity is slowly coming down as the skill in identifying the wild bee colonies is not passed on to present young tribal farmers. Domestication of honey bees with the species viz., *Apismellifera* and *Apisceranaindica* was reported to be very successful among horticulture farmers where abundant forage required for bee activity and production of honey is available. Sixteen tribal farmers from Kamaiahkunta, Pandugudem and Bandarlagudem villages of Buttaigudemmandal were identified to support with bee hive boxes under Tribal sub plan activity of KVK,

Training on bee keeping

Apiary in Kamaiah kunta village

Venkataramannagudem. Regular follow up visits were also made by the scientists of KVK to the units and advisory was also provided for effective maintenance of the bee hives. Support in terms of supply of foundation sheets and portable honey extractors are provided to these farmers for strengthening the activity. Honey can be extracted @ 2-3 Kg from each box by October and can be continued up to June. Honey extracted from these colonies were sold @ Rs. 300/- to 500/- per Kg. depending on the season and demand.

Intercropping in Oilpalm

Oilpalm orchard

Andhra Pradesh is first in oilpalm area (1.35 lakh ha) & Production (9.3 lakh t fresh fruit bunches (FFB), 1.6 lakh t crude palm oil. About 75000 farmers cultivate oilpalm in 1 lakh ha area of Godavari zone and realize monthly income round the year. The technology revolves around **3 M's** i.e., Manure, Mulching & Micro-irrigation. Adoption of better management practices has resulted in nearly doubling productivity. Generation of additional income has been demonstrated by evaluating suitable intercrops during different growth phases of Oilpalm orchards:

i. Pre-bearing phase: Intercropping of vegetables, turmeric, ginger, pineapple maize etc.,

ii. Bearing period (partial shade): Intercropping of Oilpalm with cocoa/pepper/ginger lily/ Heliconia

Table 6.11: Intercropping in oilpalm for increasing profitability

Years	Phase	Av. Yield/ha (tons)	Net returns (Rs/ha)
1-4	Pre-bearing	-	-
4- 8	Stabilizing	12	1,00,000
> 8	Stabilized	20	1,70,000

C. Krishna Zone (Krishna, Guntur, Prakasam)

The Krishna Zone comprising of three districts i.e., Krishna, Guntur and Prakasam. Red soils with clay, red loams, costal sands and saline soils and deltaic alluvium soils with good moisture retentive capacity. The normal rainfall of the zone is about 800-1100 mm.Out of total Geographical area of 37.74 lakh ha in the zone, the net area sown is 15.72 lakh ha which accounts for 41.6 % of the Geographical area. The remaining 22.02 lakh ha is occupied by forests (18.46%), barren and uncultivable land (5.88%) land put to

non agricultural use (13.69%), permanent pastures and grazing lands (2.17%) and fallow lands (7.60%).

Krishna Zone – strategies and interventions

Strategy 1: Productivity Enhancement	• Seed production of Paddy, Redgram, Korra (Foxtail millet), Castor • Pulses, maize and jowar as alternative irrigated dry crops • Disease free tissue culture banana • Rice fallow pulses - YMV tolerant Blackgram (TBG104 and GBG1) • Cotton Intercrop in redgram, millets etc. • Groundnut intercrop with redgram • Double cropping in Kharif fallow- chickpea cropping areas. Preceding catch crop of pulse/ millet followed by chickpea/ tobacco in southern light soils of Prakasam district
Strategy 2: Cost reduction	• Drum seeding of paddy • Soil test based micro nutrient application in paddy, pulses, oilseeds and millets • Seed to Seed mechanization in chickpea • Custom hiring of farm machinery • Promotion of use of Power tillers, Power weeders, Paddy threshers, Maize sheller, Wheel Hand hoe, Manual/ power operated Paddy reapers.
Strategy 3: Quality Improvement / Processing/ value addition/ niche markets	• Promotion of apiculture for small and landless farmers • Grading, processing and branding of eggs & meat • Organic eggs / fortified egg production • Processing & value added fisheries products • Millets – primary processing & value addition through establishment of minimal processing units and skill training, product development, branding, certification and market linkage • Training of rural youth and women to convert the surplus milk to milk products and run small scale cottage industries when availability of milk is more in flush season. • Installation of mini grading machines at village level. • Establishment of mandal level cold storage facilities. • Promotion of Farmers clubs/ FPOs/FPCs for value chains and market linkages

Strategy 4: Generation of additional income	• Protected cultivation+ Composting+Goatry/backyard poultry • Fodder production+ Mini dairy+Composting+ Protected cultivation • Alternate land use systems such as Agro-forests like Subabul and eucalyptus. • Mother units / local hatchery units of Backyard Poultry for improved breeds of Rajsri, Grampriya • Cluster farming @500-1000 broiler birds by 8-10 youth in low cost housing • Mushroom production • Sericulture(mulberry) production

Direct sown paddy with seed drill

KVK, Ghantasala created awareness and initiated seed drill cultivation of paddy to overcome the problems faced in the traditional method of cultivation *i.e.,* labour shortage, high cost of cultivation in Krishna District. Sri. J. Picheswara Rao, farmer in Raavivaripalem village of Mopidevi mandal has adopted seed drill cultivation for the past 5 years, he has been benefitting high net income with less cost of cultivation especially savings in respect to nursery management. Over 85 per cent of the paddy growing farmers in Mopidevi mandal got inspired seeing the overall benefits achieved by Sri. J. Picheswara Rao and started cultivation using seed drill.

Table 6.12: Comparison of direct seeded rice with transplanting method in Krishna district

S.No	Activity	Seed Drill	Traditional method
1.	Seed rate	15 kg	25-30 kg
2.	Nursery maintenance	Rs. 830/-	Rs. 2680/-
3.	Total input cost	Rs. 15,520	Rs. 20,620/-
4.	Yield per acre	30.4 q	25.9 q
5.	Gross income	Rs. 47,600/-	Rs. 40,760/-
6.	Net income	Rs. 32,080/-	Rs. 20,140/-
7.	C:B ratio	1: 3.06	1: 1.97

Shift from chemical agriculture to zero-budget natural farming in Krishna

Zero-budget natural farming

Sri Seetha Rami Reddy of Kaaza village of Movva mandal has shifted from chemical intensive agriculture to Zero-Budget Natural Farming in 6 acres. Though initially for first two years the yields were low compared to the neighbouring farmers who are practicing inorganic farming, He realised the fact that with a single cow one can practice natural farming in at least 30 acres. From one cow, daily 10-12 kg of dung and 8-10 L of urine collected was used in the preparation of *ghana* and *drava jeevamrutha*. The *drava jeevamrutha* has to be used in 4 to 10 days after preparation four times in the crop growing season starting from 30 DAP at 3 weeks interval, while Ghana jeevamrutha can be stored for 6 months after bringing down the moisture content to a minimum level by air drying. This is applied in the field maintaining 1 inch level of water @ 100 kg per acre. The *jeevamrutha* will act as an excellent tonic to the field and tones the soil in terms of supply of the nutrients and also substrate (organic C compounds) for the earth worms and microbes. Nourishing the plants with *jeevamrutha* makes the crop healthy that resists the attack by pests and diseases besides giving good yields. Spraying the extract prepared out of seven grains viz., blackgram, greengram, cowpea, horsegram, bengalgram, wheat and gingelly improved boldness of seed in pulses. For pest control, the natural farmer uses various *asthras* viz., *agniastrha*, *neemasthra*, *brahmasthra* and *dashaparnikasthra*apart from using fermented buttermilk and coconut milk for disease management. The farmer is also practicing mulching and crop residue management for improved soil health. The yield decline due to adopting natural farming is only 2 to 3 bags per acre in case of rice, but the grains fetch bonus price.

High yielding Blackgram variety TBG 104

Cluster Frontline Demonstrations organised during 2016-17 under National Food Security Mission on pulses - Blackgram, Dr. KL Rao Krishi Vigyan Kendra, Garikapadu introduced YMV Tolerant, high yielding Blackgram variety TBG 104 to farmers keep in view the most serious problem of yellow mosaic virus causing crop losses resulting in increased cost of cultivation and reduced yields. As a result of the intervention the farmer Sri D. Saibabu,Gollamudi, Nandigamamandal, Krishna District, Andhra Pradesh incurred Rs.30,000/- in both the treatment and check plots. He harvested 17.25 q/ha of blackgram with YMV Tolerant Blackgram variety TBG 104 while the check varietyLBG 752yielded

10.00 q/ha thus giving a net income of Rs. 73500 with TBG 104 and Rs.25000 with LBG 752. B: C ratio of 3.45:1 was recorded with TBG 104 and 2.4:1 with LBG 752.

Table 6.13 : Results of demonstration of high yielding blackgram variety TBG 104

Result	T1: YMV Tolerant Black-gram variety TBG 104	T2: Blackgram variety LBG 752
Cost of Cultivation (Rs./Ha.)	30000	35000
Yield (q./Ha.)	17.25	10.00
Net Income (Rs./Ha.)	73500	25000
B:C ratio	3.45:1	2.4:1

The black gram variety TBG 104 is tolerant to YMV and is high yielding.

Vermicomposting - Income generation activity

Srinivasa Rao resident of Gorantla village, Guntur Rural, Andhra Pradesh started Vermicompost unit with an annual production capacity of 300 T. The production cost incurred by him was Rs. 2.25/ kg and sells at Rs. 3.75/kg with a margin of Rs. 1.5/kg. He approached kvk, Guntur for technical support, with timely advises of kvk, Guntur scientists he could able to increase Vermicompost production (700 T) by reducing production cost Rs. 1.20/kg and sells at Rs. 4/kg with a margin of Rs. 2.80/kg.

Table 6.14: Vermicomposting

Before KVK intervention		After KVK intervention	
Produce sold	**Annual net returns**	**Produce sold**	**Annual returns**
300 T	11.25 Lakhs	700 T	28 Lakhs

Use of liquid bio fertilizers in paddy reduces cost of cultivation

Farmers of Prakasam district are using high doses of N and P fertilizers, which will lead to increased cost of cultivation and deterioration of soil heath. Demonstrations with liquid bio-fertilizers reduced usage of chemical fertilizers by 50% in paddy and reduced cost of fertilizers by Rs. 3800/ha.

Table 6.15: Use of bio fertilizers in paddy

Interventions	Yield (kg/ha)	Net returns	B:C Ratio
Liquid bio fertilizers (1250 ml Azospirillum + 1250 ml Phosphobacterium) + 50 % Recommended Dose	6302	40400	1.77
Application of chemical fertilizers	5750	26100	1.45

Drip irrigation with mulching in chilies

Farmers are adopting flood irrigation in chilli although water is scarce. For efficient utilization of available water and to overcome the evaporational loss, polyethlene mulching along with drip irrigation was demonstrated in chilli. Farmers realized higher yields with reduced cost of cultivation (Fertilizers application and weed management) by adopting drip irrigation with mulching.

Table 6.16: Better management practices in chillies

Intervention	Yield (q/ha)	Net returns	B:C Ratio
Flood irrigation	65.5	50000	1.18
Drip irrigation with polythene mulching	72.5	125000	1.52

D. Southern Zone (Chittoor, Kadapa, Nellore)

The Southern Zone comprising of three districts i.e., Chittoor, Kadapa and Nellore. Red loams, shallow to moderately deep. The normal rainfall of the zone is about700-1000 mm.Out of total Geographical are 43.59 lakh ha in the zone, the net area sown is 9.98 lakh ha which accounts for 22.89% of the Geographical area. The remaining 33.61 lakh ha is occupied by forests (22.89%), barren and uncultivable land (9.88%) land put to non agricultural use (15%), permanent pastures and grazing lands (1.76%) and fallow lands (10.16%).

Southern Zone- strategies and interventions

Strategy 1: Productivity Enhancement	• Adoption of improved tobacco varieties/hybrids (Siri and Hema for Black Soils and N-98 for red soils) • Pro-tray vegetable seedling production (tomato, chillies) • High density planting of mango & guava • Virus free budlings of sweet orange & acid lime • Micronutrients & soil test based INM –In Groundnut, Yield improvements of 28% during 2015-16 in Chittoor • Seed production of Rice, Redgram, Korra, Castor, Mungari Cotton through farmers groups. • Open / Protected cultivation - Marigold, Jasmine, Crossandra, Lilly, Chrysanthemum • Rainwater harvesting in farm ponds for supplemental irrigation through micro irrigation • Rain guns for life saving irrigation in groundnut and high value crops • Production and supply of quality groundnut seed through Mana vitana Kendras (Our Seed Centers) involving farmers clubs for village level seed production and certification

Strategy 2: Cost reduction	• Intercropping systems redgram + foxtail millet/ pearl millet/ groundnut • Promotion of micro irrigation in high value crops like sweet orange and vegetables. • In situ rainwater harvesting • Virus free citrus (lemon) planting material • Use of bio mulches in sweet orange • Soil test based nutrient application • Foliar application of micronutrients Zn, Bo, Mg & Fe • Use of Aqua seed drill for timely sowing without wasting of available soil moisture.
Strategy 3: Quality Improvement / Processing/ value addition/ niche markets	• Processing varieties of mango, tomato • Value addition of millets. Establishment of minimal processing units for seed grading and cleaning units for millets and grains • Bulk milk coolers and value addition of milk and milk products • Establishment of mandal level cold storage facilities • Promotion of Farmers clubs/ FPOs/FPCs for value chains and market linkages
Strategy 4: Generation of additional income	• Ram lamb rearing in horti-pasture systems • Dairy + Goatery+ BYP + Horticulture • Mushroom cultivation • Sericulture • Cottage enterprises – jam, jelly, pickle, juice, banana chips, milk products • Apiculture for small farmers and landless • Mini-dairy with year round fodder production, mineral supplementation, silage making • Mother units / local hatchery units for BY Poultry • Cluster farming @500-1000 broiler birds by 8-10 youth in low cost housing

Foxtail millet *(Korra)* - Bengalgram cropping sequence for resource conservation under rainfed medium black soils of Kadapa district

Bengalgram was predominant crop in black soils under rainfed conditions during *Rabi.* Due to moisture stress because of breaks in North East Monsoon and severity of Helicoverpa and wilt resulted in low yields of Bengalgram in the district. KVK Scientists demonstrated the technology by introducing short duration korra variety Suryanandi (75 days) released from RARS, Nandyal as preceding crop to Bengalgram. By doing so, weed population was being suppressed by korra resulted reducing the cost for weeding during

rainy season. Higher net returns of Rs.24, 625/- per ha was recorded in successive cropping of Korra-Bengalgram than sole Bengalgram cropping system (net returns of Rs. 9,325/-). Cropping intensity increased from 100% to 200% in rainfed chickpea growing in black soils of the district. The area of Korra -Bengal gram cropping sequence in rainfed black soils increased from the normal area of 250 ha to actual area of 2000 ha in the KVK operated villages. Rainfed farmers got valuable fodder for their milch animals.

