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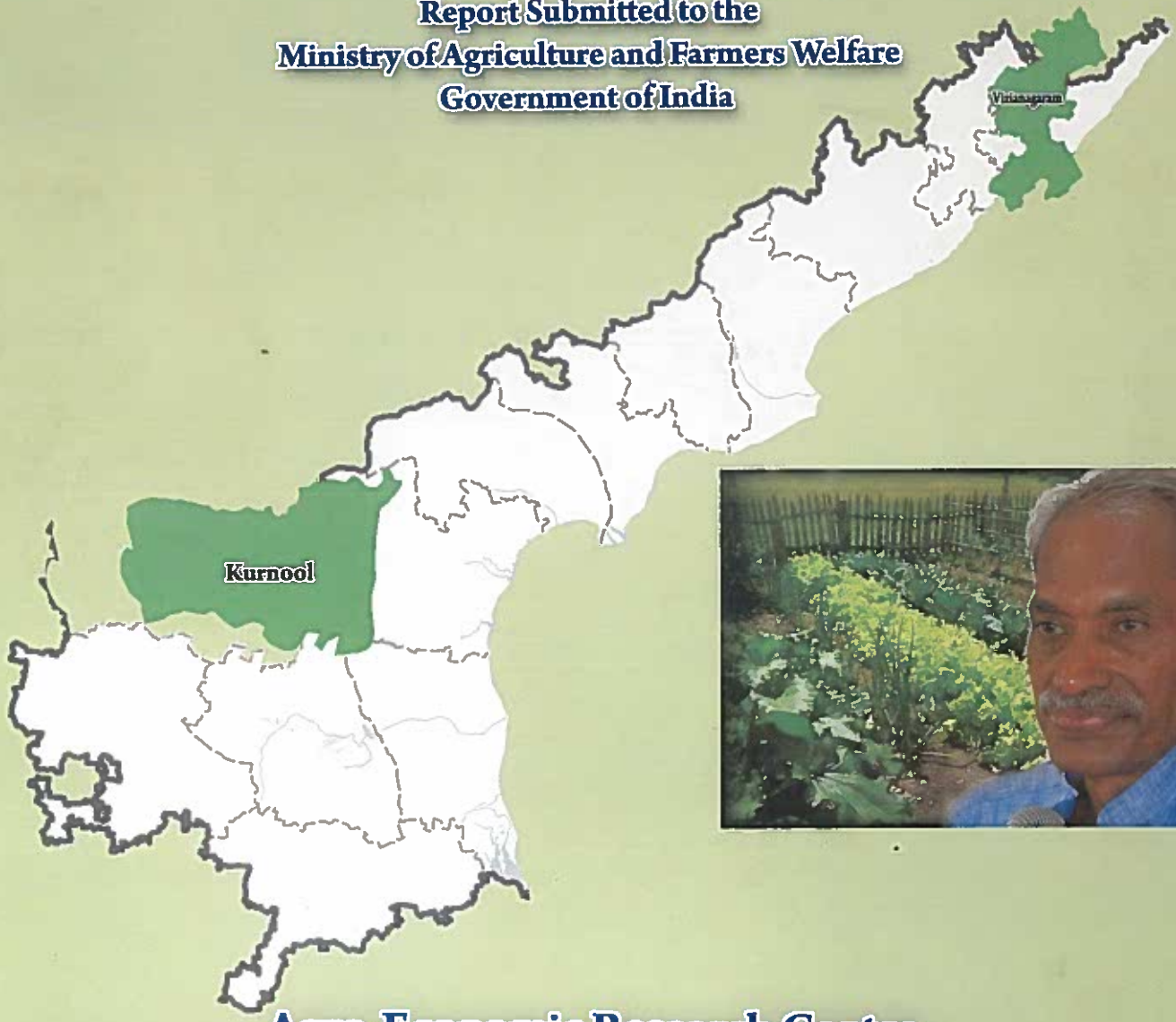
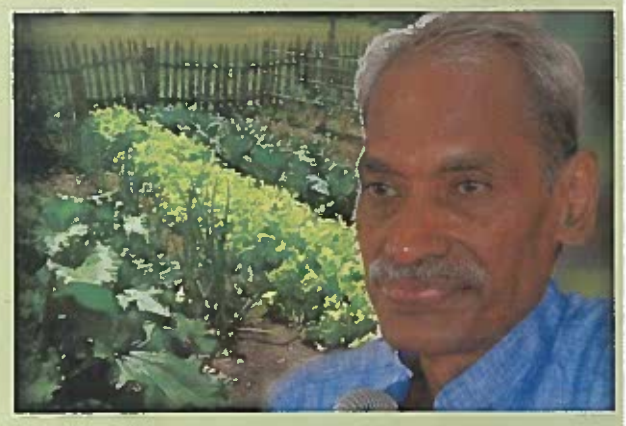
EVALUATION OF ZERO BUDGET NATURAL FARMING INITIATIVES IN ANDHRAPRADESH

DR. M. NAGESWARA RAO, Ph.D

Report Submitted to the
Ministry of Agriculture and Farmers Welfare
Government of India





Agro-Economic Research Centre
For the states of Andhra Pradesh, Telangana and Odisha
(Ministry of Agriculture & Farmers Welfare, Government of India)
Andhra University
Visakhapatnam, Andhra Pradesh
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PREFACE

Zero Budget Natural Farming (ZBNF) was originally promoted by Maharashtrian agriculturist and Padma Shri Recipient Dr. Subash Palekar Garu, who developed it in the mid 1990's as an alternative to Green revolution methods driven by H.Y.V seeds and chemical fertilizers. The promotion of Green Revolution led to increased production cost, debt burden and unprecedented farmers suicides in the state. In addition to excess use of fertilizers and pesticides resulted in soil toxicity. All these harmful practices, transition of the entire state to natural farming are a welcome move.

Andhra Pradesh Climate Resident Zero Budget Natural Farming (APCRZBNF) was initiated in 2014 with the establishment of Rythu Sadhikara Samastha (RySS) a fully government owned, not for profit organization with financial support from AZIM PREMJI Philanthropic institutions and state government. The programme aims to promote climate Resilient, chemical free and ecological agriculture. This is implemented in all the 13 districts and the study was undertaken to evaluate the progress and initiatives of ZBNF scheme in the state. The member of ZBNF farmers were 5,23,000, which participated in almost 3015 villages and 2,00,000 hectares covering across 13 districts in the state (2018-19).

The study has estimated and experimented ZBNF Vs Non-ZBNF farmers, Cost, Yield and income and the percentage of average farmer under paddy and cotton crop in Vizianagaram and Kurnool districts. The study found that an average ZBNF farmer can adopt natural fertilizer instead of chemical fertilizer consumption of paddy and cotton production cost declined to 11.43% and 10.46% than Non-ZBNF farmer. Due to which the yield of Paddy increased to 1.84% and cotton to 4.96%. Therefore the Net income of paddy increased to 34.66% and cotton at 149.35% in Vizianagaram district. In Kurnool district paddy and cotton crops of average ZBNF farmer Natural fertilizer costs declined at 10.90% and 12.78% and yield has increased to 3.40% and 5.95% against Non-ZBNF farmer. Consequently the Net income of both the study crops increased at 39.17% and 138.04% respectively.

I am grateful to Sri T. Vijay Kumar Garu IAS (Retd,) Director, ZBNF Government of Andhra Pradesh and Dr.C.P. Nagireddy Garu Senior Consultant of ZBNF programme for providing relevant information. They also advised us in selection of study crops and districts. I am also thankful to district ZBNF Officials (Vizianagaram & Kurnool) and staff in selecting the villages, Mandals, ZBNF and Non-ZBNF sample farmers while conducting the field survey. I gratefully acknowledge Prof. C. Sambamurthy Garu (Retd.) for his Valuable support.

I appreciate the Research team for their sincere effort and keen interest in under taking the study. I thank Dr M. NageswaraRao Research Officer for preparing the entire report. I appreciate the services of Dr K.V.Giri Babu and Dr P. Ramu Senior Research Investigators for Data Entry and Tabulation and Smt P. Malathi for neat Word processing.

Prof. V.KRISHNA MOHAN
In-charge Head

PROJECT TEAM

Drafting of the Report	**:**	**Dr. M. NageswaraRao**
Data Collection	**:**	**Dr. M. NageswaraRao** **Dr. K.V. GiriBabu** **Dr.K. Rambabu** **Dr. P. Ramu**
Table Generation	**:**	**Dr. K.V. GiriBabu** **Dr. P. Ramu**
Word Processing	**:**	**Smt. P. Malathi**

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1.1. Introduction:

Andhra Pradesh is a leading agrarian state in India. The state is made up two major regions of Rayalaseema and Coastal Andhra Pradesh and has a total thirteen administrative districts. Paddy is the major food crop and staple food in the state, besides farmers also grow groundnut, cotton, jowar, bajra, minor millet, coarse grain and many varieties of pulses, oilseeds, sugarcane, chilli, pepper and tobacco. On the other hand the state is the largest producer of fruits and vegetables.

1.2. Need and Scope of the Study:

Overall the cost of cultivation has increased due to excess use of chemical fertilizers, payment of debts from private money lenders, labour intensive methods of cultivation, low level of productivity due to irregular rainfall, cyclones, lack of regulated markets and minimum support price (MSP). All these lead to declined farmers income and contributed to unprecedented suicides among farmers in the state. In addition farm lands are reporting high soil toxity due to excess use of pesticides and fertilizers, thus jeopardizing public health. Therefore shifting to natural farming is a welcome move. The newly introduced technique among farmers was Zero Budget Natural Farming (ZBNF). Which was originally promoted by noted agriculturist Dr.Subash Palekar, who developed it in the mid-1990s. It has attained wide success in south India, now it has been spreading all over India.

1.3. Zero Budget Natural Farming in Andhra Pradesh (APZBNF):

Climate Resilient Zero Budget Natural Farming (CRZBNF) was undertaken. In 2014, the Government of Andhra Pradesh, Department of Agriculture with the establishment of Rythu Sadhikara Samastha (RySS), a fully government owned not for profit organization to scale up ZBNF practices, proposes to cover all 6 million farmers and eight million hectares of agricultural land in the state by 2024. The Programme aims to promote Climate-Resilent, Chemical free, ecological agriculture and provide small and marginal farmers with profitable livelihoods from agriculture. Since then there has been no farm suicides reported from areas where Agro-ecological farming practices are being followed in the state.

1.4. Objectives:

1. To study the Growth rates of Area, production and yield of paddy and cotton crops in the state during 1999-2000 to 2018-19.
2. To study the progress of Zero Budget Natural Farming (ZBNF) scheme in the state during 2015-16 to 2019-20.
3. To discuss the initiatives of ZBNF scheme in the state from 2015-16 to 2019-20.
4. To study the household characteristics cost of cultivation, yield and net income of paddy and cotton crops under ZBNF and Non-ZBNF sample farmers in selected districts of the state.

1.5. Reference period of the study: 2019-20

1.6. Methodology:

The study based on both primary as well as secondary data. The secondary data was collected from the office of Zero Budget Natural Farming (ZBNF) and the selected districts of ZBNF data drawn from the Vizianagaram and Kurnool districts various issues of statistical abstracts in Andhra Pradesh, RYSS Publications, District Hand Books of statistics, web: apzbnf.in.

Primary data was collected through a structured questionnaire. The sample districts were selected from two separate regions of the state (Vizianagaram and Kurnool). Four villages were selected from two mandals in one sample district for household survey. The total sample was 100 household from each district and the sample frame consisting 25 paddy and 25 cotton, the total 50 sample households from ZBNF farmers and the same pattern 25 paddy and 25 cotton total 50 farmers were taken from non ZBNF farmers households in each district. The total sample of the two districts was 200 households. The selection of districts and study crops were done with the co-ordination of Dr. C.P. Nagireddi garu, Senior consultant of state level ZBNF office, Guntur. The selection of sample mandals, villages and farmers selected by the district level ZBNF officials of sample districts. The sample made four standard farm categories viz., marginal upto 2.5, small 2.5 to 5,medium 5 to 10 and large above 10 acres. The sample covered all the sections of the society as marginal, small, medium and large.

1.7. Summary and Conclusions:

The study estimated the growth trends (CAGR) of paddy crop area found to be negative in the second and third period -1.64 and -0.37 percent (2009-10 t0 2018-19) and (1999-2000 to 2018-19). Production and productivity reported to be positive growth in all three periods. The negative growth rate in area is due to rain fed paddy area being converted into commercial and horticultural crops. In the case of cotton crop except the area growth -3.09 percent (1999-2000 to 2008-09) rest of all three components growth rates found to be positive respectively in the state.

The study observed the growth trends (CAGR) of sample crops paddy and cotton in the districts of Vizianagaram and Kurnool. The paddy crop growth rate in area, production and productivity reported positive in all the three periods in Vizianagaram district. In the case of Kurnool district growth trends of three components first, second and third period reported positive, besides the area growth rate in the second period was negative -3.71 per cent.

In the case of cotton crop in Vizianagaram district growth rates (CAGR) of area, production and productivity were found to be negative -3.74%, -14.50% and -10.16% in the first period (1999-2000 to 2008-09) where as the second and third period of all three components reported positive growth rates. Kurnool district the growth rate of cotton crop found to be negative in area and production -20.04% and -15.78%, while the yield growth rate positive at 4.16% in the first period. The second and total period growth rate recorded significant growth rates of area, production and productivity. The district may have availability of black soils and HYV seeds in the markets.

The APZBNF scheme commenced on pilot basis from Kharif 2016 where 704 villages were selected with 40,650 ZBNF farmers and an area 17656 hectares. It reached to 3015 Gram Panchayats 5,23,000 farmers and 2,00,000 hectares of land with 664 mandals under ZBNF scheme in the state.

The RYSS conducted the survey (Kharif 2016 and Rabi 2017) found that the average yield of ZBNF farmer per hectare is reported higher yield in all study crops than Non-ZBNF crops. Among the study crops ZBNF farmer yield of Tomato crop had maximum yield 131% while paddy and cotton yield increased at 6% and 10% over the Non-ZBNF farmer in the state.

Further in 2018 (kharif) the assessments made by RySS stated that the costs came down drastically under ZBNF farming. The study found that the cotton crop cost per hectare reduced by 30% followed by ragi 32%, Maize 29%, paddy 18% and groundnut 15% in Kharif compared to non-ZBNF farmer. The net income per hectare increased maximum 197% under cotton crop followed by 125% groundnut, 83% paddy and 46% maize under ZBNF farmer over Non-ZBNF farmer in the state. Therefore, ZBNF farmer earned maximum income 227% under cotton crop due to increasing yield and declined cost over the Non-ZBNF farmer.

The centre for Economic and Social Studies (CESS) made estimations of major crops between the ZBNF vs Non-ZBNF farmers in the state. The assessments revealed that all estimated crops net income increased and average cost declined per hectare of ZBNF over non-ZBNF farmer.

The budgetary support for implementation of ZBNF scheme increased from Rs.52.52 crore to 153.32 crore during 2015-16 to 2018-19. The AZIM PREMJI Philanthropic Institute (APPI) has granted 100 crore for technical support. Recently German assistance of Rs.304 crore will be spent on this project, which is aimed to cover 2.39 lakh farmers in around 600 village Panchayats to promote natural farming announced by Hon. Chief Minister Shri Y.S. Jagan Mohan Reddy garu led state Government. The Andhra Pradesh state government estimates that it will need 1700 crores to convert 60 lakh farmers to the ZBNF over the next 10 years.

On the whole socio-economic characteristics of sample HH under paddy and cotton crops of the sample districts found that the majority i.e 70% of members are under 16-60 age group. Except the cotton crop of Vizianagaram district, the rest of members illiterates found to be less than 40 percent . Above 60% working members of households reported farming as their main occupation.

On the whole Net Operated Area per HH is 4.44 acres under ZBNF farmer and 4.02 acres in the case of Non-ZBNF groups cultivating paddy and cotton crops in Vizianagaram district. Whereas Kurnool district it was found to be 5.23 acres under ZBNF HH and 4.25 acres in Non-ZBNF HH under Paddy and Cotton crops.

Out of 229.84 acres of Net Operated Area 51 percent area falls under rainfed and the rest of 49 percent area irrigated of the total sample HH maximum area irrigated by

electric tube well and 17.85 percent followed by canal. 15.64 percent and 13.90 percent by tanks and others under paddy and cotton crops.

The average HH per acre input costs of ZBNF farmer cultivating paddy crop was Rs.17137 compared to Non-ZBNF farmer who reported it to be Rs.19,714. For cotton crop cultivators the average expenditure per acre for ZBNF farmer was Rs.15,964, while that for Non-ZBNF farmers was Rs.17,883. So the average cost of ZBNF farmer reported ls lower than Non-ZBNF farmer of both paddy and cotton crops in Vizianagaram district.

The study found that on an average paddy farmers spent on Rs.5860 (29.73%) per acre on chemical inputs, while farmers who were participating complete ZBNF natural fertilisers spent Rs.3136 (18.30%) per acre. So the ZBNF farmer can avoid fertilizer consumption on paddy cultivation to reduce the cost by Rs. 2,724/- (11.43%) under ZBNF paddy crop. On the other hand cotton farmers in Non-ZBNF using fertiliser spent Rs.5,090 (28.54%) per acre on an acreage against Rs.2,886 (18.08%) spent by ZBNF farmers. So the average ZBNF farmer cotton production cost declined by Rs.2,104 (10.46%) in Vizianagaram district.

The average HH per acre total input costs of ZBNF farmer cultivating paddy was Rs.22,076 compared to Non-ZBNF farmer which is Rs.24,900. For cotton crop sample household found the average expenditure per acre for ZBNF farmer was Rs.23,409, while that of Non-ZBNF farmer spent Rs.27,225.

In Kurnool district Non-ZBNF farmer spent on Rs.8,663 (34.79%) per acre on chemical fertilizers and plant protection chemicals, while the ZBNF sample farmer spent Rs.5,273 (23.89%) per acre paddy cultivation. So the ZBNF farmer can avoid the fertilizer consumption and used natural fertilisers such as Jeevamrutha, Beejamrutha, Acchadana and natural pesticides on paddy crop cultivation lowering the cost by Rs.3,390 (10.90%). On the other hand non-ZBNF cotton crop farmers spent on fertilizer Rs.8,560 (31.44%)per acre against Rs.4,369 (18.66%) spent by ZBNF farmer. The cotton crop production cost declined Rs.4191 (12.78%) in Kurnool district for ZBNF farmers.

For the paddy farmer yield increased by 1.08% and average total cost declined by 13.07 percent per acre of average for ZBNF farmer over the Non-ZBNF farmer. Where as the cotton crop average ZBNF farmer per acre yield increased by 4.96 percent and the cost has declined by 10.48 percent compared to Non-ZBNF farmer in Vizianagaram district.

In Kurnool district the ZBNF farmer average HH per acre yield increased by 3.40 percent and the cost has declined by 11.34% under paddy crop over Non-ZBNF farmer. The cotton crop per acre yield increased by 5.95% and cost declined by 14.02% under ZBNF farmer than Non-ZBNF farmers in Kurnool district.

Further the study estimated the net income of ZBNF vs Non-ZBNF farmer households. The average net income per acre of paddy for ZBNF farmers HH increased by 34.66%. There are variations in this net income per acre among farmer groups of small and medium. Similarly, the cotton crop net income increased by 149.35% under ZBNF and it varied from 139.77% to 168.10% of marginal and medium farmer households.

In the case of Kurnool district average net income increased at 39.17% ZBNF farmer per acre paddy crop and varied 23.87% to 67.89% for marginal and large farmer compared to Non-ZBNF farmer. On the other hand, per acre net income for ZBNF cotton farmer also increased by 138.04% and among the farmer groups, it varied 105.86% to 208.08 percent of marginal and large farmer over the Non-ZBNF farmer in Kurnool district.

Therefore, the study found the average ZBNF farmer yield has increased and cost drastically declined than Non-ZBNF farmer for the selected crops of paddy and cotton in the districts of Vizianagaram and Kurnool in the state.

6.7. Field Observations:

1. The soil quality is poor and does not respond quickly to ZBNF practices to increase productivity of crops. So the ZBNF requires time and policy support. There fore the government should provide monetary support for converting the total land of the farmer into ZBNF.
2. The survey reveals that majority of farmers needed to sell their produce to village traders and frequently they receive below MSP for the sample crops of paddy and cotton due to lack of in time procurement.
3. ZBNF method of farming will be difficult particularly for large farmer considering huge quantity requirement of organic inputs. The preparation such huge quantity of ZBNF natural fertilisers are very difficult due to non-availability of indigenous cows tubs and labour.

4. Organic markets are not in the state. The organic production has been sold to private traders at their offer price. That offer price is less or equal to the market price. Therefore, ZBNF output has no market advantage in the state.
5. The survey reveals that majority of farmers prefer to sell their produce to village traders. They need money for urgent requirements and debt payments.

6.8. Suggestions:

1. Ensure cheap and easily accessible certification for organic products to ZBNF farmers by the government and establish organic markets in urban areas.
2. Adoption of ZBNF model can reduce heavy credit, chemicals expenditure and prevent farmer suicides. Therefore, the government should extend the ZBNF scheme with co-ordination of NGO's, FPO's and SHG's in the state.
3. To supply traditional seeds to the ZBNF farmers at subsidy prices through Seed Corporation.
4. Strengthening of agriculture market infrastructure, extend the procurement mechanism and fixing higher MSP for the organic production than in-organic production.
5. To extend more training camps at village and mandal level for extension of ZBNF area and production through ZBNF experts. They help farmers enrol into the ZBNF programme, adopt the right practices at right time by providing information and knowledge.
6. MGNREGS must be linked with farm work in order to reduce the cost of cultivation.
7. The government should protect higher price support to organic production whenever price falls compared to non-organic production.
8. Government should facilitate supply of organic inputs (ZBNF inputs) to the farmers at subsidy prices or free through SHG's, NGO's and FPO's at village level, while the natural fertilizers are very low cost, so the government has no financial burden.
9. The government should allocate separate fund from the budget to promote ZBNF farmers in the state.

EVALUATION OF ZERO BUDGET NATURAL FARMING (ZBNF) INITIATIVES IN ANDHRA PRADESH

CHAPTER - I

1.1. Introduction:

Andhra Pradesh is a leading agrarian state of India. It is the seventh largest in area and tenth most populas state in India. The geographical area of the state is about 162.87 lakh hectares. According to 2011 census the population of the state was 4.96 crore and the literacy rate stands at 67.41 percent (Separate Andhra Pradesh). Agriculture is the main occupation of the people of the state. It is known as India's "Rice Bowl" on account of its tracts of irrigated paddy cultivation within the basins of the Godavari, Krishna and Penna rivers. Across the state, 62 percent of population is employed in agriculture and allied activities, cultivating around 80 lakh hectares of cropped area and generating over a quarter of the states' GDP. The major source of irrigation is ground water followed by canals. Rice is the major food crop and staple food in the state. Besides rice, farmers also grow groundnut, cotton, jowar, bajra, minor millets, coarse grain and many varieties of pulses, oilseeds, sugarcane, chilli, pepper and tobacco. The state is the largest producer of fruits and vegetables. 14 lakh hectares of area is covered under horticultural crops. The state is made up two major regions Rayalaseema and Coastal Andhra Pradesh, and has a total of thirteen administrative districts; nine is the coastal and four in Rayalaseema regions. The seacoast of the state extends along the Bay of Bengal from Srikakulam district in the north to Nellore district in the south. It has the second largest coast line of India.

1.2.Need and Scope of the Study:

Until 1950's Indian agriculture was organic with no use of chemical fertilizers and pesticides. During those days the nation was facing poverty due to acute shortage of food grains and depended on grain imports. After 1960's Indian farmers were encouraged through Green Revolution with various incentives, to practice chemical farming, using High Yielding Variety seeds (HYV) fertilizers and pesticides..

During 1990's similar strategies were employed to propagate genetically modified (GM) and proprietary cotton promoted by US Agri business Corporation (MONSONTO). In the subsequent years various methods were employed in promoting to gene revolution. All these efforts led to increase in cost of cultivation. This consequently regulated in increased debt burden on farmers. These are the causes for farmers suicides across the country.

In Andhra Pradesh state increased cost of cultivation, debts from private money lenders, irregular rainfall, excess use chemical and fertilizers all these resulted in fall in farmers income and contributed to unprecedented suicides among farmers in the state. According to a Report by the National Crime Records Bureau (NCRB) 3.5 lakh farmers committed suicides in Andhra Pradesh during 1999-2015. In addition farmlands are reporting high soil toxity due to the excess use of pesticides and fertilizers, thus jeopardizing public health. After all these harmful effects of chemical farming, the transition of the entire state to natural farming is welcome and the newly introduced technique among farmers is Zero Budget Natural Farming (ZBNF). It has attained wide success in Southern India, and has been spreading all over India.

1.3. Zero Budget Natural Farming in Andhra Pradesh (APZBNF):

Zero Budget Natural Farming (ZBNF) is a unique chemical free method that relies on agro ecology. It was originally promoted by noted agriculturist Subash Palekar, who developed it in the mid-1990s. The ZBNF method does not need monetary investment for purchase of inputs like seeds, fertilizers and plant protection chemicals and no institutional credit would be required. Besides dependence on hired labour is reduced. He argued that the rising costs of external inputs like fertilizers, pesticides were leading to indebtedness and suicides among farmers. ZBNF makes the farmer self-reliant, so that he would be free from the clutches of money lenders. Climate Resilent Zero Budget Natural Farming (CRZBNF) was initiated in 2014 with the establishment of Rythu Sadhikara Samastha (RySS), a fully government owned not for profit organization. ZBNF is proposed to cover all 6 million farmers and eight million hectares of agricultural land in the state by 2024. The Programme aims to promote Climate-Resilient, Chemical free, ecological agriculture and provides small and marginal farmers with profitable livelihoods from agriculture.

1.4. Review of Literature:

U.N. Environment's Executive Director ERIK SOLHELM stated that the Zero Budget Natural Farming (ZBNF) is an unprecedented step towards sustainable agriculture on massive scale and the "kind of bold change we need to protect the climate, bio-diversity and food security". He noted that it is a better deal for farmer's consumers and the planet". SUNNY VERGHESE, Chair World Business Council for Sustainable Development said that ZBNF creates the social capital, which is necessary for a vibrant and inclusive agricultural

production by establishing farmers federations and Self-Help Groups (SHGs) and placing farmers at the fore front of knowledge creation and dissemination.

