Assessing the Impact of APCNF

[Andhra Pradesh Community Managed Natural Farming]

A Comprehensive Approach using Crop Cutting Experiments

Second Interim Report of 2021-22

Kharif Season

Submitted To

Rythu Sadhikara Samstha

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Acronyms

APCNF	**:**	**Andhra Pradesh Community Managed Natural Farming**
BC	:	Backward Class
CAs	:	Cluster Assistants
CCEs	:	Crop Cutting Experiments
CNF	:	Community Managed Natural Farming
CRPs	:	Community Resource Persons
CSs	:	Case Studies
DES	:	Directorate of Economics and Statistics
DGC	:	Days Green Cover
DPMs	:	District Project Managers
FGDs	:	Focus Group Discussions
FPOs	:	Farmers Producer Organizations
FYM	:	Farm Yard Manure
GCA	:	Gross Cropped Area
GPs	:	Gram Panchayats
HAT	:	High Altitude Tribal Areas
IASRI	:	Indian Agricultural Statistical Research Institute
ICRPs	:	Internal Community Resource Persons
IDSAP	:	Institute for Development Studies Andhra Pradesh
MA	:	Mandal Anchor
MF	:	Master Farmer
MGNREGS	:	Mahatma Gandhi National Rural Employment Guarantee Scheme
MT	:	Master Trainer
NGOs	:	Non-Governmental Organizations
NSSO	:	National Sample Survey Organization
OC	:	Open Category
PMDS	:	Pre-Monsoon Dry Sowing
PNPIs	:	Plant Nutrient and Plant protection Inputs
RPs	:	Resource Persons
RySS	:	Rythu Sadhikara Samstha
SC	:	Scheduled Caste
SHGs	:	Self-Help Groups
SIs	:	Strategic Interviews
SPSS	:	Statistical Package for Social Sciences
SRI	:	System of Root Intensification
ST	:	Scheduled Tribe
VOs	:	Village Organizations
ZBNF	:	Zero Budget Natural Farming

Executive Summary

0.1. Introduction

1. The objectives of the study are:
   i. To compare the socio-economic profiles of Andhra Pradesh Community Managed Natural Farming (APCNF or CNF, in short) farmers[1] and control farmers who cultivate under chemical-based farming.
   ii. To estimate and compare the cost of cultivation, cost structure, crop yields, gross and net values of output from crop cultivation under CNF and non-CNF methods.
   iii. To examine changes in the inputs used and consequent developments in the input markets and output markets.
   iv. To gauge the perceptions of the CNF farmers on Natural Farming related issues.
2. The study has deployed "***with and without***" method to assess the impact of Pre-Monsoon Dry Sowing (PMDS) plus CNF. In this method, the outcomes of PMDS+CNF farmers cultivating a particular crop are compared with the outcomes of the non-CNF farmers cultivating the same crop, using chemical inputs. The nine crops covered in this (Kharif) report are: (1) Paddy, (2) Groundnut, (3) Cotton, (4) Black Gram, (5) Maize, (6) Red Gram, (7) Chillies, (8) Ragi and (9) Tomato.
3. The study is conducted in all the 13 districts of the State of Andhra Pradesh. Quantitative data has been collected from 1,186 CNF and 748 non-CNF sample farmers. Each sample household has been visited a minimum of 2-3 times during the season, to collect the household and farming data, with a minimum time gap. Apart from collecting household and farming information, the study has conducted 834 scientific Crop Cutting Experiments (CCEs) to assess the yield of crops for this report[2].
4. Appropriate research tools have been used. The household survey for the Kharif season of 2021-22 was conducted from early-November 2021 to end of February 2022. Data is analysed and results are provided at the state level, agroclimatic zone wise, farm-size category wise, tenurial category wise and social category wise.

0.2. Profiles of CNF and non-CNF sample farmers

5. A higher percentage of CNF sample farmers hail from vulnerable communities compared to non-CNF sample farmers. The average operational holding size is 1.15 hectare and 1.36 hectare respectively for CNF and non-CNF sample farmers. Nearly one-third (31.20%) of

[1] The CNF sample is drawn from the list of farmers, who are growing Pre-Monsoon Dry Sowing (PMDS), before Kharif crop and Kharif crops under Community Managed Natural Farming (CNF) or seed to seed (S2S) without applying any chemical input, at least in one plot, i.e., PMDS+CNF farmers. In this report the words PMDS+APCNF, PMDS+CNF and CNF are used interchangeably.

[2]Further 101 CCEs were conducted for Panel farmers. The results will be used in the final report. In addition, the team visited more than 100 farmers/ fields for CCE, but could not do so, because total crop loss.

CNF sample farmers are from SCs and STs compared to 19.52% of non-NF farmers. Marginal farmers are higher in CNF over non-CNF farmers by 10 percentage points.

6. The share of young farmers (up to 40 years of age) is higher in CNF sample by 6 percentage points.

0.3. Impact of CNF on farming conditions

7. The changes in Plant Nutrition and Protection Inputs (PNPIs)[3] and paid-out costs have once again confirmed the hypothesis that ***CNF has the potential to save on cost of cultivation, especially, in the resource intensive/ high investment crops***. The per hectare savings of ₹19,000 to 29,000 in the paid-out costs of CNF Chillies, Cotton and Tomato are good illustrations of this point (Table 3.2). Under non-CNF, either PNPIs (agrochemicals) or labour or machinery costs account for the single largest cost items for different crops, but human labour emerged as a single largest cost item in every crop under CNF (Table 3.3).
8. Though CNF's major contribution is in reducing the cost of cultivation the CNF yields are higher than that of non-CNF in eight crops of the nine crops. The CNF yields are marginally lower than non-CNF yields by 2 percent only in Chillies (Table 3.4). Apart from CCE yields, the study has collected yields data from the farmers which are referred as "reported yields". The reported CNF yields are higher than the non-CNF yields in all nine crops. The difference is statistically significant in five crops at 1 percent, and in one crop, at 10 percent (Table 3.5). Apart from CNF impact, PMDS is other major factor for the higher yields obtained under CNF.
9. The difference between CNF and non-CNF output prices is more than 5% in five crops.
10. This year, the gross values of output were estimated based on reported yields of both CNF and non-CNF crops, instead of CCE yields.[4]
11. In all the nine crops covered in this report, the per hectare gross value of CNF output is higher than that of non-CNF output (Table 3.7). The difference is over ₹ 60,000 in Black gram and Tomato, over ₹ 44,000 in Ragi and about ₹ 28,000 in Chillies.
12. The net values of output are obtained by deducting the paid-out costs from the gross values of the output of each crop. In all nine crops, the net value of CNF crops are higher than that of non-CNF crops by substantial margin, ranging from ₹ 7,750 in Red gram, and ₹ 22,606 in Paddy to ₹ 64,514 in Black gram and ₹ 89,196 in Tomato (Table 3.8).

0.4. Impact of CNF on the Paddy cultivation across the Agroclimatic zones and Farmers' categories

13. The disaggregated analyses of Paddy cultivation at the agroclimatic zone level, farm-size category level, tenurial category level and social category level indicate that benefits from

[3]For the sake of comparative analysis, the biological stimulants under CNF and chemical inputs under the non-CNF, together, are referred as the plant nutrient and protection inputs (PNPIs)

[4] The major purpose of conducting the CCEs was to see the impact of CNF through an independent and scientific process. Because of limited number of CCEs in some crops, the gross and net values of output, based on CCE yields, could be estimated for fewer crops. To analyse the gross and net values of all nine crops, the reported yields are used. As CNF yields are higher than non-CNF yield in both methods, the results and conclusion will remain the same. Further, a detailed disaggregate analysis of Paddy cultivation is possible through the reported yields only.

CNF are reaching every part of the state and every section of the farmers, especially the poorer regions and sections.

0.5. Impact of CNF on inputs use, inputs markets and output markets

14. By introducing pre-monsoon dry sowing (PMDS), bund crops, border crops, 365 days green cover strategy, etc., the CNF approach is enabling farmers to utilize their land sustainably and intensively, for longer periods. The number of crops covered days over CNF fields is 187 days, vis-à-vis 152 days in non-CNF fields. Though the difference is 35 days at the state level, it is as high as 74 days in Scarce rainfall zone, 64 days in Southern zone.
15. The per hectare total labour days (family labour plus hired labour) for CNF crops is higher over non-CNF crops in seven out of nine crops covered, in the range of 9 to 55 days per hectare. Though CNF crops need a greater number of human labour days, most of those labour days have come from family labour only.
16. About 15 percent CNF farmers said that the water requirement for crop cultivation has declined considerably due to CNF. Further, 66 percent farmers said the water requirement has declined moderately due to CNF.
17. The funds requirement for working capital and need for borrowings are low under CNF as the paid-out costs are considerably low under CNF. As expected, 11 percent and 56 percent of CNF farmers have confirmed a considerable and moderate decline respectively, in the fund's requirement for agriculture. The reduction in the credit requirement for agriculture and other purposes, due to CNF, is also established in the actual borrowings by the CNF and non-CNF farmers (Table 0.1). The average loan amount for each CNF farmer is ₹71,964, and for each non-CNF farmer is ₹ 1,03,136, i.e., each non-CNF farmer has 30 percent higher loan amount vis-à-vis a CNF farmer. A considerably lower loan outstanding indicates a noteworthy reduction in the indebtedness for CNF farmers.

Table 0.1: Status of borrowing by CNF and non-CNF farmers as on date of survey

Indicator	CNF	Non-CNF
Total sample farmers	1,186	748
Number of loans	1,075	837
Number of loans per 100 farmers	91	112
Total loan amount (₹)	8,53,49,102	7,71,45,416
Average loan amount per farmer (₹)	71,964	1,03,136
Average loan outstanding per farmer (₹)	36,606	52,335

Source: IDSAP Field Survey, 2021-22

18. An overwhelming majority CNF farmers have witnessed a larger interest for CNF food grains and other crops. The CNF farmers are commanding the respect from the friends and relatives and in the output markets. Relatively, a smaller number of CNF farmers (35%) have accessed new market channels for CNF output. Three percent of CNF farmers have reported that they have received higher prices for their CNF output.

0.6. Summing up

The findings of the study have provided empirical evidence to the contribution of CNF to the farmers and farming. Marginalized and vulnerable sections such as Scheduled Castes, Scheduled Tribes, landless tenants, marginal farmers and women have high participation rates among CNF over non-CNF. Young farmers have been attracted to CNF. Cost of production of crops has decreased. By and large, crop yields, gross value of output and net value of output have increased among CNF over non-CNF. Expansion of area under CNF over years, the lesser use of water for irrigation, lower cost of credit and declining indebtedness, crop coverage of land for longer days, considerable and higher prices obtained in the case of some CNF crops reflect and demonstrate the effectiveness of the CNF in judicious use of natural resources, improving farmers livelihoods and improvement, albeit slowly, in the production system of crops.

Chapter - 1

Context, Objectives and Methodology

Chapter 1: Context, Objectives and Methodology

1.1. Context

As a society, we are facing multiple emergencies: farmers' livelihoods are under severe stress; young people are migrating from rural areas to urban areas, often for low paid jobs, as they do not see much future in agriculture livelihoods. On the other hand, the food we are eating is not safe and it is not as nutritious as it used to be in the past. We have a huge crisis on the soil front as we have lost vast amounts of soil organic matter and we continue to lose soil organic matter at a rapid pace. There is a severe water stress. There is very widespread loss of biodiversity. All these are going to exacerbate further on account of global warming[5].

It is in response to these multiple crises that the Government of Andhra Pradesh turned to Natural Farming, as a way of solving these multiple crises. The Government is looking at enhancing farmers' net incomes by reducing their costs of cultivation, improving their yields, reducing their risks and enabling them to get remunerative prices. The Government believes that these can be delivered through farming in harmony with nature, and not through use of high-cost synthetic fertilisers, pesticides, herbicides and weedicides. Government also believes that the nutritional integrity of food should be enhanced and free from chemical residues. Further, Government is very concerned about the risks to Agriculture because of the loss of soil organic matter, water stress and the worsening climate change crisis. The adoption of natural farming by the Government is not just environment friendly but is also aimed to protect the interests of the farmers and the consumers, given that it enhances climate change resilience, soil organic matter, soil fertility, water holding capacity of soils, and biodiversity (above ground and below ground).[6]

Recently RySS made one of the major breakthroughs in Andhra Pradesh Community Managed Natural Faming (APCNF) in the form of the ***Pre-Monsoon Dry Sowing (PMDS)***, a novel method of growing crops. PMDS enables farmers to raise crops in the dry seasons – before the monsoons. It is a global breakthrough. The exact science is yet to be established. The enhancement of soil biology through APCNF practices and raising of 8 to 15 diverse crops create some special conditions, which enable seed germination with very little water. PMDS is mostly practiced before the advent of monsoon, during summer and before the beginning of the Rabi season. This system believes that land should always be covered with vegetation and farmers should not depend on rainy season alone for growing crops. It contributes to continuous green cover while increasing cropping intensity, agricultural incomes, and soil fertility respectively.

The program plans to support each of the participating farmer family for at least five years, till they attain remunerative and sustainable livelihoods. APCNF also aims at creation of human and

[5] The basic information for this section was drawn from APCNF website https://apcnf.in/about-apcnf/ Accessed on 2.12.2022
[6] Ibid

social capital necessary for vibrant, inclusive, and sustainable agricultural production. Grassroots institutions such as Self-Help Groups (SHGs), Village Organizations (VOs) of SHGs and Farmers' SHGs and Farmers Producer Organizations (FPOs) are being strengthened and involved in the implementation of this transformative program. Several training and awareness programs are being conducted to encourage farmers to shift to APCNF.

Apart from state and regional level training, Non-Governmental Organizations (NGOs) and RySS District and Sub-district level teams offer training and technical support at the village level to the promising APCNF farmers. Master Farmers (MF) or Internal Community Resource Persons (ICRP) are selected from such farmers so that they can act as the main agents of change to get other farmers to adopt APCNF practices. The strategies of propagation include farmer-to-farmer learning, onsite training/ extension by Community Resource Persons (CRPs), Master Trainer (MT), et al., and pico-videos of tested practices. All the Resource Persons (RPs) provide training on APCNF principles and practices such as input preparations, crop diversification, increasing cropping intensity, inter-crops, mixed cropping and adoption of farming related livelihoods.

1.2. Objectives

The current study is in continuation of the impact studies for 2019-20, 2020-21, 2021-22 undertaken by Institute for Development Studies Andhra Pradesh (IDSAP), Visakhapatnam. This is the second interim report of 2021-22 study, covering the Kharif 2021 season. The objectives of the study are:

i. To compare the socio-economic profiles of "CNF- farmers"[7], who have adopted Andhra Pradesh Community Managed Natural Farming (APCNF or CNF) and "non-CNF farmers", i.e., control farmers, who are cultivating under mainstream farming practices known as chemical-based farming.
ii. To estimate and compare the cost of cultivation, cost structure, crop yields, gross values of output, and net values of output from crop cultivation under PMDS + APCNF and non-APCNF methods.
iii. To examine changes in the input use and consequent developments in the input markets, and output markets.
iv. To gauge the perceptions of the CNF farmers on Natural Farming related issues.