Demonstration of foxtail millet

Table 6.17 : Double cropping in medium black soils of Kadapa district

S.No	Particulars	Net returns Rs q/ha	B: C Ratio
1	Bengalgram (Sole)	9325	1.30
2	Foxtail millet (Korra) - Bengalgram	24,625	1.55

Enhanced yields due to use of *Trichoderma viride* in managing *Phytophthora* wilt in betelvine

Betelvine is predominant crop in Kullumullapalli village of Kadapa. But due to incidence of *Phytophthora* wilt resulted in reduced yields and incurring huge loss to the farmers. Farmers used to soil drench with Copper oxy chloride to manage the problem. KVK Scientists demonstrated soil application of *Trichoderma viride* keeping in view of this problem. There was about 70% decrease in disease infestation and 12.35 % increase in yield. The yield in farmers method was 44.5 Q/ha with an net profit 54,125 rupees per ha with a B:C ratio of 1:1.82. The yield when soil application of *Trichodermaviride*was done 50 Q/ha with an net profit 75,000 rupees per ha with a B:C ratio of 1:3.0.

Table 6.18 Results of demonstration of biopesticides in betelvine

S.No	Intervention	Yield Q/ha	Net Profit Rs	B: C Ratio
1	Soil drench with Copper oxy chloride	44.5	54,125	1:1.82
2	Soil application of *Trichoderma viride*	50	75,000	1:3.0

Enhanced income through Value addition to Millets

Inauguration of Arogya Millet Foods

Farm women of area depends mainly on rainfed agriculture for their livelihood, due to continuous, uneven distribution of rain fall and occurrence of frequent drought conditions the farm family is unable to get minimum returns from agriculture. After attending the training programme conducted by KrishiVigyan Kendra, Kalikiri on Processing and value addition to millets at Kalikiri, Piler of Chittoordt two trainees Mrs.Thajwarsulthana&Najimunnisha from Piler and one trainee Mrs.M.Frida from Kalikiri, Chittoor came forward to take up processing and value addition to millet as an entrepreneur activity. Under technical guidance of KrishiVigyan Kendra, Kalikiri with financial support of DWCRA they established three small scale processing and value addition unit. For establishment of the units first they procured building and then they purchased and installed the necessary equipment's viz., bakery oven, weighing scale and Sealing machine. They registered value added millet products under Food Safety and Standards Authority of India 2006 (FSSAI Reg. No. 20116020000285) with a brand name "AROGYA MILLET FOODS", and "STAR HEALTHY SNACKS". Selling their products in KrishiVigyan Kendra outlet, super markets in Tirupati, Chittoor and Nandyala. The monthly production of the is around 350kg with a net profit of Rs. 20,000-30,000/-.

Introduction of safflower as alternate crop for rabi bengalgram in Kadapa

Demonstration of Safflower var. Manjeera

Introduced Safflower variety Manjeera in area of 200 hectares as alternate crop to Rabi Bengalgram where wild deers and wild boars were more problematic. Farmers got net returns of Rs.16150/- per ha from Safflower cultivation compared to Bengalgram (Rs.8812/- per ha) besides avoiding damage to crops caused by wild deers and boars. Additional returns of Rs.7338/- per hectare from Safflower cultivation.

Entrepreneurship development through value addition to millets in Kadapa

KVK, Utukur, Kadapa is pioneering in value addition to millets by creating wide market to the products developed through skill development trainings which creates employment to rural women. So far nearly 80 product technologies has been given to nearly 2000 women at district and state wide to take up enterprising. 2 male farmers and 20 women are sustaining in agri enterprising in Kadapa. Not less than 100 women in district and state level have taken up home scale production. The production of millets like Ragi, Korra has been increased to a remarkable extent in Y.S.R district. KVK established a unit for processing of millets, Vegetables and Fruits which is training cum Incubation Centre.Rural and urban SHG's are trained for skill development in value addition to millets, Fruits and Vegetables. There are about 20 women grouped as KVK Promoted entrepreneurs. Different products are allotted to each one. To market them KVK has got sanctioned from District Collector and Joint Collector to have Outlets at Rajiv Gandhi Institute of Medical Science and Rythu Bazar Kadapa respectively. The women group is given opportunity to place the products in the outlets for sale. Four women are employed to market the groups. Since 4 years this value chain is maintained with start up of Rs. 14000 per Month to Rs. 4 Lakhs per Month turnover, apart from male agri-preneurs.

Mr. P. Premanand, Agripreneur receiving award from Prime Minister of India

Mr. P. Premanand, Agripreneur of KVK – successfully completed 6 years in Agri processing. He took technical support from KVK – for multi grain atta, pongal mix, upma Ravva, nutrimalt, multi grain snack mix, flax seed, PBR mixture, barley mixture, GG mixture, MV mixture. He got admitted into PMEGP scheme for 25lakhs with 35% subsidy. Given employment to 10 members. Received awards from Sri. Narendra Modi, present Prime minister of India in Vibrant Agri Summit and from KSMBOA, Bangalore for emerging SME of the year in customer satisfaction and he supplies nutrimalt to 260 government residential school children (72,000 thousand children) as a substitute to Tea/ Coffee & to SVIMS, Tirupathi for 160 chronic patients.

Mushroom production in Nellore district

Nellore climatic conditions demand cultivation of Milky Mushrooms & Oyster

Mushrooms and there is heavy demand for the mushrooms in urban areas. Considering above facts, the rural women and unemployed youth were trained to cultivate mushrooms at KVK, Nellore and inspired to set up enterprises for their social and economical wellbeing.There is growing demand for the mushrooms and being delicious food, it is also preferred by all age groups. Hence, to cater the needs of all sections of people the enterprise is sustainable. As, Milky mushroom (March to October) and Oyster (November to December) can be grown throughout the year, the enterprise is not limited by weather. Farmers are engaged in the mushroom production in lean periods of the day (After farm work) as it is less laborious and able to utilise their time and labour for additional income. In terms of income, the farmer is earning an additional income of Rs. 2000-3000 per 10 kgs of mushrooms per cycle (45 days) in addition to their farm income with B:C ratio of 3:1 to 4:1.

Milky Mushroom production

Rural Feed Processing Unit at Nellore

In the recent times due to increasing demand for quality mutton, many enthusiastic farmers and entrepreneurs are showing interest in taking up sheep rearing on a large scale in commercial lines. But, un organized nature of sheep rearing and marketing in addition to the shrinking grazing lands and hardships associated with traditional systems of rearing are averting them from venturing into this sector. Alternative systems of rearing wherein one can have complete control over the production system can encourage people to undertake sheep rearing in a professional and commercial manner.

To address this issue, National Research Centre on Meat (NRCM), Hyderabad has taken up rearing of ram lambs under stall feeding with 'Complete Feeds' under world bank funded National Agricultural Innovation Project. For this purpose a Rural Feed Processing Unit has been established at Chennur village of Gudurmandal in Nellore dist. of A.P.Under this, farmers are made to rear weaned ram lambs of 3-4 months age under complete confinement in their stall and the animals were never allowed to go out for grazing till they attain market weight. In the stalls, ram lambs were offered with complete feed in the feeders which can meet all the nutrient requirements in dry mash farm as seen in the case of broiler poultry rearing. The ram lambs attained market weight in 120 days

of feeding. Model composition of complete feeds is given in the table. Depending on the availability of different crop residues and agro industrial by- products in different localities the composition can be changed accordingly with the advice of the animal nutritionist.

Table 6.19 Ram lambs rearing under stall feeding with complete feeds in southern zone (Nellore)

Item	If farmer purchases complete feed	If farmer uses his own crop residues	If reared for breeding ram purpose
Avg. Cost of Ram lamb (Rs)	2700	2700	2700
Avg. Wt.of Lamb (Kg)	13	13	13
Avg. no. of days in feeding	120	120	165
Avg. Complete feed consumed (Kg)	105	105	160
Cost of complete feed/kg(Rs)	13	9.5	9.25 / 13
Total cost of feed (Rs)	1365	971.25	1480 / 2080
Other Misc. costs/ animal	300	300	350
Total inputs /animal (Rs)	1665	1271	1830 / 2430
Avg. Market wt. of animal (kg)	28	28	35
Avg sale price (Rs)	5480	5480	7200
Profit / Animal in four months (Rs)	1115	1508	2670 / 2070

Model composition of Complete feed

Ingredient	Level of inclusion
Maize straw / jowar straw	30%
Ground nut straw	20%
Maize grain	23%
Oil seed cake	12%
Rice bran / Wheat bran/ rice polish	10%
Mineral mixture	2%
Salt	1%
Molasses	2%
Vitamin mix.(ADEK)	40g/100kg

E. Scarce Rainfall Zone (Anantapur, Kurnool)

The Scarce rainfall Zone comprises of two districts i.e., Anantapur and Kurnool. Red with loamy soils, sandy soils and black cotton soils in pockets. The normal rainfall of the zone is about500-750 mm. Out of total Geographical area of 36.78 lakh ha in the zone, the net area sown is 17.71 lakh ha which accounts for 48.15% of the Geographical area. The remaining 19.07 lakh ha is occupied by forests (14.62%), barren and uncultivable land (7.96%) land put to non agricultural use (7.96 %), permanent pastures and grazing lands (0.24%) and fallow lands (13.89%).

Scarce Rainfall Zone: Strategies and Interventions

Strategy 1: Productivity Enhancement	• Drought tolerant groundnut (Dharani) sown with seed cum fertilizer drill, NRM • Improved varieties of Redgram (PRG 158), Mungari Cotton (Srinandi, Yaganti). • Millets, blackgram, greengram, sesamum as preceding crops preceding chickpea in kharif fallows • Micro irrigation system in mango, pomegranate, drumstick, papaya • Foliar application of micronutrients • Production and supply of quality groundnut seed through Mana vitana Kendras (Our Seed Centers) involving farmers clubs for village level seed production and certification • Double cropping in Kharif fallow- chickpea cropping areas. Preceding catch crop of pulse/ millet followed by chickpea/ tobacco in southern light soils of Prakasam district
Strategy 2: Cost reduction	• Intercropping systems with Redgram + Foxtail millet, Redgram + Pearl Millet, Redgram + groundnut in black soils • Promotion of zero tillage chickpea under double cropping sequence & promotion of mechanical harvest genotypes (NBeG 47) • Seed to seed mechanization in chickpea • Farm mechanization through custom hiring centres
Strategy 3: Quality Improvement / Processing/ value addition/ niche markets	• Processing varieties of mango, tomato • Organic farming/ natural farming • Processing & value addition to millets, supply chains, linking to markets

	• Shade net house for nursery and vegetable production • Promotion of Farmers clubs/ FPOs/ FPCs for value chains and market linkages
Strategy 4: Generation of additional income	• Mini diary-goatery-BYP-high value floriculture, ram lamb rearing • Semi-intensive & intensive sheep production with feed making units • Apiculture for small farmers and landless • Free range poultry farming (hatchery / mother units / feed making units)

Crop diversification with Foxtail millet (*Setaria italica*) in Kurnool district

Cotton and pigeon pea were the main crops grown in Yagantipalle village during kharif season. Most of the crops got affected with late onset of monsoon, followed by dry spells during critical stages of crop growth, which in turn severely affected the crop yields. The short duration millets viz., Foxtail millet (SIA 3085, Suryanandi) varieties with 70-75 days duration and tolerance to drought and downy mildew were introduced in place of jowar and cotton in 25 acres in 2011 Kharif. Due to lateonset of Monsoon (Third week of July) the crops experienced prolonged dry spells during grand growth period. Cotton could not be taken up due to late onset of monsoon. Jowar was sown but it was affected with terminal moisture stress. These varieties of foxtail millet could escape drought due to its shorter duration and could yield net income of about Rs. 36,879/- where as the net income for cotton farmers was only Rs. 6594/- during Kharif 2015.

Crop diversification with Foxtail millet

Seed production

Table 6.20 Crop diversification in Kurnool district

Intervention	Variety	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C ratio
2011						
Farmers practice	Cotton	380	8950	12160	3210	1.36
Improved technology	Foxtail millet	1885	11972	23900	11928	2.20
2012						
Farmers practice	Cotton	285	7570	9975	2405	1.32
Improved technology	Foxtail millet	1462	15973	21936	5963	1.37
2013						
Farmers practice	Cotton	375	12350	16875	4525	1.37
Improved technology	Foxtail millet	2320	12955	27532	14577	2.13
2014						
Farmers practice	Cotton	485	13150	18430	5280	1.40
Improved technology	Foxtail millet	2108	14065	40052	25987	2.85
2015						
Farmers practice	Cotton	510	13800	20395	6594	1.48
Improved technology	Foxtail millet	2483	14820	51699	36879	3.49

At present, the area of fox tail millet in the village is more than 1200 acres. The sustainable performance of foxtail millet coupled with market price is attracting the rainfed farmers of Prakasham, Cuddapah, and Anantapur and Kurnool district of Andhra Pradesh. The weather forecast issued by IMD and advisories by KVK scientists about deficient rain fall made farmers to grow foxtail millet as a climate resilient crop.

Increased milk yields with CSH 24 MF sorghum fodder benefits farmer in Anantapur district

Adikeshava Naidu from Bandlapalle village in Penukondamandal in Anantapur district has been having great success with CSH 24 MF sorghum green fodder. He has 2 milch buffaloes and before the RythuKosam project, he was obtaining only 4 liter milk/buffalo/day with fat content of 7%.As a part of the RythuKosam project in 2015, the farmer received the new variety of sorghum and has been reaping rewards ever since. He received 2 cuttings and sowed the new variety under the guidance of ICRISAT staff and an NGO, SAMATHA in 0.04 ha. After feeding the new variety mixed with other varieties of green fodder, he received 6 liter milk/buffalo/day with fat content 7.5%. The net income increase was ` 2,400/buffalo and almost ` 5,000/month from the two milch animals. The

overall milk yield has now increased by 120 liter/month from the two milch animals. With increased fat content, he sells the milk at ` 40/liter.

Interventions cutting across Zones

Enabling enterprises for free range poultry (BYP) - potential

Mother Units in villages

Stake holders : Unemployed youth / women farmers

Objective: To produce grown up chicks (6 weeks of age) of desi chicken breeds (Vanaraja, Gramapriya, Srinidhi, Rajasree) for free range poultry

Work Opportunity : All through the year (6 cycles/ year)

Table 6.21 Backyard poultry mother units model for 1000 birds

Particulars	Number	Rate (Rs)	Amount (Rs)
Chicks	1000	19	19000
Feed	2000	20	40000
Management Health care	1000	5	5000
Total			**64000**
Cost/bird, Rs			64
Sale price, Rs			85
Net Returns/year (6 cycles)			1,26,000
Sale of litter @ Rs 1000/ton			30,000

Cluster Broiler Farming by rural youth - potential

Stake holders : Unemployed youth / women farmers

Aim : rear commercial broiler varieties for meat production

Work Opportunity : all through the year (6 cycles in a year)

Clients : Chicken centres and individuals

Zones Specificity : Per-urban areas near to urban areas like Vijayawada, Vishakapatnam, Tirupati, Guntur, Kurnool, etc. The same stake holders can establish Hygienic chicken processing centers to cater the production from their own farming which ensures higher returns.

Table 6.22 Economics of cluster broiler farming by group approach

Cost of production/maintenance – Model for 2000 broilers			
Particulars	**Number**	**Rate, Rs**	**Amount, Rs**
Chicks	2000	42	84000
Feed	8000	25	200000
Management Health care	2000	8	16000
Total			**300000**
Cost/bird, Rs			150
Sale price, Rs			160
6 cycles / y of 2000 units/batch			120000
Litter sale @ Rs 1000, 2 t/batch			60,000

Rural Hatchery Units for BYP - potential

Stake holders: Unemployed youth / women farmers

Aim: to hatch out baby chicks from fertile eggs produced from rural / free range poultry farming

Work Opportunity: all through the year (12 cycles in a year)

Clients: All individual poultry farmers, NGOs, etc.

