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Natural Farming in Andhra Pradesh: An Overview

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The Community Managed Natural farming (CNF) is promoted and implemented since 2016 in Andhra Pradesh by Rythu Sadhikara Samastha (RySS), Government of Andhra Pradesh. The study on the assessment of the impact of CNF on farming and farmers has been sponsored by RySS and initiated in the agricultural year 2018-19 and continued in 2019-20, 2020-21, 2021-22, and further it will be continued for some more years as a longitudinal study. It has undertaken panel and best farmers' surveys, besides cross-sectional surveys in all the crop seasons throughout the agricultural years. These studies have examined social, economic and environmental impacts of CNF. They have revealed: CNF is more inclusive of pure tenants and small landholders and it has increased soil fertility; improvement in soil fertility has resulted in higher crop yields; higher crop yields have been achieved by CNF farmers in relation to non-CNF farmers at lower costs of production of crop; and CNF has generated positive externalities in terms of adoption of some of the practices of CNF by non-CNF farmers in growing crops. These leads are pointers to the inclusive and sustainable nature of CNF.

Keywords: *Natural farming, Costs and returns of crops, Crop yields, Soil health, Small landholders*

I. CONTEXT OF THE STUDY

Chemical-based agriculture has contributed to agricultural growth, food security and poverty reduction across the world (Pingali, 2012). It has enabled India in averting potential famines and in meeting its food security needs by reducing food imports (Hashim, 2017). The recent review of studies on chemical-based agriculture and alternative agriculture practices and paradigms to chemical-based agriculture has identified long-term impacts of chemical-based agriculture such as degradation of topsoil, declining groundwater levels, contamination of water bodies, and reduction in biodiversity in India (Nitin Gupta et al, 2021). A recently concluded study in Andhra Pradesh based on focus group discussions with farmers across villages in all the districts has brought out also these impacts to the fore (IDS, 2020b). Agro-ecological based natural farming has become popular, as an alternative to the chemical-based agriculture all over the world. In this context, Zero Budget Natural Farming (ZBNF) has been introduced in the state of Andhra Pradesh, the southern part of India in 2016 as an alternative to chemical-based agriculture.

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It is promoted and implemented by the Government of Andhra Pradesh. Later, the name was changed to Andhra Pradesh Community Managed Natural Farming (APCNF). APCNF is a paradigm shift in agricultural development based on agro-ecological principles. The alternatives that have emerged to chemical-based agriculture are broadly divided into two categories. They are — incremental changes; and radical changes in relation to the chemical-based agriculture for ensuring sustainable agriculture. The incremental changes are related to the practices of sustainable agriculture, while the radical changes are related to a shift to a completely new system of sustainable agricultural practices[1]. APCNF is supported by the Government of India through Rashtriya Krishi Vikas Yojana (RKVY) and Prime Minister Krishi Vikas Yojana (PKVY). It is also supported by Azim Premji Philanthropic Initiatives (APPI), Sustainable India Finance Facility (SIFF) — an innovative partnership between UN Environment, BNP Paribas, the World Agro-Forestry Centre and KfW.

The main objective of APCNF is to make agriculture economically viable, agrarian livelihoods profitable and climate-resilient. APCNF aims to reduce the cost of cultivation, enhance yields, increase incomes, reduce risks and protect the agriculture sector from uncertainties of climate change by promoting the adoption of an agro-ecological framework. The details of APCNF are presented in Box 1.

II. SCOPE OF THE STUDY

The study examines the impact of Community Managed Natural Farming (CNF) on farming and farmers. Social, economic and environmental dimensions of the impact of CNF have been examined. The social dimension has been examined in terms of inclusiveness of marginalised socio-economic groups into CNF. Social groups include Scheduled Castes (SCs), Scheduled Tribes (STs) and women farmers. Economic groups comprise pure tenants, and small landholders (marginal farmers and small farmers). Inclusiveness of the young and highly educated is also considered under social dimensions. Economic dimensions have been assessed through viability of agricultural livelihoods in terms of costs and returns on crops grown in relation to resource use under CNF and economic well-being of farmers in terms of improvement in the financial status, reduced dependency on informal institutions, the sources of high cost credit with coercive repayment conditions, share of agriculture and allied agricultural income in total annual income of farmer households, and reduced out-of-pocket expenditure towards health care. The environmental dimensions have been assessed through the improvements in soil health and its cascading effect on crops and human health. The study also analyses the harnessing of potential benefits of CNF by farmers and assesses the transformative potentiality of CNF. All these dimensions have been examined at farmer's plot, crop, individual farmer, farmer household, and state level. These are also examined at state, agro-climatic zones[2] and category of farmers[3] level.