According to the study team of the United States Department of Agriculture (USDA) reported organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, harmones, feed additives etc.,) to the maximum extent feasible. Organic farming systems rely upon crop rotations, crop residues, animal manure, off-farm organic wastes.

Palekar's teaching initially received a mixed response from farmers, until early adopters began show casing success to peers. Training workshops increased in number and size with an estimated 200 work shops having been organized over the last 15 years in Karnataka state (Khadre & Rossat, 2019) The state government of Himachal Pradesh and Karnataka have since allocated funds to support the spread of ZBNF and the state government of Rajasthan, Meghalaya and Gujarat have all expressed an interest in setting up programmes for ZBNF. The accurate number of farmers who adopted ZBNF is not available. In Karnataka for example, an estimated 60,000 to 1,00,000 farmers have attended 60 training camps organized over the last decade (ZBNF leader cited in Khadre et.al 2017).

Vijay Kumar Thallam et.al 2009 noted that in the early 2000s small farmers in Andhra Pradesh (those cultivating<2 ha) were spending 35% of their cultivation expenditure on synthetic pesticides and fertilizers (against national acreage of 30%) (Government of India 2005) First the high expenditure on synesthetic inputs is a key driver of indebtedness in the early 2000s. Small farmers in Andhra Pradesh earned just $154 annually from agriculture and related sources (with an average annual income of $440 and average expenditure of cultivation of $268 and as an average outstanding loan of $660 per farmer. (more than twice) with the national average of ($280) (Centre for Economic and Social Studies 2007).Second, this model of farming came with a high ecological foot print with the state recording amongst the highest rates of consumption of synthetic pesticides in India, with application rates of 0.87 kg./ha (against a national average of 0.3 kg/ha.). Responding to all these challenges, farmers began experimenting with alternative methods. The change was brought about by the Society for Elimination of Rural Poverty (SERP) a non-profit organisation set up by the government of Andhra Pradesh. The RYSS estimates that around 80,000 farmers have been practising ZBNF in the state (2019)

Kavitha Kuruganti of the Alliance for Sustainable and Holistic Agriculture (ASHA) emphasised that focus on natural farming and action against pesticides are complementary. These efforts are most effective together. The A.P Government hopes to spread knowledge about ZBNF from farmers to fellow farmers. A farmer will only shift to natural farming when he or she sees a fellow farmer practicing it successfully "said KORUGANTI".

According to the Net Work Project on Organic Farming (NPOF) being run by ICAR, 18 crops resulted in higher yield under organic systems after the conversion period of (2-3 years). So, the NPOF results (2013-14) cover 20 centres in 16 states. Organic farming increased the yield for example in Sikkim where the productivity of rice rose from 1.43 tonne/hectare to 1.81 tonne/hectare. No yield reduction was observed during the conversion period. Productivity increased by 11%, 17% and 24% in maize, finger millet and buck wheat respectively.

Kapil Shah and Bharat Mansata – 2019 stated that Sri Bhaskar Save, the globally honoured visionary farmer from Gujarat, started experimenting and progressively adopting the natural way of farming from 1956. He thought the organic matter in the soil should be enhanced to build optimum carbon level and avoid soil erosion. This would also reduce the need for irrigation. The very first National gathering of promoters and practitioners of organic farming in India was held in Ghandiji's Sewagram in March 1981. During the years between 1980-1995. The outstanding personalities in India like G. Nammalwar in Tamilnadu, Pratap Agarwal and Rajutitus in M.P, Shoorvir Singh in U.P., M.S. Dash Pande, Dr. Dabholkar and Pandurang Shitole in Maharashtra, Dhirendra Soneji in Gujarat, Narayana Reddy and Suresh Desai in Karnataka and so many others had already adopted eco-friendly, chemical free, sustainable farm technologies. They shared their knowledge freely with generous, compassionate spirit without claiming superiority over others.

Andhra Pradesh state Chief Minister Shri Y.S. Jagan Mohan Reddy garu (2019) conveyed this information ZBNF is being launched as it promises to end reliance on loans and drastically cut production costs, ending the debt cycle of desperate farmers.

The states of Karnataka and Andhra Pradesh have adopted ZBNF prominently studies show that a variety of social and economic benefits follow from ZBNF and a majority of respondents reported that by adopting ZBNF, over time they saw improvements in yield, soil

conservation, seed diversity and quality of produce, household food autonomy, income and health, besides reduced farm expenses and reduced need for credit.

KHADSE et.al (2017) in their survey of 75 farmers in Karnataka found that ZBNF farmers comprised 28.9% in the small farmers (<2 ha.) 43.3% in the medium farmers (2-10 ha.) and 27.8% large farmers. The majority had access to some form of irrigation and 68% owned a cow. None of the farmers were absentees. However, the ZBNF movement did not make any special efforts to reach marginal or landless farmers aside from waiving of the fees for training camps. One ZBNF leader admitted that it is difficult for a marginal farmer to leave their farm for five days for training. The survey found that 85% reported improved income, 90% reduced production costs. 92% reported reduced need for credit, 91% reported improved quality of produce and 78% of reported improved yield in Karnataka. In the case of Andhra Pradesh, the government extension model is based on group approaches through Self-Help Groups (SHGs) and claims to be putting a special emphasis on groups of landless and women farmers.

"When health is absent, wisdom cannot reveal itself, art cannot manifest strength cannot fight, wealth becomes useless and intelligent cannot be applied". The above quote isself explanatory that health comes for most in our lives but today the issue regarding general health of humans is terrible. Our daily life style has worked as a fuel for the fire that is burning our body with diseases. Latest reports from WHO points that more than 50 percent of eatables have chemicals which are carcinogenic in nature (Prasad 2016). Pesticides used to enhance the crop growth are known to mutate the human chromosomes but still they are used rapidly in more than enough quantities.

According to Ruchiob Bishine and Akshya Bhati Review paper the ZBNF is not using conventional techniques in agriculture which are like cancer to our soil and health as well. It does not only make the soil barren but ultimately leaves farmers in debt. Privatized seeds, inputs and markets are inaccessible and expensive for peasants. Indian farmers are increasingly finding themselves in a vicious cycle of debt, because of high production costs, high interest rates for credit, and the volatile market prices of crops. Therefore they choose suicides. Debt is like a leach for farmers of all sizes in India, under such conditions Zero Budget Natural Farming (ZBNF) promises to end reliance on loans and to drastically cut production costs. Zero Budget means without using any credit and without spending any money on purchased inputs, Natural farming is farming with nature without chemicals.

Zero Budget farmers use mulching, soil protection technology, natural pesticides and fertilizers. The principal methods of ZBNF include crop rotation, green manures and compost, biological pest control and mechanical cultivation. These are most popular, 4 pillors of ZBNF i.e. Jeevamrila, Bijumrika, Achadana and Whapsa. The credit for launching ZBNF should go in Subash Palekar.

Andhra Pradesh state Tobacco Boards 148th Annual meeting was held in Guntur under the chairman of Shri Y. Raghunath babu, The chairman said the Board would encourage ZBNF and the growers would be encouraged to use this system to cultivate tobacco. The ZBNF farmers reported to heavly increased the yield and quality through this method. (The New Indian Express, 22nd August 2019 daily.)

Application for Chemical fertilizers, pesticides have boomed in the agricultural land after Green Revolution. The average consumption of fertilizers increased from 106kg/per hectare in 2005-06 to 128 kg/ha in 2012-13. While the recommended ratio of use of NPK fertilizers is 4:2:1, this ratio in India is currently at 6.7:2.4:1. Overuse of urea is especially observed in the states of Punjab, Haryana and Uttar Pradesh. The Committee observed that currently 292 out of 525 districts (56%) in the country account for 85% of its fertilizers use and chemical pesticides increased from 55,540 tonnes in 2010-11 to 57,353 tonnes in 2014-15. An imbalanced use of fertilizers may lead to loss of fertility in the soil over a period of time, affecting productivity. These pesticides and chemicals are suspected to cause many health disorders. So the ZBNF is the best practice of Indian farming community.

According to Economic Survey Reports 2018-19, more than 1.6 lakh farmers are practicing the ZBNF in almost 1000 villages using some sort of state support. The original pioneer was Karnataka Rajya Raitha Sangha. Large scale training camps were organized to educate farmers in the method. A survey carried out in those early years showed that ZBNF farmers all owned small plots of land, had some access to irrigation and owned at least one cow of their own. Andhra Pradesh, Himachal Pradesh, Chattishgarh, Kerala and Uttar Pradesh have also invited Dr.Palekar to train their farmers. In June 2018, Andhra Pradesh rolled out an ambitious plan to become India's first state to practice 100% Natural Farming by 2024. It aims to phase out chemical farming over 80 lakh hectares of land, converting the states 60 lakhs farmers to ZBNF methods. (Hindu daily July 28, 2019.)

According to National Sample Survey Office (NSSO) almost 70% of agricultural households spend more than they earn and more than half of all farmers are in debt. In states such as Andhra Pradesh and Telangana, levels of indebtness are around 90%, where each household bears an average debt of 1 lakh. In order to achieve the Central government's promise to double farmers income by 2022, one aspect being considered is natural farming methods such as the Zero Budget Natural Farming (ZBNF) which reduce farmers dependence on loans to purchase inputs. Meanwhile, inter cropping allows for increased returns. A limited 2017 survey in Andhra Pradesh claimed a sharp decline in input costs and improvement in yields. (The Hindu, July 28, 2019.)

NABARD chairman H.K. Bhanwala said that the Zero Budget Natural Farming (ZBNF) can help ease rural distance. The movement will help millions of farmers cut down their input costs and practice sustainable agriculture. The proposal to revive Zero budget farming is a well thought out plan as it can help millions of farmers bring down their input costs and follow sustainable farming. This initiative will help mitigate the rural distress to a great extent. The Bhanwala said NABARD has been propagating collectivisation of farmers through farmer producer organizations, as it allows them to get collective bargaining power in buying inputs and selling their produce.

About 59% of Indian soils are low in available Nitrogen. About 49% are low in available phosphorus, and about 48% are low or medium in available potassium. Indian Soils are also varyingly deficient in micro nutrients, such as Zinc, Iron, Manganese, Copper, Molybdenum and boron. Micro Nutrient deficiencies are not just yield-limiting in themselves. They also disallow the full expression of other Nutrients in the soil leading to an overall decline in fertility. In some regions soils are saline; In other regions soils are acidic due to nutrient deficiencies or aluminium, Manganese and Iron toxicities. In certain other regions, soils are Toxic due to heavy metal pollution from industrial and municipal wastes or excessive application of fertilization and pesticides. On the other part agricultural scientists suggest that soil test based balanced fertilization and Integrated Nutrient Management (INM) methods. According to Dr.Palekar 98.5% of the nutrients that plants need is obtained from air, water and sun light. Only 1.5% from the soil,. He makes these nutrients available to the plants by increasing the population of soil micro-organism through Jivamrith with cow urine. He found that there is a self-developing, self-nourishing and totally self-reliant natural system in the forest by which all the vegetation and eco-system exit without any human existence".

The Prime Minister Shri Narendra Modi garu addressed to the UN 14th conference of parties (COP14) in greater NOIDA. This key massage was to reduce consumption of chemical fertilizers, and promote Zero Budget Natural Farming (ZBNF). The India Council of Agricultural Research (ICAR), studied the possible impact of ZBNF on yield of major crops like wheat and rice, in comparison of chemical fertilizer based farming. It needs to do large scale testing in different regions to see the nation wide implications of ZBNF on overall production of major crops.

Mahendra Dev, Director, Indira Gandhi Institute of Development Research (IGIDR) – expressed that the Natural farming could be difficult to replicate the income model on a large scale. It can be one of the models to double farmers income but not the only solution, as yield grows through ZBNF over a long period in comparison to conventional methods. More tests and studies in various Agro-climatic zones need to be done before any firm plan is made for a nation wide push", else it could be counter productive he said" Ram Koundinya, Director General of the Federation of Seed Industry in India sated that there need to be a scientific evaluation of the sustainability of ZBNF, on its impact on yields and whether it can be scaled up to cover 140 million farmers. He expressed that every technology has its own place where it gives best results. ZBNF has its own place but it needs to be evaluated first, where it can be scaled up. Also, if this technique is so attractive, why it is confined to a few farmers for so long he asked. (Business, July 30, 2019).

1.5. Objectives:

1. To study the trend rates of growth in Area, production and yield of paddy and cotton crops in the state during 1999-2000 to 2018-19.
2. To study the progress of Zero Budget Natural Farming (ZBNF) scheme in the state during 2015-16 to 2019-20.
3. To discuss the initiatives of ZBNF scheme in the state from 2015-16 to 2019-20.
4. To study the household characteristics, cost of cultivation, yield and net income of paddy and cotton crops under ZBNF and Non-ZBNF sample farmers in selected districts of the state.

1.6. Reference period of the study: 2019-20

1.7. Methodology:

The study is based on both primary as well as secondary data. The secondary data was mainly collected from the office of Zero Budget Natural Farming (ZBNF) which is being implemented by Rythu Sadhikara Samstha (RySS) Department of Agriculture, Government of Andhra Pradesh located in Guntur various issues of Seasonal and Crop Reports and Statistical Abstracts of Andhra Pradesh published by Directorate of Economics and Statistics, Government of Andhra Pradesh, Amaravathi, Agriculture Action Plan 2018-19; District Hand Book of Statistics of selected districts and Rythu Sadhikara Samstha (RySS) Publications Department of Agriculture, Government of Andhra Pradesh (web: apzbnf.in.)

Primary data was collected through a structured questionnaire. Out of 13 districts in the state the study covers two districts Kurnool and Vizianagaram for household survey. The criteria for selection of sample districts was based on two different regions in the state. Kurnool district was taken from Rayalaseema and Vizianagaram district was selected from coastal Andhra region of the state. From Kurnool district two mandals were selected and in each mandal two villages were selected for household survey. In the same way, four villages were selected from two mandals in Vizianagaram district. The study selected two important crops namely Paddy and Cotton. The selection of sample districts, mandals, villages and sample crops were selected with the co-ordination of Dr. C.P. Nagireddi garu, Senior Consultant of State level ZBNF Office, Guntur in Andhra Pradesh. The total sample in each district was one hundred (100). In each sample district 25 paddy and 25 cotton growing farmers were – a total 50 farm households were selected from ZBNF farmers and in the same way 25 paddy and 25 cotton farmers were selected from Non-ZBNF farmer household in each district. So the total sample size of two districts was 200 households. The sample mandals, villages and households were selected by the District level ZBNF officials of the sample districts and the ZBNF and Non-ZBNF households were selected by the District Project Managers (DPM) of the sample districts. The sample has broadly drawn in four standard farm size classes viz., marginal upto 2.5 acres small 2.5 to 5 acres, medium 5 to 10 acres and large above 10 acres. The study sample covered all the sections of the society such as marginal, small, medium and large and all social categories of general category,OBC, SC and ST farmers including women categories.

1.8. The Sample Design:

Table 1.1 presents the details of sample districts, mandals, villages, selected crops and number of households for field survey. Both ZBNF and Non-ZBNF sample households

were taken from two villages from each mandal. From each sample village an appropriate number of farmers representing different farm categories were chosen for household survey. The proposed sample design focused on two major crops Paddy and Cotton.

Table 1.1

Details relating to sample farmers

S.No.	Name of the District	Name of the Mandal	Name of the Village	Crop	ZBNF/Non-ZBNF	M	S	M	L	T	District Total
1	Vizianagaram	1. Parvathipuram	1. Antivalasa	Paddy	ZBNF	8	8	8	1	25	100
			2. Pultur		Non-ZBNF	8	8	8	1	25	
		2. Pachepenta	1. Kudumuru	Cotton	ZBNF	9	7	8	1	25	
			2. Bobbilivalasa		Non-ZBNF	8	8	8	1	25	
2.	Kurnool	Panyam	1. Bhupanapadu	Paddy	ZBNF	8	8	8	1	25	100
			2. Balapanur		Non-ZBNF	8	8	8	1	25	
		Midhuru	Chowtkur	Cotton	ZBNF	8	8	8	1	25	
			Gilakanur		Non-ZBNF	8	8	8	1	25	
Grand Total:											200

Source: Primary Data

1.9. Plan of the Study:

The report has been divided into five chapters, the first chapter presents the Introduction, Need and scope of the study, Review of literature, Objectives, Methodology used for selection of crops, districts, mandals, villages, sample sizes and organisation of the report.

The Second chapter presents macro view of paddy and cotton crop area, production and productivity of Andhra Pradesh state and thirteen districts. For the selected crops of paddy and cotton growth rates of CAGR of area, production and productivity were estimated and discussed at the state level for the period 1999-2000 to 2018-19. Moreover district wise paddy and cotton crops of area, production and productivity were estimated for all thirteen districts CAGR for the sample districts growth rates were analysed for two sub periods (1999-2000 to 2008-09 and 2009-10) and the total period (1999-2000 to 2018-19).

Chapter three discusses the progress of Zero Budget Natural Faming (ZBNF) in Andhra Pradesh, since 2016 through secondary data. Dr.Subash Palakar Zero Budget Natural Farming (ZBNF) practices, (1) Bijamrutha (2) Jivamrutha (3) Acchadana (4) Whapasana and pest management controls of 1. Agriasta 2.Brahmastra and Neemastra were studied. The chapter also presented the assessments of crop yields, costs and

incomes made by RySS and CESS. The budgetary support for implementation of ZBNF in the state during 2015-16 to 2020-21 is also to be found in the chapter.

Forth chapter presents the government's initiatives and existing human capital engaged in ZBNF scheme implementation. Details on average cost structure for promoting ZBNF programme of each farmer and the total village are also noted. The status of selected districts in respect of ZBNF area, crops covered and budgetary expenditure has also been discussed and new initiatives are also discussed.

Chapter five deals with the Socio-Economic characteristics of sample households, operational holdings, irrigation, and production cost and returns between the ZBNF and Non-ZBNF sample farmers over the size groups. Further assessments were made of the yield, cost and net incomes of paddy and cotton crops under ZBNF and Non-ZBNF sample households in study districts of Vizianagaram and Kurnool in the state.

Chapter six puts together Summary and Conclusions of the report.

CHAPTER – II

GROWTH RATES OF PADDY AND COTTON CROPS IN ANDHRA PRADESH (1999-2000 TO 2018-19)

This chapter discusses growth rates (CAGR) of area, production, yield of paddy and cotton crops in all 13 districts and the state of Andhra Pradesh. The details are presented for three periods, consisting of two sub periods (1999 - 2000 to 2008-2009 and 2009- 10 to 2018-19) and total period (1999 -2000 to 2018-19). The Compound Annual Growth Rates (CAGR) of area, production and yield of paddy and cotton crops of all thirteen districts and the state are estimated.

2.1 Introduction:

Agriculture is the chief source of income to the state economy. Andhra Pradesh is agrarian character and is considered as one of the most progressive states with respect to agriculture development. The dominant crops in Andhra Pradesh are rice, cotton, groundnut, jowar, maize, green gram, black gram and red gram. Among Indian states Andhra Pradesh is one of the leading rice producers accounting for 12% of total production and occupies 3rd position (123.51 lakh tonnes) in India. Rice crop is cultivated in all most all 13 districts of the state. Out of total area of 22.08 lakh hectares 56.80% area is under paddy alone followed by chillies 5.4%, Maize 5.2 %, Sugarcane 4.7%, Groundnut 3.5% and Cotton 2.8%. The paddy crop is predominantly grown in the districts of West Godavari, East Godavari, Krishna and Srikakulam.

On the other hand Cotton is one of the important commercial crops grown in the state and some of the districts have large area under black soil which is suitable for cotton crop. The Rayalaseema region is a part of the state consisting of Kurnool, Kadapa, Ananthapur and Chittoor districts andit heavily depends on rainfall. Mostly Cotton and horticultural crops are grown hear. So cotton is the second important crop for which we estimated the Compound Annual Growth Rates (CAGR) of area, production and productivity.

Table -2.1
Compound Annual Growth Rates (CAGR) of paddy crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Tonnes & yield in Kg/Ha)

S. No	Years	Paddy Crop		
		Area	Production	Yield
1	1999-2000	26.34	73.62	2795
2	2000-01	26.95	80.41	1651
3	2001-02	25.15	78.24	2085
4	2002-03	18.67	53.15	1519
5	2003-04	19.57	60.54	2622
6	2004-05	22.28	73.93	2332
7	2005-06	25.21	72.89	2251
8	2006-07	24.91	76.16	2887
9	2007-08	25.78	88.80	3682
10	2008-09	26.96	88.81	3371
11	2009-10	23.26	75.69	2930
12	2010-11	27.72	118.24	2843
13	2011-12	23.46	116.16	3301
14	2012-13	22.09	102.94	4660
15	2013-14	25.83	119.90	4641
16	2014-15	23.94	126.83	5298
17	2015-16	21.61	112.33	5198
18	2016-17	21.05	120.04	5702
19	2017-18	22.18	126.91	5722
20	2018-19	22.08	123.51	5593
1999-2000 to 2008-09 (CAGR)		**0.53**	**2.05**	**6.05**
2009-10 to 2018-19 (CAGR)		**-1.64**	**3.26**	**8.42**
1999-2000 to 2018-19 (CAGR)		**-0.37**	**3.86**	**6.32**

Source: Various issues Statistical Abstracts, Government of Andhra Pradesh.
CAGR**:** Compound Annual Growth Rate.

2.2. Growth Rates of Paddy crop in Andhra Pradesh:

Paddy is the principal crop and extensively cultivated in all 13 districts in the state. It is a food grain crop and staple food in the state. The crop is irrigated, grown in kharif and Rabi seasons. The cropped area has been declining due to adverse seasonal conditions during south west monsoon period. On the other hand, the production and productivity of Paddy are fluctuating every year but an increasing trend was observed due to extension of irrigation facilities and High Yielding Variety Seeds (HYVS) etc., Table 2.1 shown the time series data of area, production and productivity of paddy crop and estimated Compound Annual Growth Rates (CAGR) in two sub periods 1999-2000 to 2008-09 and 2009-10 to 2018-19 and the total period 1999 2000 to 2018-19 of the state (20 years period). The cropped area has declined over time from26.34 ha in 1999-2000 to 22.08 ha in 2018-19. On the other hand production has increased

from 73.62 lakh MT to 123.91 lakh MT due to increase in productivity during the study period from 1999-2000 to 2018-19 of this state. The yield growth doubled during our study period. The increasing productivity is due to extension of irrigation facilities, use of High Yielding Variety (HYV) seeds and subsidies on fertilizers and pesticides etc. Further the study estimated Compound Annual Growth Rates (CAGR) of Paddy area, production and productivity for the three periods. The first period (1999-2000 to 2008-09) showed a significant growth of all estimated components area 0.53% percent, production 2.05 % and productivity 6.05 %. The second period reported a growth Rate in 3.26% production and yield in 8.42%, but the area growth rate is found to be negative at -1.64 %. Further the total period area growth rate was negative -0.37% and the production and productivity reported positive growth rates at 3.86% and 6.32% of the State.

2.3 Growth Rates of cotton crop in Andhra Pradesh:

Cotton crop stands in the third place in terms of area and production over the past two decades. It is an important fibre crop grown in the kharif season in Andhra Pradesh. Table 2.2 presents the time series data (1999 2000 to 2018-19) of area, production and productivity of cotton. The table indicates that the cotton area was the highest at8.21% lakh hectares in the year 2014-15. It slighty declined to6.20 lakh hectares in the year 2018-19. On the whole the area under cotton crop has increased from 3.77 lakh ha to 6.20 lakh hectares between the year 1999-2000 and 2018-19. The production and productivity have been fluctuating widely over the years because it was cultivated under un-irrigated lands.

Table -2.2
Compound Annual Growth rates (CAGR) of Cotton crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Lint & yield in Lint/Ha)

S. No	Years	Cotton Crop		
		Area	Production	Yield
1	1999-2000	3.77	5.47	248
2	2000-01	3.91	6.48	298
3	2001-02	3.47	7.28	378
4	2002-03	2.55	3.89	275
5	2003-04	3.15	8.15	466
6	2004-05	4.39	10.19	417
7	2005-06	3.14	6.94	387
8	2006-07	2.42	6.89	499
9	2007-08	2.77	10.11	639
10	2008-09	3.07	10.28	586
11	2009-10	3.07	8.95	510
12	2010-11	3.81	8.55	381
13	2011-12	4.73	8.88	319
14	2012-13	5.89	15.43	445
15	2013-14	6.77	21.88	550
16	2014-15	8.21	27.51	570
17	2015-16	6.66	18.17	464
18	2016-17	4.72	15.64	563
19	2017-18	6.46	20.88	549
20	2018-19	6.20	14.91	408
1999-2000 to 2008-09(CAGR)		**-3.09**	**6.34**	**9.32**
2009-10 to 2018-19(CAGR)		**6.40**	**8.72**	**2.15**
1999-2000 to 2018-19(CAGR)		**4.37**	**7.28**	**2.58**

Source: Various issues Statistical Abstract, Government of Andhra Pradesh.

CAGR: Compound Annual Growth Rate.

Compound Annual Growth Rates (CAGR) of area, Production and Productivity were estimated for three periods. The first period (1999-2000 to 2009-10) the Compound Annual Growth Rate (CAGR) of Area witnessed a negative growth of -3.09 %, whereas the growth rate of production and productivity growth was found to be 6.34 % and 9.32 % respectively. In The second period (2009- 10 to 2018-19)Compound Annual Growth Rate (CAGR) reported positive trends in area(6.40%), production (8.72%) and productivity (2.15%). The trend growth rate for the total period (1999-2000 to 2018-19)was 4.37 % for area, 8.72% for production and 2.85% for productivity in the state.

2.4District wise growth Rates(CAGR) of paddy crop in Andhra Pradesh:

The selection of sample districts was made by the Dr.C.P.Nagi Reddy senior consultant, Andhra Pradesh Zero Budget Natural Farming (APZBNF) at Guntur in Andhra Pradesh. Out of 13 districts two districts were selected Vizianagaram from coastal Andhra Pradesh and Kurnool district from Rayalaseema region. The sample crops were paddy and cotton. Compound Annual Growth Rates (CAGR) were estimated and presented for all 13 districts in the state for a 20 years period.