Remarks: Even the stake holders of this technology can rear parents of backyard poultry farming to produce fertile eggs

Table 6.23: Rural hatchery units

Commodity	Cost of hatching, Rs	Sale price, Rs	Units / batch	No of batches/ year	Profit in 5 years, INR
Custom hatching of fertile eggs	1.0	2.20	12,000	24	17,28,000
Hatchery offal	nil	5000	200kg	24	1,20,000
Total profit					**18,,48,000**

Poultry litter to Organic Fertilizer – potential

Stake holders: Intensive broiler and layer poultry farmers

Aim: To produce organic fertilizer rich in nitrogen and available phosphorus for agricultural purpose utilizing poultry litter composting technology

Work Opportunity: Very good demand for horticultural and commercial crop production to improve soil fertility

Clients: Agricultural farmers (horticultural and commercial crop production)

Zones Specificity: Throughout the state

Remarks: Apart from providing N P and K elements, this organic fertilizer will also provide highly valuable organic matter to the soil

Table 6.24: Economics for converting Poultry litter to Organic Fertilizer

A batch of 1500 kg litter	Cost, Rs
Cost of litter, 1500 kg	1000
Composting Cost	500
Miscellaneous	200
Total Cost, kg	**1.7**

Industry promoted agro forestry systems for pulpwood production under rainfed conditions (ppp mode)

In India, the chief raw material for the pulp and paper industries is Eucalyptus, Luciana and Bamboo India is in short supply of raw pulp used for making various kinds of paper, packaging material etc. The imports are to the tune of Rs. 28,900 million. Paper and pulp industry is encouraging farmers to grow Eucalyptus and Leucaena to meet its raw material requirements. Minimum support price is announced for Leucaena and Eucalyptus wood by the Government to encourage cultivation in Andhra Pradesh. In Andhra Pradesh Eucalyptus is planted in about 50,000 ha and the area is increasing rapidly. About 40 clones were developed by the company, ITC- Bhadrachalam Paper Boards Division. The most widely used spacing for Eucalyptus is 3x2 m. A few farmers adopted 2.5 x 2.5 m spacing to take up inter cultivations in both the directions. Cotton, chilies, blackgram, greengram, rice and groundnut are taken up as intercrops during the first year of plantation cycle. Intercrops are also taken up during the second and third year of plantation, but the yield reduction observed is up to 70%. The net returns from agricultural crops ranges from 3,980 to Rs. 16,443/ha/year, whereas net returns from Eucalyptus plantations ranges from Rs. 20, 000 – 40,000.The returns from Eucalyptus plantations are significantly higher compared to majority of the annual agricultural crops grown in the district. Quality planting material, assured market and higher and assured returns and well established industry-farmer government linkage are the prime reasons for the rapid increase in area.

Switching to Floriculture with rainwater harvesting and micro irrigation

In many districts across zones scope exists for floriculture under irrigation to fetch remunerative prices. Examples include cultivation of marigold, tuberose and crossandra.

Table 6.25: Opportunities for shifting to high value crops

District	Crop	Demo/Check	Yield (q/ha)	Net returns (Rs./ha)	BC Ratio
Chittoor	Marigold	Demo	85.9	138118	2.02
		Check	67.3	67456	1.46
East Godavari	Tuberose	Demo	9.5	157000	2.20
		Check	6.8	84000	1.70
Visakhapatnam	Marigold	Demo	79.2	164208	2.59
		Check	62.4	103520	2.01
	Crossandra	Demo	13.52	267500	2.92
		Check	10.22	174600	2.31
Anantapur	Marigold	Demo	6.67	103226	2.33
		Check	4.20	65000	1.62


Diversification to high value floriculture with rainwater harvesting in rainfed areas

7. Value Chain Development, Market Linkages and Trade Potential

Value Chain Development

Agriculture in India often is characterized by dual value chains operating in parallel for the same product: one informal or traditional and the other formal or modern. Small holders are frequently involved in informal chains that deliver products to local middlemen and then to small local stores. Formal value chains can deliver the same product, usually in better or more uniform quality, from larger farms or more organized groups of small farmers to more commercial wholesalers and from there to supermarkets or exporters. This duality has been accentuated by the explosive growth of supermarkets in the country. It can limit many small producers to markets characterized by low-quality products, and low prices and low returns for them hence a frequent concern is to find ways to integrate small producers into more modern value chains, both domestic and export-oriented.

Challenges related to Value chain in Andhra Pradesh

i. **Inadequate post harvest management infrastructure**: Non-availability of farm level post-harvest infrastructure is a major gap in the supply chain of the horticultural crops in the state (*source: Linking farmers to Markets by BK Paty*). Farm level collection centers are mostly absent; sorting, grading, washing, packaging and other crop specific post harvest activities are virtually absent at the farm proximate level. This leads to higher losses and lowers the value realization by the players along the value chains especially producers.

ii. **Poor packaging practices:** Majority of the transportation of the produces to the mandi/units is done without proper packaging and buffer/insulation leading to high losses in the form of wastages. Typically, in the market yards the produce is dumped on the ground for weighment and price negotiation. Some sorting and grading is done manually in the market yards before dumping into the transporting vehicle again for further transportation. Such handling causes higher wastages.

iii. **Long and multi-layered supply chain:** Both in the case of produce to meet fresh market requirement as well for processing industry the large numbers of small farmers are unable to effectively bargain a better price in the wholesale markets. Inefficiencies in wholesale markets coupled with small farm size results in a long chain of intermediaries, multiple handling, losses in quality and increase in the gap between producer and consumer prices. Intermediaries and system inefficiencies consume a disproportionate share of consumer prices. Large number of small retailers, each handling small quantities, create high overheads is leading to high margins on produce making the consumer pay for the inefficiencies in the marketing chain.

iv. **Lack of scientific ripening facilities for crops like Banana and Mango**: In case of banana, traditional methods of post harvest handling leads to damage of fingers. Similarly, there is a lack of farm level collection centers and pack houses. De-handing is done at the destination markets and transportation of central stem along with the bunch adds up to the cost of transportation. Due to these reasons, 25-30% of the fruits are wasted due to various reasons along the value chain as mentioned earlier. There is need for new modern ripening facilities for different fruits such as banana and mango in the state at major consumption centers. The existing ripening chambers useoutdated technologies. They can be upgraded with ethylene generators, ethylene scrubbers, automated temperature control, palletisation facilities etc. This will ensure better quality and 35 longer life of the fruit ensuring higher price realizations for the producers and better quality product to the consumers.

v. **Lack of cold chain facilities:** Presence of integrated cold chain infrastructure is low for horticulture products in the state. There is very less use of refrigerated trucks even in case of highly perishable products. In the existing cold stores in the state horticulture crops such as apple, orange, chillies, turmeric and tamarind etc are stored but the there is need for more cold stores near the major consumption centres. Moreover, many of the cold stores have outdated technologies and hence have low energy efficiency. Further, availability of trained human resources for technical operations and administration in cold stores in the state is inadequate. With new cold stores coming up in good numbers, the entrepreneurs are having difficulty in recruiting and retaining the right skilled human resources.

Market Linkages

Linkages between farmers and market call for priority attention to issues on access to technology, information on institutional arrangements, support services, policies, capacity building, identification and development of markets. The problem of access to market is more pronounced for small and marginal farmers. Being smallholders, these farmers suffer from some inherent problems such as absence of economies of scale, access to information and their inability to participate in the price discovery mechanism (*source: Linking farmers to Markets by B K Paty, 2015*)

Challenges and Issues

The role of small farms in development and poverty reduction is well recognized. In the current agricultural marketing scenario of the country, the following are some of the formidable challenges to be tackled for strengthening linking of the farmers to the market (*Paty B K, 2015*)

1. **Low marketable surplus:** Most of the farmers are producing multiple crops on small/marginal holdings leading to low marketable surplus of each crop. Farmers generally do not find it profitable to take such a small quantity of surplus to the market resulting in heavy village-sale immediately after the harvest. Also they are often compelled to sell it to the village traders due to indebtedness or immediate need for cash. Even today, there is prevalence of pre-regulatory shortcomings like delayed payment and unauthorized deduction like Karda, Dhalta, Muddat, darmada etc.
2. **Long marketing channels**: The long marketing channels with multiple intermediaries for different agricultural produce are the major cause for low share of farmer in the consumer's rupee. As reported by the Millennium Study of the Ministry of Agriculture, it varies from 32 to 89 percent in different commodities.
3. **Poor Access to markets**: The National Commission on Agriculture (1976), recommended that a market should ideally serve 80 sq. Km. area. The average area served by each regulated market now in the country is 435 sq. km., varying from 103.20 sq. km. in Punjab to 11214 sq. km. in Meghalaya.
4. **Poor marketing infrastructure:** There is conspicuous paucity of infrastructure such as auction platform, drying platform, grading facilities, cold storages etc., in the present markets.
5. **Non-transparent price discovery mechanism**: The traditional price discovery mechanism prevailing in a typical regulated market is not transparent. The method prescribed for sale of agricultural produce in regulated markets is either by open auction or by the close tender method. The cumbersome process of manual tender and open auction systems in the regulated markets provide ample scope for manipulation of price formulation process. In order to overcome this problem, some states like Karnataka have introduced electronic tender of agricultural commodities in some of the selected markets.
6. **Lack of market information system**: Farmers have got to be empowered with right information at the right time and place so that they can improve their bargaining capacity in the market. The existing market information system leaves much to be desired in this respect. The last mile linkage in the existing marketing information system has got to be made to benefit the small, marginal and illiterate farmers.

Opportunities for Small Holders in Different Systems

Several innovative marketing models have evolved across the country in isolation like contract farming, cooperative and producers' companies. The collaborative efforts of

the stakeholders have contributed to the success of these models. These models, by and large, are able to address the shortcomings of the traditional marketing system. These are found to be effective in aggregating the small holders also. In view of the reforms process initiated by Government of India, there is better scope for implementing these models with customised approach. An analysis of the suitability of some of the innovative marketing models for small holders in linking them to market is placed below.

Table 7.1 Innovative marketing channels- opportunities for small holder farmers

Problem	Contract Farming	Cooperative Marketing	Producers' company
Knowledge & information	Introduction of new technology and skill transfer	Group approach helps in sharing knowledge and information	Providing advice to farmers on various technical issues
Input supply	Provision of quality inputs and production services	Scale of operation helps in procurement of quality inputs	Facilitate purchase of inputs
Price	Guaranteed and fixed pricing structures	Competitive price through arraignments of sale proceeds	Competitive prices through forward linkages
Long marke-ting channels	Buy back arrangements Direct link with buyer	Effective forward linkages	Aggregation and collection from doorstep
Poor market availability	Assured market	Group approach helps in enhancing access to market	Assured market by providing forward linkages
Value addition	Processing	Processing	Processing
Prompt Payment	Immediate	Standardized procedure	Immediate payment specially to small holders

Farmer Producer Organizations in Andhra Pradesh

In order to significantly improve the terms of smallholder farmers' access to the market and strengthen their position in agri-value chains, it is gradually being realized that if federated; small farmers can easily bargain for better prices, both while buying inputs and selling their produce. This belief has led to the concept of establishing "Farmer Producer Organizations" (FPOs) in the country. The objective of the said company can be production, harvesting, procurement, grading, pooling, handling, marketing, selling and/or export of primary produce of the members or import of goods or services for their benefit.

Case Studies (*source: Research Report IDC-16, ICRISAT scoping study in AP*)

1. Turmeric FPO (Guntur district)

Mangalagiri Agricultural Producers' Company Limited, located at Mangalagiri, Guntur district is promoted by Nilgiri Foundation, NGO. This FPO was registered in July, 2015 with 350 turmeric producing small farmers from 21 villages. These farmers collectively hold about 380 ha of land and are producing 950 tons of turmeric annually. Under normal conditions, it takes around 20 days to process turmeric after harvesting. ShriRaghuram Reddy, chairman of Nilgiri foundation introduced a novel turmeric processing system, which brings down the processing time from 20 days to 10 days. So he introduced this technology to the farmers' groups and convinced them through awareness and sensitization programmes. Also, Nilgiri foundation organized exposure visits to Erode, Tamil Nadu to witness latest turmeric processing systems for some farmers. When the farmers were convinced about the enhanced quality of curcumin in processed turmeric, they were willing to adopt the technology as they believed it fetched higher price. The FPO purchased three boilers anode polishing machine that were run by employing contract laborers during the harvest season. Inputs like seed material, organic fertilizers required for crop production are procured by the FPOfor their members through a retail outlet in Nutathi village. Turmeric is a commercial crop with high input costs to the tune of Rs 123,500 to148,200 per ha and FPO farmers benefit directly by reducing their seed and fertilizer costs by up to15%. Further farmers benefit to the extent of 10% by their collective marketing in Duggirala market. The FPOs initiative to reduce input costs, processing times and market linkage appears to impact the livelihoods of small farmers' with increased profit from turmeric cultivation.

Usage of modern technology in turmeric processing

2. Marine Fisheries FPO (Krishna district)

Samyuktha fisheries Producer Company, Etimandipallepallu village, Kruttivennu*mandal*, Krishna districthas 425 member farmers, which was registered in September, 2015, through NABARD's support and SNEHA, local NGO as facilitator. The farmer's come from 30 villages on the coastline of Krishna district. The NGO organized awareness and

exposure visits to most of the member farmer's to fish markets at Narsapur, Chennai and Bhimavaram. This has enabled farmers to realize the advantages of coming together collectively to bargain higher prices in the markets as they were cheated by the intermediaries in their villages who gave only 40-50% of prices that they in turn earned in these markets. The FPO established 3 collection centers, an ice factory and also placed cooling boxes with a weighing machine in each of the collection centre. They deal with a wide range of marine products like fish, prawn and crabs. The FPO managed bank linkages in facilitating their member farmer's to credit facility of Rs 3million through Indian Bank and Saptagiri cooperative bank. The FPO is interested to take up cultivation of casurina trees in the sandy soils to generate additional income to farmer members.

Samyuktha Fisheries Producer Company.

3. Banana FPO (Krishna district)

Sri Vigneshwara Banana FPO is located at Chagantipadu village, Thotlavallurumandal, Krishna district. This FPO was functioning as a mutually aided credit society for the last 3 years and formally registered as a company in July 2015 with 190 active members. Also, Nestham (NGO) has been hand holding theFPO with an initial share capital of Rs 0.1 million. Farmers from 30 surrounding villages encompassing5 *mandal*s converge to sell their banana fruit bunches on every Monday and Thursday during theweek. The turnover of the FPO was 9.6 million last year earning a profit of Rs 0.55 million by charging6% levy on banana sales. Farmers get the services of uniform costs of servicing of harvesting banana through engagement of labourers by the FPO at a predetermined rate and at right time. One major service rendered through this collective aggregation model is the cutting down of the transport cost of bringing the harvested banana to the market. This is being done by the FPO owned Mahindra van which is a unique strategy by the FPO that benefited the member farmers. The cost of labor charges and transport directly benefits FPO members in addition to the higher price secured from the traders who now come to this new market for buying bananas. A member farmer, Shri S Nagireddy says, "If Isell banana bunch to local trader at the farm gate, I used to get Rs 150 per bunch, here in FPO,

I get Rs325 per bunch and is more than double the previous amount. Also, being a part of the FPO fetched me100% more". The abuse of intermediaries in differential pricing has dramatically reduced for farmers participating in this FPO where grading and pricing were held with transparency. This is attracting new banana farmers from other places. The FPO started constructing a market yard and a building (3600sft) in the village through support from Horticulture department and NABARD (Rs 1.2 million). The FPOlooks to diversify its portfolio of working on other days of the week (presently market auctions are held2 days per week). There are plans to introduce auctioning of vegetables on commission basis in thenew market yard. It will be interesting to review the progress of this FPO in the coming months after the start of the new market yard.