1.3. Methodology

1.3.1. The Basic Approach

This study is a continuation of the previous impact studies conducted in 2018-19, 2019-20 and 2020-2021 on APCNF. Earlier studies assessed the effectiveness of APCNF (S2S Farmers) with

[7] The CNF sample is drawn from the list of farmers, who are growing Pre-Monsoon Dry Sowing (PMDS), before Kharif crop and Kharif crops under Community Managed Natural Farming (CNF) or seed to seed (S2S) without applying any chemical input, at least in one plot, i.e., PMDS+CNF farmers. In this report the words PMDS+APCNF, PMDS+CNF and CNF are used interchangeably.

the help of field surveys on various aspects. This study covers the same aspects with a fresh random sample of farmers adopting PMDS+CNF (Henceforth called CNF farmers in this report) and non-APCNF farmers in 2021-22

The study uses the "***with and without***" method to assess the impact of CNF. In this method the outcomes of CNF farmers, cultivating a particular crop are compared with the outcomes of the non-APCNF farmers cultivating the same crop but using chemical inputs. Costs and returns for the crops considered for the analysis were obtained from the farmers through farmer household survey to assess the impact of APCNF on costs and returns of crops. Crop Cutting Experiments (CCEs) have been conducted to assess the yields of the crops scientifically and independently.

The study is focussed on 12 major crops that are identified based on the cropped area in the state for the crop wise detailed costs, yield and returns analysis. These crops together account for more than 75% of the gross cropped area (GCA) in the state. The crops include: (1) Paddy, (2) Groundnut, (3) Cotton, (4) Bengal Gram, (5) Black Gram, (6) Maize, (7) Red Gram, (8) Chillies, (9) Green Gram, (10) Jowar, (11) Ragi and (12) Tomato. While the first 10 are cultivated on large areas in the state, the last two were selected as the special cases. Given the seasonality of some of these crops, out of total 12 sample crops, only nine were covered during the Kharif survey in this report. The crops covered in this report are: (1) Paddy, (2) Groundnut, (3) Cotton, (4) Black Gram, (5) Maize, (6) Red Gram, (7) Chillies, (8) Ragi and (9) Tomato. In this report the term 'Community Managed Natural Farming (CNF)' is used interchangeably to mean APCNF as well as PMDS+CNF. Similarly non-APCNF or non-CNF is used interchangeably.

1.3.2. Sample Design

The study was conducted in all the 13 districts of the State of Andhra Pradesh. For the CNF sample, the coverage of the study is the entire area where CNF is practiced while the rest of Andhra Pradesh is covered under non-CNF. All the GPs, where CNF practices are followed, constituted the sample frame for drawing CNF samples. This list with number of cultivators, who adopted CNF, as of April 2021, is provided by RySS. According to the data provided by RySS, the universe for PMDS+CNF consists of 2,816 GPs with 1,72,661 cultivators and 1,27,447 acres. The district wise distribution of PMDS farmers is given in Table 1.1. In the sample design, each agroclimatic zone is treated as a stratum. The total sample allocations are based on the stratum size.

Table 1.1: District wise geographical spread of PMDS in Andhra Pradesh as on March/ April 2021

Area in acres and others in numbers

District	Number of Mandals	Number of Clusters	Number of GPs with PMDS farmers	Number of PMDS Farmers	Extent of PMDS area (in Acres[8])
Anantapuramu	63	82	208	8,509	6,210
Chittoor	65	74	267	14,275	8,686
East Godavari	58	94	223	18,245	12,904
Guntur	56	69	204	11,695	8,487
Krishna	49	58	196	5,707	3,592
Kurnool	53	93	307	9,416	7,677
Prakasam	59	68	201	9,374	7,943
PSR Nellore	47	71	195	21,359	17,592
Srikakulam	38	52	181	12,670	6,704
Visakhapatnam	39	62	183	9,922	4,028
Vizianagaram	34	52	189	18,927	14,719
West Godavari	46	57	181	11,880	12,315
YSR Kadapa	51	81	281	20,682	16,588
Andhra Pradesh	658	913	2,816	1,72,661	1,27,447

Source: RySS, 2021

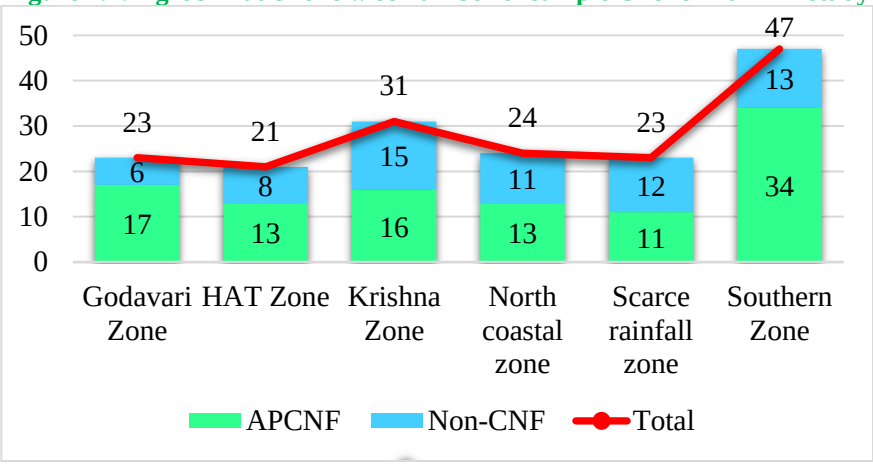
1.3.3. Selection of CNF and non-CNF Gram Panchayats (GPs)

The study proposed a total sample of 169 GPs with 104 GPs for the CNF sample and 65 GPs for non- CNF sample. Given the sample size, it was decided to limit the disaggregate analysis to six agroclimatic zones only[9]. Therefore, the sample of 104 CNF GPs was allocated across the agroclimatic zones in proportion to the size of CNF cultivators (see Table 1.1 above). The GPs allocation varies from 11 GPs in Scarce rainfall zone to 34 GPs in the Southern zone. In case of non-CNF, the total sample size of 65 GPS, was allocated to all six zones according to the farmers size obtained in 2020-21 study. Further, in the case of non-CNF GPs, the selection was based on simple random sampling. The non-CNF sample GPs distribution range is six in Godavari zone to 15 in Krishna zone (Figure 1.1). Total sample GPs, including both CNF and non-CNF, allocation is also shown in the Figure 1.1. It varies from 21 in High Altitude Tribal Areas (HAT) zone to 47 in Southern zone.

[8] One acre is equal to 0.405 hectares. As the PMDS is cultivated on a small piece of lands, normally, the area is discussed in acres.

[9]The agroclimatic zones are described in annexure Table, at the end of this chapter.

Figure 1.1: Agroclimatic zone wise number of sample GPs for 2021-22 study



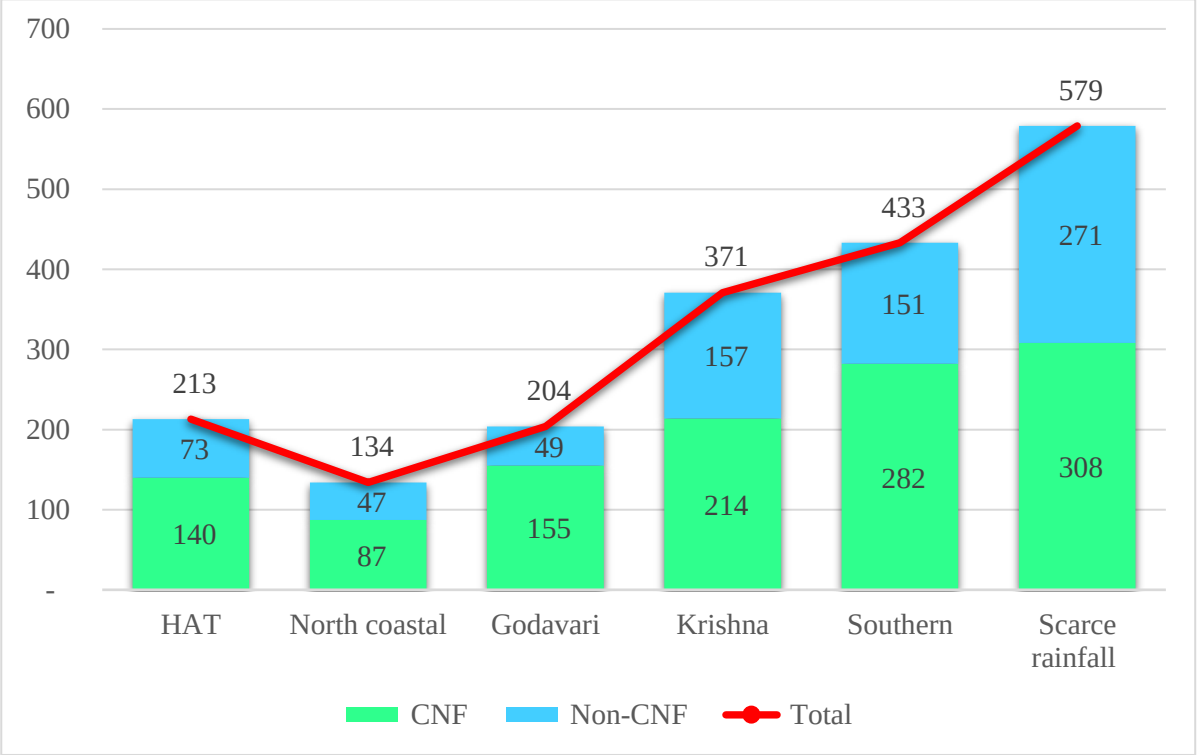
Source: IDSAP Field Survey, 2021-22

1.3.4. Selection of CNF sample farmers

Every household was listed in each of the 104 selected sample CNF GPs. In all, a total of 50,592 households were listed in 104 Sample CNF GPs. Out of these, 68.98 percent (34,897) are cultivators. Further, the listing data indicates that 16,031farmers out of total 34,897 farmers are CNF (CNF plus S2S) farmers. CNF farmers constitute 45.94 percent of total farmers. Further, 10,392 (29.78 percent of all farmers) have cultivated PMDS during the reference period. This turns out to be 64.82 percent of total CNF farmers. Similarly, 9,869 farmers, i.e., 61.56 percent of total CNF farmers were cultivating S2S on PMDS plots. The CNF sample was drawn from these 9,869 farmers.

The list of 9,869 PMDS+CNF cultivators along with the crops they grow, forms the frame for selection of CNF cultivators. The selection methodology covers the major crops specific to each zone separately. For this, the major crops in each zone are identified from the listing data. (A crop is identified as major crop when large number of cultivators report growing it). For each such major crop, the sample size is fixed at a minimum of 50 and maximum of 100 depending on the availability of cultivators of that crop. In this process, a cultivator selected for one crop may also be selected for another. After deleting such duplicates, the final set of sample cultivators was finalized. This procedure was repeated for all the zones. Under the scheme, total number of CNF sample cultivators selected was nearly 15% higher than the originally planned 1,040 (Figure 1.2). The sample design would give reliable estimates of costs and productivities, as the design treats each crop in a zone as universe and targets adequate samples.

Figure 1.2: Agroclimatic zone wise number of CNF, non-CNF and total sample



Source: IDSAP Field Survey 2021-22

1.3.5. Selection of non-CNF sample

In the case of non-CNF samples, the listing was carried out as in the case of CNF. However, the listing was confined to about 250 households per GP. In GPs with less than 250 households, the entire GP was listed. When the number of households outnumbered 250, the listing was confined to 3 randomly selected Panchayat Wards of GP and in another randomly selected ward in case of deficit (less than 250). A total 14,745 households were listed. Out of these, 11,599 cultivators form the sample frame for the selection of non-CNF sample. As in the case of CNF, in the listing operation of non-CNF, all the relevant information was collected for selecting of sample cultivators. The method followed in the selection of CNF sample farmers was also used to select non-CNF sample farmers. The only difference is that for each crop, the sample size was fixed at a minimum of 40, depending on the availability of cultivators of that crop. However, to get the required minimum number of observations for each of selected crops, the total non-CNF sample size was also increased by 15 percent over the original plan of 650. A total 1,186 CNF and 748 non-CNF sample data records are used in this report. The agroclimatic zone wise distribution of CNF, non-CNF and total sample is shown in the figure 1.2.

1.3.6. Panel survey and qualitative data

Besides cross-sectional surveys in CNF and non-CNF farmers, 260 Panel-1 (10 farmers from each of two sample villages of all 13 districts) and 130 panel-2 farmers (5 farmers from each of two villages of all 13 districts) of the CNF households were surveyed for Kharif 2020. But the research team could only trace and collect the data from 241 Panel 1 farmers and 121 Panel 2 farmers. It

may be noted that the sample attrition is one of generic problems of any Panel study. There is no exception for this study also. The results of the panel survey will be included in the final report.

Agroclimatic zone wise, farmers category wise number of CNF, non-CNF and Panel sample are given in Table 1.2.

Table 1.2: Agroclimatic zone wise farmers' category wise distribution of CNF, non-CNF and Panel sample

Geographic units & Categories	CNF	Non-CNF	Panel 1	Panel 2	CNF+Panel
Agroclimatic zones					
HAT	140	73	21	20	181
North coastal	87	47	43	15	145
Godavari	155	49	40	10	205
Krishna	214	157	47	25	286
Southern	282	151	52	31	365
Scarce rainfall	308	271	38	20	366
AP	1,186	748	241	121	1,548
Farm size categories					
Marginal	706	370	142	77	925
Small	294	230	57	29	380
Others	186	148	42	15	243
All	1,186	748	241	121	1,548
Tenurial categories					
Tenants	51	30	16	5	72
Owner-cum-tenants	96	24	15	8	119
Owners	1,039	694	210	108	1,357
All	1,186	748	241	121	1,548
Social categories					
SC	158	56	37	18	213
ST	212	90	48	31	291
BC	537	357	96	50	683
OC	279	245	60	22	361
All	1,186	748	241	121	1548

Source: IDSAP Field Survey, 2021-22

It was planned to collect the qualitative information through three methods, viz. 78 focus group discussions (FGDs), 13 Strategic Interviews (SIs) with the District Project Managers (DPMs), 13 SIs with RySS field staff, 65 case studies (CSs) of progressive and model farmers and (social) entrepreneurs, and a few case studies of horticulture farmers. Except a few SIs with DPMs, data has been collected as planned. The information was processed and developed as an independent document. Some of the insights, from the qualitative data have been incorporated in this report. The remaining insights will be incorporated in the Rabi and Final reports.

1.4. Selection of crops

Nine crops are included this report. The leftover crops are Bengal gram, Green Gram and Jowar. The crops covered, the number of available observations for the estimation of crop wise costs of cultivation, yields, prices and returns are shown in Table 1.3. Not surprisingly, Paddy has the highest number of observations, covering 54% of total CNF observations and 42% of total non-CNF sample observations. Barring CNF Maize, each of crops provide a good number of

observations to provide robust estimates. This is due to crop wise sample selection strategy that was adopted for this year.

Table 1.3: Crop wise number of CNF and non-CNF sample observations

Crop	CNF	Non-CNF
Paddy	715	412
Groundnut	110	88
Cotton	192	91
Black gram	65	46
Maize	16	50
Red gram	90	84
Chillies	44	101
Ragi	33	44
Tomato	53	58
All crops	1,318	974

Source: IDSAP Field Survey 2021-22

Crop Cutting Experiments (CCEs) were conducted scientifically to get an independent estimate of crop yields under CNF and non-CNF. For each of the selected farmer, a plot where the farmer is growing the major crop was identified. From this parcel of land, a plot of *size*[10] *as required by the procedure* has been selected at random for estimating 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 the CCEs.