III. APPROACH OF THE STUDY

The study has aimed at capturing the different contexts and different stakeholders of CNF across the state to epitomise a comprehensive, overarching and universal picture of the impact of CNF on farming and farmers. The first step of the study design in this direction was to cover the farmers situated in different agro-climatic conditions and affiliated with different categories of farmers across the state. The next step was to capture the situations where the potential impact of CNF have been realised by farmers. The other step was to identify and analyse the impact of CNF on the farmers who adopted CNF practices uniquely in isolated situations. Another step was to capture the transition trajectory of the CNF farmers. The detailed narration on the design of the study is below.

The study has deployed "with and without" approach to assess the impact of CNF. In this approach, the outcomes of CNF farmers, cultivating a particular crop, using biological inputs are compared with the outcomes of non-CNF farmers cultivating the same crop, using chemical inputs. Hence, there are CNF as well as non-CNF farmers in the study.

Three types of surveys are conducted in this study. They are: cross-sectional survey, panel survey and best farmers survey. Cross-sectional survey helps in conducting the situational analysis to assess the impact of CNF on farming and farmers. Panel survey of CNF farmers enables in capturing the transformative trajectory of farmers. The best farmers of CNF survey help to capture the potential benefits of CNF derived by the farmers.

A sample of 1140 CNF and 650 non-CNF households has been covered in the cross-section survey covered across the villages respectively. A sample of 260 Panel-1 (10 farmers from each of two sample villages of all 13 districts) and 130 panel-2 farmers (five farmers from each of two villages of all 13 districts) of the CNF households were surveyed. Further, 130 Best Farmers at the rate 10 per each of 13 districts were selected randomly from the list of Best Farmers provided by RySS, and they were surveyed.

Costs and returns of the crops considered for the analysis have been obtained from the farmers through farmer household survey to assess the impact of CNF on costs and returns of crops. Costs and returns are estimated by adopting the tools of the farm management studies i.e., cost of cultivation scheme under the Ministry of Agriculture and Cooperation, Government of India.

Crop Cutting Experiments (CCEs) have been conducted to assess the yields of the crops. CCEs were conducted scientifically to get an estimate of crop yields under PMDS+APCNF and non-APCNF. For each of the selected farmer, a plot where the farmer is growing the major crop, is identified. From this parcel of land, a plot of size as required by the procedure has been selected at random for estimating the yield through CCEs. It is to be noted that the study has adopted standard methodology of Indian Agricultural Statistical Research Institute (IASRI), which is followed by NSSO

and Directorate of Economics and Statistics (DES) of all states, including Andhra Pradesh, for conducting CCEs. It was planned to conduct at least one CCE for each sample farmer to get adequate sample for each crop.

To elaborate and expand on the survey data, qualitative research has been also conducted. Focus Group Discussions (FDGs) with farmers, Case Studies (CS) of farmers and Strategic Interviews (SIs) with District Project Managers (DPMs) — the implementers of CNF programme at district level (below state level) have been utilised to conduct qualitative research

Data required for the conduct of studies have been obtained from farmers through household listing schedule, village survey schedule, schedule for CNF households, schedule for non-CNF households, Case Studies of farmers, and focused group discussions with farmers. Data from other stakeholders have been obtained through Strategic Interviews with District Project Managers. The research tools were finalized through a series of brainstorming consultations. Intensive training and field testing were carried out to train the field investigators and supervisors.

IV. FREQUENCY OF THE STUDY CONDUCTED

The impact assessment study was initiated in the agricultural year 2018-19 and continued till the agricultural year 2021-22. It will be continued further for few more years beyond 2021- 22. Farmers and other stakeholders have been visited every agricultural year. The field staff is continuously placed in the field to track the farming and related activities of sample farmers throughout the agricultural year. They have visited farmers at pre-Kharif (PMDS), Kharif, pre-Rabi and Rabi seasons in the agricultural year. Each sample farmer is visited about eight times by the field staff during an agricultural year to collect data about farmer's household and their farming.