VIZIANAGARAM:

Table 2.3 presented the time series data of paddy crop for all 13 districts of the state from 1999-2000 to 2018-19. Compound Annual Growth Rates of area, production and productivity of paddy crop has been estimated for all districts of the state. The growth trends (CAGR) of paddy crop were estimated for sample districts of Vizianagaram and Kurnool and the estimates were made for three periods. The first period was from 1999-2000 to 2008-09 the second period from 2009-10 to 2018 19 and the third period from 1999-2000 to 2018-19. Among 13 districts, paddy area production and productivity was the highest at 3.9 lakh hectares 26.17 lakh tonnes and 6594 kg per hectare respectively in West Godavari district in the year 2018-19.In Vizianagaram, the paddy area was the highest at 1.34 lakh hectares in 2010-11 but the area has slightly declined to 1.25 lakh hectares in 2018-19. But the production and productivity show an increasing trend over a period of 20 years in the district. The highest production and productivity were reported to be 5.77 lakh tonnes in 2017-18 and4556 kg/ha in 2016-17.

Table2.3 shows the growth rates of area, production and productivity of paddy for the three different periods in Vizianagaram district. The estimates of CAGR of paddy growth rates of area production and productivity were 0.02%, 4.60% and 4.38% in the first period. Where as in the second period growth rate of paddy area was slightly increased 0.69% but the growth rates of production and productivity reported significant positive trend at 8.85% and 8.17%. Further the third period growth rate of production was at 5.29%, growth rate of area was 0.47% and that of productivity was 4.78% in Vizianagaram district. The growth rates of area, production and productivity were positive due to extension of irrigation facilities, input subsidies, availability of HYV seeds etc.,

KURNOOL:

Area under paddy in Kurnool district slightly increased from 0.94 lakh ha.to1.10 lakh ha. during the period. The paddy production increased significantly from 2.61 lakh tonnes to 6.31 lakh tonnes and productivity from 2821 kg/ha to 5746 kg/ha. The paddy area was the highest at 1.37

lakh ha in 2010-11 and the production and productivity were 6.52 lakh tonnes and 6000 kg/ha in the year 2016-17. The study estimated Compound Annual Growth Rates (CAGR) of area, production and yield under paddy crop in Kurnool district. The growth rates (CAGR) were 2.85% for area 8.47% for production and 5.50 % for productivity in the first period. The second period growth rate was found to be negative -2.87% while production and productivity reported to be positive growth rate at 4.75 % and 7.64%. The third period shows that there is positive trend in area production and productivity 1.66%, 6.17% and 4.47% respectively in Kurnool district.

The positive trends were observed in case of production and productivity in all 3 periods under paddy in Kurnool district due to use of High Yielding Variety (HYV) seeds, extension of irrigation facilities and availability of HYV seeds.

2.5 District wise Growth rates of cotton crop in Andhra Pradesh:

VIZIANAGARAM:

In Andhra Pradesh cotton is the third largest crop in terms of area cultivated in the Kharif season. Time series data was presented for all districts in Andhra Pradesh for twenty years (1999-2000 to 2018-19). Table 2.4 presented time series data for all 13 districts. Among the 13 districts of the state Kurnool district reported highest cotton area of 2.59 lakh hectares in 2018-19 followed by Guntur and Krishna districts. The study estimated the Compound Annual Growth Rates (CAGR) area, production and productivity of cotton. The growth rates were estimated for the three periods 1999-2000 2008-09, 2009-10-2018-19 and 1999-2000 to 2018-19. For the sample district of Vizianagaram growth trends of area, production and productivity were found to be negative i.e., -3.74 %, -14.50 % and -10.16 % in the first period (1999-2000 to 2008-09). Whereas in the second period (2009-10 to 2018-19) area, production and productivity reported positive rate 2.95%,10.21% and 7.12%. Further the total period 1999-2000 to 2018-19 the cotton area, production and productivity growth rate found to be positive 0.40%, 2.13% and 1.70% respectively.

Table -2.3

District wise Compound Annual growth rates (CAGR) of paddy crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Tonnes & yield in Kg/Ha)

DISTRICT/ YEAR	SRIKAKULAM			VIZIANAGARAM			VISAKHAPATNAM			EASTGODAVARI			WESTGODAVARI			KRISHNA			GUNTUR		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1999-00	1.90	3.29	1809	1.34	2.58	1990	1.06	1.45	1386	4.06	12.74	3276	4.60	14.66	3274	4.06	12.92	3278	3.18	10.22	3316
2000-01	2.09	4.01	1923	1.32	2.20	1668	1.18	1.90	1608	4.17	13.67	3279	4.72	16.53	3504	3.94	12.77	3239	3.06	10.37	3393
2001-02	1.80	3.97	2203	1.10	2.10	1904	0.90	1.53	1690	3.87	13.30	3440	4.14	14.73	3557	3.44	10.73	3123	3.17	11.16	3517
2002-03	1.54	2.69	1750	0.95	1.17	1237	0.64	0.64	1007	3.01	10.43	3462	3.32	11.66	3515	2.46	7.67	3116	2.06	6.54	3181
2003-04	1.90	4.26	2239	1.13	2.39	2114	0.89	1.45	1632	4.00	16.32	4079	4.10	16.80	4095	2.30	5.46	2375	1.76	5.00	2836
2004-05	1.93	4.54	2354	1.28	2.95	2315	0.98	1.64	1682	3.87	15.10	3897	4.20	16.50	3928	2.55	8.36	3276	2.62	9.05	3458
2005-06	1.58	2.82	1785	0.98	1.41	1434	0.89	1.32	1490	3.87	11.50	2967	4.46	13.63	3057	3.59	11.07	3080	3.20	10.04	3135
2006-07	1.97	4.99	2528	1.18	2.83	2392	0.96	1.83	1915	3.99	13.94	3492	4.34	15.57	3587	3.46	8.77	2532	3.18	8.85	2786
2007-08	2.03	6.19	3045	1.26	3.69	2917	0.99	2.01	2024	4.11	15.19	3697	4.45	16.39	3681	3.55	12.99	3659	3.07	10.61	3453
2008-09	2.06	4.15	2014	1.31	3.12	2388	1.02	1.72	1689	4.10	15.13	3690	4.50	16.00	3553	3.95	14.27	3618	3.33	11.47	3446
2009-10	1.80	3.78	2104	1.08	2.39	2209	0.68	0.74	1076	3.07	10.73	3500	3.29	11.15	3394	3.37	12.09	3592	3.03	10.67	3522
2010-11	2.13	1.84	865	1.34	3.49	2611	1.18	2.02	1716	4.11	13.08	3185	4.57	14.90	3265	3.55	10.91	3069	3.29	8.52	2585
2011-12	2.10	4.04	1919	1.25	2.68	2149	1.12	1.70	1514	3.37	11.77	3491	3.64	13.08	3597	2.72	10.12	3719	2.93	11.20	3825
2012-13	2.09	5.29	2533	1.26	3.21	2551	1.04	1.52	1463	4.01	11.02	2748	4.23	12.89	3052	2.65	9.51	3593	1.83	6.38	3483
2013-14	2.03	3.55	1749	1.17	2.91	2491	1.05	1.85	1752	4.05	12.12	2994	4.21	13.42	3191	3.63	11.76	3235	3.28	10.96	3340
2014-15	2.10	4.48	2130	1.25	3.32	2664	1.05	1.78	1687	3.94	15.63	3966	4.09	16.24	3969	2.88	9.99	3468	2.85	11.12	3897
2015-16	2.07	7.17	3466	1.27	5.60	4419	1.08	3.45	3210	3.82	21.68	5680	4.04	23.38	5789	2.21	11.14	5050	1.63	7.12	4365
2016-17	2.06	9.18	4459	1.25	5.71	4556	1.10	3.70	3365	3.84	24.41	6356	3.99	24.99	6257	2.31	13.47	5819	1.76	11.03	6271
2017-18	2.15	8.15	3795	1.29	5.77	4479	1.09	3.43	3150	3.87	25.09	6491	3.93	25.41	6461	2.59	15.48	5983	2.02	12.79	6318
2018-19	2.15	6.69	3117	1.25	4.41	3540	1.03	2.64	2568	3.86	25.86	6705	3.97	26.17	6594	2.74	17.21	6279	2.47	14.69	5950
1999-2000 to 2008-09	**0.64**	**3.92**	**3.01**	**0.02**	**4.60**	**4.38**	**-0.10**	**3.10**	**3.16**	**0.52**	**1.65**	**0.89**	**0.32**	**0.88**	**0.40**	**0.17**	**0,92**	**0.59**	**1.31**	**1.16**	**-0.32**
2009-10 to 2018-19	**0.95**	**12.60**	**11.66**	**0.69**	**8.85**	**8.17**	**1.94**	**13.00**	**11.14**	**1.28**	**11.15**	**9.87**	**0.56**	**10.07**	**9.49**	**-3.43**	**4.46**	**7.89**	**-5.02**	**3.62**	**8.65**
1999-2000 to 2018-19	**0.94**	**3.67**	**2.66**	**0.47**	**5.29**	**4.78**	**0.92**	**4.48**	**3.53**	**0.008**	**2.85**	**2.79**	**-0.40**	**2.34**	**2.71**	**-1.48**	**1.92**	**3.37**	**1.55**	**1.44**	**2.94**

Contd….

Table -2.3Contd…

District wise Compound Annual growth rates (CAGR) of paddy crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Tonnes & yield in Kg/Ha)

DISTRICT/ YEAR	PRASAKAM			NELLOR			KURNOOL			ANANTHAPUR			YSRCUDDAPA			CHITTOR		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1999-00	1.25	3.20	2632	1.98	5.44	2858	0.94	2.61	2821	0.58	1.51	2626	0.61	1.47	2442	0.75	1.52	2088
2000-01	1.47	4.73	3210	1.88	5.39	2869	1.07	1.86	1741	0.62	1.76	2843	0.68	1.75	2578	0.75	3.46	4593
2001-02	1.47	5.20	3529	2.10	7.06	3354	0.82	2.20	2694	0.71	2.05	2881	0.76	1.95	2575	0.86	2.26	2614
2002-03	0.65	1.51	2310	2.19	6.72	3069	0.59	1.25	2127	0.40	0.87	2168	0.37	0.73	1988	0.50	1.27	2528
2003-04	0.46	1.21	2630	1.55	4.14	2673	0.40	1.12	2830	0.28	0.70	2482	0.34	0.84	2463	0.46	0.85	1863
2004-05	0.94	3.16	3377	1.87	6.33	3392	0.74	2.48	3377	0.34	1.07	3177	0.53	1.61	3060	0.45	1.13	2507
2005-06	1.49	4.85	3248	2.08	7.69	3702	1.09	3.59	3301	0.48	1.26	2608	0.67	1.42	2122	0.83	2.31	2794
2006-07	1.21	4.22	3486	2.42	8.57	3542	0.93	3.07	3295	0.33	0.99	2994	0.47	1.25	2675	0.46	1.28	2762
2007-08	1.28	4.60	3601	2.34	8.57	3654	1.09	3.83	3528	0.44	1.33	2978	0.63	1.84	2942	0.52	1.57	3002
2008-09	1.31	4.82	3671	2.57	9.97	3877	1.11	3.77	3382	0.49	1.44	2964	0.65	1.28	1974	0.56	1.65	2970
2009-10	1.29	4.89	3786	2.67	10.04	3762	1.27	4.14	3271	0.52	1.48	2873	0.65	1.88	2877	0.55	1.70	3098
2010-11	1.57	5.19	3313	2.71	10.06	3712	1.37	3.97	2897	0.60	1.71	2866	0.70	1.30	1841	0.62	1.85	3007
2011-12	1.19	4.27	3603	2.55	10.31	4052	1.07	3.80	3560	0.49	1.20	2467	0.54	1.59	2944	0.51	1.69	3305
2012-13	0.52	1.90	3670	2.51	10.26	4085	0.89	3.37	3765	0.29	0.76	2631	0.31	0.81	2628	0.48	1.71	3608
2013-14	1.39	5.32	3841	2.25	9.11	4051	1.25	4.58	3670	0.40	0.88	2177	0.63	1.78	2843	0.50	1.69	3390
2014-15	1.05	4.06	3855	2.41	9.69	4025	1.15	4.44	3867	0.29	0.83	2825	0.46	1.66	3614	0.41	1.32	3233
2015-16	0.44	2.53	5701	2.88	19.35	6711	0.56	2.57	4630	0.34	1.46	4356	0.40	1.85	4587	0.88	5.02	5693
2016-17	0.40	2.16	5386	2.05	12.98	6341	1.09	6.52	6000	0.23	0.86	3764	0.50	2.48	4937	0.47	2.55	5467
2017-18	0.47	2.72	5752	2.25	15.55	6924	1.02	5.44	5326	0.31	1.30	4190	0.55	2.10	3813	0.65	3.69	5697
2018-19	0.65	3.43	5254	1.67	10.28	6159	1.10	6.31	5746	0.31	1.22	3933	0.46	2.22	4833	0.44	2.40	5454
1999-2000 to 2008-09	**1.02**	**4.18**	**3.03**	**2.80**	**6.36**	**3.33**	**2.85**	**8.47**	**5.50**	**-4.24**	**-2.72**	**1.45**	**-0.08**					
2009-10 to 2018-19	**-12.08**	**-6.38**	**6.14**	**-3.17**	**3.86**	**7.58**	**-2.87**	**4.75**	**7.64**	**-7.82**	**-2.07**	**5.67**	**-2.86**					
1999-2000 to 2018-19	**-3.13**	**-0.20**	**3.55**	**0.87**	**5.19**	**4.26**	**1.66**	**6.17**	**4.47**	**-3.11**	**-1.29**	**1.82**	**-1.03**					

Source: Various issues of Statistical Abstract, Government of Andhra Pradesh.

CAGR: Compound Annual Growth Rates

Table -2.4

District wise Compound Annual growth rates (CAGR) of cotton crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Lint& yield in Lint/Ha)

DISTRICT/ YEAR	SRIKAKULAM			VIZIANAGARAM			VISAKHAPATNAM			EASTGODAVARI			WESTGODAVARI			KRISHNA			GUNTUR		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1999-00	0.02	0.03	281	0.10	0.17	281	0.01	0.02	281	0.04	0.07	281	0.02	0.03	281	0.32	0.52	281	1.39	2.53	308
2000-01	0.02	0.03	340	0.10	0.19	340	0.01	0.02	340	0.06	0.11	340	0.02	0.04	340	0.29	0.64	392	1.25	2.53	363
2001-02	0.02	0.05	470	0.16	0.41	470	0.01	0.03	470	0.06	0.16	470	0.03	0.09	470	0.35	0.78	395	1.26	3.78	539
2002-03	0.02	0.03	320	0.12	0.22	320	0.01	0.02	320	0.05	0.08	320	0.01	0.02	320	0.31	0.58	332	0.99	1.87	341
2003-04	0.02	0.05	536	0.19	0.27	248	0.01	0.04	536	0.09	0.27	536	0.04	0.11	536	0.35	1.05	533	1.39	4.85	629
2004-05	0.03	0.07	512	0.23	0.39	303	0.03	0.09	512	0.16	0.46	512	0.09	0.25	512	0.48	1.38	517	1.78	5.93	600
2005-06	0.03	0.06	424	0.18	0.14	137	0.02	0.04	424	0.14	0.10	128	0.11	0.27	424	0.46	0.88	338	1.53	4.63	529
2006-07	0.02	0.05	538	0.11	0.11	181	0.01	0.03	538	0.09	0.19	376	0.04	0.13	538	0.32	0.85	472	1.33	4.69	619
2007-08	0.02	0.07	705	0.07	0.07	171	0.00	0.02	705	0.08	0.18	410	0.05	0.18	705	0.35	1.15	579	1.50	6.89	806
2008-09	0.02	0.06	629	0.07	0.06	164	0.00	0.01	629	0.07	0.14	334	0.04	0.13	629	0.37	1.32	629	1.66	6.44	677
2009-10	0.01	0.04	562	0.09	0.15	301	0.01	0.02	562	0.07	0.20	502	0.03	0.08	562	0.47	1.41	525	1.51	5.25	606
2010-11	0.03	0.07	397	0.11	0.11	164	0.01	0.03	397	0.12	0.22	311	0.04	0.09	397	0.52	1.18	396	1.70	4.02	414
2011-12	0.06	0.12	376	0.12	0.16	236	0.01	0.03	376	0.13	0.20	265	0.05	0.11	376	0.60	1.23	358	1.63	3.46	373
2012-13	0.10	0.34	592	0.15	0.29	350	0.03	0.10	592	0.17	0.33	338	0.06	0.22	592	0.65	2.09	566	1.87	7.09	662
2013-14	0.10	0.29	513	0.15	0.27	306	0.03	0.08	513	0.22	0.25	199	0.05	0.13	435	0.59	2.25	663	1.93	7.52	681
2014-15	0.10	0.42	771	0.16	0.37	416	0.03	0.13	771	0.22	0.48	371	0.10	0.14	247	0.56	2.62	824	2.06	10.76	912
2015-16	0.09	0.28	554	0.16	0.33	372	0.02	0.04	297	0.21	0.60	512	0.08	0.28	578	0.53	2.01	666	1.98	7.69	679
2016-17	0.07	0.24	590	0.15	0.31	373	0.02	0.02	207	0.13	0.34	463	0.05	0.15	561	0.37	1.59	748	1.42	6.54	807
2017-18	0.07	0.27	641	0.14	0.34	431	0.01	0.02	237	0.16	0.36	382	0.05	0.14	541	0.29	0.64	392	1.84	8.02	764
2018-19	0.05	0.16	503	0.11	0.26	385	0.01	0.02	254	0.12	0.32	451	0.05	0.17	552	0.47	1.74	629	1.77	7.43	715
1999-2000 to 2008-09	**1.54**	**9.04**	**8.05**	**-2.54**	**-10.17**	**-9.68**	**-5.34**	**-0.49**	**8.05**	**6.65**	**5.40**	**-0.18**	**10.54**	**14.93**	**8.05**	**2.00**	**8.17**	**6.55**	**2.78**	**10.93**	**8.24**
2009-10 to 2018-19	**6.60**	**8.48**	**2.64**	**2.60**	**8.35**	**6.35**	**1.61**	**-3.75**	**-7.73**	**3.34**	**7.09**	**2.76**	**3.94**	**6.16**	**2.01**	**-2.02**	**3.52**	**5.51**	**0.90**	**6.09**	**5.39**
1999-2000 to 2018-19	**9.84**	**11.67**	**2.37**	**-0.03**	**1.89**	**1.64**	**2.90**	**2.69**	**-0.76**	**5.57**	**6.18**	**0.50**	**3.51**	**4.00**	**1.38**	**2.69**	**6.28**	**3.78**	**2.15**	**5.26**	**3.16**

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Table -2.4contd…

District wise Compound Annual growth rates (CAGR) of cotton crop in Andhra Pradesh (1999-2000 to 2018-19)

(Area in lakh Ha's, Production in lakh Lint& yield in Lint/Ha)

DISTRICT/ YEAR	PRASAKAM			NELLOR			KURNOOL			ANANTHAPUR			YSRCUDDAPA			CHITTOR		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1999-00	0.42	0.46	187	0.05	0.05	281	1.06	1.18	189	0.09	0.11	189	0.25	0.28	189	0.00	0.00	189
2000-01	0.47	0.62	235	0.08	0.14	340	1.19	1.59	241	0.12	0.16	241	0.31	0.41	241	0.00	0.00	237
2001-02	0.38	0.63	300	0.07	0.17	470	0.83	0.87	190	0.09	0.09	191	0.22	0.23	195	0.00	0.00	180
2002-03	0.24	0.28	210	0.06	0.10	320	0.55	0.50	162	0.08	0.07	168	0.12	0.13	202	0.00	0.00	0
2003-04	0.36	0.61	305	0.10	0.30	536	0.39	0.43	196	0.04	0.04	182	0.16	0.13	148	0.00	0.00	0
2004-05	0.43	0.58	244	0.06	0.18	512	0.75	0.64	156	0.09	0.07	142	0.28	0.16	103	0.00	0.00	0
2005-06	0.21	0.33	273	0.04	0.11	424	0.24	0.23	163	0.03	0.03	183	0.15	0.12	142	0.00	0.00	175
2006-07	0.20	0.41	354	0.04	0.12	538	0.17	0.23	233	0.02	0.02	225	0.08	0.06	125	0.00	0.00	0
2007-08	0.24	0.70	511	0.05	0.20	705	0.29	0.48	291	0.03	0.02	79	0.09	0.14	273	0.00	0.00	0
2008-09	0.41	1.31	564	0.07	0.25	629	0.23	0.43	320	0.02	0.01	135	0.11	0.12	178	0.00	0.00	270
2009-10	0.33	0.94	497	0.05	0.15	562	0.36	0.53	255	0.02	0.01	104	0.13	0.18	248	0.00	0.00	249
2010-11	0.48	1.15	420	0.06	0.15	397	0.54	1.11	362	0.04	0.03	121	0.15	0.41	476	0.00	0.00	373
2011-12	0.54	1.40	451	0.15	0.35	414	0.96	1.22	222	0.19	0.12	111	0.29	0.48	293	0.00	0.00	223
2012-13	0.67	2.08	543	0.07	0.19	457	1.55	1.76	199	0.28	0.36	225	0.29	0.59	360	0.01	0.01	223
2013-14	0.84	2.81	583	0.07	0.17	439	2.04	6.80	584	0.38	0.77	359	0.36	0.53	257	0.00	0.01	436
2014-15	0.72	2.55	618	0.09	0.29	541	3.06	8.10	463	0.75	1.05	246	0.36	0.60	293	0.01	0.02	411
2015-16	0.58	1.64	493	0.06	0.13	416	2.00	3.66	320	0.61	1.01	291	0.34	0.48	249	0.01	0.02	306
2016-17	0.16	0.49	539	0.08	0.19	426	1.76	5.32	528	0.32	0.26	143	0.19	0.18	162	0.01	0.02	385
2017-18	0.36	0.85	420	0.05	0.09	344	2.59	7.34	495	0.46	1.29	496	0.25	0.18	127	0.00	0.01	468
2018-19	0.39	0.78	341	0.03	0.08	451	2.59	3.04	199	0.48	0.67	236	0.12	0.24	346	0.00	0.00	210
1999-2000 to 2008-09	**-4.67**	**7.53**	**10.90**	**-2.00**	**5.71**	**8.05**	**-18.69**	**-16.92**	**4.83**	**-17.35**	**-22.27**	**-5.04**	**-11.09**	**-14.50**	**-1.54**	**7.96**	**12.29**	**-7.53**
2009-10 to 2018-19	**-3.18**	**-3.99**	**-1.33**	**-5.43**	**-6.17**	**-1.82**	**14.18**	**14.60**	**3.67**	**15.58**	**19.21**	**10.53**	**0.64**	**-4.52**	**-5.42**	**14.41**	**15.84**	**2.48**
1999-2000 to 2018-19	**2.13**	**6.15**	**4.07**	**0.10**	**0.49**	**0.31**	**9.14**	**13.41**	**4.90**	**13.27**	**16.76**	**3.17**	**1.48**	**3.64**	**2.35**	**18.26**	**18.47**	**7.76**

Source: Various issues of Statistical Abstract, Government of Andhra Pradesh.

CAGR: Compound Annual Growth Rates

KURNOOL:

In Kurnool district Compound Annual Growth Rates (CAGR) of cotton found to be negative in area and production -20.24 %, -15.78%while the yield growth turned positive at 4.16% during the first period 1999-2000 to 2008-09. The second period 2009-10 to 2018-19 recorded significant growth in area 19.96%t, production 23.44% and productivity 3.32%. Similarly the third period (1999- 2000 to 2018-19)returns a positive growth in respect of area 8.56% production 13.22% and productivity 4.53% in the district. This may have to do with black soils and availability of HYV seeds in the markets.

Chapter - III

Progress of Zero Budget Natural Farming (ZBNF) in Andhra Pradesh

This chapter discusses the progress of Zero Budget Natural Farming (ZBNF) in Andhra Pradesh during 2015-16 and 2019-20 in respect of coverage area, villages, mandals and number of farmers under ZBNF. Rythu Sadhikara Samstha (RySS) and Centre for Economic and Social Studies (CESS) made assessments of crop yields, costs and incomes of farmers under ZBNF and Non-ZBNF farming in the state during 2015-16 to 2019-20. -

3.1 Evaluation of Zero Budget Natural Farming (ZBNF) in Andhra Pradesh:

Andhra Pradesh government, aided by the World Bank, established the Society for Elimination of Rural Poverty (SERP) with mandate of rural poverty eradication through social mobilization and empowerment of poor and rural women in the state. The SERP initiated Community Managed Sustainable Agriculture (CMSA) in 2004 to work on agriculture based livelihoods, supporting them to adopt sustainable agriculture practices to reduce the cost of cultivation to increase net income by completely avoiding use of chemical fertilizers. The major intervention of CMSA is to encourage farmers to gradually move away from chemical intensive farming. It was a very successful Agro-ecological model and helped to reduce pesticide usage just one percent in the state farmers practice. A unique feature of this programme was that it organized women into Self-Help Groups (SHGs) and initiated a collective learning process via farmer field schools extension model (Vijay et.al 2009). The same model has now been replaced by Andhra Pradesh Zero Budget Natural Farming (APZBNF).The ZBNF movement originally began in Karnataka state with a crushing spirit, helped by the Karnataka Rajya Rythu Sangh, a farmer organization and it has spread to other southern states. The government of Andhra Pradesh's vision is to scale up ZBNF to reach out to 60 lakh farmers by 2024 and to cover the entire 80 lakh hectares into Natural Farming by 2027.

The Zero Budget Natural Farming (ZBNF) programme is being implemented through Rythu Sadhikara Samstha (RySS) or Farmer empowerment Organization, a not-for-profit company established by the Government of Andhra Pradesh. The intent of government of Andhra Pradesh is to bring about an agro-ecological transformation in the state. Every farmer should come out of the present chemical input based agriculture to practice climate resilient low cost Zero Budget Natural Farming (ZBNF) and the entire cropped area in the state should be under natural forming. Andhra Pradesh Zero Budget Natural Farming (APZBNF) has been introduced in June 2015 by the department of Agriculture and the field level implementation commenced from Kharif 2016 as a pilot basis. It was promoted on a

wider scale by the former Chief Minister Shri N. Chandra Babu Naidu garu and he was a pioneer in seeing the potential of Agro-ecological farming.