1.5. Crop cutting experiments for CNF and non-CNF crops

The field team could conduct 838 CCEs during the Kharif season 2021-22. We could not conduct CCEs in 109 farmers' fields because of complete crop failures due to heavy and untimely rains. In aggregation, the crop failures are equal to five percent of total sample. Out of these109 crop failures; 47 are CNF, which are equal to 4% of CNF sample farmers; 51 are non-CNF, which are equal to 7% of non-CNF farmers; and 11 are Panel farmers crops, which are equal to 3% of Panel farmers (Table 1.4). ***It clearly indicates that the intensity of crop failures is less under CNF vis-a-vis non-CNF.***

Table 1.4: Intensity of crop failures among CNF, non-CNF and Panel farmers during Kharif 2021-22

Type of sample farmers	Sample size	Number of crop failure	Crop failures as % of sample size
CNF	1,186	47	4
Non-CNF	748	51	7
Panel	390	11	3
All sample	2,324	109	5

Source: IDSAP Field Survey 2021-22

Out of the total 838 CCEs, 471 are CNF, 264 are non-CNF and 103 are Panel farmers crops. The share of Paddy CCEs is 56% in total CNF CCEs, 33% in non-CNF CCEs and 80% in Panel farmers

[10] Normally, 5 metres by 5 metres, (5^2metres) plots are used for CCEs. However, in few crops 2 metres by 2 metres (Onion) or 10 metres by 10 metres (Red gram) are used.

CCEs. Out of 12 crops included in this study, CCEs of CNF and non-CNF are available for nine crops, which are included in this report. But some crops have very few CCEs. The crop wise number of CCEs conducted during Kharif 2021-22 are shown in the Table 1.5 below.

Table 1.5: Crop wise and type of farming wise number of CCEs conducted during Kharif 2021-22

Crop	CNF	Non-CNF	Panel total
Paddy	262	88	81
Groundnut	47	40	9
Cotton	26	20	1
Black gram	13	9	3
Maize	6	11	1
Red gram	11	15	1
Chillies	38	64	5
Ragi	10	6	-
Tomato	44	10	-
All crops	470	263	101

Source: IDSAP Field Survey 2021-22

This year, the field data was digitalized with the help of a technical agency known as "I for Development (i4D) Parishkaar Technologies". Each field staff was given a Tab. The agency developed Apps for the entry of household information and CCE data, apart from the PMDS survey data. Needless to say, the field staff was given comprehensive training about the use of the Tabs and Apps and data entry. The agency provided technical support throughout the year along with data to IDSAP in a excel form. The data was collated and processed using the SPSS and Excel software. Descriptive statistics, frequency distributions and cross tabulation are generated at state level, agroclimatic zone[11] wise, farm category wise, tenurial category wise and social category wise.

1.6. Data Collection and Management Process

In all, eleven research tools, viz. (1) Household listing schedule for the CNF GPs, (2) Household listing schedule for the non-CNF GPs, (3) Village survey schedule for CNF GPs, (4) Village survey schedule for non-CNF GPs (5) PMDS schedule to collect the data from CNF household about PMDS details, (6) Questionnaire for CNF households, (7) Questionnaire for non-CNF households, (8) Checklist for Case Studies, and (9) Checklist for Strategic Interviews, (10) Checklist for Focused Group Discussions, (11) Schedule to record the CCE related details, were used. Further, the Kharif CNF and non-CNF households' schedules were revised for the Rabi survey. The quantitative filed-based instruments have in-built checks with appropriate skip patterns over and above the supportive manual with instructions and clarification for all questionnaires. The research tools were finalized through a series of brainstorming consultations. An intensive training and field testing were carried out to train the field investigators and supervisors at Andhra University, Visakhapatnam during last week of September 2020. The field staff was placed continuously in the field in their allotted districts in order to track the farming and related activities of sample farmers throughout the year. Each sample farmer was visited about

[11]The list of agroclimatic zones in the state and related information is given in Appendix 1.

eight times by the field staff to collect data about farmer household's details and farming throughout the year.

The household survey for the Kharif season of 2021-22, was conducted from early- November 2021 till the end of February 2022. As per the design, each sample farmer was visited a minimum of two times during the season to collect household and farming data and to conduct the Crop Cutting Experiments (CCEs). Senior team members have visited the field and cross-checked the information filled and participated in data collection processes; conducted SIs with DPMs and a few field staff of RySS; and participated in the FGDs, visited fields, especially the model farmers and farm practices and social entrepreneurs.

1.7. Structure of the Report

The context, objectives and methodology of the study have been presented in Chapter 1. Chapter 2 describes the socio-economic profile of the sample CNF (PMDS+CNF) and non-CNF households. The parameters used include socio-economic group composition, literacy levels, and age of the farmers, the head of the households. Chapter 3 consists of the comparative analyses between the CNF and non-CNF farmers with regard to the changes in expenditure on Plant Nutrient and Plant Protection Inputs (PNPIs), paid-out costs, crop yields, gross and net values of output. The impact of CNF on the Paddy cultivation across the agroclimatic zones, and farmers categories is analyzed in Chapter 4. Changes in agriculture inputs use, consequent changes in the input markets, due to adoption of CNF practices are analyzed in Chapter 5. This Chapter also discusses the changes in the marketing of APCNF products. Apart from these five chapters, Executive Summary is also presented at the beginning of the Report.

Appendix 1: List of Agroclimatic zones and their demarcation

Name of the Zone	Districts and Mandals
High-altitude and Tribal areas (HAT) Zone	This zone consists of 37 High altitude and Tribal areas mandals. These include eight Mandals, viz., (1) Hiramandalam, (2) Seethampeta, (3) Kothuru, (4) Bhamini, (5) Meliaputti, (6) Saravakota, (7) Pathapatnam, and (8) Mandasa of Srikakulam district; seven mandals, viz., (9) Gummalakshmipuram, (10) Komarada; (11) Kurupam, (12) Makkuva, (13) Pachipenta, (14) Parvathipuram, and (15) Saluru of Vizianagaram district; and eleven mandals, viz., (16) Ananthagiri, (17) Arakuvalley, (18) Hukumpeta, (19) Koyyuru, (20) Chintapalle, (21) G. madugula, (22) Gudem Kotha Veedhi, (23) Dumbriguda, (24) Munchingiputtu, (25) Paderu, and (26) Pedabayalu of Visakhapatnam district; and eleven mandals, viz., (27) Addatheegala, (28) Chinthuru, (29) Devipatnam, (30) Gangavaram, (31) Kunavaram, (32) Maredumilli, (33) Rajavommangi, (34) Rampachodavaram, (35) V.R. Puram, (36) Y. Ramavaram, and (37) Yetapaka of East Godavari district.[12]
North Coastal Zone	All mandals of Srikakulam, Vizianagaram, and Visakhapatnam districts, excluding first 26 mandals (i.e., 1 to 26) of HAT zone, mentioned above.
Godavari Zone	All mandals of East Godavari, excluding last 11 mandals (i.e., 27 to 37) of HAT zone, mentioned above and all mandals of West Godavari district
Krishna Zone	All mandals of Krishna, Guntur and Prakasam districts
Southern Zone	All mandals of Nellore, Chittoor, and Kadapa districts
Scarce Rainfall Zone	All mandals of Kurnool and Anantapur districts

[12] Information was provided by Associate Director of Research (ADR), Chintapalle.

Chapter - 2

Profiles of CNF and non-CNF farmers

Chapter 2: Profiles of CNF and non-CNF farmers

2.1. Introduction

There is an argument in the literature that the CNF should bring socio-economic inclusiveness in agriculture as a factor that contributes to the sustainability of CNF. By socio-economic inclusiveness, we mean the participation of larger proportion of marginalized social groups such as Scheduled Castes (SCs), Scheduled Tribes (STs), Women, and marginalized economic groups like landless tenants, marginal and small farmers in the CNF to share the benefits that flow from CNF. The participation of many of the groups in question in CNF indicates policy of inclusiveness in agriculture. In fact, marginalized socio-economic groups get their due space in CNF due to institutional policy interventions of Rythu Sadhikara Samstha (RySS). There is also an argument that young and educated farmers are attracted by CNF.

This chapter compares the profiles of the sample farmers of CNF with those of non-CNF. The profile is characterized through parameters such as social categories of farmers (Scheduled Castes, Scheduled Tribe, Backward Castes, and Other Castes), gender categories of farmers (Male and Female), farm size category of farmers (marginal farmers, small farmers, and other category of farmers including medium and large farmers), and tenurial categories of farmers (pure tenants, owner-cum-tenant and owner). The profile includes literacy levels of the farmers (illiterate and educated farmers with different levels of education) and age of the farmers (young, middle, and old age farmers). It is very pertinent to note here that the farmers of CNF sample are drawn from the PMDS+CNF universe of the Grama Panchayats and the farmers of non-CNF sample are drawn from the non-CNF Grama Panchayats.

The analysis is conducted for agroclimatic zones and socio-economic categories of farmers.

2.2. Research Questions

In the above backdrop, this chapter addresses the following specific research questions:

i. Whether the presence of farmers belonging to SCs, STs and women is more in CNF over those in non-CNF?
ii. Are there more pure-tenant, marginal and small farmers in CNF compared to non-CNF?
iii. How far have the young, educated farmers been attracted to CNF compared to non-CNF?
iv. How do the parameters of profiles differ between CNF and non-CNF farmers across agroclimatic zones and categories of farmers?

The distribution of CNF and non-CNF farmers according to Agroclimatic Zones and Socio-economic groups is presented in Table 1.1. These are discussed in detail in this chapter.

2.3. Social Inclusiveness

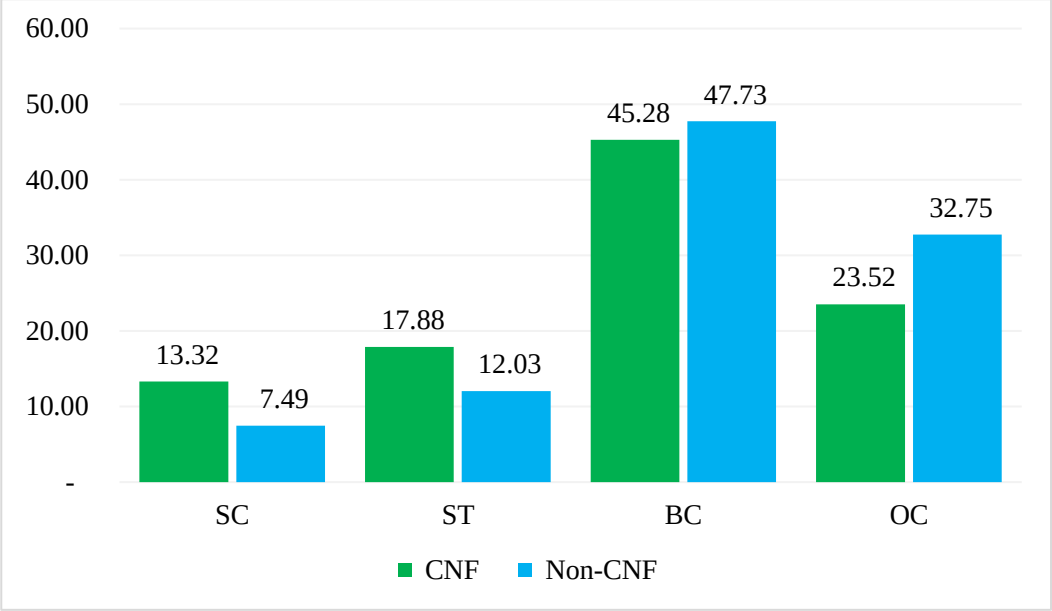
In this section, social category wise and gender wise participation are discussed.

2.3.1. Social categories of sample farmers

Representation of SCs is more among CNF compared to non-CNF in all the agroclimatic zones put together by 5.83 percentage points. The participation of SCs is higher in Krishna, Southern and Scarce Rainfall Zones. Tribal population dominates in the High-altitude Zone while backward castes are dominant in North Coastal Zone. Tenant farmers dominate in Godavari Zone. Similarly, the participation of tribal farmers in CNF is higher by 6 percentage points over non-CNF. Tribal farmers are also present in higher proportion among CNF in all the zones except North Coastal and Scarce Rainfall Zones. The social profile of farmers seems to be broad based in Scarce Rainfall and Southern zones. Presence of higher percentage of SCs and STs across all the categories of farmers in CNF compared to non-CNF indicates that the marginalised sections of farmers are shifting to CNF from non-CNF (Figure 2.1[13]).

Figure2.1: Social category wise distribution of CNF and non-CNF sample farmers

(In Percentages)



Source: IDSAP Field Survey, 2020-21

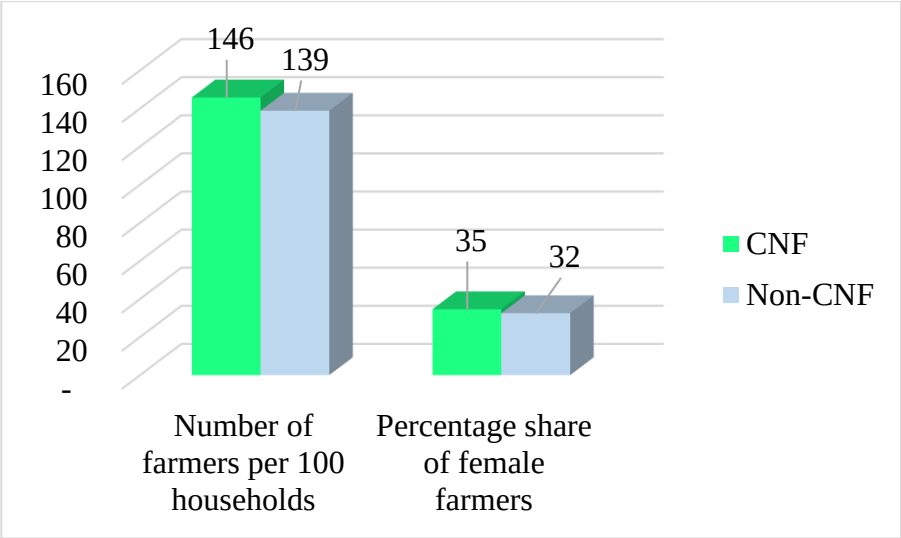
2.3.2. Gender Composition

Out of 1,186 CNF sample households, only 110 (9.27%) households are female headed households. On the other hand, 14.70% of non-CNF sample households are female headed households. However, it may be noted that head of the family alone may not be the farmer. In fact, he/ she may be a retired person and may not be a farmer at all. The study has collected details of all members of sample households. The details of household members, whose major occupation is cultivation are analysed in this chapter. The RySS effort in encouraging cultivation, in general, and women farmers, in particular, is clearly visible in the number of farmers and composition of

[13]Some of the larger tables in this chapter are given at the end of the chapters

farmers in the sample households. In total, there are 1,728 cultivators in the CNF sample and 1,038 cultivators in non-CNF sample. There are 146 cultivators for every 100 CNF sample households. The same is 139 for every 100 non-CNF sample households (Figure 2.3). Out of 1,728 CNF cultivators, 35 percent are female farmers. The same is 32 percent among the non-CNF cultivators (Figure 2.2).

Figure 2.2: Number and composition of the cultivators in CNF and non-CNF sample households in Kharif 2021-22



Source: IDSAP Field Survey, 2021-22

At the state level, the difference between the percentages of female farmers in the CNF and non-CNF sample is of three percentage points. The same is 13 percentage points in the Krishna zone, 12 percentage points in North coastal zone and 11 percentage points in the HAT zone. On the other hand, there is no difference in percentages of female farmers among CNF and non-CNF samples in the Godavari zone; and in the Southern zone, the non-CNF households are in a higher percentage by three percentage points. These variations among different farmers' categories are less compared to that of zones (Table 2.1). Female farmers participation is as high as 49 percent in CNF households in HAT zone. It is at the least (4 percent in both CNF and non-CNF households in Godavari zone. In a majority of farmers categories, the percentages of women farmers are higher in CNF households.