V. MEASURES OF IMPACT ASSESSMENT OF THE STUDY

Social, economic and environmental dimensions have been measured in the study, as noted earlier.

Social Dimensions have been measured with reference to social inclusiveness of farmers through household characteristics such as caste, gender affiliation and landholding size in order to characterise the category of farmer in terms of pure tenants, small landholders (marginal and small farmers) and large landholders (medium and large farmers), and individual characteristics of farmers viz., age and educational status. This data is collected for CNF as well as non-CNF farmer households. A higher /lower presence of SCs, STs, women, pure tenants, small landholders, youth and educated among the CNF farmers compared to those among the non-CNF indicates higher/lower socio-economic inclusion that ensures higher/lower social sustainability of CNF (Table 1).

Table 1
Measures of Social Impact

S.No	*Description of the Impact Domain*	*Description of Social Impact Indicators*
1	Social background of farmers	Presence of SCs, STs and women farmers in CNF and Non-CNF (in percentages)
2	Economic background of farmers	Presence of Small landholders (Marginal and Small farmers) in CNF and Non-CNF (in percentages)
3	Educational background of farmers	Presence of farmers as per level of education in grades in CNF and Non-CNF (in percentages)
4	Age of farmers (in years)	Presence of Young, Middle-aged and old age farmers (in percentages)
5	Shifting Occupation of Farmers	Shifting of farmers from Non-agricultural occupations to agriculture among CNF and non-CNF farmers (in percentages)

Economic Dimensions have been assessed through a three-stage analysis to capture the dynamics involved in production conditions of farming. In the first stage, the pattern of utilisation of factors of production has been assessed. In the second stage, the pattern of adoption of cost reduction and yield enhancement practices of CNF has been analysed. The pattern of utilisation of factors of production and the pattern of adoption of CNF practices together determine the costs and returns of crops grown. In the third stage, the pattern of costs and returns of crops grown has been analysed. Land, labour, water (irrigation) and working capital funds are considered as factors of production in the analysis. A comparison of these three sets of indicators between CNF and non-CNF enables assessment of the impact of CNF on farming and farmers.

The cultivated land use pattern for growing crops has been captured through three indicators, viz., cropping intensity; cultivated area under CNF over time (in hectares); the cultivated area under CNF as a percentage of cultivated land in agricultural year and cropping intensity to capture intensive use of land in an agricultural year.

The per hectare use of hired labour, family labour and total labour in labour days per hectare capture the intensive use of labour for crop production. A comparison of these indicators between CNF and non-CNF farmers captures the impact of PMDS+CNF on labour use intensity.

It is evident from the earlier studies that CNF under controlled irrigation, compared to flood irrigation, contributes more to improvements in yields of crops. Farmers who have irrigation sources for growing crops have grown the crops under CNF and non-CNF. However, farmers in canal irrigated areas are mainly dependent on flood irrigation, while farmers in rainfall dependent areas are dominantly dependent on bore-well irrigation (controlled irrigation) source. Hence, the proportion of area under

irrigation in total cultivated area and proportion of area irrigated under bore-well irrigation (controlled) have been considered as proxy indicators to measure water use.

The farmers can mobilise funds from different sources such as own savings, friends and relatives, formal institutions such as banks and informal institutions like traders and money lenders for meeting the expenditure on agricultural operations and household needs. The terms and conditions of credit vary across these institutions. The working capital requirements of the CNF farmers are lower compared to the requirements of the non-CNF farmers. As a result, farmers may reduce their dependency on the informal institutions and avoid costly credit. In this context, two indicators are formulated to examine whether the farmers' dependency on informal institutions has come down. The percentage of farmers depending on different sources of credit and the percentage of funds mobilised from different sources along with paid out costs incurred in growing crops are compared between CNF and non-CNF to assess the impact of CNF on the credit markets in terms of the dependency of farmers on costly informal credit required for growing crops.