The Chief Minister became the chairman of Climate Resilent Zero Budget Natural Farming (CRZBNF) and the agriculture minister is the vice-chairman. The state government follows the principles of Agro-ecology to meet the two goals of global food security and environment conservation. The former Chief Minister Naidu garu both conveyed and campaigned for the move, not only among the farmers in Andhra Pradesh, but also globally to raise funds. In 2015 APPI (AZIM PREMJI, Philanthropic Institute (APPI) started discussions on how best RySS and government of Andhra Pradesh could benefit from technical support grant. The government was given in 2017 a generous grant of Rs.100 crore for establishing a technical support unit within RySS, for technical services and for strengthening resources. APPI's with technical support of experts, professionals and natural farming fellows has been a very important partner in the progress of ZBNF. In November 2017 an Agriculture Summit was organized in Visakhapatnam and the main theme was 'progressive farmer and smart Farming. The focus was on innovative ideas, technologies and global best practices to-push agricultural transformation in the state. Major funding has been earmarked for the programme. The focus was also on Climate-Resilient Zero Budget Natural Farming (CRZBNF).

3.2 ZBNF Programme Architecture:

The Zero Budget Natural Farming was originally promoted by Maharastrian agriculturist and Padma Shri recipient Dr.Subhash Palekar. This is the inspiration and mentor of ZBNF in the State. The four wheels of ZBNF have been conceptualized by him. ZBNF is an alternative to the Green Revolution methods driven by chemical fertilizers and pesticides and intensive irrigation. He argued that the rising cost of these external inputs was a leading cause of indebtedness and suicides among farmers, while the impact of chemicals on the environment and on long term fertility of soil was devastating. Therefore he advocated Zero Budget Natural Farming (ZBNF) as a formal technique, advised the use of naturally occurring materials such as cow dung, cow urine and neem as manure, against the usage of fertilizers and pesticides. On 14th June 2017 Dr. Subhash Palekar was appointed as an adviser to the state of Andhra Pradesh on Zero Budget Natural Farming with the aim of encouraging natural farming. He has conducted 4 major training programmes for 28,000 farmers during 2016-18 and indirectly inspired thousands of farmers through live stream and training videos to take up ZBNF in the state.

The government of Andhra Pradesh is giving top priority to expand the Zero Budget Natural Farming (ZBNF) system to new areas and to bring more farmers into the fold. This

is the best way to bring out farmers from debt and the products grown under this method are good for health. The ZBNF programme is being implemented by RySS and the state Agriculture Commissioner serves as the Chief Executive, while Shri T. Vijay kumar, the Agriculture Adviser, is one of its Vice-chairman. The RySS is an integrated institution mechanism for all programmes and activities intended for farmer's empowerment, credit flow, financial support and allied empowerment activities. The programme has been initiated with multiple objectives of enhancing farmer's welfare, consumer welfare and for the conservation of the environment.

Zero Budget Natural Farming has basically four pillars (see Table 3.1). The other important principles are inter cropping, furrow method of cropping, contour and bunds system and use of local species of earth worm. Besides the above Palekar also gave the formula for pest management, which he named the Agniastra, Brahmastra and Neemastra (See Table 3.2).

Palekar's methods help the farmers to get rid of debt. These techniques improve soil fertility, yield and quality of product obtained. It also improves the soil accretion and water holding capacity by making micro and macro pores in the soil. Earth warm decomposes the plants and enriches the soil with compost. Pest Management method not only helps to avoid pest damage but also protect us from the pedagogical side effects of chemical methods. Unlike chemical fertilizers, soil and water pollution does not arise. Crop rotation and inter cropping protect the soil from depletion of moisture and nutrients. While mulching control the evaporation and maintains adequate moisture in the soil. It leads to favourable environments in the soil. Therefore diseases would not arise and the product quality in yield, income and health would improve.

Table 3.1

Basic Principles of ZBNF

S.No.	Methods	Preparation	Benefits
1	BIJAMRITA	It is basically made up of water (20 litres), cow dung (5 kg) Urine (5 litre) lime (50 gram) and just a handful of soil	It is a treatment used for seeds, seed lings or any planting material. It is effective in protecting young roots from fungus as well as some soil-born and seed born diseases that commonly effect plants after the monsoons. This is called micro bial seed coating.
2	JEEVAMRITHA	In 200 litres of water in a tub add 10 kg fresh cow dung, 5 to 10 litres aged cow urine and 2 kg of Jaggery. Some even add 2 kg of pulse flour and a handful soil from the farm stir the solution well and let it ferment for 48 hours in the shade. The solution is now ready to application. 200 litres of Jeevamrutham is sufficient for one acre of land.	Instead of commercially produced chemical inputs, the ZBNF promotes the application of Jeevamrutham. It provides nutrients, but most importantly acts as a catalytic agent that promotes the activity of micro organisms earthwarm activity. Jeevamrutha also helps to prevent fungal and bacterial plant diseases. That Jeevamrutha is only needed for the first 3 years of the transition, after which the system becomes self sustaining.
3	ACCHADANA /MULCHING	It could be done by soil mulch, straw mulch or live mulch, the soil all around the plant is covered, in this way weeds don't have light and space to grow up. It is not different from what happens in nature when tree leaves fall at their base.	The advantages of mulching are weed control, preserve soil heat preserve soul humidity, maintains soft soil, add organic matter.
4	Whapsa Moisture	It is the condition in which there are both air molecules and water molecules present in the soil. It encourages reducing irrigation, irrigation only at noon, in alternative furrows. It allows significant decline in need for irrigation.	Palekar challenges the idea that plant roots need a lot of water, in fact. What roots need is water vapour and therefore. Whapasa is the condition where there exists both air molecules and water molecules present in the soil.

Source: Dr. Subash Palekar - 2014

Table 3.2
Compositions and controls of Pest Management

S.No.	Methods	Preparation	Benefits
1	AGRISTA	It is composed of 10 litre local cow urine and 1 kg Tobacco, 500 gram of green chilli, 500 gram local garlic, 5kg Neem leaves pulp (crushed in urine) for spraying. 2 liter Brahmastra is taken in 100 litre of water	It is effective against the pests, leaf roller, stem borer, fruit borer, pod borer
2	BRAHMASTRA	It is prepared by neem leaves, custard apple leaves, lantern camellia leaves, guava leaves, pomegranate leaves, papaya leaves and white dhatura leaves crushed and boiled in urine.	It is used to control all of the sucking pests, pod borer, fruit borer etc.,
3	NEEMASTRA	It is made up of low cow urine 5 litre, cor dung 5 kg, and neem leaves and neem pulp (5 kg) fermented for 24 hours.	It is used for sucking pests and nearly bug.

Source: Dr.SubashPalekar - 2014

3.3 Zero Budget Natural Farming Impact:

Padmasri Dr.Subash Palekar has been organizing mega training events. So far four mega training events in Tirupati, Kakinada, Guntur (twice) have been organized in the state to benefit about 27,000 best practicing farmers directly, while several thousands of farmers also watched electronically in the state. These trainings add a huge impact on farmers in building their motivation and commitment levels to improve their own farming methods and also take this programme to other farmers. We then present some of the first available findings on the impacts of ZBNF among early adopters in Andhra Pradesh focussing on crop yields, costs of cultivation and farmers income of both ZBNF and Non-ZBNF farmers in the state.

3.4 Progress of ZBNF programme in the state:

Table 3.3 presents the progress of Zero Budget Natural Farming (ZBNF) in the state and indicates the number of Gram Panchayats (GP), number of farmers, mandals, Self Help Groups (SHGs) that are part of ZBNF. In kharif 2016, 704 villages were selected on pilot basis with funding of Government of India (GOI) through Rashtriya Krishi VikasYojana (RKVY). From 2016 onwards Department Agriculture has mandated Rythu Sadhikara Samastha (RySS) to spearhead the implementation of ZBNF programme in the state. The programme has been extended to additional 268 villages with a total of 972 villages, in kharif 2017 with funding support from GOI and GOAP through Paramparagat Krishi VikasYojana (PKVY) . The number of ZBNF farmers increased from 40,650 to 1,63,000 (4.88%). Out of 664 mandals in the state 343 (50.74%) mandals and 66,088 (0.89%) hectares of area were covered in the state during the year 2017-18. By 2018, the ZBNF programme has reached to 3015 villages reaching out to 5,23,000 farmers and 1,41,361 Self Help Groups (SHGs) covered in addition 662 (98.22%) mandals and 2,00,000 (2.69%) hectares of land across 13 districts in state. Further in the year 2019-2020 the ZBNF programme targeted to cover 6,034 villages and 5,80,000 farmers and around 2,50,000 women SHGs. The landless poor are being motivated to grow kitchen gardens also in the state. Table 3.4 shows a detailed report on landless poor and tenant farmers practicing ZBNF with targets and achievements district wise up to September, 2019 in the state. Among 13 districts Kurnool district maximum having 38,145 farmers doing ZBNF practices in the state. The state is target of ZBNF farmers was 5,80,453 but the achievement as on 30th September 2019 was 3,06,878 farmers. In the case of the landless poor practicing kitchen garden, the target was 3,84,730 ha but the achievement was 12,702 hectares in the state.

Table 3.3

Andhra Pradesh State Zero Budget Natural Farming (APZBNF) at a Glance (2016-17 to 2019-20)

Year	ZBNF Gram Panchayats	% of ZBNF villages covered into total villages	Total ZBNF Farmers	% of ZBNF Farmers covered into total Farmers	No.of Women SHGs	% of ZBNF covered into total SHGs	No.of Mandals covered into ZBNF	% of ZBNF Mandals covered into total Mandals	Total ZBNF Area in hectares	% of ZBNF area covered into total Hectares
2016-17	704	4.05	40650	1.22	--	--	--	--	17656	0.24
2017-18	972	5.60	163000	4.88	--	--	343	50.74	66088	0.89
2018-19	3015	17.36	523000	15.66	141361	19.37	662	98.22	200000	2.69
2019-20 Target	6034	34.75	580000	--	250000	34.25	664	100.00	--	--

Source: Andhra Pradesh Zero Budget Natural Farming (APZBNF) programme (RySS)

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The Table 3.5 shows the district wise progress of area and farmers under ZBNF in the state. Among 13 districts in the state Ananthapur district is found to be having the highest area of 4356 hectares, besides 4715 farmers were covered under ZBNF in the year 2016-17. In 2017-18 West Godavari district toped in area with 10,934 ha and 20,353 farmers registered under ZBNF. Further upto Sep. 2019 Nellore district got the highest number of farmers 38,145 under ZBNF in the state. On the whole progresses of area under ZBNF and number of farmers have been increasing in all districts of the state. Whereas the state total ZBNF area and number of farmers are also found to increase from 17,656 ha. and 39,856 farmers in 2016-17 to 66,088 ha in area and 158758 farmers in 2017-18.The achievement as on 30th September, 2019, there area 3,06,878 ZBNF farmers in the state (2019).

Table 3.4
Land less poor Tenant Farmer practicing under ZBNF with targets and achievements in the state

S.No	District	Farmers doing ZBNF		Land less poor practising Kitchen Gardens		cumulative
		Target	Achievement as on 30th Sep-2019	Target	Achievement as on 30th Sep-2019	
1	Srikakulam	42,309	22,209	32,319	1448	4,935
2	Vizianagaram	37,036	28,693	14,952	100	11,304
3	Visakhapatnam	48,583	37,389	19,020	818	9,406
4	East Godavari	51,210	28,970	41.257	121	40,389
5	West Godavari	42,371	31,170	42,137	2423	18,693
6	Krishna	48,363	22,809	28,758	1133	7,438
7	Guntur	37,085	24,810	42,848	1543	28,734
8	Prakasam	38,384	13,482	50,360	744	7,265
9	Kurnool	55,840	38,145	37,279	930	4,496
10	Nellore	40,870	7,530	13,013	927	9,678
11	Kadapa	48,743	25,338	30,610	1485	9,484
12	Kadapa	43,349	14,471	11,139	870	5,797
13	Ananthapur	46,310	12,042	21,018	160	5,420
	Total	5,80,453	3,06,878	3,84,730	12,702	1,68,039

Source: Andhra Pradesh Zero Budget Natural Farming (APZBNF) programme

Table 3.5

Progress of Zero Budget Natural Farming (ZBNF) in Andhra Pradesh

(Area in Hectares)

S.No.	District	2016-17		Target Area	2017-18		Target Achievement	Achievement as on 30th Sep, 2019
		Area under ZBNF	No. of Farmers		Area covered	No. of Farmers		
1	Srikakulam	754	2224	2730	2150	5670	79	22209
2	Vizianagaram	697	3161	3053	2581	9145	85	28693
3	Visakhapatnam	1183	3004	3259	3173	9536	97	37389
4	East Godavari	1625	3638	2392	5365	13759	224	28790
5	West Godavari	1811	2405	7602	10934	20353	144	31170
6	Krishna	742	3710	6211	6292	15748	101	22809
7	Guntur	827	1780	4648	5249	12249	113	24810
8	Prakasam	1594	2101	8002	7354	17514	92	13145
9	Nellore	499	2410	3240	4406	8828	136	38145
10	Chittoor	666	3371	3106	2641	7026	85	7530
11	Kurnool	1320	3257	6398	6164	14948	96	25338
12	Kadapa	1582	4080	5554	5516	14018	99	14471
13	Ananthapur	4356	4715	3924	4263	9964	109	12042
	Total	17656	39856	60120	66088	158758	110	306878

Andhra Pradesh Zero Budget Natural Farming (APZBNF) programme concept note and monthly progress.

3.5 Crop Cutting Experiments on ZBNF and Non-ZBNF Farmers in the state:

The Rythu Sadhikara Samstha (RySS), Department of Agriculture, government of Andhra Pradesh conducted crop cutting experiments in various crops of both ZBNF and non-ZBNF farmers in the state during Kharif 2016 and Rabi 2017. The results relating to crops yields are shown in Table 3.6. It is found that the ZBNF farmer's crop yield per hectare was more, in respect of all crops than for the Non-ZBNF farmers. Among the crops yield of vegetables recorded the highest increase over cereal crops and cash crops like Paddy and Cotton. Among vegetables Tomato yield reported the highest percentage increase of 131% than Non-ZBNF, followed by finger millet 71% peer millet 24% etc. The respect of paddy and cotton ZBNF yield per hectare was only marginally more than Non-ZBNF. The percentage increase in yield per hectare of both paddy and cotton under ZBNF was lower than for the vegetable crops.

Table 3.6

Crop Cutting experiments Results under ZBNF and Non-ZBNF crops yield, during Kharif 2016 and Rabi 2016-17 in Andhra Pradesh

S.No	Crop	Average yield under ZBNF (Kg/Ha.)	Average yield under Non-ZBNF (kg/ha.)	Increase in yield ZBNF over Non-ZBNF (%)
1	Paddy	5619	5293	6.00
2	Groundnut	4638	3785	23.00
3	Cotton	3706	3355	10.00
4	Finger Millet	2595	1520	71.00
5	Pearl Millet	3427	2768	24.00
6	Black gram	583	520	14.00
7	Bottle gourd	8502	7118	19.00
8	Tomato	16411	7118	131.00
9	Fox tail millet	1246	1107	13.00
10	Green gram	628	527	19.00
11	Okra	18777	11574	10.00
12	Kidney beans	1200	1000	20.00

Source: RythuSadhikaraSamstha, Department of Agriculture, Government of Andhra Pradesh

Further in 2018 (Kharif) crop cutting experiments were conducted to assess costs and incomes of major crops like paddy, groundnut, cotton, maize and Ragi. The estimates were made for both ZBNF and Non-ZBNF farmers in the state by Rythu Sadhikaraka Samstha (RySS). Table 3.7 shows the results. Total cost of cultivation of the above crops was lower under ZBNF than for Non-ZBNF. On an average cotton crop cost per hectare was less by 30% under ZBNF than under Non-ZBNF farmer followed by maize 29%, Ragi 22%, paddy18% and groundnut 15% in Kharif 2018. The average ZBNF and Non-ZBNF net incomes per hectare were also higher during the assessment year. For cotton crop per

hectare ZBNF net income was 197% more than non-ZBNF income. ZBNF incomes were higher for other crops also Ragi by 125%, Groundnut by 83%, paddy by 51% and maize by 46%. Further the total benefit was estimated in each crop under average ZBNF farmer. The column 7 showed the total benefit of each crop of ZBNF and Non-ZBNF farmers per hectare. All these assessment crops the highest percentage of total income per hectare received 227% from ZBNF farmer under cotton crop due to cultivation cost has drastically declined and yield per hectare also increased at highest compared to Non-ZBNF sample crops. Whereas the least percentage of total income increased at 69% under paddy crop over Non-ZBNF practiced crop in the state.

Further third party crop cutting experiments on ZBNF and Non-ZBNF farmers were done on major crops in Andhra Pradesh by the Centre for Economic and Social studies (CESS). The Centre has estimated and experimented the Zero Budget Natural Farming vs Non-Zero Budget Natural Farming of major crops cost, net come and the percentages of the average farmer per hectare in the state. Table 3.8 presented the assessments of crops net income and costs of both ZBNF Vs Non-ZBNF farmers. The percentage of net income of the average farmer per hectare increased in all estimated crops. Whereas the cost of cultivation per hectare average ZBNF farmer declined in all crops in the state. Among the selected crops estimations the Ground nut crop average farmer per hectare net income increased at highest percentage 111 US dollars followed by cotton 75%, Bengal gram 17%, Groundnut (RF) $11% and Paddy $10% than non-ZBNF farmers. On the other hand cost of cultivation was declined in all estimated crops of ZBNF farmer compared to Non-ZBNF farmer. The cost of cultivation per hectare declined at highest percentage in Groundnut crop at $ 17% under ZBNF farmer followed by $14% in Bengal gram, $13% in paddy, $9% in cotton and $1% in Groundnut in the state.

Table 3.7

Assessment of Zero Budget Natural Farming (ZBNF) in Andhra Pradesh

S.No	Crop	I/F	Total Costs Rs./Ha.		% of reduction Rs.	Net Income Rs./Ha		% of increase in ZBNF Income.	4+6=7 Total benefit of the farmer in %
	1	2	ZBNF Kharif 2018	Non- ZBNF Kharif 2018		ZBNF Kharif 2018	Non- ZBNF Kharif 2018		
1	Paddy	Irrigated	35739	43507	18	59448	39457	51	69
2	Groundnut	Rainfed	42197	49866	15	61077	33437	83	98
3	Cotton	Rainfed	29467	42206	30	39239	13222	197	227
4	Maize	Irrigated	8502	12006	29	26005	17844	46	75
5	Ragi	Rainfed	13662	17610	32	59200	26294	125	147

Ref: Andhra Pradesh RySS Assessments through crop cutting experiments Kharif 2018.

Table 3.8

Assessments of Cost and Income of ZBNF and Non-ZBNF farmers in the state 2019-2020

Crop	Condition	Net income $ Ha			Cost of Cultivation $ Ha		
		Net income ZBNF vs Non-ZBNF			Cost of Cultivation ZBNF vs Non-ZBNF		
		Net income ZBNF	Net income Non-ZBNF	% difference	Cost of Cultivation ZBNF	Cost of Cultivation Non-ZBNF	Percentage change
Paddy	Irrigated	667	603	10	526	604	13
Groundnut	Rainfed	129	116	11	313	376	17
	Irrigated	639	302	111	454	457	1
Cotton	Irrigated	1003	573	75	518	567	9
Bengal gram	Rainfed	769	655	17	398	464	14

Source: Centre for Economic and Social Studies (CESS) Hyderabad.

The summary results of crop cutting experiments on ZBNF and Non-ZBNF farmers made by CESS in the state. The summary results were as follows:

1. Cost of collection has shown significant differences with ZBNF costs being lower than Non-ZBNF costs across all crops.
2. Significant increase in net income for ZBNF farmers as a result of reduction in cost of cultivation: and
3. ZBNF farms reported better soil health, resilience, economic empowerment of farmers and dignity of labour.

The report (CESS) also mentioned that ZBNF has higher potential of expansion of extension services by way of increasing CRPs at the village level that may help the farmers in acquiring skills, addressing the market related issues and achieving the full potential of ZBNF.

3.6. Budgetary Support:

Andhra Pradesh is the leading state in the adoption of Zero Budget Natural Farming (ZBNF). The state has been receiving funds from Rastra Krishi VikasYojana (RKVY) and Pamparagath Krishi Vikas Yojana (PKVY) schemes in 2015-16 through department of Agriculture, Government of Andhra Pradesh and Ministry of Agriculture, Government of India. Table 3.9 summarizes the funds from 2015-16 and the total funds received Rs.52.58 crores, from RKVY Rs.34.04 crore (64.99%) and PKVY Rs.18.34 crores (35.01%) of the total funds in the state. The year 2016-17 the total ZBNF funds were slightly increased Rs.45.91(77.54%) crore, and Rs. 13.30 (22.46%) crore total Rs.59.21 crore received from RKVY and PKVY. From 2017 onwards Rythu Sadhikara Samstha has been receiving the funds directly and is implementing the ZBNF scheme in the state.

The year 2017-18 total funds were slightly declined Rs.49.31crore from RKVY Rs.38.38 (77.83%) crore and PKVY Rs.10.99 crore (22.17%). In 2018-19 the ZBNF scheme maximum funds were received Rs.153.32 crore and it is the highest amount over the past three years (2015-16, 2016-17 and 2017-18) in the state. The year 2017-18 and 2018-19 the Rythu Sadhikara Samtha, Department of Agriculture Government of Andhra Pradesh made discussions with AZIM PREMJI, Philanthropic Institute (APPI) and the APPI has granted Rs.100 crore for technical support and 22.88 crore has been released out of Rs.100 crore committed for technical support in Andhra Pradesh over 5 years.

The government of Andhra Pradesh has prepared a plan to get funds Rs.321.29 and Rs.454.65 crores for promotion under ZBNF scheme in the state. The past two years the ZBNF has been under implementation with German assistance and signed MOU between Andhra Pradesh government with representatives of German Firm KFW. In Amaravathi as a part of the agreement that plan to extend the on-going ZBNF project with the German firm. The government has taken loan of Rs.711 crores out of estimated amount of Rs.1015 crores earmarked to be spending towards the Climate Resilent Zero Budget Natural Farming (APCRZBNF). The Hon Chief Minister Shri Y.S. Jagan Mohan Reddy garu led state government will spend Rs.304 crore on the project, which is aimed to cover 2.39 lakh farmers in around 600 village panchayats and promote Natural Farming in the state.

Table 3.9

Funds Received from RKVY, PKVY and Government of Andhra Pradesh

(Rs. in crores)

S.No	Year	RKVY	PKVY	Total	Funds received from Philanthropy (APPI) for technical support
1	2015-16	34.04 (64.99)	18.34 (35.01)	52.38 (100.00)	
2	2016-17	45.91 (77.54)	13.30 (22.46)	59.21 (100.00)	
3	2017-18	38.38 (77.83)	10.93 (22.17)	49.31 (100.00)	22.88 has been released out of 100 crore committed for technical support over 5 years
4	2018-19	63.00 (41.09)	90.32 (58.91)	153.32 (100.00)	
5	Total	181.33 (57.71)	132.99 (42.32)	314.22 (100.00)	
Plan for 2019-2020 and 2020-21					
7	2019-2020	186.64	134.65	321.29	
8	2020-2021	300.00	134.65	454.65	

*() indicates percentages to total.

Source: Andhra Pradesh Zero Budget natural Farming (APZBNF) programme concept note and Monthly progress.

The Government of Andhra Pradesh estimates it will need Rs.1700 crore to convert of all its 60 lakh farmers to the ZBNF over the next 10 years. The state government is trying to raise funds from the financial institutions and global markets.

CHAPTER - IV

INITIATIVES OF ZERO BUDGET NATURAL FARMING (ZBNF) IN ANDHRA PRADESH

This chapter discusses the initiatives and implementation plan for the success of Zero Budget Natural Farming (ZBNF) programme in the state. The Average cost structure and functionaries of community cadre have been discussed to implement the ZBNF scheme in the state. The progress of ZBNF scheme in sample districts of Vizianagaram and Kurnool during 2015-16 to 2019-2020 is studied. New initiatives to cover landless, tenants and "Role of Women SHGs have also been discussed to be extended ZBNF programme in the state.

4.1. INTRODUCTION:

One of the major reseasons of farmers distress in Andhra Pradesh is identified as high cost chemical farming for over 30-50 years. Present agriculture system depends on agriculture research, agriculture scientists, agriculture extension officers, fertilizer and pesticide dealers and government subsidies on fertilizers, all these have been promoting chemical farming in the state. Instead of these barriers, the adoption of an alternative agriculture plan is required in the state. In this context, Rythu Sadhikara Samstha (RySS) under the aegis of department of Agriculture, Government of Andhra Pradesh has been implementing the Zero Budget Natural Farming (ZBNF) programme since 2015. The ZBNF aims to reduce the cost of cultivation, enhance soil fertility, increase yields, income, reduce risks and protect farm uncertainties. So the ZBNF is a regenerative agriculture practically introduced in 2016 as an alternative approach to chemical based and capital intensive agriculture in the state. The RySS has taken steps to promote the success of ZBNF in Andhra Pradesh and following important theories of change in implementing ZBNF programme.

4.2. ZBNF Programme initiatives:

1. Transformation should happen through women Self Help Groups (SHGs), farmers and farmers institutions are involved in ZBNF programme planning, implementation and monitoring.
2. Community Resource Persons (CRP) was appointed by the government to promote knowledge dissemination of ZBNF to farmers compared to chemical farming.
3. Saturation of entire village, cluster, mandal and the state requires converting all villages, farmers, farms and practices leading to a total transformation.
4. The government of Andhra Pradesh has decided strong commitment to bring about this transformation, is one of the most important factors for the success of APZBNF.

4.3. Implementation Plan of Zero Budget Natural Farming (ZBNF):

1. One implementation plan was prepared by the ZBNF to provide support to the Gram Panchayat. The plan consisting for 5-7 years and the average number of farm families is estimated to be 465 to cover 400 families in a village (around 85%).
2. Each farmer requires 3 to 5 years support, to implement the ZBNF programme, until he converts his total land into natural farming.
3. To provide this support, RySS has promoted a team of 2-3 master farmers called community Resource Persons (CRPs) at the cluster level.
4. Communities Resource persons (CRPs) are best practicing farmers. The CRPs stay in the allotted villages and motivate and support farm house holds in the villages to adopt ZBNF and provide them with careful support for a smooth transition.
5. At the end of 2-3 years, a new pool of master farmers within these Gram Panchayats (GP); become farmer trainers. Once the internal best practitioners are positioned the intensity of support to the new farmers increases. The internal best practitioner is called internal community Resource Person (IRCP). The programme makes one ICRP available for every 100 farmers.
6. These CRPs and ICRPs focus on transfer of technology and mobilizing farmers together, making farming plans and monitoring those plans. This is carried out by the women SHGs and their village organizations. The role of women is at the prominent of the programme leading to transformation of entire farming community in the village. Their strengths are social mobilization, collective action, community learning and community marketing which help in ZBNF implementation in the State.