Table 2.1: Number and Percentage of Farmers - Agroclimatic zone wise, Category wise and Gender wise in the CNF and non-CNF Households during Kharif 2021-22

Agroclimatic Zones & Farmers' categories		Units	CNF			Non-CNF			Difference*
			Male	Female	Total	Male	Female	Total	
1	2	3	4	5	6	7	8	9	10=(5-8)
Agroclimatic Zone	HAT	No.	86	82	168	76	47	123	
		%	51	49	100	62	38	100	10.60
	North coastal	No.	52	33	85	38	14	52	
		%	61	39	100	73	27	100	11.90
	Godavari	No.	157	7	164	50	2	52	
		%	96	4	100	96	4	100	0.42
	Krishna	No.	215	130	345	152	49	201	
		%	62	38	100	76	24	100	13.30
	Southern	No.	265	153	418	162	108	270	
		%	63	37	100	60	40	100	-3.40
	Scarce rainfall	No.	356	192	548	223	117	340	
		%	65	35	100	66	34	100	0.62
	AP	No.	1,131	597	1,728	701	337	1,038	
		%	65	35	100	68	32	100	2.08
Farm size category	Marginal	No.	635	353	988	324	133	457	
		%	64	36	100	71	29	100	6.63
	Small	No.	273	135	408	214	126	340	
		%	67	33	100	63	37	100	-3.97
	Others	No.	223	109	332	163	78	241	
		%	67	33	100	68	32	100	0.47
	All	No.	1,131	597	1,728	701	337	1,038	
		%	65	35	100	68	32	100	2.08
Tenurial status	Tenants	No.	52	11	63	27	9	36	
		%	83	17	100	75	25	100	-7.54
	Owner-cum-tenants	No.	103	32	135	22	5	27	
		%	76	24	100	81	19	100	5.19
	Owners	No.	976	554	1,530	652	323	975	
		%	64	36	100	67	33	100	3.08
	All	No.	1,131	597	1,728	701	337	1,038	
		%	65	35	100	68	32	100	2.08
Social category	SC	No.	161	67	228	49	25	74	
		%	71	29	100	66	34	100	-4.40
	ST	No.	158	93	251	87	50	137	
		%	63	37	100	64	36	100	0.56
	BC	No.	524	295	819	316	166	482	
		%	64	36	100	66	34	100	1.58
	OC	No.	288	142	430	249	96	345	
		%	67	33	100	72	28	100	5.20

** Difference in female participation between CNF & non-CNF in percentage points*

Source: IDSAP Field Survey, 2021-22

2.4. Economic Inclusiveness

Under this section, the average area operated by CNF and non-CNF farmers among farm size categories and tenurial categories is discussed.

2.4.1. Average operational area

On an average, CNF farmers have smaller operational holding of 1.15 hectares compared to non-CNF farmers operational holding of 1.36 hectares, i.e., 15 percent smaller holdings for CNF farmers. In four out of total six Agroclimatic zones, the average operational holdings of CNF farmers is smaller than that of non-CNF farmers. Similarly, CNF farmers have smaller operational holdings than non-CNF farmers in majority of farmers categories (Table 2.2). However, there are a few notable exceptions. The data shows that among the marginal farmers in farm size categories, the owner-cum-tenant farmers in tenurial categories and SC farmers in social categories have larger operational holdings compared to their counterparts in non-CNF.

Table 2.2: Average Operational Area among Farmers of CNF and non-CNF samples across Agroclimatic zones and Farmers' categories in Kharif 2021-22

Agroclimatic zones and farmers categories		Average operational area in hectares		percentage difference between CNF and non-CNF
		CNF	non-CNF	
1	2	3	4	5=((3-4)/4)*100
AP	AP	1.15	1.36	-15
Zones	HAT	0.99	1.71	-42
	North coastal	0.81	0.64	27
	Godavari	1.32	1.38	-4
	Krishna	0.85	1.41	-40
	Southern	1.17	1.11	5
	Scarce rainfall	1.44	1.49	-3
Farm categories	Marginal	0.57	0.55	4
	Small	1.33	1.43	-7
	Others	3.10	3.26	-5
Tenurial categories	Tenant	1.28	1.68	-24
	Owner-cum-tenant	2.22	1.66	34
	Owner	1.05	1.33	-21
Social categories	SC	0.83	0.80	4
	ST	1.09	1.53	-29
	BC	1.10	1.19	-8
	OC	1.48	1.67	-11

Source: IDSAP Survey 2021-22

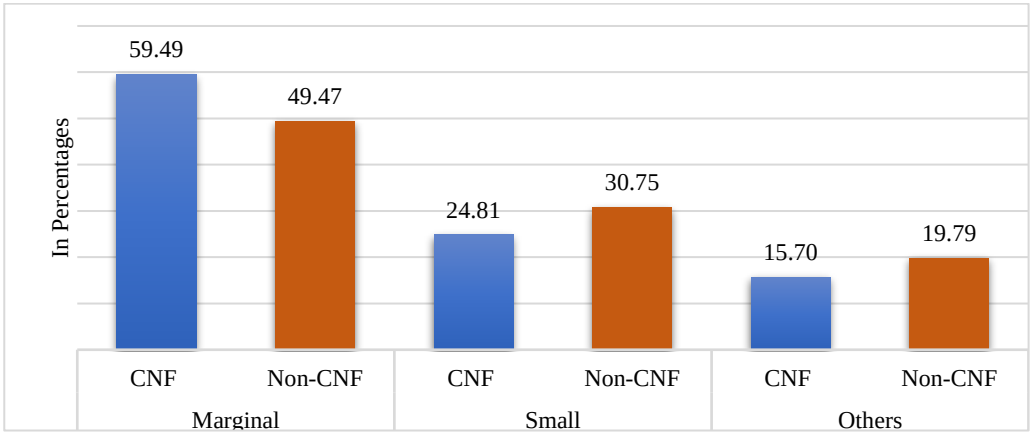
2.4.2. Composition of farm size categories of farmers

Table 2.3 portrays the distribution of farmers in CNF and non-CNF samples by the farm size, farmers' category and by zone (vertical shares add up to 100). At the aggregate level, the share of marginal farmers is higher in CNF than in non-CNF farmers by 10 percentage points (Figure 2.3). As shown in Table 2.5 (horizontal summation of shares is 100), among farmers' categories, tenants and owner cultivators, and marginal farmers have higher shares in CNF than in non-CNF sample. From the same Table, it is seen that for marginal farmers among all the social categories except SCs show higher share in CNF than non-CNF sample.

Small farmers were relatively fewer in CNF compared to non-CNF (Figure 2.3). However, as can be seen from Table 2.5, small farmers' shares are higher among HAT zone, North Coastal and Godavari Zones in CFN than in non-CFN sample. Small farmers among landless tenants and owner-cum-tenants have higher shares in CNF than in non-CNF sample. Similarly, small holdings among SC and ST categories have higher percentages in CNF than in non-CNF sample. From these figures, it amounts to say that relatively high proportion of small farmers have shifted to CNF agriculture among half of zones, two farmer categories and SC/ST categories.

Other farmers (medium and large farmers) among Scarce rainfall zone account for just more than 22.0 percent in each of the samples, while they show relatively higher shares among North Coastal Zone, Godavari and southern Zones in CNF than in non-CNF sample. While other farmers among landless tenants in CNF and non-CNF samples are not high (being 11 and 10 respectively), they have a higher number and share in CNF (47 and 49%) than in the non-CNF sample.

Figure 2.3: Farm size categories wise distribution of CNF and CNF sample farmers (in %) in Kharif 2021-22

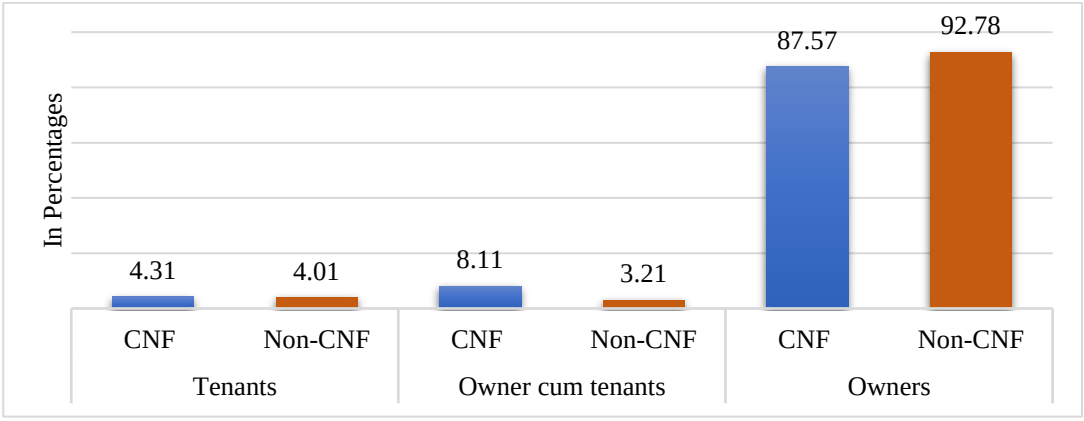


Source: IDSAP Field Survey, 2021-22

Though there is not much difference in the percentage of landless tenant farmers in CNF and non-CNF sample, the owner-cum-tenant[14] farmers' share in CNF sample is higher than non-CNF by nearly 5-percentage points. On the other hand, pure owner farmers' participation in CNF is relatively lower compared to non-CNF (Figure 2.4). More details can be seen in the Tables at the end of the chapter.

[14] Who cultivates both his own land and also some lease in lands.

Figure 2.4: Tenurial categories wise distribution of CNF and non-CNF sample farmers (in %) in Kharif 2021-22



Source: IDSAP Field Survey, 2021-22

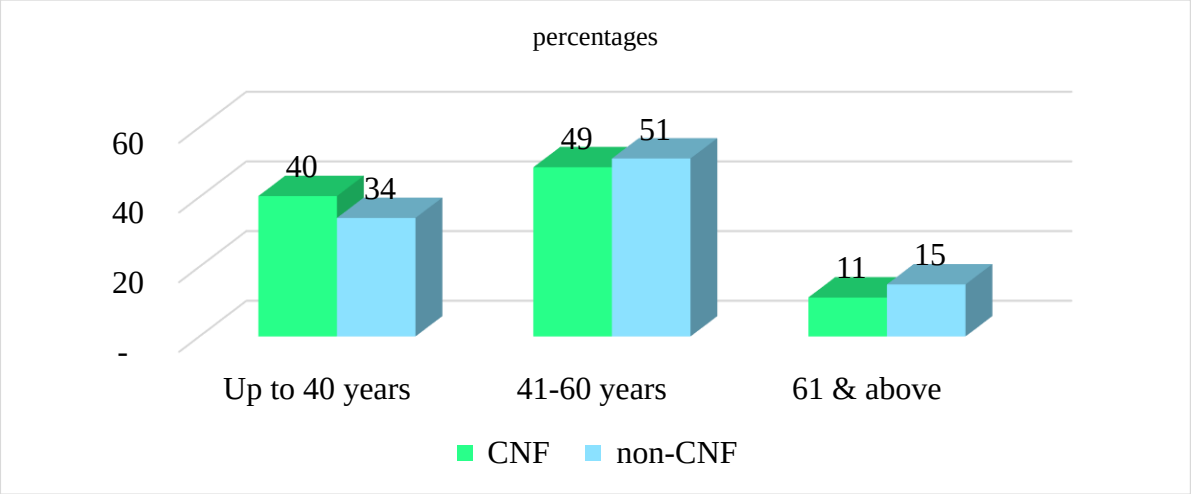
2.5. Selected demographic characteristics

In this section, the age and education of the CNF and non-CNF sample farmers are covered.

2.5.1. Age of Farmers[15]

The age composition of the farmers in CNF and non-CNF is given in the Figure 2.5. This clearly shows that CNF has attracted young farmers.

Figure 2.5: Age wise distribution of cultivators in the CNF and non-CNF sample households in Kharif 2021-22



Source: IDSAP Field Survey, 2021-22

2.5.2. Literacy levels of Farmers[16]

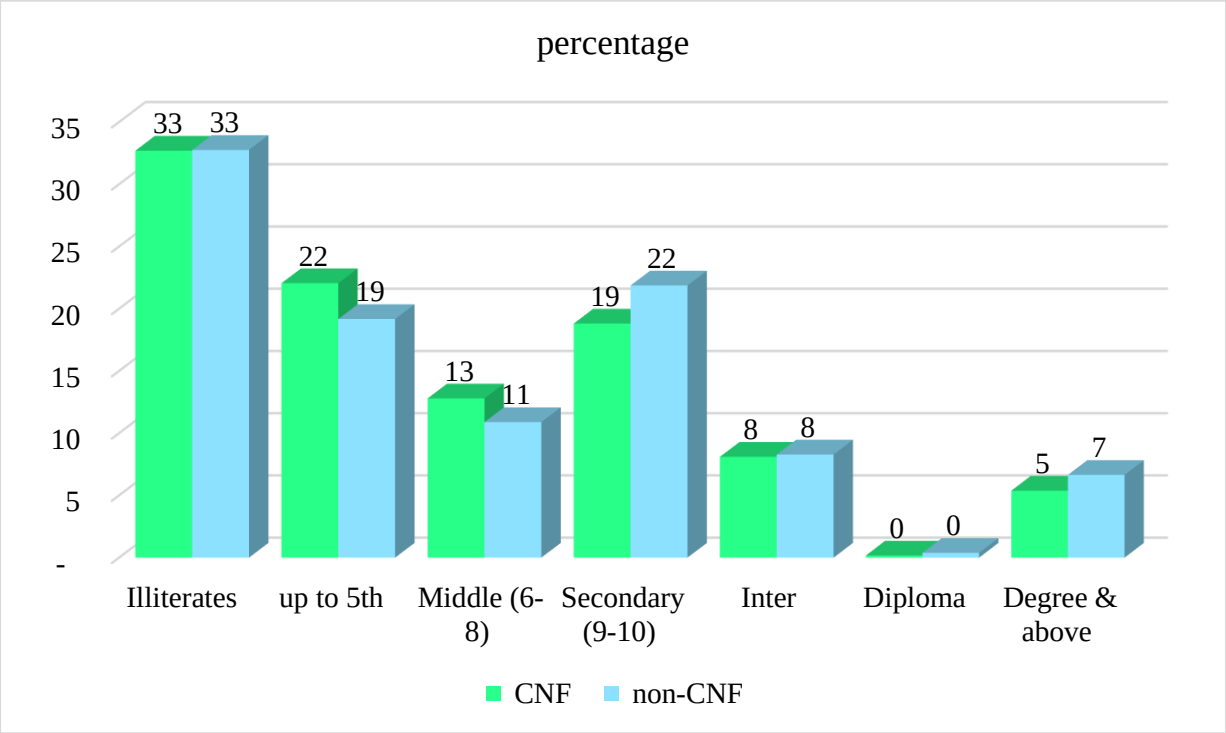
Illiterate farmers are present in equal percentage in CNF and non-CNF at the aggregate level. The percentage of CNF cultivators is higher than that of non-CNF cultivators by three percentage points in the primary education category and two percentage points among the middle level education category. On the other hand, the percentage of non-CNF cultivators is higher than that

[15] In this section, all the cultivators, in the CNF and non-CNF sample households, are used. See for more details the gender section above.