Every practice of CNF adopted has implications for the cost of cultivation of crops on one hand and the yield of crops on the other, among other benefits. Hence, the number of practices adopted as measures is considered. Similarly, the mixed cropping pattern may also have implications for cost of cultivation of crops as well as yields of crops. The percentage of farmers engaged in mixed cropping and the percentage of area under mixed cropping are considered to assess the impact of PMDS+CNF.

The expenditure incurred per hectare on biological inputs, that includes Beejamurutham, Ghana and Dravajeevamrutham, Kashyams and Ashtrams etc., under CNF and expenditure incurred on chemical inputs per hectare under non-CNF are considered as plant nutrient and protective inputs (PNPIs). The biological inputs are made from the locally available lower cost materials. The chemical inputs are the industrial inputs. A comparison has been made between the expenditures PNPIs between PMDS+CNF and Non-CNF. This indicator enables to capture the extent of saving per hectare due to the use of biological inputs compared to the chemical inputs.

Apart from expenditure on PNPIs, the survey has also collected the data about the costs of: (1) seeds, (2) human labour, (3) machine labour, (4) bullock labour, (5) implements, (6) farm yard manure (FYM), and (7) Irrigation. In almost all items, the values of purchased items and own items are also collected. The values of all these purchased and own items used in the crop cultivation, together, are referred as paid-out costs. Comparison has been made between CNF and non-CNF in respect of this indicator. The indicator enables to assess the cost of production of growing crops under CNF and non-CNF. The study has conducted CCEs to estimate the crop yields to know the yields of sample crops. CCEs are being conducted for both CNF and

non-CNF crops. The comparison of yields between CNF and non-CNF at the state level enables to assess the impact of CNF on yields. Another indicator namely gross value of crop output has been derived through crop output, obtained through CCEs multiplied by realized or locally prevailing price reported by the sample farmers plus value of by-products, reported by the farmers. This enables to assess the impact of yield and prices of crop output on the gross value of output under CNF and non-CNF farmers. Another indicator, viz., net values of output are obtained by subtracting the paid-out cost of a crop from the gross value of that crop. This facilitates the impact assessment of paid out costs, yield and prices of crop output on the net value of output between CNF and non-CNF farmers.

Family members' health, paid-out costs on health care, consumption of CNF food, taste of CNF food, financial status of family are the dimensions of farmers economic well-being considered for data collection from the farmers. This costs and returns analysis of crops for CNF and non-CNF has been conducted at agro-climatic zones level also. Further, analysis has been conducted at the farmer category level to assess whether small landholders (marginal and small farmers) have derived gains from CNF in relation to large landholders (medium and large farmers) (Table 2).

Table 2
Measures of Economic Impact

S.No	*Description of the Impact Domain*	*Description of Economic Impact Indicators*
I.	*Crop Level*	
A	Cost of production of crop	Paid-out cost per hectare for CNF and non-CNF farmers (In Rupees) Paid-out cost per quintal of crop output for CNF and non-CNF farmers (in Rupees)
B	Yield of Crop	Yield of crop output per hectare (in quintals) for CNF and non-CNF farmers
C	Value of output per Hectare (In Rupees)	Gross value of output for CNF and non-CNF farmers Net value of output for CNF and non-CNF farmers
II.	***Household Level***	
A	Income	Annual income per household on average for CNF and non-CNF farmers (in Rupees)
B	Income of small landholders	Annual income obtained by small landholders from all economic activities per household on an average for CNF and non-CNF farmers (In Rupees)
III.	*Economy Level*	
A	Savings in PNPIs (In Rupees)	Difference in expenditure on biological inputs under CNF and Chemical inputs under non-CNF for the gross cropped area at the state level

Environmental Dimensions have been assessed on the basis of voices of farmers. The reported perceptions of farmers on the environmental parameters considered have been converted into percentages. It has to be noted that the perceptions are collected from CNF (PMDS+CNF) farmers.

Soil health is considered as a measure of environmental impact of CNF. The farmers were asked whether the soil quality/soil health has improved due to CNF practices adopted. The farmers who responded positively to this question have been asked another question in continuation, as to how they perceive this. The farmers responded saying that they have come to this conclusion because of four visible changes that took place in the soils of their fields. These are softening of the soil, increased soil moisture, visibility of more earthworms in soil and more green cover in the fields.