4.4. Cost of Implementation:

The ZBNF programme is to reach every farmer in three years in a Gram Panchayat (GP). A farmer, after one year of introductory efforts, will take three more years to convert his/her entire holding and become a seed-to seed ZBNF farmer. Out of these 86 percent farmers become seed to seed this takes five years. So the state government approach is to saturate enrolling farmers in each village in 3 years to enter that village. The plan is to reach more than 80% (400 farmers) of the village by year 3. Each farmer taken 3 year to cover entire holding. Thus in 5 years, the village becomes a ‘bio-village’.

Funds required to convert a farmer is Rs.25,000 spread over a period of 5-6 years (5years implementation for one farmer + one year preparatory. Table 4.1 presented the cost of creating an eco-system to support this type of farming (ZBNF) and there is no allocation to be paid directly to the farmer. The majority of funds (nearly 73%) are spent in

capacity building of farmers. It is defined as a process of developing and strengthening the skills, instincts abilities processes, dissemination of ZBNF knowledge and human resource development. Nearly 17% is spend on institution building through women SHGs, women and men farmers and funds to farmers institutions, support in establishing markets (Inter-village, Inter-cluster, Inter district) using farmers own institutions for promoting ZBNF, input preparation, marketing and other value addition. Rs.2,000 cost per farmer is 8 percent spent on PGs certification, quality Assurance, Tracking and Monitoring and other 2 percent spent on technical support and overall programme management at the district and state levels.

Table 4.1

Average Cost Structure of the Programme

S.No.	Component	Cost per farmer (Rs.)	Percentage (%)
1	ZBNF Capacity Building	18,350	73.40
2	Support of Community institutions	4,150	16.60
3	PGS certification, Quality Assurance, Tracking and Monitoring	2,000	8.00
4	Technical support and Overall programme management	500	2.00
	Total:	25,000	100

Source: Official Website of ZBNF programme of Rythu Sadhikara Samstha, Government of Andhra Pradesh

4.5. Human Capital in ZBNF Cluster, District and State level:

The programme will be promoted by a specialized wing of the government called Rythu Sadhikara Samstha (RySS). An interesting innovation here is that the agency has recruited over 100 natural farming fellows. Agriculture graduates, who will demonstrate the benefits of ZBNF by taking up farming in rented plots and staying in villages to answer their queries. Table 4.2 presented cluster level implementation of ZBNF programme in the state.

A “ZBNF Cluster” would consist of five geographically contiguous Gram Panchayats comprising about 2,000 farm families. Internal CRPs are also explained for every 100 farmers on transfer of technology and transformation of entire community in the village. The ICRPs are positioned in Gram Panchayat (GP) called as 3 CRPs and those positioned at cluster level as level ICRPs. Besides core ZBNF function, we require CRPs specialized in Institution Building (IB) and digital literacy (for data collection, data entry and data analytics) - Both at cluster level and at the GP level. CRPs are also required in certain thematic areas like marketing, Health and Nutrition, Energy, water etc.

Table 4.2

A Typical Cluster will have the following human capital

Human Capital	Per Cluster of 2000 farmers
Community – Level 1	
Level 1 CRP (ZBNF, 1B)	1
Thematic CRPs level 1	1-3
Internal CRP (ZBNF, 1B+Digital, Thematic) Level - 3	Upto 20
Professional – Level	--
Natural Farming Fellows	1
Total	23-25

Source: Andhra Pradesh Zero Budget Natural Farming (APZBNF) programme concept note.

To coordinate the cluster team, there are three types of functionaries at the district level, community cadre and Agriculture Department staff on deputation and other at out sourced cadre.

At the district level, the ZBNF programme is implemented by that Joint Director of Agriculture. The cluster Activists (CA) cluster Resource Persons (CRPs) organized training programmes and instructed the farmers to reach new villages and motivate them to come under this method. Proper awareness programmes, counselling also should be given to farmers to attract them. Women Self-Help Groups (WSHGs), farmer groups also should be brought under ZBNF model in the state. Besides all the JDA's at district level work with NGO's which in turn identify and work with farmers best suited to adopt natural farming. So as to create the first rung of best practising as master farmer. Most of the farmers are selected for training as master farmers have previously participated in the Community Managed Sustainable Agriculture (CMSA) programme. Once the master farmers internalise ZBNF over 2-3 years, they identify and hand hold a second rung of best practicing farmers in every village. Gradually over 5 years first and second rung master farmers work towards bringing all farmers in the village under ZBNF. The NGO's help create Women's Self Help Groups (WSHGs) promote Farmer Producer Originations and work with them to put in place the participatory Guarantee system. Under this system farmers declare their produce as organic as opposed to a third party certifying it as such. The NGO's also help the agriculture department link farmer producer groups to the market. So that farmers can sell their produce directly to consumers.

Table 4.3 presents the district level community cadre in the state for implementation of ZBNF. The total district level cadre were organized by Rythu Sadhikara Samstha (RySS) and has taken steps for implementation of ZBNF in the state. The 346 divisional and sub divisional anchors at state level were setup to coordinate each cluster of making and

monitoring the plans to implement the ZBNF programme in each district. 1062 community Resource Persons (CRP) and 4146 International Community Resource Persons (ICRP) who are master farmers in the village were trained and appointed by the CRPs to encourage and support new farmers in every mandal of the state. Total 5554 Resource persons were to coordinate the farmers to promote ZBNF in all districts of the state. In addition, 17 marketing people and 20 scientific officers were advised to extend the organic output markets and the scientific officials measure the nutrition of organic product in the state.

Table 4.3

Community Cadre at District level

S.No	District	Divisional and Sub divisional anchors	Mandal CAPs/Mandal CAS/PRPs	ICRPs	Total	Marketing	Health and Nutrition
1	Srikakulam	21	62	199	282	2	2
2	Vizianagaram	20	68	211	299	0	1
3	Visakhapatnam	24	79	279	382	1	1
4	East Godavari	41	97	323	421	1	2
5	West Godavari	26	70	244	340	1	1
6	Krishna	31	74	262	367	2	1
7	Guntur	27	82	354	463	1	1
8	Prakasam	27	84	374	485	1	2
9	Nellore	25	92	236	353	1	2
10	Chittoor	27	91	267	385	2	2
11	Kurnool	27	89	467	583	1	2
12	Kadapa	25	94	448	567	2	1
13	Ananthapur	25	80	482	587	2	2
	Total	346	1062	4146	5554	17	20

Source: Andhra Pradesh Zero Budget Natural Farming

Besides that the Department of Agriculture, Government of Andhra Pradesh transferred their staff on deputation to promote ZBNF in all districts of the state. Table 4.4 presented the deputation of employees from department of Agriculture and out sourced persons for functioning ZBNF programme in the state. Total 36 officials are executing the activities of ZBNF programme, such as 17 District Project Managers (DPM's) , 8 Agricultural Officers (AO's), 4 BTMS and 7 Agriculture Extension Officers (AEO's) besides 96 out sourcing staff were to support the functionaries of ZBNF in the state.

Table 4.4

Functionaries on Deputation from Department of Agriculture and Out sourced in Andhra Pradesh

S.No	District	On Deputation from Dept. of Agriculture				Other Support Staff and Out Sourced Cadre						
		DPMS	AO"S	BTMS/ ATMS	AEO/ MPEO	Jr. Asst/ Sr. Asst.	DEO	DRP	URP	CO-Ordi-nator	OS	TOTAL
1	Srikakulam	1	1	0	1	1	1	2	3	0	1	11
2	Vizianagaram	1	1	0	1	0	1	2	3	0	1	10
3	Visakhapatnam	2	0	1	1	1	1	3	0	0	0	9
4	East Godavari	1	0	1	0	1	1	3	3	0	1	11
5	West Godavari	1	1	0	1	0	1	3	3	0	1	11
6	Krishna	2	0	1	0	1	1	3	3	1	1	13
7	Guntur	2	1	0	1	0	1	3	3	1	1	13
8	Prakasam	2	1	0	0	0	1	3	2	0	1	10
9	Nellore	1	1	0	1	0	1	3	3	1	1	12
10	Chittoor	1	0	0	0	1	1	3	2	0	1	9
11	Kurnool	1	1	0	0	1	1	3	1	0	1	9
12	Kadapa	1	0	1	1	0	2	3	5	1	2	16
13	Ananthapur	1	1	0	0	1	1	3	1	0	0	8
	Total	17	8	4	7	7	14	37	32	4	12	142

Source: Andhra Pradesh Zero Budget Natural Farming

Women Self Help Groups (WSHGs) and farmer producer Organizations (FPOs) at key ground level institutions are being leveraged for motivation, monitoring and accountability. Farmer to farmer extension happens through community level functionaries called CRPs (Community Resource Persons). They help farmers enrol into the ZBNF programme, adopt the right practices at the right time by providing information and knowledge, conduct farmer field schools and assess the outcomes in a participatory fashion.

4.6. Progress of ZBNF Scheme in Vizianagaram District:

Table 4.5 presented the progress of ZBNF Scheme in Vizianagaram district. The ZBNF scheme was initiated in the year 2016-17 which covered 100 villages with 9 mandals. The Scheme has extended to 416 villages with 34 mandals (2019-2020). The targeted ZBNF area and farmers were 17587 ha and 37036 farmers (2019-2020) in the district. Table 4.6 shows the major crops covered and targeted in the district. The total targeted ZBNF area is 17587 hectares and the highest 11,038 hectares of area targeted under paddy crop followed by 4221.20 hectares of horticultural crops. 450.8 ha by cotton and 416.7 ha. grew vegetables in the year 2019-2020. Table 4.7 shows the working cadre under ZBNF scheme in Vizianagaram district. The total ZBNF scheme working cadre was 344 members and the highest 222 members are internal community Resource Persons (ICRPs). Who exclusively participated to implement the ZBNF programme at village level to convert the farmer and his total land into ZBNF method of cultivation. The table 4.8 presents the budgetary support for

implementation of ZBNF scheme in Vizianagaram district during the period 2016-17 to 2018-2019. The year 2016-17 Rastreya Krishi Vikas Yojana (RKVY) release Rs.177.68 lakhs and spent Rs.80.80 lakhs on implementation of ZBNF scheme whereas in the year 2018-19 both RKVY and PKVY released total budget of Rs.80.35 lakhs. The expenditure was Rs.165.71 lakh spent for Expansion of ZBNF scheme in Vizianagaram district.

Table 4.5

Coverage of Zero Budget Natural Farming (ZBNF) in Vizinagaram district (2019-20)

Phase	Year	No. of Clusters	No. of Mandals	No. of Gram Panchayats	No. of Villages	Targeted area Ha.	Targeted Farmers No.s
I	2016-17	10	9	77	100	3031	7578
II	2017-18	25	12	78	125	5072	12680
III	2018-19	17	13	68	17	12874	26509
IV	2019-20	62	-	174	174	17587	37036
	Total	114	34	397	416	--	--

Secondary data: Department of Agriculture, Zero Budget Natural Farming, Vizianagaram dist.

Table – 4.6

Crops covered under Zero Budget Natural Farming (ZBNF) in Vizinagaram district

S.No	Crop	Area Targeted (Ha.)
1	Paddy	11038.0
2	Maize	245.9
3	Sugarcane	143.4
4	Groundnut	34.2
5	Cotton	450.8
6	Horticultural crops	4221.2
7	Millets	1036.9
8	Vegetables	416.7
	Total	**17587**

Source: Department of Agriculture, Zero Budget Natural Farming, Vizianagaram district

Table – 4.7

ZBNF Working Caders in Vizianagaram district (2019-20)

Working Strength	
DPM	1
AOZBNF	1
AEOICT	1
DEO	1
DRPS	2
ATM	1
OS	1
ZBNF DAS	2
SDAs	8
MCRPs	18
CRPs	13
Cas	11
ICRPs	222
IBDAS	2
IBSDAS	9
PRPs	34
NFFs	17
TOTAL:	**344**

Source: Department of Agriculture, Zero Budget Natural Farming, Vizianagaram district

Table – 4.8

ZBNF year wise Released and Expenditure in Vizianagaram district

(Rs. in lakhs)

ZBNF – Releases and Expenditure					
S.No	Scheme	Year	Budget Released	Expenditure spent	Total
1	RKVY	2016-17	17768	8080	
2	PKVY	2017-18	10000	7000	
	RKVY	2017-18	12500	3768	
3	PKVY	2018-19	2726	7907	
	RKVY	2018-19	5279	11292	
			48273	**38050**	

Source: Department of Agriculture, Zero Budget Natural Farming, Vizianagaram district

4.7. Progress of ZBNF Scheme in Kurnool district:

Table 4.9 shows the coverage of ZBNF programme in Kurnool district. The ZBNF scheme was launched in the year 2016-17 with 59 villages in 7 mandals, where as in 2018-19 the villages increased to 135 with 47 mandals under ZBNF scheme. The targeted farmers and area reported to be 44350 and 17740 hectares in the year 2018-19. Table 4.10 presented the area under ZBNF scheme. The ZBNF area was 1300 hectares in 2016-17 and it increased to 18370 hectares in the year 2019-2020.Table 4.11 shows total working cadre was 587 members, the highest 404 members working in internal community Resource Persons in the district. Table 4.12 presented budget support for implementation of ZBNF

scheme in Kurnool district. The total budget released Rs.1,27,824 crore and spent Rs.98265 crore during the period 2017-18 to 2019-2020 for extension of ZBNF programme in Kurnool district.

Table – 4.9

Coverage of Zero Budget Natural Farming (ZBNF) in Kurnool district

Phase	Year	No. of Clusters	No. of Mandals	No. of Gram Panchayats	No. of Villages	No. of	Targeted area Ha.	Targeted Farmers No.s
I	2016-17	11	7	59	59	3254	1320	3300
II	2017-18	39	20	39	39	14695	5960	14900
III	2018-19	37	26	37	37	29948	17740	44350

Source: Department of Agriculture – Rythu Sadhikara Samstha, Zero Budget Natural Farming, Kurnool district, Andhra Pradesh

Table – 4.10

Area under ZBNF in Kurnool District 2015-16 to 2019-20

S.No	Year	Ha.
1	2015-16	0
2	2016-17	1300
3	2017-18	6466.8
4	2018-19	12204
5	2019-20	18370

Source: Department of Agriculture – Rythu Sadhikara Samstha, Zero Budget Natural Farming, Kurnool district, Andhra Pradesh

Table – 4.11

ZBNF Working Cadres in Kurnool district

S.No	**Working Strength**	
1	DPM	1
2	AOZBNF	0
3	AEOICT	1
4	DEO	1
5	DRPS	2
6	ATM	1
7	OFC	1
8	OS	2
9	ZBNF SDA	11
10	MCRPs	19
11	MCAs	12
12	MA	29
13	ICRPs	404
14	IBSDA	11
15	PRPs	34
16	IBICRPS	39
17	NFFs	18
	TOTAL:	**587**

Source: Department of Agriculture – Rythu Sadhikara Samstha, Zero Budget Natural Farming, Kurnool district, Andhra Pradesh

Table – 4.12

ZBNF year wise Released and Expenditure in Kurnool district

(Rs. in lakhs)

ZBNF – Releases and Expenditure				
S.No	Scheme	Year	Budget Released	Expenditure spent
1	RKVY	2016-17	--	--
2	PKVY	2016-17	--	--
3	RKVY	2017-18	14857	9995
4	PKVY	2017-18	10000	8399
5	RKVY	2018-19	42966	33016
6	PKVY	2018-19	40000	26898
7	RKVY	2019-20	10000	9973
8	PKVY	2019-20	10000	9983
			127824	98265

Source: Department of Agriculture – Rythu Sadhikara Samstha, Zero Budget Natural Farming, Kurnool district, Andhra Pradesh

4.8. New Initiatives in the Programme:

A) Emphasis on the poorest:

The Andhra Pradesh ZBNF programme priority agenda is to emphasis on landless, tenants and the role of women SKGs in working with them. The overall goal is to ensure food and nutrition security while ensuring a monthly income of at least Rs.10,000. 14 lakh poorest of the poor families are expected to be covered in the next 5 years. The strategy includes the following.

1) Encourage the poor families to take up kitchen gardens in their homesteads through ZBNF methods as an entry point activity and also to access healthy and nutrition food for their family.

2. Facilitating landless agriculture labour to be tenant farmers adopting ZBNF.

3. Promote ZBNF food Consumption plans for the poorest trough women SHGs and help them in demand aggregation and procurement.

4. Developing SC/ST assigned lands and encouraging, them to take up ZBNF farming in convergence with MGNREGA, ST/SC sub plans etc.,

5. Enabling poorest of the poor families to take up preparation and selling of ZBNF in occupants through ZBNF shops and making them entrepreneurs who could market ZBNF produce.

6. Facilitating back yard poultry and allied livelihoods.

7. Sensitize pop SHGs on drudgery reduction in chemical farming a reason for switching over to ZBNF work or take preventive measures.

B. Farmer Field Schools (FFS):

FFS is one of the important participatory extensions elements. In partnership with FAO, RySS had piloted in one district (GUNTUR). The FFS focuses on integrating the benefits of Agro-ecology in ZBNF programme. It also focuses on deepening of the technical knowledge of all field cadres working directly with farmers ensuring farmers last in ZBNF permanently. Promote soil Health is special topic along with 365 days Green Cover Frame Work.

C. Health and Nutrition Interventions:

The Health and Nutrition Component integrates safe agriculture practices, chemical free food along with the health of the farmers their families and consumers at large. Currently health and nutrition intervention are being undertaken in 40 villages in 8 districts through institutional linkage and thematic campaigns.

Natural Farming Fellows (NFFs) who are young and agri graduates turned into farmers practicing Natural Farming are now helping school children and the staff to set up kitchen garden in their schools.

D. Community Marketing:

Community marketing strategy focuses on assuring consumption at household and village level. The surplus production is sold at the local markets at competent prices promoting healthy food for farmers and their families. There is a special emphasis on strengthening market linkages, value addition, ZBNF shops, ZBNF canteens and hotels through farmers entrepreneurship and Farmer producer organizations.

E. Community Managed Seed System:

The programme is working intensively on developing indigenous seed. A community managed system has been developed, in association with NGOs community based organizations and government.

F. Collective Input Preparations:

The Net work of women SHGs is bringing together the community to collectively prepare inputs to be applied into the fields. The collective preparations methodology helps in reducing drudgery, encourages knowledge dissemination among peers and strengths community bond to take upZBNF in the state.

Summary:

The Andhra Pradesh Zero Budget Natural Faming (APZBNF) has been implementing by Rythu Sadhikareka Samstha (RySS) since 2015. The RySS has taken various initiatives for promoting the success of the ZBNF Scheme and the average cost structure for implementing at village level analysed. The state, district and cluster level community cadre has been presented for implementation of ZBNF scheme in the state. The ZBNF area progress, crops covered, working cadre and budget support in selected districts of Vizianagaram and Kurnool since 2015 is analysed. Further new initiatives have been presented to extend the ZBNF area and ensuring a monthly income of at least 10,000 of the poor families to be covered in the next 5 years of the state under ZBNF programme.

CHAPTER – V

SOCIO-ECONOMIC PROFILE, COST, PRODUCTIVITY, PRODUCTION AND INCOMES OF PADDY AND COTTON CROPS UNDER ZBNF AND NON-ZBNF FARMERS IN ANDHRA PRADESH

This chapter has been divided into four sections. Section one discusses the profile of selected districts of Vizianagaram and Kurnool in the state. The second section describes the socio-economic characteristics of selected farmers. The third section presents the characteristics of operational holdings, sources of irrigation. The fourth section examines estimation of production cost, yield and net incomes of ZBNF and Non-ZBNF households under Paddy and Cotton crops of Vizianagaram and Kurnool districts of the state.

SECTION – I

5.1. Profile of Selected districts:

Vizianagaram and Kurnool districts are selected from the two separate regions for the study of ZBNF and Non-ZBNF farmers from coastal Andhra Pradesh and Telangana regions. The sample farmers selected both ZBNF and Non-ZBNF method of farming for estimation of costs, yield and incomes separately under Paddy and Cotton crops in Vizianagaram and Kurnool districts of the state.

VIZIANAGARAM DISTRICT:

Vizianagaram district was formed as a 23rd district in the state on 1st June 1979 with some parts from the neighbouring districts of Srikakulam and Visakhapatnam. The district has an area of 653.9 thousand hectares and the Cropped Area is 412.5 thousand hectares which is 63 percent of total area and the forest area constituted 17.8 percent of total geographical area. The district can be divided into two distinct natural physical divisions i.e. plain and hilly regions. The hilly region is mostly covered with densely wooded forests and comes under agency tract of the district. The soils in the districts area are predominantly loomy with medium fertility. The plains part of the district is a well cultivated tract and hilly region covered with by the Eastern Ghats. According to 2011 census the district has a total population of 23,44,474 and density of population is 358 per square kilometre. There are two revenue divisions and 34 mandals, 935 panchayats and 1551 revenue villages in the district. The district is predominantly agricultural as 68.4 percent of workers are engaged in agriculture and about 82 percent of the district is living in rural areas and depend on agriculture for their livelihood. The major crops grown in the district are paddy, ragi, bajra, sugarcane, cotton, pulses, mestha, maize, tobacco and groundnut. Rainfed is the

characteristics of agriculture in the district and about 80 percent of the area is cultivated paddy during Kharif season under tank irrigation which inturn depend on the local rainfall.

The principal rivers flowing in the district are Nagavali, Vegavathi, Survarnamukhi, Chempavathi and Gomuki and the irrigation covered about 43,984 hectares in the district. Nagavali is the main river which flows for about 112 kms in the district. The rural population of the district is 18.37 lakhs (82%) of total population and the urban population is 4.12 lakh (18%) of total population. The literacy rate is 51.82 percent as against the average of 61.65 percent for the entire AP. The Vizianagaram district has been comparatively backward in the field of education etc.

KURNOOL DISTRICT:

The district of Kurnool is located in the Western Central part of Andhra Pradesh and its capital is the town of Kurnool. It is one of the four districts in Rayalaseema. The toal geographical area of the district is 17,658 lakh hectares and the forests are covered about 19 percent of the geographical area. The Net cropped area is 9.01 lakh hectares and farming 48.20 percent of the total geographical area. The Net irrigated area amounts only 1.52 lakh hectares. Jowar, Paddy, Cotton, Groundnut, Bajra and Sunflower were the major crops. About 5 percent of geographical area of the district is under various horticultural crops. The district mostly gets rainfall during both the monsoon seasons. Tungabadra is the major river flowing through the states of Karnataka and Andhra Pradesh. Canals, tanks and wells are the major sources, significant of irrigation. District has mineral resources cement grade lime stone, Barytes, Ironore, clays, slate and quartz etc., Kurnool is regarded as an industrially backward district.

The district is second largest by area and tenth largest by population in the state. The district comprises three revenue divisions, 54 revenue mandals, 889 gram panchayats and 921 revenue villages. The total population of the district is 40,53,463 as per 2011 census. Average literacy rate of Kurnool district is 59.97 percent.

SECTION – II

5.2. Socio-Economic Characteristics of Selected farmers:

Socio-Economic back ground and demographic factors influenced to a significant degree to make the efficiency of any farming household. Education levels of the farmer made to know the farm ability, production techniques, land use pattern and government policies. This study sample HH has been grouped as per their size of operational holding groups. Marginal farm had operational holding upto 2.5 acres, small farmers had 2.5 to 5 acres, medium farm hh 5.00 to 10 acres and large farm HH had their operational holding above 10 acres. The study has taken 100 HH from each district of Vizianagaram and Kurnool to collect primary data covering Paddy and Cotton cultivators.

VIZIANAGARAM DISTRICT: PADDY CROP:

Table 5.1 describe socio-economic profile of sample household of ZBNF and Non-ZBNF farmer under paddy crop. Paddy crop ZBNF sample HH average size was 3.72 and among the size groups varied from 2.5 from marginal farmers group to 4.38 in medium farmer group. The average sample HH has 52.27 percent male and 47.73 percent female members. Regarding head of HH maximum 96 percent are male members in the survey. All size groups of sample HH have reported maximum 68.18 percent number of members is under 16 to 60 age group. About educational status of all sample constituted to be 36 percent illiterates and 64 per cent literates. Among literates 32 percent studied upto secondary followed by 24 percent primary and 4 percent from higher secondary and degree. The caste component among the HH groups has highest 84 percent from OBC category and 76.47 percent of the working members have reported farming as their main occupation.

Further the table shows the demographic profile of Non-ZBNF sample HH under Paddy crop. Out of 25 Non-ZBNF HH, the average HH size is reported to be 3.96 members and among the size groups varied from 3.63 for marginal farm group to 6 from large farm group of HH. On an average total HH members 58.59 percent male and 41.41 percent female. The total Non-ZBNF HH is responded by heads and male members in the survey. Among the HH it was reported that 63.64 percent are in 16 to 60 age group and 44 percent illiterates and 56 percent literates. In the case of caste composition 76 percent constituted to be OBC followed by 12% ST, 8% General and 4% SC category. Further 74% working members expressed farming as the main occupation.