[16] In this section, all the cultivators, in the CNF and non-CNF sample households, are used. See for more details the gender section above.

of CNF farmers by three percentage points in the secondary education category and two percentage points in the Degree and above category (Figure 2.6 and Table 2.7).

Figure 2.6: Education of the head of the household of CNF and Non-CNF farmers (in %) in Kharif 2021-22



Source: IDSAP Field Survey, 2020-21.

2.6. Conclusions

There is a higher presence of SCs and STs across all the categories of farmers in CNF compared to non-CNF, indicating that marginalised sections of farmers are shifting to CNF from non-CNF. Further, the participation of women cultivators is higher in CNF over those in non-CNF farmers at the aggregate level and Krishna zone, North Coastal zone and HAT zone, in particular. More of younger and less of older farmers are adopting CNF.

Additional Tables of Chapter 2

Table 2.3: Distribution of Farmers in CNF and non-CNF Samples by agroclimatic zones and Socio-economic groups in Kharif 2021-22

Zones & Categories	CNF								Non-CNF							
	Marginal		Small		Others		All		Marginal		Small		Others		All	
Units →	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Agroclimatic zone																
HAT	75	10.64	54	18.37	10	5.376	139	11.73	29	7.84	25	10.87	19	12.84	73	9.76
North coastal	61	8.65	19	6.46	7	3.763	87	7.34	38	10.27	8	3.48	1	0.68	47	6.28
Godavari	80	11.35	41	13.95	34	18.28	155	13.08	30	8.11	9	3.91	10	6.76	49	6.55
Krishna	154	21.84	42	14.29	18	9.677	214	18.06	79	21.35	35	15.22	43	29.05	157	20.99
Southern	174	24.54	61	20.75	48	25.806	282	23.8	90	24.32	46	20	15	10.14	151	20.19
Scarce rainfall	162	22.98	77	26.19	69	37.097	308	25.99	104	28.11	107	46.52	60	40.54	271	36.23
AP	706	100	294	100	186	100	1,186	100	370	100	230	100	148	100	748	100
Tenurial categories																
Tenants	29	4.11	11	3.74	11	5.914	51	4.3	16	4.32	4	1.74	10	6.76	30	4.01
Owner-cum-tenants	22	3.12	27	9.18	47	25.269	96	8.1	8	2.16	6	2.61	10	6.76	24	3.21
Owners	655	92.77	256	87.07	128	68.817	1,039	87.59	346	93.51	220	95.65	128	86.49	694	92.78
All	706	100	294	100	186	100	1,186	100	370	100	230	100	148	100	748	100
Social category																
SC	106	15.04	44	14.97	8	4.301	158	13.33	46	12.43	5	2.17	5	3.38	56	7.49
ST	105	14.89	82	27.89	24	12.903	211	17.81	43	11.62	27	11.74	20	13.51	90	12.03
BC	361	51.06	102	34.69	75	40.323	538	45.32	188	50.81	118	51.3	51	34.46	357	47.73
OC	134	19.01	66	22.45	79	42.473	279	23.54	93	25.14	80	34.78	72	48.65	245	32.75
All	706	100	294	100	186	100	1,186	100	370	100	230	100	148	100	748	100

Note: Horizontal percentages are given in other Tables below; ***Source: IDSAP Survey 2021-22***

Table2.4: Social category wise distribution of CNF and non-CNF farmers in different agroclimatic zones (%)

Zones& Categories	Unit	CNF					Non-CNF				
		SC	ST	BC	OC	All	SC	ST	BC	OC	All
Zone											
HAT	Number		133	7		**140**		68	4	1	**73**
	Percentage	-	95.00	5.00	-	**100**	-	93.15	5.48	1.37	**100**
North coastal	Number			87		**87**	2	3	42		**47**
	Percentage	-	-	100.00	-	**100**	4.26	6.38	89.36	-	**100**
Godavari	Number	9	57	47	42	**155**	8		19	22	**49**
	Percentage	5.81	36.77	30.32	27.10	**100**	16.33	-	38.78	44.90	**100**
Krishna	Number	44	5	81	84	**214**	12	1	43	101	**157**
	Percentage	20.56	2.34	37.85	39.25	**100**	7.64	0.64	27.39	64.33	**100**
Southern	Number	53	17	109	103	**282**	22	4	62	63	**151**
	Percentage	18.79	6.03	38.65	36.52	**100**	14.57	2.65	41.06	41.72	**100**
Scarce rainfall	Number	52		206	50	**308**	12	14	187	58	**271**
	Percentage	16.88	-	66.88	16.23	**100**	4.43	5.17	69.00	21.40	**100**
AP	Number	158	212	537	279	**1186**	56	90	357	245	**748**
	Percentage	13.32	17.88	45.28	23.52	**100**	7.49	12.03	47.73	32.75	**100**

Source: IDSAP Survey 2021-22

Table2.5: Farm size wise distribution of CNF and non-CNF farmers across agroclimatic zones and socio-economic categories (in %)

Geographic units & Categories	Units	CNF				Non-CNF			
		Mar-ginal	Small	Others	All	Mar-ginal	Small	Others	All
Agroclimatic Zone									
HAT	Number	75	54	10	**139**	29	25	19	**73**
	Percentage	53.96	38.85	7.19	**100**	39.73	34.25	26.03	**100**
North coastal	Number	61	19	7	**87**	38	8	1	**47**
	Percentage	70.11	21.84	8.05	**100**	80.85	17.02	2.13	**100**
Godavari	Number	80	41	34	**155**	30	9	10	**49**
	Percentage	51.61	26.45	21.94	**100**	61.22	18.37	20.41	**100**
Krishna	Number	154	42	18	**214**	79	35	43	**157**
	Percentage	71.96	19.63	8.41	**100**	50.32	22.29	27.39	**100**
Southern	Number	174	61	48	**282**	90	46	15	**151**
	Percentage	61.70	21.63	17.02	**100**	59.60	30.46	9.93	**100**
Scarce rainfall	Number	162	77	69	**308**	104	107	60	**271**
	Percentage	52.60	25.00	22.40	**100**	38.38	39.48	22.14	**100**
AP	Number	706	294	186	**1,186**	370	230	148	**748**
	Percentage	59.53	24.79	15.68	**100**	49.47	30.75	19.79	**100**
Tenurial categories									
Tenants	Number	29	11	11	**51**	16	4	10	**30**
	Percentage	56.86	21.57	21.57	**100**	53.33	13.33	33.33	**100**
Owner-cum-tenants	Number	22	27	47	**96**	8	6	10	**24**
	Percentage	22.92	28.13	48.96	**100**	33.33	25.00	41.67	**100**
Owners	Number	655	256	128	**1,039**	346	220	128	**694**
	Percentage	63.04	24.64	12.32	**100**	49.86	31.70	18.44	**100**
All	Number	706	294	186	**1,186**	370	230	148	**748**
	Percentage	59.53	24.79	15.68	**100**	49.47	30.75	19.79	**100**
Social category									
SC	Number	106	44	8	**158**	46	5	5	**56**
	Percentage	67.09	27.85	5.06	**100**	82.14	8.93	8.93	**100**
ST	Number	105	82	24	**211**	43	27	20	**90**
	Percentage	49.76	38.86	11.37	**100**	47.78	30.00	22.22	**100**
BC	Number	361	102	75	**538**	188	118	51	**357**
	Percentage	67.10	18.96	13.94	**100**	52.66	33.05	14.29	**100**
OC	Number	134	66	79	**279**	93	80	72	**245**
	Percentage	48.03	23.66	28.32	**100**	37.96	32.65	29.39	**100**
All	Number	706	294	186	**1,186**	370	230	148	**748**
	Percentage	59.53	24.79	15.68	**100**	49.47	30.75	19.79	**100**

Source: IDSAP Survey 2021-22

Table 2.6: Tenurial category wise distribution of CNF and non-CNF farmers across different agroclimatic zones and social categories

Zones & social categories	Unit	CNF				NON-CNF			
		Tenants	Owner-cum-tenants	Owners	All	Tenants	Owner-cum-tenants	Owners	All
Agroclimatic zone									
HAT	Number			139	**139**	1	1	71	**73**
	Percentage	-	-	100.00	**100**	1.37	1.37	97.26	**100**
North coastal	Number		8	79	**87**		1	46	**47**
	Percentage	-	9.20	90.80	**100**	-	2.13	97.87	**100**
Godavari	Number	28	36	91	**155**	11	2	36	**49**
	Percentage	18.06	23.23	58.71	**100**	22.45	4.08	73.47	**100**
Krishna	Number	10	15	187	**212**	12	14	131	**157**
	Percentage	4.72	7.08	88.21	**100**	7.64	8.92	83.44	**100**
Southern	Number	10	18	254	**283**	2	1	148	**151**
	Percentage	3.53	6.36	89.75	**100**	1.32	0.66	98.01	**100**
Scarce rainfall	Number	3	19	286	**310**	4	5	262	**271**
	Percentage	0.97	6.13	92.26	**100**	1.48	1.85	96.68	**100**
AP	Number	51	96	1,036	**1,186**	30	24	694	**748**
	Percentage	4.30	8.09	87.35	**100**	4.01	3.21	92.78	**100**
Social category									
SC	Number	8	12	138	**158**	7	4	45	**56**
	Percentage	5.06	7.59	87.34	**100**	12.50	7.14	80.36	**100**
ST	Number	4	12	195	**211**	1	1	88	**90**
	Percentage	1.90	5.69	92.42	**100**	1.11	1.11	97.78	**100**
BC	Number	24	38	477	**539**	10	7	340	**357**
	Percentage	4.45	7.05	88.50	**100**	2.80	1.96	95.24	**100**
OC	Number	15	34	229	**278**	12	12	221	**245**
	Percentage	5.40	12.23	82.37	**100**	4.90	4.90	90.20	**100**
All	Number	51	96	1,039	**1,186**	30	24	694	**748**
	Percentage	4.30	8.09	87.61	**100**	4.01	3.21	92.78	**100**

Source: IDSAP Survey 2021-22

Table 2.7: Age wise distribution of CNF and non-CNF farmers (Head of the household) across different Agroclimatic zones and socio-economic Groups (in %)

Zones& Categories	Unit	CNF				non-CNF			
		Up to 40 years	41-60 years	61 & above	Total	Up to 40 years	41-60 years	61 & above	Total
Agroclimatic zone									
HAT	Number	83	79	6	168	40	66	17	123
	Percentage	49.40	47.02	3.57	100	32.52	53.66	13.82	100
North coastal	Number	28	45	12	85	14	26	12	52
	Percentage	32.94	52.94	14.12	100	26.92	50.00	23.08	100
Godavari	Number	60	95	9	164	15	25	12	52
	Percentage	36.59	57.93	5.49	100	28.85	48.08	23.08	100
Krishna	Number	104	190	51	345	49	126	26	201
	Percentage	30.14	55.07	14.78	100	24.38	62.69	12.94	100
Southern	Number	180	189	49	418	97	142	31	270
	Percentage	43.06	45.22	11.72	100	35.93	52.59	11.48	100
Scarce rainfall	Number	241	241	66	548	138	145	57	340
	Percentage	43.98	43.98	12.04	100	40.59	42.65	16.76	100
AP	Number	696	839	193	1,728	353	530	155	1,038
	Percentage	40.28	48.55	11.17	100	34.01	51.06	14.93	100
Farm size category									
Marginal	Number	404	466	118	988	162	228	67	457
	Percentage	40.89	47.17	11.94	100	35.45	49.89	14.66	100
Small	Number	162	206	40	408	106	177	57	340
	Percentage	39.71	50.49	9.80	100	31.18	52.06	16.76	100
Others	Number	130	167	35	332	85	125	31	241
	Percentage	39.16	50.30	10.54	100	35.27	51.87	12.86	100
All	Number	404	466	118	988	162	228	67	457
	Percentage	40.89	47.17	11.94	100	35.45	49.89	14.66	100
Tenurial categories									
Tenants	Number	30	31	2	63	12	21	3	36
	Percentage	47.62	49.21	3.17	100	33.33	58.33	8.33	100
Owner-cum-tenants	Number	48	75	12	135	9	15	3	27
	Percentage	35.56	55.56	8.89	100	33.33	55.56	11.11	100
Owners	Number	618	733	179	1,530	332	494	149	975
	Percentage	40.39	47.91	11.70	100	34.05	50.67	15.28	100
All	Number	696	839	193	1,728	353	530	155	1,038
	Percentage	40.28	48.55	11.17	100	34.01	51.06	14.93	100
Social category									
SC	Number	100	104	24	228	28	34	12	74
	Percentage	43.86	45.61	10.53	100	37.84	45.95	16.22	100
ST	Number	123	121	7	251	45	73	19	137
	Percentage	49.00	48.21	2.79	100	32.85	53.28	13.87	100
BC	Number	344	371	104	819	196	224	62	482
	Percentage	42.00	45.30	12.70	100	40.66	46.47	12.86	100
OC	Number	129	243	58	430	84	199	62	345
	Percentage	30.00	56.51	13.49	100	24.35	57.68	17.97	100
All	Number	696	839	193	1,728	353	530	155	1,038
	Percentage	40.28	48.55	11.17	100	34.01	51.06	14.93	100

Source: IDSAP Survey 2021-22

Table 2.8: Education of the head of the household of CNF and Non-CNF farmers across the Zones and farmers categories

Zones& Categories	Unit	CNF								Non-CNF							
		Illite-rates	up to 5th	6th - 8th	9th-10th	Inter	Diplo ma	Degree & above	Total	Illite-rates	up to 5th	6th - 8th	9th-10th	Inter	Diploma	Degree & above	Total
		Agroclimatic zone															
HAT	No.	90	15	19	23	13		8	168	55	17	13	29	6		3	123
	%	54	9	11	14	8	-	5	100	45	14	11	24	5	-	2	100
North coastal	No.	37	11	6	19	7		5	85	22	11	5	8	2		4	52
	%	44	13	7	22	8	-	6	100	42	21	10	15	4	-	8	100
Godavari	No.	47	53	16	30	12		6	164	7	17	3	10	6		9	52
	%	29	32	10	18	7	-	4	100	13	33	6	19	12	-	17	100
Krishna	No.	129	74	50	58	18		16	345	65	35	28	47	11	2	13	201
	%	37	21	14	17	5	-	5	100	32	17	14	23	5	1	6	100
Southern	No.	125	93	51	86	31	2	30	418	85	50	25	61	25		24	270
	%	30	22	12	21	7	0	7	100	31	19	9	23	9	-	9	100
Scarce rainfall	No.	137	135	79	109	59	1	28	548	106	69	39	72	36	2	16	340
	%	25	25	14	20	11	0	5	100	31	20	11	21	11	1	5	100
AP	No.	565	381	221	325	140	3	93	1,728	340	199	113	227	86	4	69	1,038
	%	33	22	13	19	8	0	5	100	33	19	11	22	8	0	7	100
		Farm size category															
Marginal	No.	352	197	140	175	78	3	43	988	155	92	48	92	40	1	29	457
	%	35.63	19.94	14.17	17.71	7.89	0.30	4.35	100.00	33.92	20.13	10.50	20.13	8.75	0.22	6.35	100.00
Small	No.	143	96	41	72	29		27	408	125	60	39	68	22	2	24	340
	%	35.05	23.53	10.05	17.65	7.11	-	6.62	100.00	36.76	17.65	11.47	20.00	6.47	0.59	7.06	100.00
Others	No.	70	88	40	78	33		23	332	60	47	26	67	24	1	16	241
	%	21.08	26.51	12.05	23.49	9.94	-	6.93	100.00	24.90	19.50	10.79	27.80	9.96	0.41	6.64	100.00
All	No.	565	381	221	325	140	3	93	1,728	340	199	113	227	86	4	69	1,038
	%	32.70	22.05	12.79	18.81	8.10	0.17	5.38	100.00	32.76	19.17	10.89	21.87	8.29	0.39	6.65	100.00
		Tenurial categories															
Tenants	No.	14	23	6	15	2		3	63	10	7	5	9	3		2	36
	%	22.22	36.51	9.52	23.81	3.17	-	4.76	100.00	27.78	19.44	13.89	25.00	8.33	-	5.56	100.00
Owner-cum-tenants	No.	39	32	12	38	8		6	135	6	7	1	9	2		2	27
	%	28.89	23.70	8.89	28.15	5.93	-	4.44	100.00	22.22	25.93	3.70	33.33	7.41	-	7.41	100.00
Owners	No.	512	326	203	272	130	3	84	1,530	324	185	107	209	81	4	65	975
	%	33.46	21.31	13.27	17.78	8.50	0.20	5.49	100.00	33.23	18.97	10.97	21.44	8.31	0.41	6.67	100.00