In order to understand the cascading effects of improved soil health on crop health, a question was asked on the health of the crops due to improved soil health under CNF. The farmers say that they observed that the grain weights have increased, plant stems were stronger, and the crops had become more resilient towards weather variability — getting more resistance to dry spells, and withstanding heavy rains and strong winds (Table 3).

Table 3
Measures of Environmental Impact

S.No	*Description Of the Impact Domain*	*Description of Environments Impact Indicators*
1	Soil Health / fertility	a. CNF Farmers reported soil health / fertility improved (in percentage). b. CNF Farmers reported the softening of soil (in percentage). c. CNF Farmers reported the visibility of more earthworms in the soil (in percentages) d. CNF Farmers reported improvements in green cover in the fields (in percentages)
2	Crop Health	a. CNF Farmers reported that emergence of strong stems of plants of crops (in percentage) b. CNF Farmers reported that grain weight of crop increased (in percentages) c. CNF Farmers reported that the crop output is tasty (in percentages) d. CNF Farmers reported that the crops withstand dry spells, strong winds and heavy rains.

VI. MAJOR FINDINGS OF THE STUDY

The studies conducted in Kharif and Rabi seasons of the agricultural years 2018-19, 2019-20 and 2020-21 have been brought out as Kharif Report, Rabi Report and

consolidated Report for each of the agricultural years. The major findings of these studies are organised under three dimensions of impact, viz., social, economic and environmental. The details of the findings are presented below.

6.1 Social Dimensions

The presence of SCs and STs, pure tenants, small landholders in CNF is higher compared to that in non-CNF. This indicates that CNF is more inclusive of the marginalised sections of the farming community. The efforts of RySS, focusing on the marginalised sections of the society to achieve more socio-economic inclusiveness in CNF emerges to be successful. A relatively higher share of young and middle age farmers in CNF over the non-CNF category is noteworthy. Similarly, proportion of educated and highly educated in CNF is considerably high. This is one of the greatest achievements of CNF. This may facilitate more experimentations in growing crops and innovative marketing strategies for CNF products. This in turn brings in vibrancy and ensures sustainability of CNF. Further, there are indications that the people from other occupations have got into CNF over non-CNF. This indicates that CNF is more attractive than other occupations. It may be noted that the members of farmers' families who have diversified into other occupations due to distress conditions prevalent in chemical-based agriculture might have come back to CNF. The social sustainability measured in terms of social dimensions is ensured through socio-economic inclusiveness to share the gains from CNF equitably (IDS, 2020b, 2020c, 2021a and 2021c).

There are also indications from the analysis that the farmers on their own have entered in to CNF even though they have not participated /registered with RySS for practicing CNF in the villages in the Kharif plan of 2019-20. This indicates the positive externalities of CNF. This also signals that the farmers on their own practice CNF even when the RySS withdraws this Programme in coming years after achieving their targets (2020d)

6.2 Economic Dimensions

The economic dimensions have been assessed at crop, household, and state economy level. Costs and returns framework is used to assess the economic dimensions at crop level. The level and composition of household income and distribution of income between small landholders and large landholders has been assessed to measure impact on economic dimensions at household level. Saving in expenditure on chemical fertilisers due to the use of biological inputs of CNF have been analysed at the state level. This analysis is based on the hard data collected from farmer households. Soft data has also been collected from households through the perception of the farmers in regards to the economic status in terms of improvement in the financial status and reduction in the out- of- pocket expenditure towards health care.