4. Noveeal Coconut Producer Company Limited (East Godavari)

Noveeal coconut Producer Company was registered under companies act during the year 2013. The mission of the company aims to support farmers by extending assistance for planting, production, marketing and export of coconut and its products and their vision is to encourage the coconut industry and to bring confidence among coconut farmers by producing value added products. So far 247 societies were land holding size per member is 0.97 ha and number of trees per member is 144. The company in consortium with other developing agencies and produces few value added products which are having good potential and demand in both national and international markets. The major benefits derived by small and marginal farmers' are: increase in per capita income in coconut cultivation, increase the producer's share in consumer rupee, better price stabilization, better utilization of input subsidies provided by the Government and creation of increased employment opportunities etc.

Table 7.2 Successful examples of FPOs

S.No.	Name of FPO	Issue resolved with the help of FPO
1.	Sri. Vegneswara Banana Farmer PC Ltd	Farmer Opinion: Initially Rate of Banana Bunch 100/- now with the help of FPO it increased to 325/-
2.	MangaladriAgri PC Ltd	• Price of turmeric in Duggirala went low due to poor variety of seed and were changed and price increased to Rs 1500/ton). • Better technology adoption for boiler and polishing • Drying time reduced to 12 hours from 24 hours. • Due to new technology, boiling time reduced to 10-12 days from 20 days

S.No.	Name of FPO	Issue resolved with the help of FPO
3.	Noveeal Coconut PC Ltd	• The per capita income of the farmer for this year is Rs 37050/ha from coconut cultivation. • Majority of the farmers were convinced to join in the form of fertilizer subsidy. • 20-30% rise in the coconut price was observed during this year. • The producer share in consumer price has improved to 40-50% from earlier 25-30%. This year, with proper linkages and organization, is planning to improve the share.. • Formation of FPO has created an additional 200 workdays of employment to the • members

Source: Research Report IDC-16, Farmer Producer Organization in Andhra Pradesh: A Scoping Study by ICRISAT Development Center. http://oar.icrisat.org/9870

Table 7.3 Potential areas for setting up of FPOs in livestock and fisheries sector

S.No.	District	Potential area
1.	Srikakulam	Cow milk
2.	Vishakhapatnam	
3.	Vizianagaram	
4.	East Godavari	Buffalo Milk, Brackish Water Fish Production
5.	West Godavari	Buffalo Milk, Fresh Water Fish, Brackish Water Fish Production
6.	Krishna	Buffalo Milk, Fresh Water Fish, Brackish Water Fish Production
7.	Guntur	Buffalo Milk
8.	Prakasam	Buffalo Milk, Sheep And Goats
9.	Nellore	Sheep And Goats, Brackish Water Fish Production
10.	Kadapa	Buffalo Milk, Sheep And Goats
11.	Chittoor	Milk, Milk Products And Fodder, Sheep And Goats
12.	Kurnool	Cow Milk, Sheep And Goats

Source: Research Report IDC-16, Farmer Producer Organization in Andhra Pradesh: A Scoping Study by ICRISAT Development Center. http://oar.icrisat.org/9870

State Government Initiative: Transforming Agriculture into Agri-business

One million farmers will be organized into 1000 FPOs for Value chain development and better market linkage (*source: Commissioner of Horticulture presentation to Chief Minister, Government of AP*)

Table 7.4: Sector-wise targets for organizing farmers into FPOs

Sl. No	Sectors	FPOs	Farmers	Commodities
1	Agriculture	314	3,73,039	Maize, Millets, Oil Seeds and Pulses
2	Horticulture	345	2,74,153	Fruits, Vegetables, Spices and Flowers
3	Animal Husbandry	238	2,45,000	Milk, Meat, Egg, Backyard Poultry and Fodder
4	Fisheries	103	1,07,808	Fish, Prawn, Crab and Shrimp
	Total	**1,000**	**10,00,000**	

Trade Potential

A favorable agro-climatic condition and long coastline have enabled agriculture and allied activities to play a key role for Andhra Pradesh in terms of contribution to output, employment and foreign exchange. *Andhra Pradesh is one of the largest producers of rice, maize, groundnut, sunflower, and cotton in the country. It also ranks first in the production of brackish water shrimp and fresh water prawn, and second in production of fresh water fish. The State also ranks fourth in marine fish production and boasts of a well-developed animal husbandry sector as well.*

Export potential

The diverse resource endowments coupled with robust production and value addition, position the State at the fulcrum of the exports sector in India. The State has significant comparative advantage in several products, which can be explored for boosting exports. Non-basmati rice export has highest share of 36.52 per cent among all other agro based products exported from Andhra Pradesh.

Table 7.5 Percentage share in India's exports (2016-17)

Product name	India		Andhra Pradesh		Percent share in Qty (Metric tons)	Percent share in value (Rs. Crore)
	Qty (Metric tons)	Value in Rs. Crore	Qty (Metric tons)	Value in Rs. Crore		
Albumin (eggs & milk)	1703.13	87.79	180.55	10.34	10.60	11.78
Cereal preparations	339922.17	3565.55	64560.67	565.10	18.99	15.85
Cocoa products	25648.91	1086.75	1543.78	16.38	6.02	1.51
Fruits and Vegetable seeds	11288.51	522.75	486.11	76.94	14.72	4.31
Jaggery& confectionery	297678.49	1467.93	19545.32	94.2	6.57	6.42
Miscellaneous preparations	282575.94	2565.80	18630.83	45.6	6.59	1.78
Non basmati rice	6770803.17	16929.87	2722549	6182.49	40.21	36.52
Other cereals	168431.60	395.65	38919.95	79.99	23.11	20.22
Processed meat	140.70	4.58	14	0.25	9.95	5.46
Poultry Products	448724.63	530.44	12896.21	70.8	13.35	2.87
Total	**21258880.15**	**108284.21**	**2918877.31**	**7618.05**	**7.04**	**13.73**

Source: Compiled from APEDA

Table 7.6: Status of Exports from Andhra Pradesh (2016-17)

S.No.	Products	Qty (metric tons)	Rs. Crore
1.	Albumin(eggs & milk)	180.55	10.34
2.	Basmati rice	59.59	0.7
3.	Buffalo meat	15351.57	280.99
4.	Cereal preparations	64560.67	565.1
5.	Cocoa products	1543.78	16.38
6.	Cucumber and gherkins (prepd. &presvd)	8510.49	42.67
7.	Dairy products	199.95	1.48
8.	Dried & preserved vegetables	4.38	0.13

S.No.	Products	Qty (metric tons)	Rs. Crore
9.	Floriculture	725.67	11.45
10.	Fresh mangoes	882.55	10.14
11.	Fresh onions	75.68	0.26
12.	Fruits & vegetables seeds	486.11	76.94
13.	Guargum	0.33	0.04
14.	Jaggery& confectionery	19545.32	94.2
15.	Maize	2123.46	21.15
16.	Mango pulp	3.83	0.06
17.	Milled products	817.84	5.9
18.	Miscellaneous preparations	18630.83	45.6
19.	Natural honey	6.26	0.28
20.	Non basmati rice	2722549	6182.49
21.	Other cereals	38919.95	79.99
22.	Other fresh fruits	4305.13	42.95
23.	Other fresh vegetables	2600.96	15.57
24.	Other processed fruits & vegetables	3150.98	23.7
25.	Poultry products	12896.21	70.8
26.	Processed meat	14	0.25
27.	Pulses	494.2	9.5
28.	Sheep/goat meat	238.41	8.99
	Andhra Pradesh total	**2918877**	**7618.05**

Source: APEDA, 2016-17

Table 7.7: Marine products export from Andhra Pradesh (2015-16)

Port	Quantity in ton	Value in Crore
Vizag	128718	7161
Krishnapatnam	38412	2167.01

Source: MPEDA, 2015-16.

Table 7.8: District wise focus sectors for export

S. No.	District	Resource base	Potential export sectors
1.	Srikakulam	• Srikakulam is a leading producer of Mesta in the state, and there exists scope for development of jute industry in the district • Given the substantial coconut production in the district, coir based industries can be promoted. • Horticulture based industries can also be encouraged as there is substantial horticulture production in the district.	Coir products, horticulture, Jute products
2.	Vizianagaram	• Nearly one-fifth of the total sown area in the district is under non-food crops, with groundnut and sesame being the major ones. • Paddy and pulses are the major food crops grown in the district.	Processed food
3.	Visakhapatnam	• In terms of agricultural produce, the district ranks the highest among all the districts of the State for acreage and production of sugarcane. • Paddy and millets are the important food crops, while coconut is an important non-food crop grown for the district. • The district also has substantial marine resources.	Marine products are an important Export item for the district. Nearly US$ 1.12 billion of marine products were exported from the district in 2013-14, accounting for 22.5 percent of India's exports of these products.
4.	East Godavari	• Availability of fertile delta lands allows production of various agricultural and horticultural crops. • The district has abundant marine and fisheries resources.	Processed food, Marine products
5.	West Godavari	• West Godavari is primarily an agrarian district and contributes to nearly half of the State's rice production. • Oil palm, sugarcane, corn, mango and banana are some other agricultural produce from the district.	• Processed food, horticulture, Marine Products. • West Godavari district is a leader in prawn exports from the State

S. No.	District	Resource base	Potential export sectors
6.	Krishna	• Nearly 70 percent of the land area in the district is irrigated by Krishna River and its tributaries, thereby leading to abundant agro and marine resources.	Food processing, marine products
7.	Guntur	• Nearly one-fourth of the total area sown in Guntur district is under non-food crops, of which cotton is a significant produce. • Guntur also has the largest area under chilli production, among all the districts of the State. In fact, the district is the biggest spot market for chilli in the country.	• The district is an important centre for export of tobacco, cotton and chilli. • Enhancement in capacities for greater value addition and processing of agricultural produce can improve the prospects for exports of processed food from the district.
8.	Prakasam	• More than one-third of the total sown area of the district is under non-food crop. • Tobacco, cotton and Bengal gram are some of the major commercial crops grown. • Rich in inland and marine fish, and prawn resources.	• Marine products and Processed food
9.	Kurnool	• 40 percent of its total sown area under non-food crops. • Groundnut, sunflower, tobacco are some of the non-food crops grown. • Leading producer of tomatoes and onions.	• Processed food
10.	Anantapur	• Close to three-fourth of the total area sown in the district is under non-food crops. • The district is one of the largest producers of groundnut. • 46 percent of total cropped area for Mulberry.	• Silk
11.	Kadapa	• The major crops grown in the district are paddy, red gram, Bengal gram, groundnut and cotton. • Substantial horticultural production, and has significant production of tomatoes and onions.	• Processed food

S. No.	District	Resource base	Potential export sectors
		• Fruit crops of mango, banana, melons, papaya, etc. are also abundantly grown in the district • Commercial crops like turmeric, chilli, coriander and chrysanthemum.	
12.	Chittoor	• Of the total sown area, more than 40 percent is under non-food crops. • Major producers of mangoes in the State, which has led to concentration of fruit canning units in the district	• Processed food
13.	Nellore	• Nellore has the largest tobacco cultivation in Andhra Pradesh. • The district is also famous for rice production and aquaculture.	• Processed food, marine products

Source; EXIM bank research report, March 2017.

Strategy for Export Promotion

In order to take a holistic view planning of a strategy for promotion of exports from Andhra Pradesh would entail strategizing across various levels. Strategies will be required for creating an enabling environment across sectors, as also for capacity building in sectors with high potential for exports. Select such strategies are discussed in the following section.

1. Augment Warehousing And Storage Capacity: Lack of adequate transportation, storage and distribution services is an issue for exporters across the country. Specifically, in the context of Andhra Pradesh, this is a major constraint as perishable products account for a significant share of the State's exports. Agro and food processing and marine products are key export sectors for the State, and the Government is also focusing on incentivizing pharmaceutical exports. These require adequate warehousing and cold storage infrastructure. There is significant demand-supply mismatch+ in storage infrastructure. In 2015-16, food grain production in the State was estimated at 13.8 million MT. Horticulture production during the year was 18.8 million MT. As per industry norms, the storage facility should typically be 60 percent of the production amount19. According to this benchmark, the State should have at least 19 million tonnes of storage space. However, according to the Andhra Pradesh State Warehousing Corporation, the State currently has only about 1.1 million MT per annum of warehousing capacity.

The State also needs substantial expansion of cold storage infrastructure, which is critical for ensuring quality and maintaining shelf life of products. Currently, the State has 203 cold storage units, with capacity of 584 thousand MT table. There is need for more such units to meet the growing demand for safe handling of exports. The State can also develop a multi-modal cold chain network which shall involve two or more modes of transport for facilitating transportation and storage of perishable products. Investment in development of last mile connectivity can also serve as an objective for this proposed multi-modal network.

Table 7.9: Storage capacity of warehouses in the state

Ownership	Number	Capacity (MT)
Cooperative	9	6269
Public	6	2519
Private	188	575453
Grand Total	**203**	**584241**

2. Establishment of Coastal Economic Zones

Fourteen Coastal Economic Zones (CEZs) have been identified along the coastline of the country in the National Perspective Plan of the Sagarmala Programme. These economic zones are expected to lower the cost of movement of goods and thereby improve export competitiveness. The CEZs shall comprise existing major and non-major ports, industrial units and requisite evacuation infrastructure. Two CEZs have been proposed in the State of Andhra Pradesh – one covering the ports of Kakinada, Vizag and Gangavaram; and the other around the port of Krishnapatnam. Creation of adequate infrastructure in the CEZs needs to be complemented through incentives from the Government for enterprises located within these.

3. Branding of Geographical Indications Products: GIs are considered important tools for marketing strategies, and function as product differentiators. To reap the benefits of GI status, it is important for the GI brand to be recognized as a reliable and preferred brand in the market with a distinguished positioning. Guntur SannamChilli and Banaganapalle Mango in the category of agricultural products are GIs from Andhra Pradesh.

4. Skill development and capacity building: Exporters need to have in-depth knowledge of the latest global developments pertaining to international trade viz., export finance, insurance, packaging / eco-labelling, quality, etc. They should also acquaint themselves with the rules and procedures of importing countries. Hence, there is a need to conduct Workshops / Seminars / Conferences regularly on different aspects of international trade and across different sectors in the State.