Zones& Categories	Unit	CNF								Non-CNF							
		Illite-rates	up to 5th	6th - 8th	9th-10th	Inter	Diplo ma	Degree & above	Total	Illite-rates	up to 5th	6th - 8th	9th-10th	Inter	Diploma	Degree & above	Total
All	No.	565	381	221	325	140	3	93	1,728	340	199	113	227	86	4	69	1,038
	%	32.70	22.05	12.79	18.81	8.10	0.17	5.38	100.00	32.76	19.17	10.89	21.87	8.29	0.39	6.65	100.00
		Social category															
SC	No.	62	48	38	46	21		13	228	22	16	8	14	9		5	74
	%	27.19	21.05	16.67	20.18	9.21	-	5.70	100.00	29.73	21.62	10.81	18.92	12.16	-	6.76	100.00
ST	No.	125	37	23	33	21		12	251	63	22	13	30	6		3	137
	%	49.80	14.74	9.16	13.15	8.37	-	4.78	100.00	45.99	16.06	9.49	21.90	4.38	-	2.19	100.00
BC	No.	290	174	106	146	60	3	40	819	177	86	47	93	46	2	31	482
	%	35.41	21.25	12.94	17.83	7.33	0.37	4.88	100.00	36.72	17.84	9.75	19.29	9.54	0.41	6.43	100.00
OC	No.	88	122	54	100	38		28	430	78	75	45	90	25	2	30	345
	%	20.47	28.37	12.56	23.26	8.84	-	6.51	100.00	22.61	21.74	13.04	26.09	7.25	0.58	8.70	100.00
All	No.	565	381	221	325	140	3	93	1,728	340	199	113	227	86	4	69	1,038
	%	32.70	22.05	12.79	18.81	8.10	0.17	5.38	100.00	32.76	19.17	10.89	21.87	8.29	0.39	6.65	100.00

Note: Educational details of a few sample farmers are not available; Source: IDSAP Survey 2021-22

Table 2.9: Primary occupation of CNF and Non-CNF farmers (head of the family) by Agroclimatic zone wise and different Socio-economic category wise (in %)

Geographic units & Categories	Unit	CNF						Non-CNF					
		Cultivator	Wage labour	Regular& salary employment	Business/ self-employment	Others	Total	Cultivator	Wage labour	Regular & salary employment	Business/ self-employment	Others	Total
		Agroclimatic zones											
HAT	No.	80	43	1	1	15	**140**	68	3		1	1	**73**
	%	57	31	1	1	11	**100**	93	4	-	1	1	**100**
North coastal	No.	45	33	3	2	3	**86**	37	7			3	**47**
	%	52	38	3	2	3	**100**	79	15	-	-	6	**100**
Godavari	No.	142	5	6	2		**155**	43	3	1	1	1	**49**
	%	92	3	4	1	-	**100**	88	6	2	2	2	**100**
Krishna	No.	194	10	1	3	5	**213**	144	5	2	1	5	**157**
	%	91	5	0	1	2	**100**	92	3	1	1	3	**100**
Southern	No.	245	7	8	8	12	**280**	123	1	1		26	**151**
	%	88	3	3	3	4	**100**	81	1	1	-	17	**100**
Scarce rainfall	No.	274	6	8	8	12	**308**	162	46	13	30	20	**271**
	%	89	2	3	3	4	**100**	60	17	5	11	7	**100**
AP	No.	980	104	27	24	47	**1,182**	577	65	17	33	56	**748**

Geographic units & Categories	Unit	CNF						Non-CNF					
		Cultivator	Wage labour	Regular& salary employment	Business/ self-employment	Others	Total	Cultivator	Wage labour	Regular & salary employment	Business/ self-employment	Others	Total
	%	83	9	2	2	4	**100**	77	9	2	4	7	**100**
		Farm size category											
Marginal	No.	561	77	16	19	29	**702**	270	41	7	22	30	**370**
	%	80	11	2	3	4	**100**	73	11	2	6	8	**100**
Small	No.	249	23	8	4	11	**295**	182	16	4	9	19	**230**
	%	84	8	3	1	4	**100**	79	7	2	4	8	**100**
Others	No.	170	4	3	1	7	**185**	125	8	6	2	7	**148**
	%	92	2	2	1	4	**100**	84	5	4	1	5	**100**
All	No.	980	104	27	24	47	**1,182**	577	65	17	33	56	**748**
	%	83	9	2	2	4	**100**	77	9	2	4	7	**100**
		Tenurial categories											
Tenants	No.	44	2	3	2		**51**	25	3	2			**30**
	%	86	4	6	4	-	**100**	83	10	7	-	-	**100**
Owner-cum-tenants	No.	87	3	2	3	1	**96**	20	1	1	2		**24**
	%	91	3	2	3	1	**100**	83	4	4	8	-	**100**
Owners	No.	847	99	22	19	46	**1,033**	532	61	14	31	56	**694**
	%	82	10	2	2	4	**100**	77	9	2	4	8	**100**
All	No.	978	104	27	24	47	**1,180**	577	65	17	33	56	**748**
	%	83	9	2	2	4	**100**	77	9	2	4	7	**100**
		Social category											
SC	No.	137	7	1	4	9	**158**	42	7	1	1	5	**56**
	%	87	4	1	3	6	**100**	75	13	2	2	9	**100**
ST	No.	148	43	6	1	15	**213**	76	6	1	5	2	**90**
	%	69	20	3	0	7	**100**	84	7	1	6	2	**100**
BC	No.	439	49	15	17	15	**535**	248	49	7	20	32	**356**
	%	82	9	3	3	3	**100**	70	14	2	6	9	**100**
OC	No.	256	5	5	2	8	**276**	211	3	8	7	17	**246**
	%	93	2	2	1	3	**100**	86	1	3	3	7	**100**
All	No.	980	104	27	24	47	**1,182**	577	65	17	33	56	**748**
	%	83	9	2	2	4	**100**	77	9	2	4	7	**100**

Note: - Occupation details of a few CNF sample are not available; ***Source: IDSAP Survey 2021-22***

Chapter - 3

Impact of CNF on the farming conditions

Chapter 3: Impact of CNF on the farming conditions

3.1. Introduction

The impact of CNF on the farming conditions is covered in this chapter. These conditions include changes in the cost of cultivation, crop yields, gross returns and net returns, due to CNF. In other words, the chapter deals with the economic sustainability of the CNF. The CNF program will economically sustain, if and only if it results in higher farm surpluses or profits compared to non-CNF. Higher surpluses under CNF can be obtained by reducing cost of cultivation, increasing crop yield and obtaining higher prices vis-à-vis non-CNF. As mentioned in the first chapter, there is adequate data for nine crops for Kharif 2021season report. Though adequate observations are available for getting robust results for all these nine crops at the state level, disaggregated analysis is possible only for Paddy crop. Therefore, changes in costs, yields, prices, and returns for all nine crops at the state level are analysed in this chapter. In the next Chapter , the impact of CNF on Paddy cultivations across agroclimatic zones, farm size categories, tenurial categories, and social categories is analysed.

3.2. Plant nutrient and protection inputs

One of the principal objectives of CNF is to replace agrochemicals, viz., fertilisers and pesticides with biological stimulants such as Beejamrutham, Ghana Jeevamrutham, Drava Jeevamrutham, Kashayams and Asthrams. For the sake of comparative analysis, the biological stimulants and other natural inputs such as Kashayams and Asthrams under CNF on one hand and chemical inputs under the non-CNF on the other hand are referred as Plant Nutrient and Protection Inputs (PNPIs). The crop-wise expenditure on PNPIs under CNF and fertiliser and pesticides costs under non-CNF cultivation are shown in Figure 3.1. The expenditure on chemical inputs, under non-CNF is quite high, especially in the resource-intensive crops like Chillies, Cotton, and Tomato. The expenditure on PNPIs is as high as ₹43,051 per hectare in Chillies, ₹32,081 per hectare in Tomato, and ₹22,836 per hectare in Cotton, under non-CNF. But the expenditure on PNPIs under CNF is quite low for these crops. The expenditure on PNPIs under CNF is ₹8,700 per hectare in Chillies, ₹8,998 per hectare in Tomato, and ₹ 5994 per hectare in Cotton (Table 3.1). In earlier 'Assessing the Impact of APCNF' studies, it was clear that the potential to save in the expenditure on PNPIs is high in the resource intensive or high investment crops. This year's results also confirms that hypothesis. In high investment crops, the savings are as high as ₹35,156 per hectare (82%) in Chillies, ₹23,083 per hectare (72%) in Tomato (Table 3.1) and ₹16842 per hectare (74%) in Cotton. However, savings in the expenditure on PNPIs are lower in low resources intensive crops like pulses, oilseeds, coarse cereals, and millets. Out of the total nine crops considered in this report, the CNF farmers have saved in their expenditure on PNPIs in eight crops, in the range of 33% to 82% vis-à-vis non-CNF farmers. The only exception is Ragi, in which the expenditure on PNPIs, under CNF, is higher, by about ₹1,175, which turns

out to be two-thirds higher (Table 3.1). It shows how certain crops are grown in the state with minimum or lower investment.

Table 3.1: Crop wise expenditure on PNPI under CNF and non-CNF and their differences in Kharif 2021-22

				₹ / hectare
Crop	CNF in ₹ / hectare	Non-CNF ₹/ hectare	Difference in ₹/ hectare	Difference in %
1	2	3	4=2-3	5=(4/3)*100
Paddy	8,118	15,036	-6,917	-46
Groundnut	4,834	9,846	-5,012	-51
Cotton	5,994	22,836	-16,842	-74
Black gram	6,154	12,808	-6,653	-52
Maize	8,700	12,900	-4,200	-33
Red gram	4,548	7,137	-2,588	-36
Chillies	7,896	43,051	-35,156	-82
Ragi	2,932	1,757	1,175	67
Tomato	8,998	32,081	-23,083	-72

Source: IDSAP Field Survey, 2021-22

3.3. Paid-out costs

Apart from PNPIs, the farmers invest considerable amount on different farm inputs, such as (1) seed, (2) farmyard manure (FYM), including penning[17], (3) human labour, (4) bullock labour, (5) machine labour, (6) implements and (7) irrigation. Both own and hired or purchased inputs and services are used in the cultivation. In this study, the monetary values of own and purchased/ hired inputs plus PNPIs are included in the paid-out cost of cultivation. But the value of family labour is not included in the paid-out cost. The paid-out cost used, in this study, is close to the concept of 'A1'[18] cost of cultivation. Other cost items normally referred/ used in different concepts of cost of cultivation are actual rent paid on the lease in land, imputed rental value of own land, imputed value of family labour, depreciation of machinery, interest paid, etc. In order to reduce the complications in the estimations, the study used the paid-out Cost as defined above. Further, as the study compares CNF and non-CNF, and the concepts are used uniformly for both types of farming.

Crop wise paid-out costs under CNF and non-CNF are shown in Table 3.2. Higher cost of cultivation under non-CNF is one of the major contributory factors for the farmers distress in the state and also in the country. The major benefit observed in all previous studies, including the studies by others on the subject indicate that the reduction in the cost of cultivation is the major contribution of CNF. The results in Table 3.2, once again confirms that finding. The paid-out cost under CNF is lower than that of non-CNF in eight out of nine crops which are considered in this report. The savings in paid-out costs are more than ₹20,000 per hectare in two crops, more than ₹10,000 per hectare in another three crops, and about ₹9,000 per in one crop. In relative terms, the savings in the paid-out costs due to CNF are more than 20 percent in three crops and

[17] Penning means keeping livestock, particularly the small ruminants, in the field for their dung/ droppings. The livestock owner gets some payment either in cash or kind for this service.

[18] Cost –A1: Actual paid out costs for owner cultivator. This cost approximates to the actual expenditure incurred in cash and kind.

more than 10 percent in another two crops (Table 3.2). In respect of Red gram, the cost of cultivation under CNF is higher than non-CNF by 11 percent.

Table 3.2: Crop wise paid-out costs under CNF and non-CNF and their differences in Kharif 2021-22

				₹/ hectare
Crop	**CNF in ₹/ hectare**	**Non-CNF ₹/ hectare**	**Difference in ₹/ hectare**	**Difference in %**
1	**2**	**3**	**4=2-3**	**5=(4/3)*100**
Paddy	54,173	65,659	-11,486	-17
Groundnut	50,933	55,113	-4,180	-8
Cotton	53,957	73,770	-19,813	-27
Black gram	39,942	43,159	-3,218	-7
Maize	63,451	72,191	-8,739	-12
Red gram	31,490	28,382	3,108	11
Chillies	99,240	1,23,301	-24,061	-20
Ragi	43,746	44,341	-594	-1
Tomato	71,805	1,00,892	-29,087	-29

Source: IDSAP Field Survey, 2021-22

It is interesting to note that five out of nine crops analysed in this report have larger saving in the paid-out costs than that in the expenditure on PNPIs. It implies that CNF not only contributed for the savings in PNPIs, but also in the other inputs. One reason is a possibility of splitting of the cost of cultivation of CNF crops between PMDS and Kharif crop season. That is, a part of costs incurred in cultivation, particularly the land preparation might be borne by the farmers at the time of PMDS. It indicates a staggered use of family labour, farm machinery, biological stimulants, etc. It would optimize the use of those inputs and reduce peak time demands. In other four crops the CNF farmers have incurred higher investment in other inputs. Values of different inputs used in CNF and non-CNF and their absolute and relative differences are given in Table 3.3. Out of eight inputs included, labour, PNPIs, Machinery and seed are major inputs, in that order. However, there are minor variations according to geographical location and crops. Barring one or two exceptions, the labour cost is higher under CNF than that of non-CNF. This implies that more employment can be generated with CNF. Few possible reasons for the requirement of higher doses of human labour, under CNF, are (1) preparation of the biological stimulants, (2) cultivation of mixed crops, bund crops, border crops, and (3) processes related to higher crop yields. Data also indicate that machine and bullock labour are substitutable.