Table 5.1

Demographic profile of the Paddy crop ZBNF and Non-ZBNF farmers in the district of Vizianagaram

Characteristics	Paddy-ZBNF					Paddy Non-ZBNF				
	M	S	MED	L	T	M	S	MED	L	T
No. of households	8	8	8	1	25	8	8	8	1	25
Household size (average)	2.5	3.63	4.38	4	3.72	3.63	3.75	4.25	6	3.96
Male	45.00	55.17	57.14	25.00	52.27	62.07	56.67	58.82	50.00	58.59
Female	55.00	44.83	42.86	75.00	47.73	37.93	43.33	41.18	50.00	41.41
Gender % of Head of the household										
Male	87.5	100	100	100	96	100	100	100	100	100
Female	12.5	0.00	0.00	0.00	4	0.00	0.00	0.00	0.00	0.00
Identity of respondent (%)										
Head	100	100	100	100	100	100	100	100	100	100
Others	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Age group of the members (%)										
<16	10.00	13.79	17.14	25.00	14.77	20.69	20.00	26.47	33.23	23.33
16-60	75.00	65.52	65.72	75.00	68.18	62.07	63.33	64.71	66.67	63.64
>60	15.00	20.69	17.14	0.00	17.05	17.24	16.67	8.82	0.00	13.13
Education status of the members (%)										
Illiterate	75.0	12.5	25.0	0.0	36.0	37.5	50.0	50.0	0.0	44.0
Primary up to 5	12.5	12.5	50.0	0.0	24.0	37.5	25.0	12.5	0.0	24.0
secondary up to 10	12.5	62.5	12.5	100.0	32.0	12.5	12.5	37.5	0.0	20.0
Higher secondary up to 12	0.0	0.0	12.5	0.0	4.0	12.5	0.0	0.0	0.0	4.0
Diploma	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Degree	0.0	12.5	0.0	0.0	4.0	0.0	12.5	0.0	100.0	8.0
Post Graduation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caste (%) of HH										
General	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	8.0
OBC	50.0	100.0	100.0	100.0	84.0	87.5	100.0	37.5	100.0	76.0
SC	25.0	0.0	0.0	0.0	8.0	0.0	0.0	12.5	0.0	4.0
ST	25.0	0.0	0.0	0.0	8.0	12.5	0.0	25.0	0.0	12.0
Main Occupation (%) or working members										
Agriculture	76.47	77.27	76.00	75.00	76.47	72.73	73.91	70.83	100.00	73.97
Salaried work	5.88	0.00	8.00	0.00	4.41	4.55	4.35	8.33	0.00	5.48
Own business	5.88	9.09	8.00	0.00	7.35	4.55	4.35	12.50	0.00	6.85
Pensioner	11.76	13.64	8.00	25.00	11.76	18.18	17.39	8.33	0.00	13.70

Source: Field Survey

COTTON:

Table 5.2 presented the demographic profile of ZBNF and Non-ZBNF HH under cotton crop in Viziangaram district. The average size of ZBNF HH is 3.60 members the percentage of male members 46.67 percent and female 53.33 percent. Out of 25 ZBNF HH maximum 84 percent heads of HH and 88 percent male farmers responded in the survey. On the whole Maximum 70.00 percent of members under 16 to 60 age group. In the case of educational status reported 64 percent illiterates. Looking at the average HH among different caste categories 96 percent of HH under ST category and 78.57 percent working members reported farming as their main occupation under ZBNF.

Further table 5.2 shows the demographic profile of Non-ZBNF HH under cotton crop. The average size of HH found to be 3.72 members, across the farm size groups varied from 3.25 members from marginal to 4.25 members in small farmer group. The average HH constituted to be 52.69 percent male and 47.31 percent female. About decision making reported 92 percent male farmers and 100 percent male heads of the house participated in the survey. Out of 25 Non-ZBNF HH the maximum number 67.74 percent of members are in 16 to 60 age group. In the case of education status 80 percent HH are illiterates. Regarding caste composition of all farmer size groups 68 percent belongs to ST category and 32 percent OBC. 75.34 percent of working members reported farming as their main occupation.

KURNOOL DISTRICT: PADDY CROP:

Table 5.3 presented demographic profile of selected ZBNF and Non- ZBNF farmers under paddy crop in Kurnool district. On the whole average size of ZBNF HH was 4.08, consisting 51.96 percent male and 48.04 female members. Out of 25 HH 84 percent male members are heads and 92 percent responded by male members in the survey. Regarding age group of members 81.37 percent are in the 16-60 age group. In the case of educational status reported to be 96 percent literates and 4 percent illiterates. On the whole average HH educational standard found to be highest at 68 percent studied upto 10^{th} class. Social category of HH shows highest 56 percent from general category followed by 28 percent and 16 percent under OBC and SC category of HH respectively. 81.32 percent working members reported farming as main occupation. Further table 5.3 presented Non-ZBNF, HH and the average HH size was 3.12. Out of 25 HH male and female members ratio was 55.13 percent and 44.87 percent. 100 percent head of the households are males and

Table 5.2: Demographic profile of the Cotton crop ZBNF and Non-ZBNF farmers in the district of Vizianagaram

Characteristics	Cotton -ZBNF					Cotton - Non-ZBNF				
	M	S	MED	L	T	M	S	MED	L	T
No. of households	9	7	8	1	25	8	8	8	1	25
Household size (average)	3.00	4.43	3.63	3.00	3.60	3.25	4.25	3.63	4.00	3.72
Male	51.85	45.16	44.83	33.33	46.67	57.69	50.00	51.72	50.00	52.69
Female	48.15	54.84	55.17	66.67	53.33	42.31	50.00	48.28	50.00	47.31
Gender % of Head of the household										
Male	88.89	85.71	87.50	0.00	84.00	87.50	87.50	100.00	100.00	92.00
Female	11.11	14.29	12.50	100.00	16.00	12.50	12.50	0.00	0.00	8.00
Identity of respondent (%)										
Head	88.89	85.71	100.00	0.00	88.00	100.00	100.00	100.00	100.00	100.00
Others	11.11	14.29	0.00	100.00	12.00	0.00	0.00	0.00	0.00	0.00
Age group of the members (%)										
<16	18.52	19.35	27.59	0.00	21.11	23.08	17.65	24.14	25.00	21.51
16-60	74.07	7.97	65.51	66.67	70.00	61.54	70.59	68.97	75.00	67.74
>60	7.41	9.68	6.90	33.33	8.89	15.38	11.76	6.90	0.00	10.75
Education status of the members (%)										
Illiterate	77.78	71.43	37.50	100.00	64.00	87.50	87.50	62.50	100.00	80.00
Primary up to 5	11.11	28.57	62.50	0.00	32.00	0.00	12.50	37.50	0.00	16.00
secondary up to 10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Higher secondary up to 12	11.11	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00
Diploma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Degree	0.00	0.00	0.00	0.00	0.00	12.50	0.00	0.00	0.00	4.00
Post Graduation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Caste (%) of HH										
General	11.11	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00
OBC	0.00	0.00	0.00	0.00	0.00	37.50	50.00	0.00	100.00	32.00
SC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST	88.89	100.00	100.00	100.00	96.00	62.50	50.00	100.00	0.00	68.00
Main Occupation (%) or working members										
Agriculture	81.82	76.00	76.19	100.00	78.57	70.00	71.43	81.82	100.00	75.34
Salaried work	4.55	8.00	0.00	0.00	4.29	0.00	3.57	4.55	0.00	2.74
Own business	4.55	4.00	14.29	0.00	7.14	10.00	10.71	4.55	0.00	8.22
Pensioner	9.09	12.00	9.52	0.00	10.00	20.00	14.29	9.09	0.00	13.70

Source: Field Survey

The 96 percent HH responded by head of HH. The age group of total members of sample HH found to be 80.00 percent members from 16 to 60 age group and maximum 80 percent members literates and 20 percent illiterates. Regarding caste composition 56 percent OBC category followed by 36 percent general and 8 percent SC category. 82.61 percent working members expressed farming as their main occupation.

Table 5.3: Demographic profile of Paddy crop ZBNF and Non-ZBNF farmers in Kurnool district

Characteristics	Paddy - ZBNF					Paddy - Non-ZBNF				
	M	S	MED	L	T	M	S	MED	L	T
No. of households	8	8	8	1	25	8	8	8	1	25
Household size (average)	3.25	3.88	5.00	5.00	4.08	3.00	2.63	2.88	10.00	3.12
Male	46.15	58.06	50.00	60.00	51.96	54.17	52.38	56.52	60.00	55.13
Female	53.85	41.94	50.00	40.00	48.04	45.83	47.62	43.48	40.00	44.87
Gender % of Head of the household										
Male	75.00	87.50	87.50	100.00	84.00	100.00	100.00	100.00	100.00	100.00
Female	25.00	12.50	12.50	0.00	16.00	0.00	0.00	0.00	0.00	0.00
Identity of respondent (%)										
Head	100.00	87.50	87.50	100.00	92.00	100.00	87.50	100.00	100.00	96.00
Others	0.00	12.50	12.50	0.00	8.00	0.00	12.50	0.00	0.00	4.00
Age group of the members (%)										
<16	15.38	6.45	7.50	20.00	9.81	16.48	13.53	8.70	20.00	14.68
16-60	73.08	83.87	87.50	60.00	81.37	75.17	76.95	86.95	80.00	79.77
>60	11.54	9.68	5.00	20.00	8.82	8.35	9.52	4.35	0.00	5.56
Education status of the members (%)										
Illiterate	12.50	0.00	0.00	0.00	4.00	25.00	0.00	37.50	0.00	20.00
Primary up to 5	0.00	0.00	0.00	0.00	0.00	25.00	12.50	0.00	100.00	16.00
secondary up to 10	75.00	75.00	62.50	0.00	68.00	25.00	62.50	37.50	0.00	40.00
Higher secondary up to 12	0.00	12.50	37.50	0.00	16.00	12.50	25.00	25.00	0.00	20.00
Diploma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Degree	12.50	12.50	0.00	100.00	12.00	12.50	0.00	0.00	0.00	4.00
Post Graduation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Caste (%) of HH										
General	62.50	37.50	62.50	100.00	56.00	37.50	25.00	50.00	0.00	36.00
OBC	25.00	25.00	37.50	0.00	28.00	50.00	62.50	50.00	100.00	56.00
SC	12.50	37.50	0.00	0.00	16.00	12.50	12.50	0.00	0.00	8.00
ST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Main Occupation (%) or working members										
Agriculture	76.19	82.76	81.08	100.00	81.32	80.95	78.95	90.48	75.00	82.61
Salaried work	4.76	3.45	5.41	0.00	4.40	4.76	5.26	4.76	12.50	5.80
Own business	9.52	3.45	8.11	0.00	6.59	4.76	5.26	0.00	12.50	4.35
Pensioner	9.52	10.34	5.41	0.00	7.69	9.52	10.53	4.76	0.00	7.25

Source: Field Survey

COTTON CROP:

Table 5.4. shows the demographic profile of cotton crop of ZBNF and Non—ZBNF sample HH in Kurnool district. Out of 25 HH under ZBNF sample farmers, the average size of HH members are to be 4.12 and across four size groups varied between 3.38 in small farmers and 5 members in medium farmer group, Male female ratio constituted to be

Table 5.4 Demographic profile Cotton crop ZBNF and Non-ZBNF farmers in Kurnool district

Characteristics	Cotton - ZBNF					Cotton - Non-ZBNF				
	M	S	MED	L	T	M	S	MED	L	T
No. of households	8	8	8	1	25	8	8	8	1	25
Household size (average)	4.00	3.38	5.00	4.00	4.12	4.63	3.75	2.88	2.00	3.68
Male	56.25	55.56	45.00	50.00	51.46	45.95	50.00	56.52	50.00	50.00
Female	43.75	44.44	55.00	50.00	48.54	54.05	50.00	43.48	50.00	50.00
Gender % of Head of the household										
Male	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Identity of respondent (%)										
Head	87.50	100.00	100.00	100.00	96.00	100.00	100.00	87.50	100.00	96.00
Others	12.50	0.00	0.00	0.00	4.00	0.00	0.00	12.50	0.00	4.00
Age group of the members (%)										
<16	9.38	7.41	10.00	25.00	9.71	10.81	10.00	17.39	6.00	11.05
16-60	84.38	81.48	82.50	75.00	82.52	81.38	83.69	73.91	94.00	83.25
>60	6.25	11.11	7.70	0.00	7.77	7.81	6.31	8.70	0.00	5.71
Education status of the members (%)										
Illiterate	50.00	37.50	37.50	0.00	40.00	50.00	12.50	50.00	0.00	36.00
Primary up to 5	12.50	0.00	25.00	0.00	12.00	0.00	25.00	0.00	0.00	8.00
secondary up to 10	0.00	12.50	25.00	100.00	16.00	12.50	50.00	25.00	100.00	32.00
Higher secondary up to 12	12.50	0.00	12.50	0.00	8.00	12.50	12.50	12.50	0.00	12.00
Diploma	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	8.00
Degree	25.00	50.00	0.00	0.00	24.00	0.00	0.00	12.50	0.00	4.00
Post Graduation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Caste (%) of HH										
General	0.00	0.00	0.00	100.00	4.00	0.00	0.00	0.00	100.00	4.00
OBC	62.50	87.50	87.50	0.00	76.00	100.00	87.50	100.00	0.00	92.00
SC	37.50	12.50	12.50	0.00	20.00	0.00	12.50	0.00	0.00	4.00
ST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Main Occupation (%) or working members										
Agriculture	86.21	80.00	83.33	100.00	83.87	81.82	88.89	78.95	100.00	83.95
Salaried work	3.45	4.00	5.56	0.00	4.30	3.03	3.70	0.00	0.00	0.00
Own business	3.45	4.00	2.78	0.00	3.23	6.06	3.70	10.53	0.00	6.17
Pensioner	6.90	12.00	8.33	0.00	8.60	9.09	3.70	10.53	0.00	7.41

Source: Field Survey

51.46:48.54 of the total members of the sample HH. Out of 25 HH maximum 96 percent responded by males and 100 percent male persons are heads. In the case of all size groups of HH 82.52 percent number of members are under 16-60 age group and educational status constitutes 60 percent literates and 40 percent illiterates. Regarding caste composition from all farmer size groups are shown 76 percent OBC followed by 20

percent SC and 4 percent general category. The maximum 83.87 number of working members reported farming as their main occupation.

Further Non-ZBNF cotton crop sample farmers demographic profile is presented in the following Table 5.4. The average size of HH is 3.68 members. Across the size groups this size varied from 2.00 members in large farmer to 4.6 members in marginal farmer HH. On an average the ratio between male and female ratio 50 percent of all sample HH. The survey indicated that all male members are heads and 96 percent male persons participated in the survey. Regarding age group highest 83.25 percent members belonged to 16-60 age group. About literacy of all members reported to be 36 percent illiterates, rest of 64 percent literates and 36 percent studied up to 10^{th} class. The majority of HH i.e., 92 percent are under OBC category. On the whole 83.95 percent working members reported farming as their main occupation under cotton crop in Kurnool district.

SECTION – III

5.3 Characteristics of Operational Holdings:

PADDY AND COTTON:

VIZIANAGARAM DISTRICT:

Table 5.5 presented the characteristics of operational land holdings of ZBNF and Non-ZBNF sample HH under Paddy crop. It is observed from the table that the average house hold own land was 2.70 acres. Among the farm size groups marginal farmer average operational own land found to be 1.01 acres, followed by 2.88, 4.30 and 2.00 acres in small, medium and large farmers respectively. On the whole per HH average leased-in land was 2.50 acres, and the farm size group large farmer leased in land reported to be highest 30.00 acres. The leased out land reported to be small extent of area 0.20 acres from marginal farmer. Among the farmers groups average Net Operated Area reported to be 1.70 acres from marginal, followed by 3.76 acres in small, 6.80 acres medium and 32.00 acres in large farmer. On the whole average Net Operated Area was 2.58 acres cultivated under ZBNF method and the 2.56 acres cultivated in Non-ZBNF 2.56 method. The ZBNF sample farmers cultivate both ZBNF and Non-ZBNF methods under Paddy crop.

Table 5.5: Characteristics of Operational Holdings of Paddy crop sample farmers in Vizianagaram District

(Area in acres)

Farm size	Owned land	Leased in	Leased out	Net operated area	ZBNF area	Non-ZBNF area
Paddy - ZBNF						
Marginal	1.01	0.69	0.20	1.70	1.51	0.13
Small	2.88	0.88	0.00	3.76	2.00	1.76
Medium	4.30	2.50	0.00	6.80	3.30	3.50
Large	2.00	30.00	0.00	32.00	10.00	22.00
Total	2.70	2.50	0.06	5.14	2.58	2.56
Paddy – Non-ZBNF						
Marginal	1.46	0.48	0.00	1.93	0.00	1.93
Small	3.41	0.00	0.00	3.41	0.00	3.41
Medium	6.38	0.50	0.00	6.88	0.00	6.88
Large	10.50	0.00	5.00	5.50	0.00	5.50
Total	4.02	0.31	0.20	4.13	0.00	4.13

Source: Field Survey

Further the table shows the area operated by Non-ZBNF sample HH. The Net Operated Area (NOA) of average farmer reported to be 4.13 acres and the average HH own land was 4.02 acres. The leased in and leased-out land was reported to be meagre extent of 0.31 and 0.20 acres. Among the farmers groups the marginal HH own land reported to be 1.46 acres followed by 3.41, 6.88 and 5.50 acres in small, medium and large farmer group. There was absence of ZBNF method cultivable land reported by all Non-ZBNF farmers under paddy crop in Vizianagaram district.

COTTON:

Table 5.6 shows the operational holdings of Cotton crop in both ZBNF and Non-ZBNF sample HH in Vizianagaram district. The average HH owned land was 3.41 acres and leased-in and leased out area reported to be 0.82 acres and 0.32 acres. So the Net Operated Area (NOA) of ZBNF famer groups per HH was 3.91 acres. Out of 3.91 acres large extent of area 3.63 acres cultivated in ZBNF method and the rest of the land 0.28 acres cultivated in Non-ZBNF method.

Table 5.6: Characteristics of Operational Holdings of Cotton crop sample farmers in Vizianagaram District

(Area in acres)

Farm size	Owned land	Leased in	Leased out	Net operated area	ZBNF area	Non-ZBNF area
Cotton -ZBNF						
Marginal	1.88	0.06	0.00	1.94	1.81	0.13
Small	2.43	1.50	0.00	3.93	3.93	0.00
Medium	4.96	1.00	0.00	5.96	5.21	0.75
Large	11.00	0.00	8.00	3.00	3.00	0.00
Total	3.41	0.82	0.32	3.91	3.63	0.28
Cotton –Non-ZBNF						
Marginal	1.56	0.00	0.00	1.56	0.00	1.56
Small	3.75	0.38	0.00	4.13	0.00	4.13
Medium	5.25	1.81	0.00	7.06	0.00	7.06
Large	12.00	0.00	0.00	12.00	0.00	12.00
Total	3.86	0.70	0.00	4.56	0.00	4.56

Source: Field Survey

Further the table has shown the Non-ZBNF sample HH operational holdings of Cotton crop in Vizianagaram district. The average HH owned land reported to be 3.8 acres; leased-in land was 0.70 acres and leased out land was absent. Per HH Net Operated Area reported to be 4.56 acres and the total 4.56 acres cultivated under non-ZBNF method. So the ZBNF method of cultivation was absent by all Non-ZBNF HH under cotton crop.

Therefore we observed that the Net Operated Area of ZBNF sample farmers followed both ZBNF and Non-ZBNF methods of cultivation under paddy and cotton crops. Whereas all non-ZBNF sample farmers expressed that they only practice Non-ZBNF method of cultivation of sample crops in Vizianagaram and Kurnool districts.

KURNOOL: PADDY:

Table 5.7 provides information of ZBNF and Non-ZBNF sample HH under Paddy crop in Kurnool district. The Paddy crop overall per HH owned land was 3.84 acres and lease-in land 1.80 acres. While small and medium farmers HH are having leased in land as 3.25 and 2.38 acres. The leased-out land was absent average HH Net Operated Area found to be

5.10 acres. Out of 5.10 acres 2.00 acres cultivated through ZBNF method and rest of 3.10 acres cultivated in Non-ZBNF method expressed by ZBNF farmers in Kurnool district.

Table 5.7: Characteristics of Operational Holdings of Paddy crop sample farmers in Kurnool District

(Area in acres)

Farm size	Owned land	Leased in	Leased out	Net operated area	ZBNF area	Non-ZBNF area
Paddy - ZBNF						
Marginal	1.50	0.00	0.00	1.50	1.50	0.00
Small	2.25	3.25	0.00	5.50	2.75	2.75
Medium	6.38	2.38	0.00	8.76	1.75	7.00
Large	15.00	0.00	0.00	15.00	2.00	13.00
Total	3.84	1.80	0.00	5.10	2.00	3.10
Paddy – Non-ZBNF						
Marginal	1.28	0.25	0.00	1.53	0.00	1.53
Small	2.63	0.75	0.00	3.38	0.00	3.38
Medium	6.81	0.63	0.00	7.44	0.00	7.44
Large	11.00	0.00	0.00	11.00	0.00	11.00
Total	3.87	0.52	0.00	4.39	0.00	4.39

Source: Field Survey

Further Non-ZBNF farmers per HH own land area found to be 3.87 acres, and leased in land was 0.52 acres. Whereas the leased out land was absent. The average HH Net Operated Area found to be 4.39 acres and all Non-ZBNF farmer groups followed the Non-ZBNF method of cultivation under paddy crop in Kurnool district.

COTTON:

Table 5.8 presented the characteristics of Operational holdings under Cotton crop in Kurnool district. The table shows ZBNF farmers per HH Net Operated Area found to be 5.36 acres. The owned and leased-in land found to be 4.32 acres and 1.04 acres. There was absence of leased out land. Among the farmer group large farmer group expressed that their leased in land reported maximum 15.00 acres. Out of 5.36 acres 3.56 acres cultivated under organic method (ZBNF) and the remaining 1.80 acres grown in organic method expressed by the ZBNF sample HH in Kurnool district.

Table 5.8: Characteristics of Operational Holdings of Cotton crop sample farmers in Kurnool District

(Area in Acres)

Farm size	Owned land	Leased in	Leased out	Net operated area	ZBNF area	Non-ZBNF area
Cotton -ZBNF						
Marginal	1.72	0.00	0.00	1.72	1.72	0.00
Small	3.66	0.00	0.00	3.66	3.41	0.25
Medium	6.13	1.38	0.00	7.50	5.75	1.75
Large	16.00	15.00	0.00	31.00	2.00	29.00
Total	4.32	1.04	0.00	5.36	3.56	1.80
Cotton –Non-ZBNF						
Marginal	1.25	0.38	0.00	1.63	0.00	1.63
Small	2.88	0.75	0.00	3.63	0.00	3.63
Medium	5.13	0.69	0.00	5.81	0.00	5.81
Large	14.00	0.00	0.00	14.00	0.00	14.00
Total	3.52	0.58	0.00	4.10	0.00	4.10

Source: Field Survey

On the other hand Non-ZBNF sample farmers under Cotton crop, over all per HH owned land was 3.52 acres. The leased in land found to be 0.58 acres and no extent of leased out land. The Net Operated Area was 4.10 acres and cultivated in Non-ZBNF method. So the total area Non-ZBNF method of cultivation reported by all Non-ZBNF farmers in Kurnool district.

5.4 Source of Irrigation: VIZIANAGARAM District:

Adequate irrigation potentiality is one of the important parameters for intensive use of available land resources, Table 5.9 shows the percentage of irrigation in Net Operated Area irrigated by all sources of Paddy crop such as canal, canal plus, tube well, only electric tube well, diesel tube well, tanks and rainfed under ZBNF and Non-ZBNF farmers. On the whole out of 127 acres of total ZBNF sample farmers Net operated under Paddy crop maximum 59.06% area irrigated only under electric tube well and 26.38% tanks and others. The remaining 14.57 percent area comes under rainfed. Category wise with regard to marginal farm HH Net operated area 63.24 percent irrigated by electric tube well followed by 51.85 percent small farmers. 66.50 percent large farmer group and further Table 5.9

presented the percentage of irrigated area and source of irrigation under Non-ZBNF paddy crop farmers. Out of 114.06 acres of Net Operated Area, maximum 91.96 percent area under rainfed, the rest of 8.04 percent irrigated by tanks. Category wise marginal *farmers* maximum net area operated area under rainfed reported to be 100 percent followed by 78.75 percent marginal farmer. Therefore the ZBNF sample farmers expressed electric tube well provided the lion's share of irrigation of total net operated area under ZBNF method of paddy crop whereas paddy crop under Non-ZBNF farmers maximum area depends on rainfed due to the selected villages are in hill track in Vizianagaram district.

Table 5.10 indicates the percentage of irrigation of Net Operated Area and irrigated by sources of cotton crop farmers in both ZBNF and Non-ZBNF sample farmers. It reveals the table 5.10 out of 96.66 acers Net Operated Area maximum 97.95 percentage area depend under rainfed and the rest 2.05 percent irrigated by tanks. Category wise marginal farmers total Net Operated Area under rainfed. In the case of small farmers 93.64 percentage area under rainfed, medium and large category farmers total Net Operated Area (100 percent) under rainfed.

Table 5.9: Source of irrigation of Net Operated Area (%) of paddy crop sample farmers in Vizianagaram District

(Area in Acres)

Farm size	Only canal	Canal+ Tube well	Electrical tube well	Diesel tube well	Tanks& others	Rain fed	Total operated area
Paddy - ZBNF							
Marginal	0.00	0.00	63.24	0.00	11.03	25.74	(13.60) 100.00
Small	0.00	0.00	40.74	0.00	51.85	7.41	(27.00) 100.00
Medium	0.00	0.00	65.07	0.00	14.71	20.22	(54.40) 100.00
Large	0.00	0.00	66.50	0.00	31.25	6.25	(32.00) 100.00
Total	0.00	0.00	59.06	0.00	26.38	14.57	(127.00) 100.00
Paddy – Non-ZBNF							
Marginal	0.00	0.00	0.00	0.00	0.00	100.00	(12.56) 100.00
Small	0.00	0.00	0.00	0.00	21.25	78.75	(33.00) 100.00
Medium	0.00	0.00	0.00	0.00	4.55	95.45	(56.50) 100.00
Large	0.00	0.00	0.00	0.00	0.00	100.00	(12.00) 100.00
Total	0.00	0.00	0.00	0.00	8.04	91.96	(114.06) 100.00

Source: Field Survey
Notes: Brackets in figures indicates total operated area.

In the case of cotton crop Non-ZBNF farmers total operated area was 114.06 acres. Out of which maximum crop area 75.88 percent grown under rainfed and 10.53 percent area irrigated by canal. The remaining 8.33 percent under tanks and 5.26 percent area electric tube well. Category wise the marginal group 76.00 percent area under rainfed, 16.00 and 8.00 percent area irrigated by canal and tanks. The small, medium and large farmers group reported that 78.79, 72.57 and 83.33 percent area cultivated under rainfed.

Therefore in Vizianagaram district the sample HH of both paddy and cotton crop sample farmers in ZBNF and Non-ZBNF practices maximum operated area under rainfed and tanks due to the sample villages are hill track in Vizianagaram district.