8. Policy and Investment Requirements and Role of the Government

Policy

- The growth strategy should simultaneously focus on equitability by promoting higher agriculture growth in less developed regions including rainfed areas, among more vulnerable sections like marginal and small land holders.
- Diversification into high value produce, such as horticulture, livestock and fisheries have been found to contribute more to income growth and these sectors need to be given priority.
- The government investments can be strengthened in agriculture by convergence of resources through schemes that are operated in different departments and ministries. Such examples include utilizing the funds under MNREGA, for creating small irrigation sources, rural roads, etc.
- Promotion of crop zones and technology targeting
- Micro-irrigation in horticutlure
- Promotion of ID crops in rice fallow areas
- Farm mechanization in rainfed areas
- Promotion of natural & organic farming
- Support to value chains & branding for niche products
- Promote cold storage & processing infrastructure
- Inclusion of millets in PDS & mid-day meal scheme
- Boost to protected cultivation
- Market intelligence & market reforms
- Incentives to federation of farmers to cut input costs and maximize profits through FPOs / FPCs
- Revival of T & V system by Line departments with technical backstopping from SAUs/ KVKs
- Increasing coverage of more numbers of farms under crop insurance every season

Investment requirements for doubling farm income

Estimates show that farmers would need a cumulative private capital investment of Rs. 21.71 billion over the 7 years period of 2016-17 to 2022-23 (table). When it comes to public investments, presuming the marginal efficiency of investment (MEI) on each economic head would remain unchanged, the gross cumulative public investment required would be **Rs. 0.36 billion for Agriculture** & Allied activities, Rs. 270.47 billion for minor, medium and major irrigation systems, Rs. 0.08 billion for rural energy, and Rs. 9.50 billion for rural roads for transport infrastructure.

Table 8.1: Investment requirements over a 7 years period of 2016-17 to 2022-23 (Rs. Billion) at 2004-05 prices.

State	Private Investment		Public Investment		Investment For		
	Agriculture & Allied	Irrigation	Agriculture & Allied	Irrigation (Excluding Flood control)	Rural Energy	Rural Road Transport	Agriculture (Weighted)
Andhra Pradesh	21.71	4.28	0.36	270.47	0.08	9.50	679
All-India	463	66.53	58.54	626.42	32.26	323.55	1023

Source: Report of the Committee on Doubling Framers' Income by Ministry of Agriculture & FW.

Table 8.2: Annual % increase in investment required in AP to achieve growth rate for doubling farmers income

State	Private Investment		Public Investment				Public Investment `for' Agriculture (weighted)	Private & Public Investments
	Agriculture & Allied	Irrigation	Agriculture re & Allied	Irrigation	Rural energy	Rural roads and transport		
Andhra Pradesh	3.17	0.94	0.06	17.71	0.01	1.55	32.37	35.54
Total 20 states	**6.62**	**1.62**	**1.41**	**9.57**	**0.82**	**5.25**	**6.92**	**13.54**

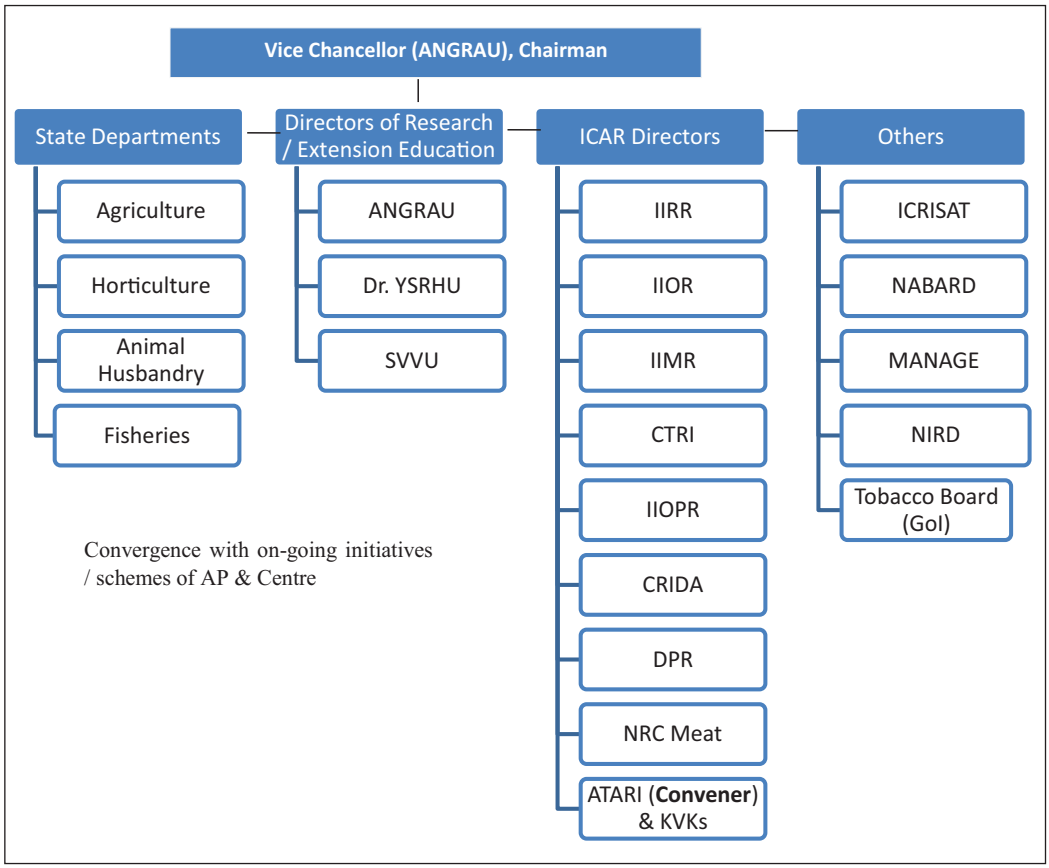
Source: Report of the Committee on Doubling Framers' Income by Ministry of Agriculture.

Role of the Government

- Agricultural policy in tune with sustainable development goals
- Irrigation development
- Development of agriculture infrastructure
- Regulation of seed, fertilizer and pesticide inputs for quality and reasonable pricing
- Promotion of crop zones and technology targeting
- Promotion of processing and value addition of agriculture produce
- Market reforms
- Promotion of irrigated dry crops in water scarce rainfed areas
- Fillip to rainwater harvesting and efficient recycling
- Promotion of carbon sequestration policies to restore soil health and sustainable productivity increases
- Promote convergence of all stakeholders engaged with farmers
- Promote crop insurance in a big way so as to cover loanee and non-loanee farmers
- Land reforms to address the problems of tenant farmers operating nearly 33% of land holdings in the state
- Promote public and private investments in and for agriculture
- Promote value chain centric agricultural extension in place of the current production centric agricultural extension

9. Implementation plan and Institutional responsibilities

Institutions for implementation and monitoring of Action Plan



Institutional Responsibilities

In Andhra Pradesh there are six agro-ecological zones in which research and extension institutes/ organizations are located working on technology development and application in agriculture and allied sectors. Also several ICAR institutes/ regional stations have the mandate of catering to the technology development needs of the varied farming situations in these agro-ecological zones. The roles and responsibilities of these institutes are furnished in the table below. The identified institutes will provide technical backstopping and frontline extension education programmes including technology assessment, demonstration and skill training. All the organizations will have to work close with the state departments of agriculture, horticulture, animal husbandry and fisheries. The time available for implementation of interventions towards doubling farmers' income is till 2022. The yearly changes in income will be documented at household level compared to the established baseline of 2015-16. The State Coordination Committee will undertake monitoring of implementation of the DFI strategy and action plan through field visits and review workshops in convergence with central and state departments of agriculture and allied sectors.

Table 9.1 Institutional Responsibilities

S. No.	Agro-ecological zones	Organization	Responsibility
1	North coastal zone and High altitude tribal areas	• ANGRAU Research stations (RARS, Anakapalle;ARS, Yelamanchili ; ARS, **Amadalavalasa** ;ARS**Ragolu**;ARS, Vizianagara) • IIMR, Hyderabad • ITDA	Adaptive trials for productivity enhancement in sugarcane, paddy, groundnut, sesame, mestha and rice fallow pulses.
		KVKs (Srikakulam, Vishakapatnam 1 & 2, Vizianagaram)	Baseline and implementation of technology interventions for DFI in adopted villages (3 per KVK) and impact assessment
		CMFRI Regional Center, Visakhapatnam	• Seed production technologies of selected high value fin fishes and shellfishes. • Production technology demonstrations for sea cage farming and coastal mariculture • Advisories for health management in selected finfish and shellfish for mariculture and aquriculture.

S. No.	Agro-ecological zones	Organization	Responsibility
		Department of Agriculture/ ATMA	• Implementation of crop zone approach with focus on paddy, pulse, millet and groundnut based cropping systems • Promotion of water and labour saving practices in paddy • Promotion of catch crops: Sesamum, ragi, mesta as pre kharif crops • Pulse in rice fallows • Pulse, maize, ragi as irrigated dry crops to double productivity • Redgram on rice bunds • Extensive adoption of green manuring & micro-nutrient correction • Ground water exploitation through NTR Jala Siri • Seed production through Community Managed Sustainable Systems for seed (CMSS – Mana Vithhana Kendras) • Ridge and furrow planting (Seed cum fertilizer drills) in millets • Intercropping of millets with redgram (2:1) • Custom hiring centres (CHCs) for farm machinery • Implementation of contingency plans for agriculture and allied sectors • Promotion of organic farming/ natural farming in clusters at farmer level • Soil health card mission for increasing nutrient use efficiency • Increased coverage of farmers including loanee and non loanee farmers under crop insurance • Certificate of cultivation to tenant farmers for credit support
		Department of Horticulture	• Potential area expansion under horticulture (fruits and vegetables) crops by 12 % in Visakhapatnam, 32% in Vizianagaram and 44% in Srikakulam district. • Value chains in cashew, mango, spices and coconut • Banana and mango in Vizianagaram

S. No.	Agro-ecological zones	Organization	Responsibility
			• Organic farming of mango, pepper, cashew, coffee and vegetables in Visakhapatnam district • Clonal seed gardens of cocoa and central nurseries for improved varieties of pepper in high altitude areas • Expansion of horticulture area under micro irrigation (PMKSY)
		Department of Animal Husbandry	• Support for value addition (cow milk)
		Department of Fisheries	• Sea food processing
2.	Godavari Zone	IIOPR	• Demonstration of technologies for productivity enhancement from 20t/ha to 40t/ha in Farmer First villages (500 households over 3 years) and horizontal spread in the district. • Intercropping in oilpalm with profitable crops such as cocoa, vegetables, spices and flower
		CTRI	• High yielding cultivars for northern light soils • Value added products from tobacco • Cost reduction with briquettes from tobacco waste
		• IIRR, Hyderabad • IIMR, Hyderabad • ANGRAU Research stations (ARS Maruteru; ARS Pulla; ARS Kovvur; ARS Vijayarai; ARS Ambajipet; Seed production farm, Venkataramannagudem)	• Demonstration of high yielding multiple stress tolerant paddy varieties and hybrids • Frontline demonstrations of high yielding cultivars of sorghum • Seed production of paddy HYVs • Technologies for Productivity enhancement and cost reduction in banana
		• Dr.YSR Horticulture University • ITDA • KVIC	• Demonstration of profitable intercrops in coconut • Demonstration of cost effective pest and disease management technologies in coconut • Stability in coconut production through environmentally safe and long lasting control of coconut mite and black headed caterpillar • Value added products from coconut, palmyra, rubber and millets. • Replacement of seedling orchards in cashew with grafts. • Custom production and supply of quality vegetable seedlings using hi-tech protected nursery (Dr. YSRHU) • Apiary and Sericulture with support of ITDA and KVIC

S. No.	Agro-ecological zones	Organization	Responsibility
		KVKs (East Godavari 1 & 2, West Godavari 1& 2)	Baseline and implementation of technology interventions for DFI in adopted villages (3 per KVK) and impact assessment.
		Department of Agriculture/ ATMA	• Early Kharif paddy followed by rabi paddy • Pulse as summer crop • Redgram on rice bunds • Micronutrient application in saturation mode of coverage • Promotion of Paddy + fish cultivation • Ground water exploitation through NTR Jala Siri • Seed production through Community Managed Sustainable Systems for seed (CMSS – Mana Vithhana Kendras) • Custom hiring centres (CHCs) for farm machinery • Implementation of contingency plans for agriculture and allied sectors • Promotion of organic farming/ natural farming in clusters at farmer level • Soil health card mission for increasing nutrient use efficiency • Increased coverage of farmers including loanee and non loanee farmers under crop insurance • Certificate of cultivation to tenant farmers for credit support
		Department of Horticulture	• Potential area expansion of horticulture crops (fruits and vegetables) by 14% in East Godavari and 23% in West Godavari districts • Ultra high density planting in mango with drip irrigation in Krishna and Prakasam districts • Value chain in banana, coconut, cashew and papaya in East and West Godavari districts • Intercropping in oilpalm • Clonal seed gardens of cocoa in West Godavari • Expansion of horticulture area under micro irrigation (PMKSY)
		Department of Animal Husbandry	• Support to FPOs for buffalo milk
		Department of Fisheries	• Support to FPOs for fresh water fish production in West Godavari • Support to FPOs for brackish water fish production in East and West Godavari

S. No.	Agro-ecological zones	Organization	Responsibility
3.	Krishna Zone	• IIOR, Hyderabad • ANGRAUResearch stations (RARS Lam; ARS, Bapatla; CRS, Bapatla; Bacterial Inoculants Unit, Amaravati; Seed Production Farm, Jangamaheswarapuram; ARS, Darsi; ARS, Vuyyuru; ARS Machilipatnam; ARS, Endakuduru; ARS, Ghantasala; HRS, Nuzvid) • Dr. SVVU • Dr. YSRHU	• Integrated crop management in paddy with focus on cost reduction technologies (soil test based nutrient management and pest management) • Seed production and demonstration of YMV disease tolerant cultivars of blackgram and greengram in rice fallows. • Demonstration of drought tolerant and high yielding varieties of groundnut, sesame, sunflower and castor • Value addition of oilseeds at village level through FPOs/FPCs • Demonstration of bio-inoculants for seed treatment in pulses • Integrated crop management in Mango • Demonstration of high density planting in guava • Custom production and supply of quality vegetable seedlings using hi-tech protected nursery (Dr. YSRHU) • Demonstration of improved agro techniques for productivity enhancement and cost reduction in vegetables through ICM practices.
		• KVKs (Krishna 1&2, Guntur, Prakasam (1&2)	Baseline and implementation of technology interventions for DFI in adopted villages (3 per KVK) and impact assessment.
		• Department of Agriculture	• Early Kharif paddy & rice fallow pulse • Micronutrient correction • Pulse, maize, jowar as ID rabi crop • Redgram on rice bunds • Summer pulse as third crop • Protective irrigation through rain guns • Intercrop in redgram, millets etc. • Cultivation of border crops: Redgram, Jowar on bunds • Micronutrient application in saturation mode of coverage • Management of pink boll worm in cotton • Promote short duration pulses as pre kharif crops in NSP area and August paddy transplanted areas (late kharif situations) • Implementation of contingency plans for agriculture and allied sectors