Table 3.3: Percentage share of different farm inputs in the paid-out costs of selected crops in CNF and non-CNF in Kharif 2021-22

Input	Paddy				Groundnut				cotton			
	₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %
1	2	3	4=2-3	5=(4/3)*100	6	7	8=6-7	9=8/7*100	10	11	12=10-11	13=12/11*100
Seed	2,199	2,531	-332	-13.13	13,297	13,396	-99	-0.74	5,129	4,774	354	7.42
PNPI	8,118	15,036	-6,917	-46.01	4,834	9,846	-5,012	-50.91	5,994	22,836	-16,842	-73.75
FYM/Penning	3,524	3,301	223	6.76	2,897	2,184	713	32.66	5,753	1,031	4,723	458.21
Human Labour	21,042	25,848	-4,806	-18.59	14,839	12,447	2,392	19.21	22,143	27,913	-5,770	-20.67
Bullock Labour	1,955	2,688	-733	-27.28	3,383	2,251	1,132	50.31	4,319	2,988	1,331	44.54
Machine Labour	16,752	15,692	1,060	6.75	10,587	13,878	-3,291	-23.71	9,694	13,352	-3,658	-27.40
Implements	268	280	-12	-4.24	947	985	-38	-3.83	822	769	54	7.00
Water Fees	315	283	32	11.33	149	127	22	17.59	103	107	-4	-4.14
Paid-out Cost	54,173	65,659	-11,486	-17.49	50,933	55,113	-4,180	-7.58	53,957	73,770	-19,813	-26.86

Source: IDSAP Field Survey, 2021-22

Table 3.3 cont.

Input	Blackgram				Maize				Redgram			
	₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %
1	14	15	16=14-15	17=16/15*100	18	19	20=18-19	21=20/19*100	22	23	24=22-23	25=24/23*100
Seed	3,029	2,639	389	14.75	4,370	7,285	-2,915	-40.01	1,826	1,076	750	69.72
PNPI	6,154	12,808	-6,653	-51.95	8,700	12,900	-4,200	-32.56	4,548	7,137	-2,588	-36.27
FYM/Penning	2,191	2,896	-705	-24.35	6,343	1,459	4,883	334.61	2,202	689	1,512	219.45
Human Labour	10,228	8,269	1,959	23.69	17,302	14,674	2,628	17.91	8,049	6,060	1,989	32.82
Bullock Labour	485	100	385	386.23	3,313	22,814	-19,500	-85.48	2,709	2,188	520	23.78

Input	Blackgram				Maize				Redgram			
	₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %
Machine Labour	16,733	15,534	1,199	7.72	22,177	12,011	10,166	84.64	11,922	10,971	951	8.67
Implements	556	563	-7	-1.20	1,032	465	567	122.03	204	261	-56	-21.58
Water Fees	565	351	215	61.14	214	584	-369	-63.28	30	-	30	
Paid-out Cost	39,942	43,159	-3,218	-7.46	63,451	72,191	-8,739	-12.11	31,490	28,382	3,108	10.95

Source: IDSAP Field Survey, 2021-22

Table 3.3 cont.

Input	Chillies				Ragi				Tomato			
	₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF		₹ per hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %	CNF	Non-CNF	in ₹	in %
1	26	27	28=26-27	29=28/27*100	30	31	32=30-31	33=32/31*100	34	35	36=34-35	37=36/35*100
Seed	32,982	15,554	17,428	112.05	-	-	-		15,333	26,471	-11,138	-42.08
PNPI	7,896	43,051	-35,156	-81.66	2,932	1,757	1,175	66.90	8,998	32,081	-23,083	-71.95
FYM/Penning	6,907	2,837	4,070	143.45	3,816	4,045	-229	-5.67	6,298	5,220	1,078	20.66
Human Labour	28,720	36,706	-7,986	-21.76	19,027	21,838	-2,811	-12.87	22,180	19,029	3,151	16.56
Bullock Labour	9,693	5,863	3,830	65.33	15,783	12,385	3,398	27.44	1,631	1,479	152	10.31
Machine Labour	11,688	17,792	-6,104	-34.31	2,187	4,291	-2,104	-49.04	15,302	15,275	27	0.18
Implements	350	912	-562	-61.58	2	20	-18	-90.01	951	1,078	-127	-11.74
Water Fees	1,003	585	418	71.45	-	4	-4	-100.00	1,113	260	852	327.24
Paid-out Cost	99,240	1,23,301	-24,061	-19.51	43,746	44,341	-594	-1.34	71,805	1,00,892	-29,087	-28.83

Source: IDSAP Field Survey, 2021-22

3.4. Crop yields

Though CNF's major contribution is in reducing the cost of cultivation, the popular interest in CNF stems from its impact on crop yields. Given the importance of measuring the impact of CNF on crop yields, the study is mandated to conduct CCEs to assess the yield scientifically and independently. The yields obtained through CCEs are close to the normal yields reported by the Directorate of Economics and Statistics (DES) in almost all crops. As per the CCEs data, the CNF yields are higher than the non-CNF yields in eight out of nine crops covered in this report. Only the Chillies yield under CNF is less than non-CNF yields by 0.6 quintals per hectare[19] (Figure 3.4). The CNF yields are higher than non-CNF yields by 39.91% in Tomato, 35.37% in Ragi, 26.97% in Red gram, 18.67% in Black gram and 17.31% in Paddy (Table 3.4).

Table 3.4: Crop wise number of CCEs and yields estimated through CCEs under CNF and non-CNF in Kharif 2021-22

Quintals / hectare

Crop	Number of CCEs		Yields (quintals/ hectare)		Difference between CNF and non-CNF	
	CNF	Non-CNF	CNF	Non-CNF	in quintals	in %
1	2	3	4	5	6=4-5	7=6/5*100
Paddy	262	88	45.89	39.12	6.77	17.31
Groundnut	47	40	16.35	15.64	0.71	4.54
Cotton	26	20	12.61	11.53	1.08	9.34
Black gram	13	9	9.04	7.61	1.42	18.67
Maize	6	11	46.93	44.10	2.83	6.41
Red gram	11	15	6.07	4.78	1.29	26.92
Chillies	38	64	26.31	26.91	-0.60	-2.24
Ragi	10	6	12.19	9.01	3.19	35.37
Tomato	44	10	186.70	133.45	53.25	39.91

Source: IDSAP Field Survey, 2021-22

Apart from conducting CCEs, the study collected information on reported yields from the farmers. Crop wise reported yields under CNF and non-CNF are presented in Figure 3.5. In each of the nine crops covered, the reported CNF yields are higher than that of non-CNF yields. Out of nine crops, the difference between CNF and non-CNF is statistically significant at 1% level of confidence, in five crops. In another crop, the difference is significant at 10 percent level of confidence. The differences between CNF and non-CNF yields vary from 2.21% in Cotton to 95.61% in Black gram. The difference is as high as 60.48% in Groundnut, 50.45% in Ragi, and 42.11% in Chillies (Table 3.5). Apart from CNF impact, PMDS is other major factor for the higher yields obtained under CNF. Recently RySS introduced PMDS as an integral part of CNF. There is enough evidence from different parts of the state, suggesting that PMDS is improving

[19] During the study period (2021-22), the overall Chillies production and yields, in the state, are affected by the invasive pests and untimely rains. The State Government acknowledges this fact. But certain villages are less affected due to their timing of sowing and seed variety. As CCEs are conducted in less number and in different time periods, CCE yields did not give a comprehensive picture about the Chillies yields in the state.

soil quality and contributing not only to higher yields, but also crops' resilience to weather anomalies. (Table 3.5).

Table 3.5: Crop wise sample size and reported yields under CNF and non-CNF in Kharif 2021-22

quintals/ hectare

Crop	Sample (number)		Yield (quintals/ hectare)		Difference in quintals	Difference in %
	CNF	Non-CNF	CNF	Non-CNF		
1	2	3	4	5	6=4-5	7=6/5*100
Paddy	715	412	54.23	47.56	6.67*	14.02
Groundnut	110	88	13.44	8.37	5.06*	60.48
Cotton	192	91	10.79	10.55	0.23	2.21
Black gram	65	46	13.36	6.83	6.53*	95.61
Maize	16	50	47.68	44.15	3.53	8.00
Red gram	89	84	7.81	6.82	1.00	14.59
Chillies	44	101	21.94	15.44	6.50*	42.11
Ragi	33	44	33.44	22.23	11.21*	50.45
Tomato	53	58	239.47	183.74	55.73@	30.33

Note: '*' significant at 1%, '@' significant at 10%
Source: IDSAP Field Survey, 2021-22

3.5. Prices

Prices are one of the important factors for the expansion of CNF in the state. Though the major benefit from CNF is the reduction in the cost of cultivation, farmers expect higher pricing for their CNF produces. Further, they usually devote more family time for CNF and expect higher prices for CNF food grains. Some of the CNF farmers, albeit small number do put in extra efforts, such as selling in the ***Shandis*** (temporary markets organized on a fixed day and/ or time), selling as retail trader, supplying to the retail shops, processing – milling, packing, etc., door delivery, online selling, etc., to obtain higher prices for their CNF produce. On the other hand, there is high and growing demand for chemical free food items. The demand in the urban areas, particularly in the cities for chemical free food items is conspicuous, but the rural demand remains invisible. APCNF is not only providing chemical-free food to the rural areas, but also propagating awareness about the benefits of the chemical-free food in the rural areas in general, and farming community in particular. According to the field notes and qualitative information gathered in two Godavari districts and Krishna districts, villagers are paying up to 50 percent higher price for CNF rice. In other districts also, people are preferring CNF food items. The crop wise prices obtained for CNF and non-CNF output are given in Figure 3.7 and more details are given in Table 3.6. Out of nine crops covered, CNF output has fetched higher prices over non-CNF output in six crops and non-CNF farmers got higher prices in three crops. The difference between CNF and non-CNF output prices is more than 5% in five crops, viz., Black gram (25.57%), Maize (18.13%), Red gram (8.04%) and Tomato (5.49%). CNF prices are lower than non-CNF prices by 22.71% only in the case of Chillies Apart from local factors (local supply demand), the preference for CNF output may explain the higher prices obtained in four CNF crops. The prices of Chillies fluctuate widely wherein, the timing of sale would have larger impact on the prices obtained.

Table 3.6: Crop wise prices realised by the farmers for their CNF and non-CNF output in Kharif 2021-22

				₹/ quintal
Crop	**CNF**	**Non-CNF**	**Difference in ₹**	**Difference in %**
1	2	3	4=2-3	5=4/3*100
Paddy	1,722	1,736	-14.42	-0.83
Groundnut	4,746	4,847	-101.00	-2.08
Cotton	7,820	7,699	121.01	1.57
Black gram	7,477	5,954	1,522.72	25.57
Maize	1,928	1,632	295.90	18.13
Red gram	6,802	6,296	506.21	8.04
Chillies	14,148	18,306	-4,158.08	-22.71
Ragi	4,000	3,985	15.42	0.39
Tomato	922	874	47.97	5.49

Source: IDSAP Field Survey, 2021-22

3.6. Gross value of output

The gross value of crop output per hectare is estimated by multiplying the 'crop yield', as reported by the farmers, with 'realized or locally prevailing price' reported by the sample farmers, and adding 'value of by-products', reported by the farmers. The per hectare gross value of CNF output is higher than that of non-CNF output in all the nine crops covered in the study. The difference is over ₹60,000 in Black gram and Tomato, over ₹44,000 in Ragi and about ₹28,000 in Chillies. It may be noted that though the CNF Chillies got about 22% lower price, the gross value of output is higher than that of non-CNF by 9.8%, due to 42% higher yields obtained in CNF Chillies vis-à-vis non-CNF (Table 3.7).

Table 3.7: Crop wise gross values[20] of CNF and non-CNF crop output in Kharif 2021-22

				₹/ hectare
Crop	CNF	Non-CNF	Difference in ₹	Difference in %
1	2	3	4=2-3	5=4/3*100
Paddy	99,612	88,491	11,121	12.57
Groundnut	71,529	45,850	25,679	56.01
Cotton	84,581	81,358	3,223	3.96
Black gram	1,02,188	40,892	61,296	149.90
Maize	93,662	73,520	20,142	27.40
Red gram	54,163	43,305	10,858	25.07
Chillies	3,10,419	2,82,723	27,696	9.80
Ragi	1,33,854	89,359	44,495	49.79
Tomato	2,20,781	1,60,673	60,109	37.41

Source: IDSAP Field Survey, 2021-22

3.7. Net value of crop output

The crop wise net value of output is obtained by subtracting the 'paid-out cost' of a crop from the 'gross value' of that crop. Crop wise net value of CNF and non-CNF outputs are given in Table 3.8. Though, the non-CNF farmers got good gross value of each crop output, their net value of output is low in majority of crops, due to the higher cost of cultivation. In fact, the net value of output is negative in non-CNF Groundnut (- ₹9,264 per ha) and non-CNF Black gram (-₹2,267 per ha) (Table 3.8).

[20] Based on reported yields

Table 3.8: Crop wise net values[21] of CNF and non-CNF crop output in Kharif 2021-22

				₹/ hectare
Crop	CNF	Non-CNF	Difference in ₹	Difference in %
1	2	3	4=2-3	5=4/3*100
Paddy	45,439	22,832	22,606	99
Groundnut	20,596	-9,264	29,859	-322
Cotton	30,624	7,588	23,036	304
Black gram	62,247	-2,267	64,514	-2,846
Maize	30,211	1,329	28,882	2,173
Red gram	22,673	14,923	7,750	52
Chillies	2,11,179	1,59,422	51,757	32
Ragi	90,107	45,018	45,089	100
Tomato	1,48,976	59,780	89,196	149

Source: IDSAP Field Survey, 2021-22

3.8. Conclusions

The expenditure on PNPI in low under CNF in eight out of nine crops covered in this report. Further, the paid-out cost is also low under CNF, in all nine crops covered. In five of those eight crops, the savings in the paid-out costs are larger than the savings obtained in the expenditure on PNPIs. It implies that CNF not only contributed for the savings in PNPIs, but also in other inputs.

As per the CCE data, the CNF yields are higher than that of non-CNF in eight crops. In the 9th crop, the difference is negligible. In each of the nine crops covered, the reported CNF yields are higher than that of non-CNF yields. The difference between CNF and non-CNF output prices is more than 5% in four crops, viz., Black gram (25.57%), Maize (18.13%), Red gram (8.04%) and Tomato (5.49%). Apart from local factors (local supply demand), the preference for CNF output may explain the higher prices obtained in four CNF crops. We surmise this from the fact that among all nine crops covered in this study, the gross and net values of CNF crops' output are higher than that of non-CNF output.

[21] Based on reported yields

Chapter - 4

Impact of CNF on the Paddy cultivation across agroclimatic zones and farmers' categories

Chapter 4: Impact of CNF on the Paddy cultivation across the Agroclimatic zones and Farmers' categories

4.1. Disaggregate analyses

While the study design is to provide state level estimates only, some disaggregate analyses have been conducted among agroclimatic zones, farm size categories, Tenurial categories, and social categories, to get additional insights. However, only Paddy has adequate number of samples for the disaggregate analyses. Hence the analyses are limited to Paddy only in this report.

4.2. Agroclimatic zones

This section covers the performance of each zone with respect to paid-out cost, crop yields and net value of output in addy cultivation.