Table 5.10: Source of irrigation of Net Operated Area % of Cotton crop sample households in Vizianagaram District

(Area in acres)

Farm size	Only canal	Canal+ Tube well	Electrical tube well	Diesel tube well	Tanks & others	Rain fed	Total operated area
Cotton-ZBNF							
Marginal	0.00	0.00	0.00	0.00	0.00	100.00	(15.52) 100.00
Small	0.00	0.00	0.00	0.00	6.36	93.64	(31.47) 100.00
Medium	0.00	0.00	0.00	0.00	0.00	100.00	(46.67) 100.00
Large	0.00	0.00	0.00	0.00	0.00	100.00	(3.00) 100.00
Total	0.00	0.00	0.00	0.00	2.05	97.95	(96.66) 100.00
Cotton- Non-ZBNF							
Marginal	16.00	0.00	0.00	0.00	8.00	76.00	(12.56) 100.00
Small	0.00	0.00	9.09	0.00	12.12	78.79	(33.00) 100.00
Medium	14.16	0.00	5.31	0.00	7.96	72.57	(56.50) 100.00
Large	16.67	0.00	0.00	0.00	0.00	83.33	(12.00) 100.00
Total	10.53	0.00	5.26	0.00	8.33	75.88	(114.08) 100.00

Source: Field Survey

KURNOOL DISTRICT:

Table 5.11 shows that the percentage of total operated area and irrigation sources of paddy crop ZBNF sample farmers. Out of 127.52 acres maximum 39.61 percent irrigated area by canal followed 27.45 percent tanks and others, 17.25 percent rainfed, 12.55 percent electric tube well and 3.14 per cent under canal. Over the size groups marginal

farm HH 41.67 percent area irrigated electric tube well followed by 33.33 percent canal and 25.00 percent area tanks and others. The small farm HH reported 24.59 per cent area under rainfed. The rest of area 27.87 percent area electric tube well, 22.95 percent canal, 13.11 per cent area canal plus tube well and 11.48 per cent area irrigated under tanks. In the case of medium farmers maximum 56.43 percent area irrigated by canals followed by 20.71 percent rainfed and 19.29 and 3.37 per cent under tanks and electric tube well. The large farmers total operated area irrigated under tanks of ZBNF farmers.

Table 5.11: Source of irrigation of Net Operated Area (%) of Paddy crop sample households in Kurnool District

(Area in acres)

Farm size	Only canal	Canal+ Tube well	Electrical tube well	Diesel tube well	Tanks & others	Rain fed	Total operated area
Paddy -ZBNF							
Marginal	33.33	0.00	41.67	0.00	25.00	0.00	(12.00) 100.00
Small	22.95	13.11	27.87	0.00	11.48	24.59	(30.50) 100.00
Medium	56.43	0.00	3.57	0.00	19.29	20.71	(70.00) 100.00
Large	0.00	0.00	0.00	0.00	100.00	0.00	(15.00) 100.00
Total	39.61	3.14	12.55	0.00	27.45	17.25	(127.52) 100.00
Paddy –Non-ZBNF							
Marginal	100.00	0.00	0.00	0.00	0.00	0.00	(12.25) 100.00
Small	62.96	14.81	0.00	11.11	11.11	0.00	(27.00) 100.00
Medium	72.27	0.00	12.61	0.00	3.36	11.76	(59.50) 100.00
Large	90.91	0.00	0.00	0.00	0.00	9.09	(11.00) 100.00
Total	74.94	3.64	6.83	2.73	4.56	7.29	(109.76) 100.00

Source: Field Survey

Further Non-ZBNF sample farmers total operated area was 109.76 acres. Out of which maximum 74.94 per cent area irrigated by canals followed by 6.83 per cent electric tube well and 7.29 percent depends on rainfed. Among size groups marginal farmers had 100 percent of their area irrigated by canals followed by 62.96 small, 72.27 medium and 90.91 percent area under large farmers group. The other sources of irrigation canal, electric tube well, canal plus, tube well, diesel well and tanks irrigation also covered a meagre percentage of area. So canal and tanks are the major source of irrigation under ZBNF farmers. Whereas Non-ZBNF farmers canal is the only major source of irrigation under paddy crop in Kurnool district.

Table 5.12 shows the percentage of irrigation of total Operated area and irrigated sources of cotton crop ZBNF and Non-ZBNF sample farmers. It reveals from the Table that out of 127.00 acres total operated area maximum 59.06 percent area irrigated by electric tube well followed by 26.38 percent tanks and 14.57 percent area covered under rainfed. Category wise marginal group 63.24 percent area irrigated by electric tube well followed by 40.84, 65.07 and 62.50 percentage from small, medium and large farmer groups. Whereas tank irrigation maximum 51.85 percent area under small farmers and the highest rainfed area 25.74 percent reported from marginal in Kurnool district.

Table 5.12: Source of Irrigation of Net Operated Area (%) of Cotton crop sample households in Kurnool District

(Area in acres)

Farm size	Only canal	Canal+ Tube well	Electrical tube well	Diesel tube well	Tanks & others	Rain fed	Total operated area
Cotton - ZBNF							
Marginal	0.00	0.00	63.24	0.00	11.03	25.74	(13.60) 100.00
Small	0.00	0.00	40.74	0.00	51.85	7.41	(27.00) 100.00
Medium	0.00	0.00	65.07	0.00	14.71	20.22	(54.40) 100.00
Large	0.00	0.00	62.50	0.00	31.25	6.25	(32.00) 100.00
Total	0.00	0.00	59.06	0.00	26.38	14.57	(127.00) 100.00
Cotton - Non-ZBNF							
Marginal	0.00	0.00	0.00	0.00	0.00	100.00	(15.45) 100.00
Small	0.00	0.00	0.00	0.00	21.25	78.75	(27.30) 100.00
Medium	0.00	0.00	0.00	0.00	4.55	95.45	(55.00) 100.00
Large	0.00	0.00	0.00	0.00	0.00	100.00	(5.50) 100.00
Total	0.00	0.00	0.00	0.00	8.04	91.96	(103.25) 100.00

Source: Field Survey

The table further shows percentage of irrigated area and source of irrigation of total operated area of Non-ZBNF farmers. On the whole out of 103.25 acres of total operated area, maximum 91.96 percent area reported under rainfed and 8.04 percent under tank irrigation. Across the farmer groups, marginal and large farmer HH reported 100 percent area cultivated under rainfed followed by 78.75 and 95.45 per cent constituted from small and medium farmer groups in Kurnool district.

The source of irrigation under cotton crop found to be maximum and 60 percent total operated area irrigated by electric tube well reported of all ZBNF farmer groups

whereas above 90 percent area grew under rainfed expressed by marginal, medium and large farmer groups of Non-ZBNF cotton sample farmers in Kurnool district.

SECTION –IV

5.5. Cost of Cultivation of Paddy and Cotton Crops of Sample Districts:

VIZIANAGARAM DISTRICT: PADDY CROP

Table 5.13 presented per acre cost of cultivation of Paddy crop under ZBNF and Non-ZBNF households in Vizianagaram district. The Table shows that over all, per acre total cost of ZBNF household was Rs.17137 of which the expenditure on ploughing cost was maximum share 20.57 followed by 20.23 percent harvesting and threshing and 18.30 percent spent on natural fertilizers. Among the land holding groups, bearing per acre total cost reported maximum at Rs.17595 with large farmer household and minimum at Rs.16630 with marginal farm household. Across average costs, ploughing expenditure reported maximum cost of the total cost reported from all four farm households and maximum amount spent Rs.3750 with large farmer and minimum Rs.3350 from marginal farmer groups.

Natural Farming fertilizer costs ranked third place of the total costs and these costs consisting seed treatment (Beejamrutha), Jeevamutha, Wapasana and pest management. Among farmer groups the average household per acre natural fertiliser costs including labour costs reported maximum share at 18.88 per cent and minimum 17.51 per cent of total costs from marginal and small farmer group HH.

Further the following Table 5.13 Shows the cost of cultivation of paddy crop under Non-ZBNF sample households. Overall per acre total cost of cultivation reported to be Rs.19714 of which the Non-ZBNF input costs such as the expenditure on chemical fertilizers and plant protection chemicals with labour costs reported maximum share 29.73 percent of the total costs, followed by 18.83

percent ploughing, 18.00 per cent harvesting and threshing and 11.79 percent from sowing charges. Among the farmer groups average farmer per acre total cost reported maximum amount Rs.20,050 with large farmer group and minimum Rs.19,360 from marginal farmer group. On the other hand Non-ZBNF fertilizer and pesticide costs of all farm groups indicated maximum costs Rs.5,920 (29.97 percent) and minimum Rs.5,750 (20.70 percent) from medium and marginal farmer group under paddy crop of non-ZBNF sample households in Vizianagaram district.

Table 5.13
Cost of Cultivation of Paddy Crop in Vizianagaram District 2019-2020
(Rs. per Acre)

Sl.No	Seed	ZBNF Paddy					Non-ZBNF Paddy				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
		640	660	655	660	654	650	670	675	680	669
	%	3.85	3.86	3.80	3.75	3.81	3.36	3.40	3.42	3.39	3.39
1	Ploughing	3350	3400	3600	3750	3525	3420	3800	3750	3900	3713
	%	20.14	19.91	20.88	21.31	20.57	17.67	19.30	18.98	19.45	18.83
2	Sowing charges	2250	2300	2320	2200	2268	2360	2320	2280	2340	2325
	%	13.53	13.47	13.45	12.50	13.23	12.19	11.78	11.54	11.67	11.79
	ZBNF										
3	Seed treatment (Bijamurutham)	40	30	38	45	38					
	%	0.24	0.18	0.22	0.26	0.22					
6	Jeevamruta Including Labour Charges	1650	1680	1590	1640	1640					
	%	9.92	9.84	9.22	9.32	9.57					
8	Wapasana	0	0	0	0	0					
	%	0.00	0.00	0.00	0.00	0.00					
	Pest management Including labour charges	1450	1280	1520	1580	1458					
	%	8.72	7.49	8.82	8.98	8.50					
	ZBNF Input Costs	3140	2990	3148	3265	3136					
	%	18.88	17.51	18.26	18.56	18.30					
12	Non-ZBNF										
13	Chemical fertilizer						4200	4300	4500	4350	4338
	%						21.69	21.84	22.78	21.70	22.00
14	Plant Protection Chemicals						1550	1580	1420	1540	1523
	%						8.01	8.02	7.19	7.68	7.72
	Non ZBNF costs						5750	5880	5920	5890	5860
	%						29.70	29.86	29.97	29.38	29.73
15	Field yard manure	780	810	720	650	740	1060	940	950	600	888
	%	4.69	4.74	4.18	3.69	4.32	5.48	4.77	4.81	2.99	4.50
16	Weeding	2100	2350	2020	2430	2225	1650	1420	1540	1860	1618
	%	12.63	13.76	11.71	13.81	12.98	8.52	7.21	7.80	9.28	8.20
18	Harvesting& Threshing	3320	3450	3480	3620	3468	3450	3620	3520	3600	3548
	%	19.96	20.20	20.18	20.57	20.23	17.82	18.38	17.82	17.96	18.00
19	Transport costs	1050	1120	1300	1020	1123	1020	1040	1120	1180	1090
	%	6.31	6.56	7.54	5.80	6.55	5.27	5.28	5.67	5.89	5.53
20	Total cost	16630	17080	17243	17595	17137	19360	19690	19755	20050	19714
	%	100	100	100	100	100	100	100	100	100	100

Source: Primary Data

Therefore the estimations under ZBNF and Non-ZBNF farmers paddy crop indicated that the average household per acre total cost was maximum of large farmer group of both ZBNF and Non-ZBNF farmers. Where as the average household per acre ZBNF natural

fertilizer costs Vs Non-ZBNF fertiliser and pesticide costs reported less Rs.2,724 (11.43%). Therefore the ZBNF method of farming reduces the cost of cultivation than Non-ZBNF farming under paddy crop.

COTTON CROP:

Table 5.14 shows the estimations of cost of cultivation per acre under cotton crop of both ZBNF and Non-ZBNF sample farmers in Vizianagaram district. Overall per acre total cost of cultivation reported to be Rs.15964 under ZBNF household. Out of it Rs.4,193 (26.26 percent) maximum share spent on harvesting and threshing operation followed by ploughing 20.91 percent and 18.08 percent natural fertilizers. Across size groups average household total cost per acre reported maximum amount Rs.16,315 and minimum Rs.15,575 from medium and large farmer groups. The Natural Farming fertilizer costs consisting of seed treatment, Jeevamrutha, Achadana and pest management including labour charges. Among the farmer group natural farming fertilizer costs presented maximum at Rs.2,955 (18.97 per cent) and minimum Rs.2,855 (17.50 percent) from large and medium farmer groups. Across these natural faming fertilizer costs on the whole the average household per acre cost for Jeevamrutha reported maximum cost Rs.1,650 than other ZBNF input costs.

Further Table 5.14 depicts the estimations of Non-ZBNF farmers cost of cultivation. On the whole per acre cost of cultivation reported to be Rs.17,833 of which expenses of Non-ZBNF input costs reported maximum Rs.5,090 (28.54 percent) of total costs, followed by harvesting and threshing 23.76 percent and ploughing costs 19.21 percent. Across farm size groups total cost per acre maximum Rs.18,190 and least Rs.17,140 from small and large farmers groups. The Non-ZBNF material costs are chemical fertilizers and plant protection chemicals including labour costs. The Non-ZBNF costs reported maximum share of the total costs expressed by all farmer groups and maximum amount Rs.5,300 (29.14%) spent on small and least Rs.4,850 (28.30%) from large farmer group.

So the average farmer per acre natural farming fertilizer costs reported 18.08 percent under ZBNF farming where as Non-ZBNF farmer spent for Non-ZBNF such as chemicals and the share was 28.54 percent of total costs. So the natural fertilizer costs declined Rs.2,204 (10.46%) compared to chemical farming under paddy crop in Vizianagaram district.

Table 5.14
Cost of Cultivation of Cotton crop in Vizianagaram district 2019-2020

(Rs. per Acre)

Sl.No	Seed	ZBNF Cotton					Non-ZBNF Cotton				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
		1520	1560	1500	1540	1530	1560	1580	1510	1520	1543
	%	9.69	9.58	9.19	9.89	9.58	8.67	8.69	8.39	8.87	8.65
1	Ploughing	3250	3350	3400	3350	3338	3340	3400	3520	3440	3425
	%	20.72	20.58	20.84	21.51	20.91	18.56	18.69	19.56	20.07	19.21
2	Sowing charges	1450	1550	1540	1610	1538	1530	1560	1520	1610	1555
	%	9.24	9.52	9.44	10.34	9.63	8.50	8.58	8.44	9.39	8.72
	ZBNF										
3	Seed treatment (Bijamurutham)	45	50	55	55	51					
	%	0.29	0.31	0.34	0.35	0.32					
6	Jeevamruta	1450	1500	1520	1650	1530					
	%	9.24	9.21	9.32	10.59	9.58					
8	Wapasana	0	0	0	0	0					
	%	0.00	0.00	0.00	0.00	0.00					
	Pest management	1350	1340	1280	1250	1305					
	%	8.61	8.23	7.85	8.03	8.17					
	ZBNF Input Costs	2845	2890	2855	2955	2886					
	%	18.14	17.75	17.50	18.97	18.08					
12	Non-ZBNF										
13	Chemical fertilizer						3200	3100	2890	2850	3010
	%						17.78	17.04	16.06	16.63	16.88
14	Plant Protection Chemicals						2020	2200	2100	2000	2080
	%						11.22	12.09	11.67	11.67	11.66
	Non ZBNF costs						5220	5300	4990	4850	5090
	%	0.00	0.00	0.00	0.00	0.00	29.00	29.14	27.72	28.30	28.54
15	Field yard manure	680	710	780	520	673	600	720	650	400	593
	%	4.34	4.36	4.78	3.34	4.21	3.33	3.96	3.61	2.33	3.32
16	Weeding	1840	1870	1920	1600	1808	1350	1450	1560	1200	1390
	%	11.73	11.49	11.77	10.27	11.32	7.50	7.97	8.67	7.00	7.79
18	Harvesting& Threshing	4100	4350	4320	4000	4193	4400	4180	4250	4120	4238
	%	26.14	26.72	26.48	25.68	26.26	24.44	22.98	23.61	24.04	23.76
19	Transport costs	0	0	0	0	0	0	0	0	0	0
	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Total cost	15685	16280	16315	15575	15964	18000	18190	18000	17140	17833
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Primary Data

KURNOOL DISTRICT: PADDY CROP:

Table 5.15 shows per acre total cost of cultivation of paddy crop under ZBNF and Non-ZBNF sample farmer in Kurnool district. Overall, per acre total cultivation cost under ZBNF household reported to be Rs.22,076 of which the ZBNF input cost was maximum Rs.5,273 (23.89%) followed by harvesting and threshing costs Rs.4,480 (20.29%) and ploughing costs Rs 3,399 (15.40%). Across the size groups average household reported per acre total cost was maximum at Rs.22,323 for marginal farmers and minimum at Rs. 21,635 for small farmer. Per acre ZBNF practices costs reported maximum at Rs.5,558 from marginal farmers. (24.90%) and least Rs.5,015 (22.55%). Regarding the second highest cost per acre is reported for harvesting and threshing operations and the four farm groups indicated these costs are similar, reported highest 20.57% and least 19.80% from small and marginal farm households of the total costs of ZBNF farmers under paddy crop in Kurnool district.

On the other hand Table 5.15 depicts the estimated cost per acre under Non-ZBNF paddy household in Kurnool district. On the whole per acre cost of cultivation reported to be Rs.24,900 of which expenses on Non-ZBNF practices costs consisting of chemical fertilizer and plant protection chemicals. This shows maximum share 34.79 percent of the total costs followed by harvesting and threshing costs 16.46 percent of the total costs. Across the farm size groups total cost per acre maximum Rs.25,840 and least Rs.24,220 from large and marginal farm households. The ZBNF material costs of natural fertilizers including labour costs per acre spent maximum 36.00 percent and least 34.19 percent from large and medium farmer groups. So the natural fertilizer costs from all farm size groups and average farmer reported to be 10 per cent less than Non-ZBNF farmer method of cultivation under paddy crop in Kurnool district.

COTTON CROP:

Per acre, total cost of cultivation of cotton crop under ZBNF and Non-ZBNF methods of sample farmers are given in Table 5.16. The table shows that overall per acre total cost under ZBNF method was Rs.23,409 of which the expenditure on harvesting and threshing cost was maximum at 26.33 per cent followed by ZBNF natural fertilizer costs 18.66 percent and 15.26 percent of ploughing costs. Across the size groups per acre total cost was maximum Rs.23,942 and Rs.22,490 minimum reported from medium and marginal farmer groups. The costs of harvesting and threshing costs are more or less equal for all farmer groups under cotton crop. Regarding ZBNF natural fertilizer costs among the size groups

per acre highest amount was 19.59 per cent and least amount 17.39 percent from small and large farmer groups. Across the natural fertilizer costs per household highest 9.34 percent spent on Jeevamrutham followed by pest management 9.12 percent and least 0.20 percent in spent on seed treatment (Beejamrutham).

Further Table 5.16 furnished per acre cost of cultivation under cotton crop under Non-ZBNF sample households of Kurnool district. On the whole per acre cost of cultivation was reported to be Rs.27, 225 of which input costs reported highest 31.44 percent followed by harvesting and threshing costs 22.98 percent and 14.20 percent in ploughing costs. The Non-ZBNF costs mainly consisting chemical fertilizers and plant protection chemicals indicated 31.44 percent of total costs under cotton crop. Across the size groups per acre total cultivation cost including transport reported maximum Rs.27,780 from medium farmer group and least Rs.26,490 from marginal group farmer household followed by the harvesting and threshing costs reported maximum at 23.18 percent and least 22.71 percent large and medium farmer groups of Cotton crop under Non-ZBNF farmers in Kurnool district. Thus the maximum variation reported among the costs between ZBNF vs Non-ZBNF farmer per acre is 13.38 percent under cotton crop in Kurnool district.

Table 5.15
Cost of Cultivation of Paddy crop in Kurnool district 2019-2020

(Rs. per Acre)

Sl.No	Seed	ZBNF - Cotton					Non-ZBNF Cotton				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
		860	875	830	840	851	825	790	820	810	811
	%	3.85	4.04	3.73	3.80	3.86	3.41	3.20	3.30	3.13	3.26
1	Ploughing	3425	3020	3650	3500	3399	3140	3220	3410	3280	3263
	%	15.34	13.96	16.42	15.82	15.40	12.96	13.03	13.74	12.68	13.10
2	Sowing charges	2600	2520	2580	2340	2510	2350	2240	2460	2500	2388
	%	11.65	11.65	11.61	10.58	11.37	9.70	9.07	9.91	9.67	9.59
	ZBNF										
3	Seed treatment (Bijamurutham)	58	60	55	50	56					
	%	0.26	0.28	0.25	0.23	0.25					
6	Jeevamruta	2950	2950	2620	2850	2843					
	%	13.22	13.64	11.79	12.88	12.88					
8	Wapasana	0	0	0	0	0					
	%	0.00	0.00	0.00	0.00	0.00					
	Pest management	2550	2320	2340	2290	2375					
	%	11.42	10.72	10.53	10.35	10.76					
	ZBNF Input Costs	5558	5330	5015	5190	5273					
	%	24.90	24.64	22.56	23.46	23.89					
12	Non-ZBNF										
13	Chemical fertilizer						5675	5200	5315	6200	5598
	%						23.43	21.05	21.42	23.98	22.48
14	Plant Protection Chemicals						2750	3250	3170	3090	3065
	%						11.35	13.16	12.77	11.95	12.31
	Non ZBNF costs						8425	8450	8485	9290	8663
	%	0.00	0.00	0.00	0.00	0.00	34.79	34.20	34.19	36	34.79
15	Field yard manure	1260	1330	1200	1100	1223	1520	1615	1480	1700	1579
	%	5.64	6.15	5.40	4.97	5.54	6.28	6.54	5.96	6.57	6.34
16	Weeding	2350	2240	2620	2810	2505	2260	2340	2240	2420	2315
	%	10.53	10.35	11.79	12.70	11.35	9.33	9.47	9.03	9.36	9.30
18	Harvesting& Threshing	4420	4450	4550	4500	4480	3940	4210	4160	4080	4098
	%	19.80	20.57	20.47	20.34	20.29	16.27	17.04	16.76	15.78	16.46
19	Transport costs	1850	1870	1780	1840	1835	1760	1840	1760	1780	1785
	%	8.29	8.64	8.01	8.32	8.31	7.27	7.45	7.09	6.88	7.17
20	Total cost	22323	21635	22225	22120	22076	24220	24705	24815	25860	24900
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Primary Data

Table – 5.16
Cost of Cultivation of Cotton crop in Kurnool district 2019-2020

(Rs. per Acre)

Sl.No	Seed	ZBNF - Cotton					Non-ZBNF Cotton				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
		1650	1670	1620	1600	1635	1620	1650	1690	1640	1650
	%	7.34	7.12	6.77	6.74	6.98	6.12	5.95	6.08	6.10	6.06
1	Ploughing	3650	3580	3450	3610	3573	3750	3830	3920	3960	3865
	%	16.23	15.26	14.41	15.21	15.26	14.16	13.81	14.11	14.73	14.20
2	Sowing charges	2255	2340	2550	2460	2401	2480	2410	2420	2470	2445
	%	10.03	9.97	10.65	10.36	10.26	9.36	8.69	8.71	9.19	8.98
	ZBNF										
3	Seed treatment (Bijamurutham)	40	46	52	48	47					
	%	0.18	0.20	0.22	0.20	0.20					
6	Jeevamruta	2100	2300	2350	2000	2188					
	%	9.34	9.80	9.82	8.43	9.34					
8	Wapasana	0	0	0	0	0					
	%	0.00	0.00	0.00	0.00	0.00					
	Pest management	2050	2250	2160	2080	2135					
	%	9.12	9.59	9.02	8.76	9.12					
	ZBNF Input Costs	4190	4596	4562	4128	4369					
	%	18.63	19.59	19.05	17.39	18.66					
12	Non-ZBNF										
13	Chemical fertilizer						4200	4450	4320	4100	4268
	%						15.86	16.04	15.55	15.25	15.67
14	Plant Protection Chemicals						4100	4300	4350	4420	4293
	%						15.48	15.50	15.66	16.44	15.77
17	Irrigation costs										
	%						0.00	0.00	0.00	0.00	0.00
	Non ZBNF costs						8300	8750	8670	8520	8560
	%	0.00	0.00	0.00	0.00	0.00	31.33	31.54	31.21	31.68	31.44
15	Field yard manure	1620	1740	1690	1540	1648	750	820	540	460	643
	%	7.20	7.41	7.06	6.49	7.04	2.83	2.96	1.94	1.71	2.36
16	Weeding	1825	1980	2470	2920	2299	2200	2600	2880	2250	2483
	%	8.11	8.44	10.32	12.30	9.82	8.31	9.37	10.37	8.37	9.12
18	Harvesting& Threshing	6050	6210	6290	6100	6163	6140	6360	6310	6210	6255
	%	26.90	26.46	26.27	25.70	26.33	23.18	22.93	22.71	23.09	22.98
19	Transport costs	1250	1350	1310	1380	1323	1250	1320	1350	1380	1325
	%	5.56	5.75	5.47	5.81	5.65	4.72	4.76	4.86	5.13	4.87
20	Total cost	22490	23466	23942	23738	23409	26490	27740	27780	26890	27225
	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source : Primary Data

5.6. Yield and Cost differences ZBNF vs Non-ZBNF by farm size:

Table 5.17 presented paddy and cotton crop yield and costs under ZBNF and non-ZBNF sample households in Vizianagaram district. On an average HH per acre paddy crop yield is reported to be 19.33 quintals under ZBNF household. Where as Non-ZBNF yield reported at 18.98 qtls. ZBNF farmer groups yield per acre increased at 1.84 percent over non-ZBNF households. Among the ZBNF farmer HH yield assessments of ZBNF practices under paddy crop maximum yield indicated 3.23 percent from medium farmer and least 1.10 percent in the case of large farmer. On the other hand the average household per acre cost reported to be Rs.17,137 under ZBNF household, whereas Non-ZBNF farmer cost was Rs.19,714. So the ZBNF household per acre cost of cultivation was lower at 13.07 percent over non-ZBNF farmer. Moreover all groups of ZBNF farmers reported less costs than the non-ZBNF famer groups. So the ZBNF HH cost of cultivation was reduced highest 14.40 percent from marginal and least 12.24 percent in large farmer over Non-ZBNF households under paddy crop in Vizianagaram district. This clearly shows that cost of cultivation under ZBNF has reduced to a greater extent than that of Non-ZBNF.