S. No.	Agro-ecological zones	Organization	Responsibility
			• Promotion of organic farming/ natural farming in clusters at farmer level • Soil health card mission for increasing nutrient use efficiency • Increased coverage of farmers including loanee and non loanee farmers under crop insurance • Certificate of cultivation to tenant farmers for credit support
		• Department of Horticulture	• Potential area expansion of horticulture (fruits and vegetables) crops by 24% in Krishna, 36% in Guntur and 37% in Prakasam districts. • Value chain in chillies in Guntur and Prakasam districts • Value chain of mango in Krishna district • Organic farming in Chilli in Prakasam district • Support to FPOs for value chain of turmeric in Guntur district • Protected cultivation in cluster approach in identified mandals of Guntur and Prakasam districts • Pesticide free curry leaf and chillies production in Guntur and Prakasam districts. • Expansion of horticulture area under micro irrigation (PMKSY)
		Department of Animal Husbandry	• Support to FPOs for value chain of buffalo milk in Krishna and Guntur districts • Support to FPOs for value chain of buffalo milk, sheep and goats in Prakasam district
		Department of Fisheries	• Support to FPOs for fresh water fish and brackish water fish production in Krishna district
4.	Southern Zone	• CRIDA, Hyderabad • IIMR, Hyderabad • DPR, Hyderabad • NRC (Meat), Hyderabad • ANGRAUResearch stations (RARS, Tirupati; ARS, Nellore; ARS, Perumallapalli; ARS, Kavali; ARS, Petlur; ARS, Podalakur; ARS, Anantarajupeta; ARS, Utukur)	• Demonstration of rainwater harvesting and efficient recycling through micro irrigation at critical crop growth stages • Demonstration of contingency crop planning • Crop diversification and demonstration of climate resilient agricultural practices • Conservation agricultural practices using cluster approach and farmers clubs • Custom hiring centers for farm machinery and implements

S. No.	Agro-ecological zones	Organization	Responsibility
		• Dr. SVVU • Dr.YSRHU	• Value addition of nutri cereals such as sorghum, pearlmillet, finger millet and minor millets through skill training and entrepreneurship development • Primary processing, branding and market linkages for millet products • Technical backstopping and establishment of mother care units for continued supply of improved breeds of backyard poultry in villages for higher egg and meat production and income • Technical backstopping and establishment of rural poultry hatchery units for supply of chicks of improved breeds • Demonstration of cluster broiler farming by rural youth and marketing. • Integrated farming system demonstrations with agriculture + fisheries/dairy/poultry + horticulture • Cost reduction technologies in prawn culture and composite fish farming • Promotion of micro irrigation in high value horticulture • Supply and value chains through FPOs/FPCs
		KVKs (Chittoor 1&2, Kadapa 1&2, Nellore 1&2)	Baseline and implementation of technology interventions for DFI in adopted villages (3 per KVK) and impact assessment.
		Department of Agriculture/ ATMA	• Green manuring • Year round green fodder production • Millets, blackgram, greengram, sesamum as preceding crops to chickpea • Promotion of zero tillage chickpea under double cropping sequence. • Promotion of mechanical harvest genotypes (NBeG 47 etc). • Protective irrigation through rain guns • Implementation of contingency plans for agriculture and allied sectors • Promotion of organic farming/ natural farming in clusters at farmer level • Soil health card mission for increasing nutrient use efficiency

S. No.	Agro-ecological zones	Organization	Responsibility
			• Increased coverage of farmers including loanee and non loanee farmers under crop insurance • Certificate of cultivation to tenant farmers for credit support
		Department of Horticulture	• Potential area expansion in horticulture (fruits and vegetables) crops by 18% in Chittoor, 23% in Kadapa and 47% in Nellore districts • Ultra high density planting in mango with drip irrigation in Chittoor • Value chains of mango, banana, chillies, capsicum, cucumber and tomato in Chittoor district • Value chains of banana and pomegranate in Kadapa district • Support to FPOs for value chain of tomato in Chittoor distri • Expansion of horticulture area under micro irrigation (PMKSY)
		Department of Animal Husbandry	• Support to FPOs for value chain of sheep and goats in Nellore and Kadapa districts • Support to FPOs for value chain of buffalo milk in Kadapa district • Support to FPOs for value chain of milk, milk products, fodder, sheep and goats in Chittoor district
		Department of Fisheries	• Support to FPOs for value chain in brackish water fish production
5.	Scarce Rainfall Zone	• CRIDA, Hyderabad • IIMR, Hyderabad • DPR, Hyderabad • NRC (Meat), Hyderabad • ANGRAU Research stations (RARS, Nandyal; ARS, Anantapur; ARS, Reddipalli ; ARS, Kadiri) • Dr. YSRHU • Dr. SVVU	• Demonstration of improved varieties of redgram • Demonstration of intercrops in redgram with foxtail millet, pearl millet and groundnut. • Demonstration of rainwater harvesting and efficient recycling through micro irrigation at critical crop growth stages • Crop diversification and demonstration of climate resilient agricultural practices • Demonstration of contingency crop planning/alternative crops to groundnut under aberrant monsoon • Conservation agricultural practices using cluster approach and farmers clubs • Custom hiring centers for farm machinery and implements

S. No.	Agro-ecological zones	Organization	Responsibility
			• Value addition of nutri cereals such as sorghum, pearl millet, finger millet and minor millets through skill training and entrepreneurship development • Primary processing, branding and market linkages for millet products • Technical backstopping and establishment of mother care units for continued supply of improved breeds of backyard poultry in villages for higher egg and meat production and income • Technical backstopping and establishment of rural poultry hatchery units for supply of chicks of improved breeds • Demonstration of cluster broiler farming by rural youth and marketing. • Integrated farming system demonstrations with agriculture + fisheries/dairy/poultry+horticulture • Cost reduction technologies in prawn culture and composite fish farming • Promotion of micro irrigation in high value horticulture • Supply and value chains through FPOs/FPCs
		KVKs (Anantapur 1&2, Kurnool 1&2)	Baseline and implementation of technology interventions for DFI in adopted villages (3 per KVK) and impact assessment.
		Department of Agriculture/ ATMA	• Ridge and furrow planting (Seed cum fertilizer drills) • Implement resource conservation practices in pulses, groundnut and millets • Rain water harvesting for supplemental irrigation in high value crops • Millets, blackgram, greengram, sesamum as preceding crops to chickpea • Cultivation of border crops: Redgram, Jowar on bunds • Promotion of zero tillage chickpea under double cropping sequence. • Protective irrigation through rain guns in this rainfed crops • Promote pulses as intercrops in groundnut, cotton, millets.

S. No.	Agro-ecological zones	Organization	Responsibility
			• Year round green fodder production • Promotion of organic farming/ natural farming in clusters at farmer level • Implementation of contingency plans for agriculture and allied sectors • Seed production through Community Managed Sustainable Systems for seed (CMSS – Mana Vithhana Kendras) • Micronutrient application in saturation mode of coverage • Soil health card mission for increasing nutrient use efficiency • Increased coverage of farmers including loanee and non loanee farmers under crop insurance • Certificate of cultivation to tenant farmers for credit support
		Department of Horticulture	• Potential area expansion in horticulture (fruits and vegetables) crops by 39% in Kurnool and 42% in Anantapur districts • Ultra high density planting in mango with drip irrigation in Kurnool • Value chains of chillies, cucumber, capsicum, banana and pomegranate in Anantapur district • Value chains of chillies and mango in Kurnool district • Support to FPOs for value chain of tamarind in Anantapur and onion in Kurnool district • Expansion of horticulture area under micro irrigation (PMKSY)
		Department of Animal Husbandry	• Support to FPOs for value chain in cow milk, sheep and goats

10. Summary recommendations

1. In Andhra Pradesh 62% of the population is dependent on agriculture. Cropped areas in Andhra Pradesh fall into six zones based on agro-climatic conditions viz., high altitude and tribal areas, north coastal zone, Godavari zone, Krishna zone, southern zone and scarce rainfall zone. The average size of land holdings in Andhra Pradesh marginally declined to 1.06 ha while, number of holdings increased to 76.21 lakhs.

2. Agriculture is diversified with 28 crops under cultivation with rice, maize, pulses, groundnut, cotton, chilies, tobacco and sugarcane as major crops. The cropping intensity is about 124%. The state receives an average normal rainfall of 556 mm of south-west monsoon and 296 mm from north-east monsoon. The groundwater potential is estimated at 16.43 lakh ha with 15.09 lakh borewells. Andhra Pradesh is known as river state with canal irrigation of 10.81 lakh ha. The gross irrigated area in the state is 35.47 lakh ha and net irrigated area is about 27.43 lakh ha.

3. Gross state domestic product (GSDP) of Andhra Pradesh registered a growth rate of 11% in 2015-16 and is higher than the growth of GDP of the country during the last three years. The share of agriculture sector in Gross value added (GVA) in 2016-17 at current prices was 31.8%. Agriculture sub sector registered a growth rate of 2.03% in 2016-17. Horticulture grew at impressive rate of 16.79%. Livestock sector emerged as an alternative and dependable source of income generation during drought and registered a growth rate of 12.18%. Fisheries sector registered a phenomenal growth rate of 30.09%. The Per-capita income of Andhra Pradesh at constant prices (2011-12) registered a growth rate of 10.97%. The literacy rate stands at 67.35%.

4. In terms of marketing infrastructure in agriculture, 22 regulated markets have been linked to e-NAM. The state government initiated the primary sector mission and prepared action plans for achieving double digit growth. Soil testing and soil health card mission is given prime importance with distribution of 42.38 lakh soil health cards to farmers with a target of covering 76 lakhs farm holdings in the state. The state government is a pioneer in deployment of ICT initiatives in agriculture and e-governance for the benefit of farmers. Crop insurance, organic/ natural farming, support for tenant farmers, credit support and seed production are other important initiatives in recent times. Similarly several initiatives have been launched in horticulture, animal husbandry and fisheries sector.

5. Yield gaps in major crops such as paddy, sugarcane, cotton, pulses and oilseeds are bridgeable as demonstrated in farmers' fields.

6. Potential for development of horticulture has been identified for Rayalseema region of the state. Micro irrigation through drip and sprinkler has proved effective both in terms of cost and output. Potential for development of livestock depends on addressing shortages in feed (42%) and fodder (41% green fodder and 21% dry fodder). A comprehensive fodder policy is necessary to boost growth of livestock sector. Fisheries occupy an important place in the socio-economic development of Andhra Pradesh. The state government unveiled a fisheries policy in 2015 to achieve 42 lakh tons of fish production with GVA of Rs.80,000 crore by 2019-20. The potential of agro forestry revolves around popularization of clonal technology in Eucalpytus and Leucaena based systems in the state.

7. There is considerable scope for boosting post harvest processing by setting up of food parks on PPP basis or private investment in the state. District-wise potential for realizing growth in post harvest processing has been presented in the report linking agriculture, potential industries and export potential.

8. Identified agro-ecology specific technologies related to strategies for doubling farmers' income through productivity enhancement, cost reduction, quality improvement/ processing/ value addition/ niche markets and generation of additional income. Evidences and potential contribution of key technologies for north coastal zone, godavari zone, krishna zone, southern zone and scarce rainfall zone has been presented in the report. Interventions cutting across zones have also been identified in agro-forestry, poultry, livestock and horticulture sectors.

9. Challenges and issues in value chain development, market linkages and trade potential have been discussed and identified opportunities for small holders in different systems. The report includes case studies highlighting the potential contribution of FPOs. Policy and investment requirements in agriculture and allied sectors and role of government has been indicated in the report. Implementation plan and institutional responsibilities have been delineated.

Technological interventions matrix for districts of Andhra Pradesh

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
1.	Srikakulam	North Coastal Zone	paddy, maize, cashew nut, coconut, chilies	Productivity enhancement and cost reduction	Direct seeding of paddy with drum seeder	Paddy is the major crop grown in Srikakulam district during kharif to an extent of 2.0 lakh ha. Majority of farmers cultivate paddy crop by transplanting method by engaging 10 women labour for transplanting and 8-10 men labour for nursery pulling. Transplanting window is 15 to 20 days only, so that labour availability becomes the critical issue to complete the transplanting in time. The cost of labour is also high during peak transplantation period, which is one of the major contributing factors for escalating the cost of cultivation in paddy. Direct seeding of paddy with drum seeder in paddled soil is the technology to reduce the cost of cultivation without compromising the yield. Drum seeder technology is very much effective because it saves time, labour and cost of cultivation due to skipping of nursery raising, nursery pulling and transplanting. In this method the yield increase is by 4.1% and cost of cultivation is reduced by an amount of Rs 4000-5500 per/acre.
2.	Srikakulam	North Coastal Zone	paddy, maize, cashew nut, coconut, chilies	Climate resilience	Promotion of flood tolerant paddy varieties in flood prone areas of Andhra Pradesh	About 1.39 m ha area is flood prone in Andhra Pradesh. Paddy is mainly affected due to inundation or transient water logging. Under the National Initiative on Climate Resilient Agriculture (NICRA) project, KVKs in Srikakulam and West Godavari performed on-farm testing of flood tolerant paddy varieties exposed to different flooding conditions. Among various varieties tested MTU-1061 gave a yield advantage of 28.6 to 59.1% over check (MTU-7029) and 40 to 65% increase in net income.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
3.	Srikakulam	North Coastal Zone	paddy, maize, cashew nut, coconut, chilies	Integrated Farming Systems (IFS)	Paddy cum fish culture	Srikakulam district is mainly known for paddy cultivation with an area 2.0 lakh ha. Out of this area, 13% of area is being frequently affected with floods and inundation every year due to unexpected rains/ floods leading to yield loss of paddy crop in an extent up to 20-60%. The low lying unproductive land can be converted to productive units through proper land shaping and integration of paddy with fish culture. Pond dykes can be utilized for growing horticulture crops like banana, papaya, vegetable crops and the retained water in reserve pond and trenches can be utilized for life saving irrigation to rabi crops after harvesting of fish. The intervention IFS paddy cum fish (0.7 ac paddy,0.3 ac fish culture) gave yield (Paddy :11.34 q, Fish :4.20 q) With net returns of Rs. 28760/ha, whereas sole paddy crop in flood prone area gave yield of 13.77 q with net returns of Rs.10480/ha.
4.	Srikakulam	North Coastal Zone	paddy, maize, cashew nut, coconut, chilies	Productivity enhancement and cost reduction	Zero tillage Maize cultivation in rice fallow situations – A cost reduction and resource conservation technology	Maize is the second major crop grown in Srikakulam district after paddy, occupying 5314 ha area and plays a major role in the income levels of farmers. Maize is cultivated without any preparatory tillage under no tillage situation, seed is sown immediately harvesting of paddy with available residual soil moisture. As per the field condition 3 - 4 irrigations are required, two irrigations will be saved compared to normal method of maize cultivation. The yield obtained was about 7 per cent higher than conventionally cultivated maize. After the successful demonstration of technology in farmers field, 1850 farmers and presently around 2500 acres of area is under zero tillage maize.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
5.	Vizianagaram	North Coastal Zone	paddy, banana, cashew nut, mango, oil palm and chilies	Productivity enhancement	Reviving cultivation of rice fallow pulses with the introduction of disease tolerant varieties	A significant decline in rice fallow pulse area was witnessed in Andhra Pradesh due to severe incidence of Yellow Mosaic Virus (YMV) disease in short duration pulse crops (blackgram and greengram). Demonstration of YMV tolerant cultivar LBG-752 in participatory cluster frontline demonstrations by KVK Vizianagaram indicated a bridgeable yield gap of 6.16 q/ha and additional net returns of Rs. 46200/ha
6.	Vizianagaram	North Coastal Zone	paddy, banana, cashew nut, mango, oil palm and chilies	Productivity enhancement	Intercropping in Sugarcane enhances profitability in Vizianagaram district of North Coastal Zone.	Sugarcane is cultivated as a rainfed crop in North coastal zone especially in Vizianagaram district in an area of 1.3 lakh ha. However, the productivity of sugarcane is very low at 58.9 t/ha against the state average of 76.2 t/ha. Promotion of intercropping with short duration legumes / vegetables has the potential of generating additional income leading to investments in sugarcane cultivation for productivity enhancement and increased profitability. A number of intercrops in sugarcane were evaluated by RARS, Anakapalle by adopting paired row planting method (120 x 60 cm). Few intercrops that showed promise and potential for up scaling are: Sugarcane + bhendi (Sugarcane equivalent yield: 118.2 t/ha; net returns of Rs. 128,940/ha), sugarcane + cluster bean(Sugarcane equivalent yield: 119.1 t/ha; net returns of Rs. 129,919/ha), sugarcane + spinach (Sugarcane equivalent yield: 105.1 t/ha; net returns of Rs. 102,420/ha) Sugarcane sole (Sugarcane equivalent yield: 98.2 t/ha; net returns of Rs. 95,913/ha)