The expenditure per hectare on plant nutrition and plant protection inputs has come down considerably due to the use of biological inputs, made out of local resources that cost very less, under CNF over non-CNF. This is true across all the crops. It is pronounced among the highly input intensive crops. Further the paid-out costs incurred per hectare and per quintal are found to be lower for the crops grown under CNF compared to those under non-CNF. The yield of crops (quintals per hectare) is higher in case of some crops and more or less the same under CNF compared to those under non-CNF. The gross value of output of crops per hectare is higher under CNF over non-CNF across all crops. The same is true even in case of net value of output by and large. The sustainable intensive use of crop land, intensive use of labour, especially family labour, lesser use of water for irrigation especially ground water, and low cost credit mobilised from sources other than traders and money lenders for production of crops and household needs, increased adoption of number of CNF practices that reduce cost of production and improve yield, and relatively higher prices for some of the CNF crop outputs have enabled farmers to obtain higher yields at lower cost of production of crops grown (IDS, 2019a, 2019b, 2020a, 2020b, 2020c, 2021a and 2021c). This has led to higher annual household incomes, higher share of agricultural income in the total annual household income, higher share of income from livestock indicating strong linkages between agriculture and animal husbandry, and equitable distribution of income gains from CNF between small landholders and large landholders, for CNF farmers compared to non-CNF farmers. The use of biological inputs due to CNF has contributed to savings in expenditure on fertilisers at the state level and has also contributed considerably to the state income (IDS, 2021a).

A considerable percentage of farmers have reported that their family health has improved due to the consumption of tasty and chemical free food grown under CNF. This has in turn resulted in the reduction of out-of-pocket expenditure towards health care. Farmers have also reported that their financial position has improved. All these indicators have revealed that the economic status of farmers has improved (IDS, 2019a, 2019b, 2020a, 2020b, 2020c, 2021a, and 2021c).

The panel data analysis of CNF farmers has revealed that the area under crops of CNF as well as yields of crops of CNF have increased. This reflects the transformative potential of CNF in the state of Andhra Pradesh.

6.3 Environmental Dimensions

Almost all the CNF farmers have reported that CNF has contributed to improvements in soil health/quality. The softening of soil, increased presence of earthworms and green cover in fields stand as testimony to the improvement in soil fertility. Strong stems of crops and increased grain weight of crops provides additional evidence. Further, farmers have reported that the crops are able to withstand heavy-rains,

strong winds and dry spells. This indicates that CNF has contributed to the enhanced resilience of crops to weather variability. Thus, CNF has enabled soils to provide ecological services to crops grown (IDS, 2019a, 2019b, 2020a, 2020b, 2020c, 2021a, and 2021c).

VII. CONCLUSION

CNF is more inclusive of pure tenants and small landholders. It has increased soil fertility that has resulted ultimately in higher crop yields. Moreover, higher crop yields have been achieved by CNF farmers in relation to non-CNF farmers at lower costs of production of crop. Further, CNF has generated positive externalities in terms of adoption of some of the practices of CNF by non-CNF farmers in growing crops. These leads are pointers to the inclusive and sustainable nature of CNF.

Notes

1. For details see (Nitin Gupta et al, 2021)
2. The 13 districts of Andhra Pradesh State have been classified into six agro-climatic zones. They are: High altitude and Tribal Zone; North Coastal Zone; Godavari Zone; Krishna Zone; Southern Zone; and Scarce Rainfall Zone. High altitude and Tribal areas of Srikakulam, Vizianagaram, Visakhapatnam and East Godavari districts together constitute the High altitude and Tribal areas Zone. North Coastal Zone encompasses the districts, viz., Srikakulam, Vizianagaram, and Visakhapatnam excluding high altitude and tribal areas of these districts. East Godavari (excluding high altitude and tribal areas) and West Godavari together come under Godavari Zone. The districts, viz., Krishna, Guntur and Prakasam together constitute Krishna Zone. Chittoor, YSR Kadapa and PSR Nellore districts are together grouped as Southern Zone. Kurnool and Anantapuramu constitute Scarce Rainfall Zone.
3. The farmers are classified into four categories, viz., Pure Tenants (landless farmers but cultivating land on lease); Marginal Farmers with less than 2.5 acres, Small Farmers are those with landholding of between 2.5-5.0 acres of land; medium and large farmers are those with more than 5 acres of landholding

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BOX 1
Andhra Pradesh Community Managed Natural Farming (APCNF)