Table 5.17
Yield and Cost differences between ZBNF & Non-ZBNF under Paddy and Cotton crop Farmers in Vizianagaram District

(Rs. Per Acre)

Sl.No	Crop	Yield			Cost		
	Paddy (Qtls)	ZBNF	Non-ZBNF	% Increase	ZBNF	Non-ZBNF	% Reduction
1	Marginal	**20.10**	**19.70**	**2.03**	**16630**	**19360**	**14.10**
2	Small	**19.60**	**19.40**	**1.03**	**17080**	**19690**	**13.26**
3	Medium	**19.20**	**18.60**	**3.23**	**17243**	**19755**	**12.72**
4	Large	**18.40**	**18.20**	**1.10**	**17595**	**20050**	**12.24**
5	Total	**19.33**	**18.98**	**1.84**	**17137**	**19714**	**13.07**
	Cotton (Qtls)						
1	Marginal	**4.60**	**4.40**	**4.55**	**15685**	**18000**	**12.86**
2	Small	**4.90**	**4.50**	**8.89**	**16280**	**18190**	**10.50**
3	Medium	**4.40**	**4.25**	**3.53**	**16315**	**18000**	**9.36**
4	Large	**4.10**	**4.00**	**2.50**	**15575**	**17140**	**9.13**
5	Total	**4.50**	**4.29**	**4.96**	**15964**	**17833**	**10.48**

Source: Primary data.

Further the following table shows yield and cost of cotton crop per acre under ZBNF and Non-ZBNF sample households. The ZBNF household average cotton crop yield per acre reported to be 4.50 quintal and 4.29 quintals under Non-ZBNF farmer households. The cotton crop yield assessments were reported higher in all four groups of ZBNF households

over Non-ZBNF households and the average household per acre cotton crop yield maximum 4.90 percent under ZBNF household over Non-ZBNF household. Among ZBNF farmer groups maximum yield increased at 8.89 percent from small farmer group and least 2.50 percent in the case of large farmer. On the other hand cost of cultivation per acre under ZBNF farmer household is lower than Non-ZBNF farmer groups. The average household under ZBNF farmer per acre cost of production reduced maximum at 12.86 percent and least in 9.13 percent from marginal and large farm household compare the costs of Non-ZBNF households under cotton crop in Vizianagaram district. Therefore the percentage of Paddy and Cotton crop yields increased and the costs have declined of all ZBNF households over Non-ZBNF households in Vizianagaram district.

Table 5.18
Yield and Cost differences between ZBNF & Non-ZBNF farmers under Paddy and Cotton Crop in Kurnool District

(Rs. Per Acre)

Sl.No	Crop	Yield			Cost		
	Paddy (Qtls)	ZBNF	Non-ZBNF	% Increase	ZBNF	Non-ZBNF	% Reduction
1	Marginal	**24.50**	**23.90**	**2.51**	**22323**	**24220**	**7.83**
2	Small	**23.90**	**22.40**	**6.70**	**21635**	**24705**	**12.43**
3	Medium	**22.40**	**22.80**	**-1.75**	**22225**	**24815**	**10.44**
4	Large	**23.50**	**22.10**	**6.33**	**22120**	**25860**	**14.46**
5	Total	**23.58**	**22.80**	**3.40**	**22076**	**24900**	**11.34**
	Cotton (Qtls)						
1	Marginal	**6.60**	**6.20**	**6.45**	**22490**	**26490**	**15.10**
2	Small	**6.50**	**6.30**	**3.17**	**23466**	**27740**	**15.41**
3	Medium	**6.60**	**6.50**	**1.54**	**23942**	**27780**	**13.82**
4	Large	**7.00**	**6.20**	**12.90**	**23738**	**26890**	**11.72**
5	Total	**6.68**	**6.30**	**5.95**	**23409**	**27225**	**14.02**

Source: Primary data

Table 5.18 reported the yield and cost per acre under paddy and cotton crop of ZBNF and Non-ZBNNF households in Kurnool district. On the whole average household per acre yield of paddy crop is 23.58 quintals under ZBNF practices and 22.80 quintals in Non-ZBNF household. So the average yield under ZBNF practicing farmer is more at 3.40 percent over the Non-ZBNF practicing farmers. Among the ZBNF farmer highest yield difference is reported at 6.70 percent from small farmer group. Whereas yield per acre declined at -1.75 percent from medium famer household compared to that of Non-ZBNF households. Further the cost of cultivation of average household per acre declined from ZBNF farm households by11.34 percent. Among all ZBNF farmer groups maximum cost declined 14.46 percent from large farmer group and least reported 7.83 per cent from marginal famer

compared to Non-ZBNF farmer under paddy crop. In case of cotton crop average sample household per acre yield reported to be 6.68 quintals and 6.30 quintals under ZBNF and Non-ZBNF practice respectively in Kurnool district. The average yield has increased at 5.95 percent under ZBNF household than Non-ZBNF farm household. Among the ZBNF farmer size groups maximum yield increased at 12.90 per cent from large farmer group compared to Non-ZBNF farmer group and the yield variation was between 1.54 percent to 12.90 percent from medium and large farmer groups. On the other hand average cost of cultivation per acre Rs.23,409 and Rs.27,225 of ZBNF and Non-ZBNF farmer households. This indicates the average HH cost share declined at 14.02 percent in ZBNF farmer household than Non-ZBNF household. All ZBNF sample farmer groups the average household cotton crop costs per acre declined than Non-ZBNF farm households and it varied from 11.72 per cent to 15.41 percent between small and large farmer groups under ZBNF practices than Non-ZBNF farmer groups in Kurnool district.

Table 5.19 depicts the output value, cost and net income of paddy and cotton crop sample households under ZBNF and Non-ZBNF practices in Vizianagaram district. On an average per acre net income of paddy sample household is reported to be Rs.13,058, across the groups per acre paddy crop net income varied from Rs.10,925 from large farmer to Rs.14,726 from marginal farmer. On the other hand Non-ZBNF average household net income was Rs.9,688 and among the groups per acre Non-ZBNF net income ranged between Rs.8,160 to Rs.11,175 of large and marginal farmer groups. So per acre net income is higher from all ZBNF farmer groups over the Non-ZBNF farming households. The average ZBNF household per acre net income share increased 34.66 percent and among the groups maximum 44.26 percent from medium farmers group under paddy crop in Vizianagaram district.

Further the table presented the estimations per acre cotton crop output value, cost and net returns of all size groups of sample households in Vizianagaram district. On an average per acre cotton crop net income of ZBNF farm household is reported to be Rs.6,316, across the groups per acre net income varied from Rs.4,515 from large farmer to Rs.7,775 in marginal farmer household. On the other hand per household Non-ZBNF farm net income per acre accounts to be Rs.2,533 and across the groups per acre income ranged between Rs.1,860 and Rs.3,185 for large and marginal farmer group of households respectively. Thus the average net income of all ZBNF households reported to be higher over Non-ZBNF farmers constituted to be Rs.3,783 (149.35 per cent) and among farmer groups ZBNF household per acre net income share increased between 139.77 per cent to

168.10 per cent of medium and marginal farmer groups compared to Non-ZBNF farm households under cotton crop in Vizianagaram district.

Table 5.19
Value of Out put , Cost & Net Income for the survey of Paddy and Cotton Crops in Vizianagaram District (Kharif 2019)

(Rs Per Acre)

Sl.NO	Farm Size	ZBNF			Non ZBNF			Difference ZBNF VS NonZBNF	
		Value of Output	cost of Production	Net Income	Value of Output	cost of Production	Net Income	Net Income	Benefit of Farmer %
	Paddy								
1	Marginal	31356	16630	14726	30535	19360	11175	3551	31.78
2	Small	30576	17080	13496	30070	19690	10380	3116	30.02
3	Medium	30336	17243	13093	28830	19755	9075	4018	44.28
4	Large	28520	17595	10925	28210	20050	8160	2765	33.88
5	Total	30195	17137	13058	29411	19714	9698	3361	34.66
	Cotton								
1	Marginal	23460	15685	7775	20900	18000	2900	4875	168.10
2	Small	24010	16280	7730	21375	18190	3185	4545	142.70
3	Medium	21560	16315	5245	20188	18000	2188	3058	139.77
4	Large	20090	15575	4515	19000	17140	1860	2655	142.74
5	Total	22280	15964	6316	20366	17833	2533	3783	149.35

Source: Primary data

Table 5.20 presented the value of output, cost and net returns of paddy and cotton crop under ZBNF and Non-ZBNF sample farmers in Kurnool district. Average household per acre net income reported to be Rs.16, 116 and it varied among the size groups minimum Rs.14,063 for medium farmer group to 17,367 in case of marginal farmers. On the other hand Non-ZBNF household net income reported to be Rs.11,580. Net income increased in all ZBNF farmer groups over Non-ZBNF farmers and the average household net income for paddy farmer group increased by Rs.4,536 (39.17 percent) and the farmer groups maximum share increased at 67.89 per cent for large farmer and least 20.56 per cent in medium farmer group over Non-ZBNF household under paddy crop in Kurnool district.

Table 5.20
Value of Out put , Cost & Net Income for the survey of Paddy and Cotton Crops in Kurnool District (Kharif 2019)

(Rs Per Acre)

Sl.NO	Farm Size	ZBNF			Non ZBNF			Difference ZBNF VS Non-ZBNF	
		Value of Output	cost of Production	Net Income	Value of Output	cost of Production	Net Income	Net Income	Benefit of Farmer %
	Paddy								
1	Marginal	39690	22323	17367	38240	24220	14020	3347	23.87
2	Small	38718	21635	17083	35840	24705	11135	5948	53.42
3	Medium	36288	22225	14063	36480	24815	11665	2398	20.56
4	Large	38070	22120	15950	35360	25860	9500	6450	67.89
5	Total	38192	22076	16116	36480	24900	11580	4536	39.17
	Cotton								
1	Marginal	34320	22490	11830	31620	26490	5130	6700	130.60
2	Small	33800	23466	10334	32760	27740	5020	5314	105.86
3	Medium	34320	23942	10378	32500	27780	4720	5658	119.87
4	Large	36400	23738	12662	31000	26890	4110	8552	208.08
5	Total	34710	23409	11301	31973	27225	4748	6554	138.04

Source: Primary data

Further under cotton crop sample households average household per acre net income under ZBNF farmer reported to be Rs.11,301 and it varied among the groups. On the other hand under Non-ZBNF household net income was reported to be 4748. The cotton crop net income of the average ZBNF farmer per acre reported to be 138.04 percent higher over non-ZBNF farmer and maximum reported to be 208.08 per cent for large farmer household under cotton crop in Kurnool district.

CHAPTER – VI

EVALUATION OF ZERO BUDGET NATURAL FARMING (ZBNF) INITIATIVES IN ANDHRA PRADESH

SUMMARY AND CONCLUSIONS

Introduction:

Andhra Pradesh is one of the leading agrarian states, having seventh largest area and tenth largest populas state in India. The state made up two major regions of Rayalaseema and Coastal Andhra Pradesh and has a total thirteen administrative districts.According to 2011 census, the state population was 4.96 crores and the literacy rate stands at 67.41 percent (Separate Andhra Pradesh). Agriculture is the main occupation and has been known as India's "Rice Bowl" on account of its tracts of irrigated paddy cultivation with in the basins of the Godavari, Krishna and Penna rivers. Across the state, 62 percent of the population is employed in agriculture and allied activities, cultivating around 80 lakh hectares of cropped area and generating over a quarter of the states GDP. Rice is the major food crop and staple food in the state, besides rice farmers also grow groundnut, cotton, jowar, bajra, minor millet, coarse grain and many varieties of pulses, oilseeds, sugarcane, chilli, pepper and tobacco. The state is the largest producer of fruits and vegetables.

6.1. Need and Scope of the Study:

In Andhra Pradesh state cost of cultivationincreased mostly due to debts from private money lenders, irregular rainfall, excess use of chemicals and fertilizers leading to declined incomeof farmers and contributed to our unprecedented suicide epidemic among farmers in the state. In addition, farmlands are reporting high soil toxicity due to the excess use of pesticides and fertilizers, thus jeopardizing public health. Therefore, natural farming is a welcome move and newly introduced technique among farmers. Zero Budget Natural Farming (ZBNF) was originally promoted by noted agriculturalist Dr.Subhash Palekar, who developed this in the mid 1990's. It has attained wide success in Southern India, now it has been spreading all over India.

6.2 Zero Budget Natural Farming in Andhra Pradesh (APZBNF):

Dr.Subhash Palekar argued that the rising costs of external inputs like seeds, fertilizers, pesticides were leading cause of indebtedness and suicides among farmers. So the ZBNF launched and it makes self-reliant, so that the farmer would be free from the clutches of moneylenders and market dispensed high cost inputs.

In 2014 the Government of Andhra Pradesh, Department of Agriculture has undertaken Climate Resilient Zero Budget Natural Farming (CRZBNF) with the establishment of Rythu Sadhikara Samastha (RySS), a fully government owned not for profit organization. It was proposedthatZBNF practices to cover all 6 million farmers and eight million hectares of agricultural land in the state by 2024. The Programme aims to promote Climate-Resilient, Chemical free, ecological agriculture and provide small and marginal farmers with profitable livelihoods from agriculture. Since then there has been no farm suicides reported from areas where Agro-ecological farming practices are being followed in the state.

6.3. Objectives:

1. To study the Growth rates in Area, production and yield of paddy and cotton crops in Andhra Pradesh during 1999-2000 to 2018-19.
2. To study the progress of Zero Budget Natural Farming (ZBNF) scheme in the state during 2015-16 to 2019-20.
3. To discuss the initiatives of ZBNF scheme in the state from 2015-16 to 2019-20.
4. To study the household characteristics, cost of cultivation, yield and net income of paddy and cotton crops under ZBNF and Non-ZBNF farmers in selected districts of the state.

6.4. Reference period of the study: 2019-20

6.5. Methodology:

The study based on both primary as well as secondary data. The secondary data was mainly collected from the office of Zero Budget Natural Farming (ZBNF) which is being implemented by Rythu Sadhikara Samstha (RySS) Department of Agriculture, Government of Andhra Pradesh Pradesh in Guntur district. The district level ZBNF data collected from the sample districts of Vizianagaram and Kurnool. Data collected from ZBNF various issues of statistical abstracts in Andhra Pradesh published by Directorate of Economics and Statistics, Government of Andhra Pradesh and Rythu Sadhikara Samstha (RySS) publications. District Hand Book of Statistics of sample districts, Agriculture Action Plan – 2018-19 and web: apzbnf.in.

Primary data has collected through a structured questionnaire. Out of 13 districts in the state, the study covers two districts Kurnool and Vizianagaram for household survey.

The selection of districtscovered in two separate regions in the state. Kurnool district was taken from Rayalaseema region and from this district two mandals were selected and each mandal two villages were selected for household survey. In the same way, four villages have selected from two mandals in Vizianagaramfrom Coastal Andhra Pradesh region of the state. The study selected two important crops namely Paddy and Cotton. The selection of districts, villages and study crops were selected with the co-ordination of Dr.8Nagireddigaru, Senior Consultant of State level ZBNF office Guntur in Andhra Pradesh. The total sample was 200 households each district sampling frame consisting 25 paddy and 25 cotton, the total 50 sample households from ZBNF farmers and the same way 25 paddy and 25 cotton households total 50 farmers were taken from Non ZBNF farmers household in each district. The sample farmers wereselectedby the District level ZBNF officials of the sample districts. The sample has made under probability proportion method in four standard farm size classes viz marginal upto 2.5 acres small 2.5 to 5 acres, medium 5 to 10 acres and large above 10 acres. The sample covered all the sections of the society such as marginal, small, medium and large and all caste composition of general category,OBC, SC and ST farmers including women.

6.6. Summary and Conclusions:

The selected crops of Paddy and Cotton crop area, production and yield Compound Annual Growth Rates (CAGR) were estimated with three periods of the total study period (1999-2000 to 2018-19) of the state.

The first period Paddy growth rate of area, production and productivity found to be positive at 0.53, 2.05 and 6.05percent (1999-2000 t0 2008-09). The second and total period (2009 to 2010 to 2018- 2019 and 1999-2000 to 2018-2019) area growth rate reported negative as -1.64 and -0.37percent production and yield growth rate increased at significant 3.26, 3.86percent and 8.42 and 6.32percent respectively. So the negative growth rate in area due to rainfed paddy grown area converted into commercial and horticultural crops in the state, such as oilpalm, cotton etc. in the state.

Cotton crop area, production and yield growth rate found to be significant in all three estimated periods except the area growth rate reported negative -3.09 percent in the first period (1999-2000 to 2008-09).The increasing growth rates of production and yield due to availability of HYV seeds and higher market prices.

The sample district of Vizianagaram Paddy crop growth rates (CAGR) of area, production and yield in all three-studyperiods found to be significant. In the case of Kurnool district first, second and third period growth rates (CAGR) found to be positive besides the area growth rate was declined -2.87percent in the second period.

Cotton crop area, production and yield growth rate found to be negative -3.74, -14.50 and -10.16percent in the first period (1999-2000 to 2008-09). The second and third period's growth trends of three components reported positive trends in Vizianagaram district. On the other hand in Kurnool district second and total period of all three components area, production and yield reported significant growth rates under cotton crop due to government programmes, availability of suitable black soils and HYV seeds in the open markets.

The APZBNF scheme commenced on pilot basis from Kharif 2016 where 704 villages were selected with 40,650 ZBNF farmers and an area 17656 hectares. It reached to 3015 Gram Panchayats 5,23,000 farmers and 2,00,000 hectares of land with 664 mandals under ZBNF scheme in the state.

The RYSS conducted the survey (Kharif 2016 and Rabi 2017) foundthat the averageyield ofZBNF farmer per hectare is reported higheryield in all study crops than Non-ZBNF crops. Among the study crops ZBNF farmer yield of Tomato crophad maximum yield 131% while paddy and cotton yield increased at 6% and 10% over the Non-ZBNF farmer in the state.

Further in 2018 (kharif) the assessments made by RySS stated that the costs came down drastically under ZBNF farming. The study found that the cotton crop cost per hectare reduced by 30% followed by ragi 32%, Maize 29%, paddy 18% and groundnut 15% in Kharif compared to non-ZBNF farmer. The net income per hectare increased maximum 197% under cotton crop followed by 125% groundnut, 83% paddy and 46% maize under ZBNF farmer over Non-ZBNF farmer in the state. Therefore, ZBNF farmerearned maximum income 227% under cotton crop due to increasing yield and declined cost over the Non-ZBNF farmer.

The centre for Economic and Social Studies (CESS) made estimations of major crops between the ZBNF vsNon-ZBNF farmers in the state. The assessments revealed that all estimated crops net income increased andaverage cost declined per hectare of ZBNF over non-ZBNF farmer.

The budgetary support for implementation of ZBNF scheme increased from Rs.52.52 crore to 153.32 crore during 2015-16 to 2018-19. The AZIM PREMJI Philanthropic Institute (APPI) has granted 100 crore for technical support. Recently German assistance of Rs.304 crore will be spent on this project, which is aimed to cover 2.39 lakh farmers in around 600 village Panchayats to promote natural farming announced by Hon. Chief Minister Shri Y.S. Jagan Mohan Reddy garu led state Government. TheAndhra Pradesh state government estimates that it will need 1700 crores to convert 60 lakh farmers to the ZBNF over the next 10 years.

On the whole socio-economic characteristics of sample HH under paddy and cotton crops of the sample districts found that the majority i.e 70% of members are under 16-60 age group. Except the cotton crop of Vizianagaram district, the rest of members illiterates found to be less than 40 percent .Above 60% working members of households reported farming as their main occupation.

On the whole Net Operated Area per HH is 4.44 acres under ZBNF farmer and 4.02 acres in the case of Non-ZBNF groups cultivating paddy and cotton crops in Vizianagaram district. Whereas Kurnool district it was found to be 5.23 acres under ZBNF HH and 4.25 acres in Non-ZBNF HH under Paddy and Cotton crops.

Out of 229.84 acres of Net Operated Area 51 percent area falls under rainfed and the rest of 49 percent area irrigated of the total sample HH maximum area irrigated by electric tube well and 17.85 percent followed by canal. 15.64 percent and 13.90 percent by tanks and others under paddy and cotton crops.

The average HH per acre input costs of ZBNF farmer cultivating paddy crop was Rs.17137 compared to Non-ZBNF farmer who reported it to be Rs.19,714. For cotton crop cultivators the average expenditure per acre for ZBNF farmer was Rs.15,964, while that for Non-ZBNF farmers was Rs.17,883. So the average cost of ZBNF farmer reported ls lower than Non-ZBNF farmer of both paddy and cotton crops in Vizianagaram district.

The study found that on an average paddy farmers spent on Rs.5860 (29.73%) per acre on chemical inputs, while farmers who were participating complete ZBNF natural fertilisers spent Rs.3136 (18.30%) per acre. So the ZBNF farmer can avoid fertilizer consumption on paddy cultivation to reduce the cost byRs. 2,724/- (11.43%) under ZBNF paddy crop. On the other hand cotton farmers in Non-ZBNF using fertiliser spent Rs.5,090 (28.54%) per acre on an acreage against Rs.2,886 (18.08%) spent by ZBNF farmers. So the average ZBNF farmer cotton production cost declined by Rs.2,104 (10.46%) in Vizianagaram district.

The average HH per acre total input costs of ZBNF farmer cultivating paddy was Rs.22,076 compared to Non-ZBNF farmer which is Rs.24,900. For cotton crop sample household found the average expenditure per acre for ZBNF farmer was Rs.23,409, while that of Non-ZBNF farmer spent Rs.27,225.

In Kurnool district Non-ZBNF farmer spent on Rs.8,663 (34.79%) per acre on chemical fertilizers and plant protection chemicals, while the ZBNF sample farmer spent Rs.5,273 (23.89%) per acre paddy cultivation. So the ZBNF farmer can avoid the fertilizer consumption and used natural fertilisers such as Jeevamrutha, Beejamrutha, Acchadana and natural pesticides on paddy crop cultivation lowering the cost by Rs.3,390 (10.90%). On the other hand non-ZBNF cotton crop farmers spent on fertilizer Rs.8,560 (31.44%)per acre against Rs.4,369 (18.66%) spent by ZBNF farmer. The cotton crop production cost declined Rs.4191 (12.78%) in Kurnool district for ZBNF farmers.

For the paddy farmer yield increased by 1.08% and average total cost declined by 13.07 percent per acre of average for ZBNF farmer over the Non-ZBNF farmer. Where as the cotton crop average ZBNF farmer per acre yield increased by 4.96 percent and the cost has declined by 10.48 percent compared to Non-ZBNF farmer in Vizianagaram district.

In Kurnool district the ZBNF farmer average HH per acre yield increased by 3.40 percent and the cost has declined by 11.34% under paddy crop over Non-ZBNF farmer. The cotton crop per acre yield increased by 5.95% and cost declined by 14.02% under ZBNF farmer than Non-ZBNF farmers in Kurnool district.

Further the study estimated the net income of ZBNF vs Non-ZBNF farmer households. The average net income per acre of paddy for ZBNF farmers HH increased by

34.66%. There are variations in this net income per acre among farmer groups of small and medium. Similarly, the cotton crop net income increased by 149.35% under ZBNF and it varied from 139.77% to 168.10% of marginal and medium farmer households.

In the case of Kurnool district average net income increased at 39.17% ZBNF farmer per acre paddy crop and varied 23.87% to 67.89% for marginal and large farmer compared to Non-ZBNF farmer. On the other hand, per acre net income for ZBNF cotton farmer also increased by 138.04% and among the farmer groups, it varied 105.86% to 208.08 percent of marginal and large farmer over the Non-ZBNF farmer in Kurnool district.

Therefore, the study found the average ZBNF farmer yield has increased and cost drastically declined than Non-ZBNF farmer for the selected crops of paddy and cotton in the districts of Vizianagaram and Kurnool in the state.

6.7. Field Observations:

1. The soil quality is poor and does not respond quickly to ZBNF practices to increase productivity of crops. So the ZBNF requires time and policy support. Therefore the government should provide monetary support for converting the total land of the farmer intoZBNF.
2. The survey reveals that majority of farmers needed to sell their produce to village traders and frequently they receive below MSP for the sample crops of paddy and cotton due to lack of in time procurement.
3. ZBNF method of farming will be difficult particularly for large farmer considering huge quantity requirement of organic inputs. The preparation such huge quantity of ZBNF natural fertilisers are very difficult due to non-availability of indigenous cows tubs and labour.
4. Organic markets are not in the state. The organic production has been sold to private traders at their offer price. That offer price is less or equal to the market price. Therefore, ZBNF output has no market advantage in the state.
5. The survey reveals that majority of farmers prefer to sell their produce to village traders. They need money for urgent requirements and debt payments.

6.8. Suggestions:

1. Ensure cheap and easily accessible certification for organic products to ZBNF farmers by the government and establish organic markets in urban areas.
2. Adoption of ZBNF model can reduce heavy credit, chemicals expenditure and prevent farmer suicides. Therefore, the government should extend the ZBNF scheme with co-ordination of NGO's, FPO's and SHG's in the state.
3. To supply traditional seeds to the ZBNF farmers at subsidy prices through Seed Corporation.
4. Strengthening of agriculture market infrastructure, extend the procurement mechanism and fixing higher MSP for the organic production than in-organic production.
5. To extend more training camps at village and mandal level for extension of ZBNF area and production through ZBNF experts. They help farmers enrol into the ZBNF programme, adopt the right practices at right time by providing information and knowledge.
6. MGNREGS mustbe linked with farm work in order to reduce the cost of cultivation.
7. The government should protect higher price support to organic production whenever price falls compared to non-organic production.
8. Government should facilitate supply of organic inputs (ZBNF inputs) to the farmers at subsidy prices or free through SHG's, NGO's and FPO's at village level, while thenatural fertilizers are very low cost, so the government has no financial burden.
9. The government should allocate separate fund from the budget to promote ZBNF farmers in the state.

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Agro - Economic Research Centre
Andhra University, Visakhapatnam

Office Phone : 0891 - 2755873 | Fax: 0891 - 2755873
Director's Phone : 0891 - 2755874 | E-mail: hdaercvsp@gmail.com