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
7.	Visakhapatnam	North Coastal Zone	paddy, ragi, bajra ,jowar and cash crops sugarcane, groundnut, sesame, niger and chilies	Generation of additional income	Mushroom cultivation as livelihood option in tribal villages of Visakhapatnam	Training on Mushroom cultivation during 2015- 2016 under Tribal Sub Plan (TSP) programme was given to 60 farmers and youth from 6 tribal mandals on chemical treatment of paddy straw, preparation of beds, spawning and casing of mushroom beds etc. On completion of training mushroom cultivation was taken up by one SHG with the technical support by the staff KVK. Each member of the group is earning additional income of Rs. 2750-00 per month and the total family income per month rose to Rs. 11,950-00.
8.	Visakhapatnam	North Coastal Zone	paddy, ragi, bajra ,jowar and cash crops sugarcane, groundnut, sesame ,niger and chillies	Cost reduction	Pro-tray nursery for Ginger cultivation	The tribal farmers in Araku Mandal of Visakhapatnam district cultivate ginger as a major cash crop besides paddy and pulses. They are facing many problems while cultivating ginger due to unavailability of quality seed material, high seed cost and low yields. An amount of Rs. Rs.45000/acre has been spent solely on seed during peak season. With the intervention of Pro-tray nursery for Ginger cultivation, the cost on seed was brought down by Rs. 44000 per acre because of which an addition net income of Rs. 54,400 could be obtained with B:C ratio of 4.0 compared to 1.92 in the conventional method.
9.	West Godavari	Godavari zone	paddy, banana, sugarcane, chillies, coconut, maize, and tobacco. oil palm	Crop diversification	Tobacco farmer switches to horticulture	Sri. Muppena Ramana Reddy, a tobacco farmer switched to cashew in his 4 acres of land located in Gopalapuram area of West Godavari district due to fluctuation in market prices and delays in payment. Cashew grafts of BPP-8 and BPP - 9 were planted along with adoption of irrigation, fertilizer application, and pest and disease management and pruning. Income from tobacco in Godavari area is about Rs. 1 lakh / ha/year (@2000 kg/ha yield) whereas the income from Cashew was 2.5 lakhs (3rd to 5th year) and additional income

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						was obtained from intercrop of Maize during 1st two years. M. Ramana Reddy's 4 ac garden motivated other farmers to switch to cashew in 500 ha area in surrounding villages.
10.	West Godavari	Godavari zone	paddy, banana, sugarcane, chillies, coconut, maize, and tobacco. oil palm	Productivity enhancement and cost reduction	Direct seeding in paddy with drum seeder in West Godavari	Paddy is the predominant crop grown in Matsyapuri village during kharif and rabi seasons. The preferred varieties of paddy were MTU-7029 (Swarna) and MTU-1010. Due to poor release of canal water at critical stages i.e during panicle initiation stage to flowering stage, grain shattering due to low temperatures at the time of harvesting and heavy rains during threshing affected the paddy yield to an extent of 50 percent. Further the rabi sowings were also delayed forcing the farmers to forego the summer pulse cultivation which is the common practice in this area in the earlier times. During Rabi 2011-12 under NICRA, demonstrations on paddy direct sowing with drum seeder was taken up.the direct sown paddy matured 15 days earlier compared to manual transplanted crop facilitating to escape from the rains at the time of threshing. The yield was 15.4 percent more than transplanted paddy and the cost of cultivation was reduced by 6250 Rs/ha.
11.	West Godavari	Godavari zone	paddy, banana, sugarcane, chilies, coconut, maize, and tobacco. oil palm	Value addition	Millet processing - a group approach for livelihood enhancement of tribal woman in West Godavari	Training programmes on millet processing were conducted by KVK, Venkataramannagudem, Andhra Pradesh to tribal Self Help Groups (SHGs) under TSP. Two Self Help Groups viz., Girivanitha and Giriposhana were formed which established their own millet processing units with the financial assistance of ITDA. Both the groups supply approximately 800kg (400 kg each) of millet products to schools every week and each group is earning an amount of Rs.2,00,000 per month. After deducting the expenses, net profit is shared

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						among the members of the group. The millet products are also supplied to nearby super markets in Eluru, Koyyalagudem, Rajahmundry and local shandies in the villages. Recently an outlet in Eluru Rythu Bazar was also started and the sales are encouraging with a turnover of about Rs. 30,000/- to 50,000/- per month.
12.	West Godavari	Godavari zone	paddy, banana, sugarcane, chilies, coconut, maize, and tobacco. oil palm	Productivity enhancement	Integrated management of cashew orchards in West Godavari	Cashew is the main horticultural crop and provides livelihood to tribal adivasi families. The training programmes and demonstrations given on the INM and IPM of cashew and on canopy management by KVK brought down injudicious use of fertilizers and pesticides and encouraged the tribal farmers to take up ecologically safe plant protection measures like spray of neem oil and neem and pongamia soap when the pest load is low in the beginning of the flowering season. A total of 57.8 (12% increase over previous year) tonnes of cashew nuts were marketed by these 223 farmers with an average price of Rs. 123.5 per kg of nuts. Each farmer on an average got an amount of Rs. 31,251 per acre at the end of the season.
13.	West Godavari	Godavari zone	paddy, banana, sugarcane, chilies, coconut, maize, and tobacco. oil palm	Generation of additional income	Apiculture – A successful skill based intervention for improved livelihood of rural and tribal families of West Godavari	Collection of honey from wild bee colonies is one of the income sources for rural/tribal families during lean periods of employment i.e. during November to February in tribal areas of west Godavari district. Sixteen tribal farmers from Kamaiahkunta, Pandugudem and Bandarlagudem villages of Buttaigudemmandal were identified to support with bee hive boxes under Tribal sub plan activity of KVK, Venkataramannagudem. Regular follow up visits and advisory was also provided for effective maintenance of the bee hives. Honey can be extracted @ 2-3 Kg from each box by

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						October and can be continued up to June. Honey extracted from these colonies was sold @ Rs. 300/- to 500/- per Kg. depending on the season and demand.
14.	West Godavari	Godavari zone	paddy, banana, sugarcane, chilies, coconut, maize, and tobacco. oil palm	Crop diversification	Intercropping in Oilpalm	Andhra Pradesh is first in oilpalm area (1.35 lakh ha) & Production (9.3 lakh t fresh fruit bunches (FFB), 1.6 lakh t crude palm oil. About 75000 farmers cultivate oilpalm in 1 lakh ha area of Godavari zone and realize monthly income round the year. The technology revolves around **3 M's** i.e., Manure, Mulching & Micro-irrigation. Adoption of better management practices has resulted in nearly doubling productivity.
15.	East Godavari	Godavari zone	paddy, coconut, cotton, cashew nuts, sugarcane, mangoes, plantation crops.	Integrated Farming Systems (IFS)	Enhancing income of tribal fishermen through reservoir fisheries in East Godavari.	The agency area of East Godavari district has vast potential for development of fisheries as there are many perennial hill streams and rivers like Godavari and Sileru flowing through the area. To improve the socio – economic condition and livelihood of the affected tribal families, Krishi Vigyan Kendra Pandirimamidi has taken initiative to create awareness among tribal farmers on reservoir management and were able to motivate 147 tribal families to take up fisheries activity. During December, 2012 two lakhs fish fingerlings were released in Bhupathipalem Reservoir and the tribal fisher men started harvesting fish with the grill nets and teppas since October, 2014. The average size of the harvested fish ranged from 3 to 5 kg., and the fish were sold at Rs.100/kg at the reservoir site. The members of the society harvested 5 to 6 quintals of fish per day which was marketed through Primary Tribal Fishermen Co-operative Society (PTFCS). The profit thus obtained was distributed equally among the tribal fishermen families after completion of the fish harvesting. Tribal families were ensured an income of Rs. 20,000 to 25,000 per family over a period of eight months.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
16.	East Godavari	Godavari zone	paddy, coconut , cotton , cashew nuts, sugarcane , mangoes , plantation crops.	Productivity enhancement	Reviving cultivation of rice fallow pulses with the introduction of disease tolerant varieties	A significant decline in rice fallow pulse area was witnessed in Andhra Pradesh due to severe incidence of Yellow Mosaic Virus (YMV) disease in short duration pulse crops (blackgram and greengram). Demonstration of YMV tolerant cultivar MASH-338 in participatory cluster frontline demonstrations by KVK East Godavari indicated a bridgeable yield gap of 5.60 q/ha and additional net returns of Rs. 28000/ha.
17.	East Godavari	Godavari zone	paddy, coconut, cotton, cashew nuts, sugarcane, mangoes, plantation crops.	Productivity enhancement	Enhanced yields due to improved variety and best management practices in Sorghum cultivation	Farming in agency areas of East Godavari district of A.P has been characterized as a subsistence activity with farmers producing a wide array of crops (including multiple cultivars of the same crop) for their own consumption, using few purchased inputs.. The productivity level of these crops is very low resulting in poor economic status of these tribal farmers. Sorghum seed (improved variety CSV-15) along with package of improved practices and timely plant protection measures resulted in higher productivity of 7-8q/acre compared to 1-2 q/acre by their traditional practices. An average net income of Rs.10,000/- was achieved by the tribal farmers who followed the improved practices and realized an average benefit cost ratio of 5.99. Superior quality traits of the newly introduced CSV-15variety fetched premium price of Rs. 1500/q in the local market compared to the Rs.1100/- per quintal of local varieties.
18.	East Godavari	Godavari zone	paddy, coconut, cotton , cashew nuts, sugarcane , mangoes , p1lantation crops.	Productivity enhancement	Goatery breed for higher income in East Godavari.	Black Bengal breed of goat which is found in West Bengal, Bihar, Odisha and Bangladesh, are prolific i.e., quick population build up, high disease tolerance ability and can adapt to local environment easily. These breeds gave high net returns due to kidding at least twice in a year with low mortality and these breeds are easy for rearing as this doesn't

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						have any feed preference. Krishi Vigyan Kendra, Kalvacharla, East Godavari, first conducted one farm trial with Black Bengal breed of goat with 3 farmers as well as on campus at KVK. The rearing of black Bengal goat there was an additional income of about Rs.13,0000/- per goat. With the successful demonstration at present there are around 700 beneficiaries (250 through ATMA and 350 through state animal husbandry and dairy department and progressive farmers) have started backyard rearing of goat in about 32 villages.
19.	Krishna	Krishna Zone	paddy, maize, greengram, blackgram, cotton, sugarcane	Cost reduction and productivity enhancement	Direct sown Paddy with seed drill	Sri. J. Picheswara Rao, farmer in Raavivaripalem village of Mopidevi mandal has adopted seed drill cultivation for the past 5 years, he has been benefitting high net income with less cost of cultivation especially savings in respect to nursery management. The yield increase oven conventional method was about 17.37 % with net income of Rs. 32080/ha.
20.	Krishna	Krishna Zone	paddy, maize, greengram, blackgram, cotton, sugarcane	Cost reduction	Shift from Chemical Agriculture to Zero-Budget Natural Farming in Krishna	Sri Seetha Rami Reddy of Kaaza village of Movva mandal has shifted from chemical intensive agriculture to Zero-Budget Natural Farming in 6 acres. From one cow, daily 10-12 kg of dung and 8-10 L of urine collected was used in the preparation of *ghana* and *drava jeevamrutha*. This is applied in the field which act as an excellent tonic to the field and tones the soil in terms of supply of the nutrients and also substrate (organic C compounds) for the earth worms and microbes. For pest control, the natural farmer uses various *asthras* viz., *agniastrha*, *neemasthra*, *brahmasthra* and *dashaparnikasthra*apart from using fermented buttermilk and coconut milk for disease management. The farmer is also practicing mulching and crop residue management for improved soil health. The yield decline due to adopting natural farming is only 2 to 3 bags per acre in case of rice, but the grains fetch bonus price.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
21.	Guntur	Krishna Zone	paddy, maize, sorghum, black gram, green gram, pigeon pea, ground nut, chick pea, and sesame.	Generation of additional income	Vermicomposting	Srinivasa Rao resident of Gorantla village, Guntur Rural, Andhra Pradesh started vermicompost unit with an annual production capacity of 300 T. The production cost incurred by him was Rs. 2.25/ kg and sells at Rs. 3.75/kg with a margin of Rs. 1.5/kg. He approached KVK, Guntur for technical support, with timely advises of KVK, Guntur scientists he could able to increase Vermicompost production (700 T) by reducing production cost Rs. 1.20/kg and sells at Rs. 4/kg with a margin of Rs. 2.80/kg.
22.	Prakasam	Krishna Zone	paddy, pulses, cotton, oilseeds, maize, chillies and horticulture crops.	Productivity enhancement and cost reduction	Liquid bio fertilizers in Paddy reduces cost of cultivation	Farmers of Prakasam district are using high doses of N and P fertilizers, which will lead to increased cost of cultivation and deterioration of soil heath. Demonstrations with liquid bio-fertilizers reduced usage of chemical fertilizers by 50% in paddy and reduced cost of fertilizers by Rs. 3800/ha.
23.	Prakasam	Krishna Zone	paddy, pulses, cotton, oilseeds, maize, chillies and horticulture crops.	Productivity enhancement	Reviving cultivation of rice fallow pulses with the introduction of disease tolerant varieties	A significant decline in rice fallow pulse area was witnessed in Andhra Pradesh due to severe incidence of Yellow Mosaic Virus (YMV) disease in short duration pulse crops (blackgram and greengram). Demonstration of YMV tolerant cultivar TBG-104 in participatory cluster frontline demonstrations by KVK East Godavari indicated a bridgeable yield gap of 10.05 q/ha and additional net returns of Rs. 45457/ha.
24.	Chittoor	Southern Zone	paddy, ragi , groundnut , sugarcane and mangoes	Value addition	Enhanced income through Value addition to Millets	Mrs.M.Frida from Kalikiri, Chittoor came forward to take up processing and value addition to millet as an entrepreneur activity after attaending the training programme conducted by KVK Kalikiri. Under technical guidance of KVK and with financial support of DWCRA they established three small scale processing and value addition unit. They registered value added millet products under Food Safety and Standards Authority of India 2006 (FSSAI Reg. No. 20116020000285) with a brand