The programme narrative of the Andhra Pradesh Community Managed Natural farming (APCNF) is as follows. The Government of Andhra Pradesh introduced Zero Budget Natural Farming (ZBNF) in 2016 as an alternative to conventional agriculture practices that relied heavily on the usage of chemical fertilisers and pesticides. Eventually, the programme was rechristened as Andhra Pradesh Community Managed Natural Farming (APCNF). The programme intends to cover six million farmers and the entire cropped area in the state. To provide implementation and steering support to the programme, an independent entity, Rythu Sadhikara Samastha (RySS) , a not-for-profit company was established. Till date, 0.7 million (700 thousand) farmers from 400 clusters covering 1,911 villages in 345 mandals, spread across 13 districts have been enrolled in the programme. The programme plans to support each participating farmer for a minimum of five years, till they attain remunerative and sustainable livelihoods. APCNF also aims at the creation of human and social capital necessary for vibrant, inclusive, and sustainable agricultural production. Grassroots institutions such as Self-Help Groups (SHGs), Village Organisations (VOs) and Farmers Producer Organizations (FPOs) are being strengthened and involved in the implementation of this transformative programme. Several training and awareness programmes are regularly conducted to encourage farmers to switch to natural farming and use locally available natural organic resources instead of chemically produced agricultural inputs.

Apart from the state and regional level training, Non-Government Organisations (NGOs) and RySS offer training and technical support to successful local APCNF farmers called Master Farmers (MF) or Internal Community Resource Persons (ICRP), who act as the change agents and encourage other farmers to adopt Community Natural Farming (CNF) practices. The strategies of propagation include peer-to-peer learning with Master farmers, Community Resource Persons (CRPs), and audio visual tools containing tested practices. Internal Community Resource Persons(ICRPs), Community Resource Persons (CRPS) and Cluster Assistants (CAs) provide training on Community Natural Farming (CNF) principles and practices such as input preparations, crop diversification, increasing cropping intensity, multi-layer crops, mixed or inter cropping and allied farming livelihoods.

A recent breakthrough in the Community Natural Farming (CNF) programme has been the adoption of *Pre-Monsoon Dry Sowing (PMDS)*, a novel method of growing crops. PMDS enables farmers to raise crops in the dry seasons – before the monsoons, and after the kharif (monsoon) crop. The enhancement of soil biology through APCNF practices and the raising of 8 to 15 diverse crops create unique conditions,

which enable seed germination with very little water and enable plants to harness water vapour from the atmosphere in the form of early morning dew. The dew provides the required moisture to the soil which is facilitated by the mulch material spread across the field. This is largely practiced prior to the start of monsoon, during summer and before beginning of the Rabi (winter cropping) season. This cropping system is based on the belief that land should always be covered with vegetation and farmers should not depend on the rainy season alone for growing crops. It contributes to cropping intensity, agricultural incomes, soil fertility and a continuous green cover. Farmers practicing *Pre-Monsoon Dry Sowing* (PMDS) need to follow the *Pre-Monsoon Dry Sowing* (PMDS) protocols. According to official data available, *Pre-Monsoon Dry Sowing* (PMDS) was adopted by 12,549 farmers spread across 24,307 acres and 1,800 villages across AP in 2019-20. This has increased to approximately 90,000 farmers and 50,000 acres of land, across the state, in 2020-21.

Objectives of Community Natural Farming (CNF) are of *i*) reduction in cost of cultivation through elimination of chemical fertilisers and pesticides, *ii*) usage of locally available inputs, *iii*) adoption of natural means to improve soil fertility and soil quality *iv*) 365 Day Green Cover (365 DGC) and different models of agriculture and *v*) promotion of village seed banks.

Under the aegis of the Community Natural Farming (CNF) programme, climate risks are addressed by treating each holding unit as a watershed and adopting diversified crop models such as a 5-layer model (multiple layers of crops are grown on a piece of land simultaneously) and 36x36 models (a piece of 36 meter by 36-meter land developed with diversified crops to yield sustainable and continuous income to farming households throughout the year). System of Root Intensification (SRI) and micro irrigation is promoted to improve water usage efficiency. Community Natural Farming (CNF) includes seed treatment through liquid microbial solution (Beejamurutham), soil treatment and soil fertility enhancement through locally produced liquid and solid microbial materials, from local cow dung-based formulations (Beejamurutham, Dravajeevamrutham and Ghanajeevamrutham), soil protection by taking crop residues back to the soil and using live mulching to keep the ground covered all the time through poly-cropping.

Source: IDS (2021b)

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