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						name "AROGYA MILLET FOODS", and "STAR HEALTHY SNACKS". Selling their products in KrishiVigyan Kendra outlet, super markets in Tirupati, Chittoor and Nandyala. The monthly production of the is around 350kg with a net profit of Rs. 20,000-30,000/-.
25.	Kadapa	Southern Zone	groundnut, paddy, cotton, pigeonpea, sunflower, bengalgram, sesamum, mango, banana, papaya, orange, lemon, chillies, onion, tomato	Sustainable intensification/ climate resilience	Foxtail millet *(Korra)* - Bengalgram cropping sequence for resource conservation under rainfed medium black soils of Kadapa district.	Bengalgram was predominant crop in black soils under rainfed conditions during *Rabi.* Due to moisture stress because of breaks in North East Monsoon and severity of Helicoverpa and wilt resulted in low yields of Bengalgram in the district. KVK Scientists demonstrated the technology by introducing short duration korra variety Suryanandi (75 days) released from RARS, Nandyal as preceding crop to Bengalgram. By doing so, weed population was being suppressed by korra resulted reducing the cost for weeding during rainy season. Higher net returns of Rs.24, 625/- per ha was recorded in successive cropping of Korra-Bengalgram than sole Bengalgram cropping system (net returns of Rs. 9,325/-). The area of Korra -Bengal gram cropping sequence in rainfed black soils increased from the normal area of 250 ha to actual area of 2000 ha in the KVK operated villages. Rainfed farmers got valuable fodder for their milch animals.
26.	Kadapa	Southern Zone	groundnut, paddy, cotton, pigeonpea, sunflower, bengalgram, sesamum, mango, banana, papaya, orange, lemon, chillies, onion, tomato	Productivity enhancement	Enhanced yields due to use of *Trichoderma viride* in managing *Phytophthora* wilt in Betel vine	Betelvine is predominant crop in Kullumullapalli village of C.K.Dinnemandal. But due to incidence of *Phytophthora* wilt resulted in reduced yields and incurring huge loss to the farmers. Farmers used to soil drench with Copper oxy chloride to manage the problem. KVK Scientists demonstrated soil application of *Trichoderma viride* keeping in view of this problem. There was about 70% decrease in disease infestation and 12.35 % increase in yield. The yield in farmers method was 44.5 Q/ha with an net profit 54,125 rupees per ha with a B:C ratio of 1:1.82. The yield when soil application of *Trichoderma viride* was done 50 Q/ha with an net profit 75,000 rupees per ha with a B:C ratio of 1:3.0.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
27.	Kadapa	Southern Zone	groundnut, paddy, cotton, pigeonpea, sunflower, bengalgram, sesamum, mango, banana, papaya, orange, lemon, chillies, onion, tomato	Crop diversification	Introduction of Safflower as alternate crop for Rabi Bengalgram	Introduced Safflower variety Manjeera in area of 200 hectares as alternate crop to Rabi Bengalgram where wild deers and wild boars were more problematic. Farmers got net returns of Rs.16150/- per ha from Safflower cultivation compared to Bengalgram (Rs.8812/- per ha) besides avoiding damage to crops caused by wild deers and boars. Additional returns of Rs.7338/- per hectare from Safflower cultivation.
28.	Nellore	Southern Zone	paddy, bajra, jowar and ragi crop, tobacco, groundnut, chillies, sesame, sugarcane	Generation of additional income	Mushroom production	Nellore climatic conditions demand cultivation of Milky Mushrooms & Oyster Mushrooms and there is heavy demand for the mushrooms in urban areas. Farmers are engaged in the mushroom production in lean periods of the day (After farm work) as it is less laborious and able to utilise their time and labour for additional income. In terms of income, the farmer is earning an additional income of Rs. 2000-3000 per 10 kgs of mushrooms per cycle (45 days) in addition to their farm income with B:C ratio of 3:1 to 4:1.
29.	Nellore	Southern Zone	paddy, bajra, jowar and ragi crop, tobacco, groundnut, chillies, sesame, sugarcane	Generation of additional income	Rural Feed Processing Unit at Nellore	National Research Centre on Meat (NRCM), Hyderabad has taken up rearing of ram lambs under stall feeding with 'Complete Feeds' under world bank funded National Agricultural Innovation Project. For this purpose a Rural Feed Processing Unit has been established at Chennur village of Gudurmandal in Nellore dist. of A.P. Under this, farmers are made to rear weaned ram lambs of 3-4 months age under complete confinement in their stall and the animals were never allowed to go out for grazing till they attain market weight. In the stalls, ram lambs were offered with complete

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
						feed in the feeders which can meet all the nutrient requirements in dry mash farm as seen in the case of broiler poultry rearing. The ram lambs attained market weight in 120 days of feeding. The profit earned within 4 months is about Rs.2670-2070 per animal.
30.	Kurnool	Scarce Rainfall	rice, sorghum, groundnut, cotton, bengal gram, sun flower, castor, red gram, mango, sweet orange, tomato, onion, coriander, brinjal	Productivity enhancement	Reviving cultivation of rice fallow pulses with the introduction of disease tolerant varieties	A significant decline in rice fallow pulse area was witnessed in Andhra Pradesh due to severe incidence of Yellow Mosaic Virus (YMV) disease in short duration pulse crops (blackgram and greengram). Demonstration of YMV tolerant cultivar TBG-104 in participatory cluster frontline demonstrations by KVK Kurnool indicated a bridgeable yield gap of 9.84 q/ha and additional net returns of Rs. 57124/ha
31.	Kurnool	Scarce Rainfall	rice, sorghum, groundnut, cotton, bengal gram, sun flower, castor, red gram, mango, sweet orange, tomato, onion, coriander, brinjal	Crop diversification	Crop diversification with Foxtail millet (*Setaria italica*)	Cotton and pigeon pea were the main crops grown in Yagantipalle village during kharif season. Most of the crops got affected with late onset of monsoon, followed by dry spells during critical stages of crop growth, which in turn severely affected the crop yields. The short duration millets viz., Foxtail millet (SIA 3085, Suryanandi) varieties with 70-75 days duration and tolerance to drought and downy mildew were introduced in place of jowar and cotton in 25 acres in 2011 Kharif. These varieties of foxtail millet could escape drought due to its shorter duration and could yield net income of about Rs. 36,879/- where as the net income for cotton farmers was only Rs. 6594/- during Kharif 2015.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
32.	Anantapur	Scarce Rainfall	groundnut, sweet lime, mango, pomegranate, vegetables.	Productivity enhancement	Increased milk yields with CSH 24 MF sorghum fodder benefits farmer in Anantapur district	Adikeshava Naidu from Bandlapalle village in Penukonda-mandal in Anantapur district has been having great success with CSH 24 MF sorghum green fodder. He has 2 milch buffaloes and before the RythuKosam project, he was obtaining only 4 liter milk/buffalo/day with fat content of 7%.As a part of the RythuKosam project in 2015, the farmer received the new variety of sorghum and has been reaping rewards ever since. After feeding the new variety mixed with other varieties of green fodder, he received 6 liter milk/buffalo/day with fat content 7.5%. The net income increase was ` 2,400/buffalo and almost ` 5,000/month from the two milch animals. The overall milk yield has now increased by 120 liter/month from the two milch animals. With increased fat content, he sells the milk at ` 40/liter.
33.	Applicable to all districts of Andhra Pradesh	North Costal Zone, Godavari Zone, Krishna Zone, Southern Zone and Scarce Rainfall Zone		Generation of additional income	Mother Units in villages-Potential model for 1000 birds (Up to 6 weeks of age)	Setting up of mother units can be taken up by unemployed youth/ women farmers. The aim is to produce grown up chicks (6 weeks of age) of desi chicken breeds (Vanaraja, Gramapriya, Srinidhi, Rajasree) for free range poultry. The cost/ bird, Rs. 64 and sale price, Rs.8/ bird. The net returns/ year (6cycles) is Rs. 126000. The litter can be sold @ Rs 1000/ton. Birds in the mother unit can be reared up to 10-15 weeks to produce coloured birds for meat purpose.
34.	Vijayawada, Vishakapatnam, Tirupati, Guntur, Kurnool,	North Costal Zone, Krishna Zone, Southern Zone and Scarce Rainfall Zone		Generation of additional income	Cluster Broiler Farming by rural youth-Potential model for 2000 broilers	Cluster broiler farming can be taken up by unemployed rural youth/ women farmers. The aim is to rear commercial broiler varieties for meat production The economics for the potential model is cost per bird is Rs. 150 and sale price is Rs. 160/ bird. The net returns /year (6cycles) of 2000 units/ batch is Rs.120000 and litter can be sold @Rs 1000, 2t/ batch. They can even establish hygienic chicken processing centres to cater the production from their own farming which will ensure higher returns.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
35.	Applicable to all districts of Andhra Pradesh	North Costal Zone, Godavari Zone, Krishna Zone, Southern Zone and Scarce Rainfall Zone		Generation of additional income	Rural Hatchery Units for Backyard Poultry	Rural hatchery unit can be set up by rural youth and women farmers. The aim of the unit is to hatch out baby chicks from fertile eggs produced from rural / free range poultry farming. It provides work opportunity all through the year (12 cycles in a year). The profit obtained by this potential model (24,000 eggs hatcher at 28d interval) in 5 years is Rs.1848000.
36.	Applicable to all districts of Andhra Pradesh	North Costal Zone, Godavari Zone, Krishna Zone, Southern Zone and Scarce Rainfall Zone		Generation of additional income	Poultry litter to Organic Fertilizer	The stakeholders for this technological intervention are intensive broiler and layer poultry farmers. The main aim is to produce organic fertilizer rich in nitrogen and available phosphorus for agricultural purpose utilizing poultry litter composting technology. The Cost of litter, 1500 kg is Rs.1000, composting cost is Rs.500, and miscellaneous cost is Rs 200 with total cost per kg is Rs 1.7/- only.
37.	Chittoor, East Godavari, Visakhapatnam, Anantapur	North Costal Zone, Godavari Zone, Southern Zone and Scarce Rainfall Zone		Crop diversification	Switching to Floriculture with rainwater harvesting and micro irrigation	In many districts across zones scope exists for floriculture under irrigation to fetch remunerative prices. Examples include cultivation of marigold, tuberose and crossandra. The demonstrations were conducted by KVKs on Marigold in Chittoor and Visakhapatnam where the yield gap w.r.t farmer's field ranged from 16-18 q/ha. The demonstrations on tuberose gave yield increase of 40% in East Godavari. Crossandra demonstrations in Visakhapatnam district showed a yield increase of 32.2% over farmers plot.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
38.	Guntur	Krishna Zone	paddy, maize, sorghum, black gram, green gram, pigeon pea, ground nut, chick pea, and sesame.	Value chain development	Turmeric FPO	Mangalagiri Agricultural Producers' Company Limited, is promoted by Nilgiri Foundation, NGO. This FPO was registered in July, 2015 with 350 turmeric producing small farmers from 21 villages. These farmers collectively hold about 380 ha of land and are producing 950 tons of turmeric annually. A novel turmeric processing system, which brings down the processing time from 20 days to 10days was introduced to the farmers groups. Turmeric is a commercial crop with high input costs to the tune of Rs 123,500 to148,200 per ha and FPO farmers benefit directly by reducing their seed and fertilizer costs by up to15%. Further farmers benefit to the extent of 10% by their collective marketing in Duggirala market. The FPOs initiative to reduce input costs, processing times and market linkage appears to impact the livelihoods of small farmers' with increased profit from turmeric cultivation.
39.	Krishna	Krishna Zone	paddy, maize, greengram, blackgram, cotton, sugarcane	Value chain development	Marine Fisheries FPO	Samyuktha fisheries Producer Company, Etimandipallepallu village, Kruttivennu *mandal*, Krishna district has 425 member farmers from 30 villages, which was registered in September, 2015, through NABARD's support and SNEHA, local NGO as facilitator. The FPO established 3 collection centers, an ice factory and also placed cooling boxes with a weighing machine in each of the collection centre. They deal with a wide range of marine products like fish, prawn and crabs. The NGO organized awareness and exposure visits to most of the member farmer's to fish markets at Narsapur, Chennai and Bhimavaram. This has enabled farmers to realize the advantages of coming together collectively to bargain higher prices in the markets as they were cheated by the intermediaries in their villages who gave only 40-50% of prices that they in turn earned in these markets.

S. No.	Districts	Agro climatic Zones	Major crops	Area	Major intervention	Objective contribution
40.	Krishna	Krishna Zone	paddy, maize, greengram, blackgram, cotton, sugarcane	Value chain development	Banana FPO	Sri Vigneshwara Banana FPO formally registered as a company in July 2015 with 190 active member. Farmers from 30 surrounding villages encompassing 5 *mandal*s converge to sell their banana fruit bunches on every Monday and Thursday during the week. The turnover of the FPO was 9.6 million last year earning a profit of Rs 0.55 million by charging 6% levy on banana sales. A member farmer, Shri S Nagireddy says, "If I sell banana bunch to local trader at the farm gate, I used to get Rs 150 per bunch, here in FPO, I get Rs 325 per bunch and is more than double the previous amount. Also, being a part of the FPO fetched me 100% more". The abuse of intermediaries in differential pricing has dramatically reduced for farmers participating in this FPO where grading and pricing were held with transparency. This is attracting new banana farmers from other places.
41.	East Godavari	Godavari Zone	paddy, coconut, cotton, cashew nuts, sugarcane , mangoes , plantation crops.	Value chain development	Coconut FPO	Noveeal coconut Producer Company was registered under companies act during the year 2013. The support farmers is provided by extending assistance for planting, production, marketing and export of coconut and its products and their vision is to encourage the coconut industry and to bring confidence among coconut farmers by producing value added products. So far 247 societies, where land holding size per member is 0.97 ha and number of trees per member is 144. The company in consortium with other developing agencies and produces few value added products which are having good potential and demand in both national and international markets. The major benefits derived by small and marginal farmers' are: The per capita income of the farmer ha increased to Rs 37050/ha from coconut cultivation. The producer share in consumer price has improved to 40-50% from earlier 25-30.

State Coordination Committee for Andhra Pradesh

i)	**Vice Chancellor**, Acharya N.G. Ranga Agrl. University, Guntur, Andhra Pradesh	:	Chair.
ii)	**Director, ATARI**, Zone X, Santosh Nagar, Saidabad, P.O.– 500 059, Hyderabad	:	Convener
iii)	Director, CTRI, Dr NC Gopalchari Road, Bhaskar Nagar, Rajahmundry-533 105, Andhra Pradesh	:	Member
iv)	Director, IIOPR, Pedavegi, Near Jawahar-534 450, Godhavari Dist., Andhra Pradesh	:	Member
v)	One Nominee of the DG ICRISAT	:	Member
vi)	Director CRIDA, Santosh Nagar, Saidabad, P.O. – 500 059,	:	Member
vii)	Director, IIRR, Rajendra Nagar-500 030,Telengana	:	Member
viii)	Director, IIMR, Rajendra Nagar-500 030,Telengana	:	Member
ix)	Director IIOR, Rajendra Nagar-500 030,Telengana	:	Member
x)	Director, Directorate of Poultry Research, Rajendra Nagar,Telangana	:	Member
xi)	Director, Agriculture, Govt. of Andhra Pradesh	:	Member
xii)	Director, Horticulture, Govt. of Andhra Pradesh	:	Member
xiii)	Director, Animal Husbandry, Govt. of Andhra Pradesh	:	Member
xiv)	Director, Fisheries, Govt. of AP	:	Member
xv)	Nominee of Secretary DAC&FW	:	Member
xvi)	Nominee of Secretary, DAHDF	:	Member
xvii)	Nominee of Secretary, Ministry of Food Processing Industries	:	Member
xviii)	NGOs	:	Co-opted Member
xix)	Farmers	:	Co-opted Member
xx)	Commodity Boards	:	Co-opted Member
xxi)	Financial Institutions / Banks / NABARD	:	Co-opted Member

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