4.2.1. Paid-out costs in Paddy cultivation

The impact of CNF on paid-out costs across the agroclimatic zones is given in Table 4.1. It has been mentioned earlier in this study report that the potential for savings in the paid-out cost is high in resource intensive crops. Similarly, the potential for savings in the paid-out costs is high in the resource intensive zones, i.e., in zones that involve higher investment in cultivation. However, there are some exceptions. The Godavari and North-coastal zones, which have higher paid-out cost of ₹77,570 and ₹74,739 respectively, have highest savings in the paid-out cost in Paddy cultivation, due to CNF. But Krishna zone, which also has higher paid-out costs got very little saving. On the other hand, the HAT zone, which has least paid-out cost under non-CNF, got third highest savings due to CNF.

Table 4.1: Agroclimatic zone wise paid-out cost of Paddy under CNF and non-CNF and their differences in Kharif 2021-22

Farm size categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
HAT	42,270	53,106	-10,836	-20.40
North coastal	54,749	74,739	-19,990	-26.75
Godavari	46,686	77,570	-30,883	-39.81
Krishna	73,993	75,676	-1,683	-2.22
Southern	58,477	53,724	4,753	8.85
Scarce rainfall	56,036	59,989	-3,952	-6.59
AP	54,173	65,659	-11,486	-17.49

Source: IDSAP Field Survey, 2021-22

4.2.2. *Paddy yields*

Agroclimatic zone-wise Paddy yields under CNF and non-CNF and their differences in Kharif 2021-22 is shown in Table 4.2. The Paddy yields are higher in five out of six zones. The difference is as high as 21.69 quintals in Scarce rainfall zone, followed by 14.98 quintals in Southern zone, 6.08 quintals in Krishna zone and 4.18 quintals in Godavari zone. Only in North coastal zone, the CNF Paddy yields are less than that of non-CNF by 0.4 quintal per hectare.

Table 4.2: Agroclimatic zone Paddy yields under CNF and non-CNF and their differences in Kharif 2021-22

Farm size categories	CNF (quintals/ hectare)	Non-CNF (quintals/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
HAT	51.12	50.30	0.82	1.63
North coastal	55.04	55.44	-0.40	-0.72
Godavari	56.37	52.19	4.18	8.01
Krishna	60.76	54.68	6.08	11.12
Southern	46.54	31.56	14.98	47.47
Scarce rainfall	66.25	44.56	21.69	48.68
AP	54.23	47.56	6.67	14.02

Source: IDSAP Field Survey, 2021-22

4.2.3. *Net Value of Paddy output*

Agroclimatic zone wise net value of Paddy output under CNF and non-CNF and differences are shown in Table 4.3. The net value of CNF Paddy output is higher than that of non-CNF in every zone. The results reconfirm the assertion that the major benefit from APCNF is the reduction in the cost of cultivation. The Godavari zone, which has over ₹30,000 savings in the paid-out costs (see Figure 4.9 above) got highest additional net value of ₹53,549 per hectare, due to CNF. As mentioned above, the higher prices for CNF could be another factor for higher net value of CNF Paddy output in the Godavari zone. The HAT zone and North coastal zone too got higher net value for Paddy, primarily due to savings in the costs. Higher prices for CNF Paddy could be another contributory factor in the HAT zone. The Scarce rainfall zone, which got additional yields due to CNF, got ₹33,113 additional net value of Paddy output. The Krishna zone, which got less savings in paid-out costs and Southern zone, which incurred higher paid-out due to CNF, got the least increase in the net value of Paddy output. However, the results prove that the benefits from CNF are accruing to all parts of the state.

Table 4.3: Agroclimatic zone wise net value of Paddy output under CNF and non-CNF and differences in Kharif 2021-22

Farm size categories	CNF (₹ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
HAT	45,555	26,217	19,337	74.76
North coastal	51,982	30,750	21,233	69.05
Godavari	73,928	20,380	53,549	262.76
Krishna	43,102	34,274	8,828	25.76
Southern	21,193	14,319	6,874	48.01
Scarce rainfall	48,155	15,042	33,113	220.14
AP	45,439	22,832	22,606	99.01

Source: IDSAP Field Survey, 2021-22

4.3. Farm size categories

In this section, the sample farmers are categorized into three groups, viz., (1) marginal farmers with operational holding up to 1 hectare, (2) small farmers with operational holding of 1-2 hectares and (3) other farmers or medium and large farmers with operational holding of over 2 hectares.[22] The performance of these three categories in Paddy cultivation under CNF and non-CNF are analysed. As in the previous section, the analysis is limited to three major indicators, viz., paid-out costs, crops yields and net value of Paddy output.

4.3.1. Paid-out costs

The paid-out cost of Paddy production under CNF and non-CNF as per the farm size categories is given in Table 4.4. The classic Indian debate on 'farm size and productivity relationship' suggests that small farmers tend to invest more and get higher productivity. In the present context, the marginal farmers invested the highest amount (₹76,082) followed by small farmers and other farmers under non-CNF. Hence, marginal farmers save the highest amounts (₹18,850), followed by small farmers and other farmers.

Table 4.4: Farm size categories wise paid-out cost of Paddy under CNF and non-CNF and their differences in Kharif 2021-22

Farm size categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
Marginal	57,232	76,082	-18,850	-24.78
Small	49,680	56,500	-6,819	-12.07
Others	50,665	53,365	-2,700	-5.06
All	54,173	65,659	-11,486	-17.49

Source: IDSAP Field Survey, 2021-22

4.3.2. Yields

Marginal farmers got highest yields under CNF in absolute terms. However, compared to non-CNF farmers, CNF small farmers got highest additional yields of 9.49 quintals, followed by other farmers (5.67 quintals per ha) and marginal farmers (5.33 quintals per ha). At the State level, CNF farmers got 6.67 quintals per hectare higher yields compared o non-CNF farmers. (Table4.5). The results indicate that small and marginal farmers are not only participating in good numbers in the CNF, but are also getting benefited equally.

[22] As per the latest data, at the state level, only 10 percent farmers have operational holding of 2 hectares and above. In the sample also, a smaller number of farmers have 2 plus hectares. Hence, the medium and large farmers have been clubbed together.

Table 4.5: Farm size categories wise Paddy yields under CNF and non-CNF and their differences in Kharif 2021-22

Farm size categories	CNF (quintals/ hectare)	Non-CNF (quintals/ hectare)	Difference between CNF & non-CNF	
			In quintals	in %
1	2	3	4=2-3	5=4/3*100
Marginal	54.71	49.38	5.33	10.79
Small	53.55	44.06	9.49	21.54
Others	53.62	47.95	5.67	11.82
All	54.23	47.56	6.67	14.02

Source: IDSAP Field Survey, 2021-22

4.3.3. Net value of Paddy yields

Though marginal farmers experienced least increase in the Paddy yields, they got near highest additional net value of Paddy output, due to CNF. Both marginal and small farmers of CNF got higher value of output by more than ₹25,000 per hectare compared with their counterparts in non-CNF. But in the CNF, other farmers showed only ₹15,026 per hectare increase in net value compared to their counterparts of non-CNF sample.. It clearly shows that CNF is more beneficial for small and marginal farmers.

Table 4.6: Farm size categories wise net value of Paddy output under CNF and non-CNF and their differences in Kharif 2021-22

Farm size categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
Marginal	42,249	17,123	25,127	146.74
Small	50,480	24,867	25,613	103.00
Others	48,605	33,580	15,026	44.75
All	45,439	22,832	22,606	99.01

Source: IDSAP Field Survey, 2021-22

4.4. Tenurial categories

For additional insights, the sample farmers have been grouped in terms of their tenurial categories. The three groups considered here are (1) tenant farmers, (2) owner-cum-tenant farmers and (3) owner farmers.[23] Again the performance of these three categories on paid-out costs, yields and net value of output in Paddy cultivation under CNF and non-CNF are analysed in this section.

4.4.1. Paid-out costs

Owner-cum-tenant farmers, who have higher investment under non-CNF, got more savings due to CNF as high as ₹24,029 than their counterparts of non-CNF. Even the tenant farmers, who

[23] Though these terms are self-explanatory, they are defined here for the sake of common understanding. Tenant farmer is the one, who does not own or cultivate his/ her own land, but cultivate the leased in land only. Owner-cum-tenant farmer is the one, who cultivates leased in lands along with his/ her own land. Owner farmer is the one, who cultivates his own land only.

may or may not invest more on cultivation saved more in paid-out costs, followed by other farmers, in comparison with their non-CNF counterparts (Table4.7).

Table 4.7: Tenurial category wise paid-out costs of Paddy under CNF and non-CNF and their differences in Kharif 2021-22

Tenurial categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			in ₹	in %
1	2	3	4=2-3	5=4/3*100
Tenant	46,896	64,589	-17,693	-27.39
Owner-cum-Tenant	55,185	79,214	-24,029	-30.33
Owner	54,645	64,479	-9,834	-15.25
All	54,173	65,659	-11,486	-17.49

Source: IDSAP Survey 2021-22

4.4.2. *Yields*

The owner-cum-tenant farmers got lesser yields under CNF, compared to the non-CNF farmers. Further, they got lower yields under CNF compared to other two categories and the state average. This needs further investigation. On the other hand, the tenant farmers got highest yields under CNF. They also got highest additional yields of 10.26 quintal per hectare compared to additional yields of owner farmers (7.56 quintals) and owner-cum-tenant farmers (-3.01 quintals), due to CNF (Table 4.8). It indicates that tenant farmers got full benefits from CNF.

Table 4.8: Tenurial categories wise Paddy yields under CNF and non-CNF and their differences in Kharif 2021-22

Tenurial categories	CNF (quintals/ hectare)	Non-CNF (quintals/ hectare)	Difference between CNF & non-CNF	
			In quintals	in %
1	2	3	4=2-3	5=4/3*100
Tenant	61.07	50.81	10.26	20.19
Owner-cum-Tenant	49.74	52.75	-3.01	-5.71
Owner	54.25	46.69	7.56	16.19
All	54.23	47.56	6.67	14.02

Source: IDSAP Field Survey, 2021-22

4.4.3. *Net value of Paddy output*

The results of net value of Paddy yields also confirm that tenant farmers derived maximum benefits from CNF. The tenant farmers have obtained the highest net value of Paddy output under CNF, followed by Owner-cum-tenant farmers; and as a consequence, tenants got the highest additional net value of Paddy output due to CNF, followed by owner-cum-tenant farmers (Table 4.9).

Table 4.9: Tenurial category wise net value of Paddy output under CNF and non-CNF and their differences in Kharif 2021-22

Tenurial categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
Tenant	67,076	33,126	33,950	102.49
Owner-cum-Tenant	48,834	26,246	22,588	86.06
Owner	43,256	21,322	21,933	102.87
All	45,439	22,832	22,606	99.01

Source: IDSAP Field Survey, 2021-22

4.5. Social categories wise Paddy cultivation

To get further insights, the Paddy cultivation data has further been reorganized according to the social categories, viz., SC, ST, BC and OC farmers. Again, the same three indicators, viz., paid-out costs, yields and net value of Paddy output have been analysed.

4.5.1. Paid-out costs

SC farmers have incurred higher paid-out cost under CNF compared to non-CNF, by a considerable margin of ₹18,993 per hectare. Such scenario was not seen in any of the previous surveys and studies and in any other part of the present study. This phenomenon needs additional investigations. Barring this, the other social categories which usually invest more on non-CNF Paddy obtained higher savings in paid-out costs due to CNF. BC farmers showed the highest savings (₹19,375 per hectare (Table 4.10).

Table 4.10: Social category wise paid-out cost of Paddy under CNF and non-CNF and their differences in Kharif 2021-22

Social categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
SC	83,821	64,827	18,993	29.30
ST	44,984	51,989	-7,005	-13.47
BC	53,924	73,299	-19,375	-26.43
OC	51,185	62,419	-11,234	-18.00
All	54,173	65,659	-11,486	-17.49

Source: IDSAP Field Survey, 2021-22

4.5.2. Yields

CNF yields are higher than that of non-CNF, for all four social categories. BCs farmers have obtained the highest yields of 56.15 quintal per hectare under CNF. On the other hand, SC farmers got the highest additional Paddy yield in both absolute and relative (percentage) terms, due to CNF, among all social categories (Table 4.11). The difference in Paddy yields of ST CNF and non-CNF farmers is marginal. These results once again confirm that the poor and vulnerable sections too can obtain benefits from CNF.

Table 4.11: Social category wise Paddy yields under CNF and non-CNF and their differences in Kharif 2021-22

Social categories	CNF (quintals/ hectare)	Non-CNF (quintals/ hectare)	Difference between CNF & non-CNF	
			In quintals	in %
1	2	3	4=2-3	5=4/3*100
SC	54.35	45.10	9.25	20.51
ST	51.73	50.21	1.52	3.03
BC	56.15	47.97	8.18	17.05
OC	53.53	46.22	7.31	15.82
All	54.23	47.56	6.67	14.02

Source: IDSAP Field Survey, 2021-22

4.5.3. Net value of Paddy output

Social category wise net value of Paddy output is shown in Table 4.12. Except the SCs who have incurred higher paid-out costs under CNF (see Table 4.10), all other three categories have higher net value under CNF, ranging from ₹19,203 per hectare for ST farmers to ₹32,730 per hectare

for BC farmers. As mentioned at different places in this report, the reduction in the paid-out costs is the major benefit obtained from CNF which is once again confirmed by these results. Though there is considerable increase in the yields under CNF for three social categories, viz., SC, BC and OC, it did not reflect in their net value because they got a lower price for their CNF output in the range of 2 percent to 5 percent. The possible reasons could be that the CNF farmers might have sold their CNF Paddy to their relatives and friends in the villages at the local prices. The non-CNF farmers might have sold their non-CNF Paddy at nearby markets thereby incurring additional transport and related costs. On the other hand, the ST farmers got just 1.5 quintals per hectare additional yield under CNF, but got higher net value due to CNF, because of higher price realization.

Table 4.12: Social category wise net value of Paddy output under CNF and non-CNF and their differences in Kharif 2021-22

Social categories	CNF (₹/ hectare)	Non-CNF (₹/ hectare)	Difference between CNF & non-CNF	
			In ₹	in %
1	2	3	4=2-3	5=4/3*100
SC	16,235	22,106	-5,872	-26.56
ST	46,454	27,251	19,203	70.47
BC	52,118	19,388	32,730	168.81
OC	45,829	26,083	19,745	75.70
All	45,439	22,832	22,606	99.01

Source: IDSAP Field Survey, 2021-22

4.6. Conclusions

The disaggregated analyses of Paddy cultivation at the agroclimatic zone level, farm size category level, tenurial category level and social category level indicate that benefits from CNF are reaching every part of the state and every section of farmers. These include the HAT zone in the north and the Scarce rainfall zone in the southern part of the state. It also leads to more employment and more income for marginal farmers, tenant farmers and SC and ST farmers.

Chapter - 5

Impact of CNF on farm inputs and outputs markets

Chapter 5: Impact of CNF on farm inputs and outputs markets

5.1. Introduction

In this chapter, the impact of CNF on the use of the land, labour, purchased inputs, irrigation, farm investment and credit have been analysed. The analysis is based on the farmers' experience collected in the form of quantitative data. Apart from quantitative evidence, the qualitative information, i.e., farmers responses to various issues with respect to inputs use and farm practices are also presented.

5.2. Impact of CNF on land use

There are two ways of increasing land use for cultivation of CNF - the increase in number of farmers joining the cultivation of CNF every year and increase in the average area for by CNF farmers over the years. The data of RySS clearly indicates that the number of farmers cultivating CNF has been increasing over years. The second way is the increase in the allocation of cultivated area under CNF by the CNF farmers over the years. The data collected by IDSAP has revealed that the area allocated for CNF has been on the increase during the last four Kharif seasons, that is, from 2018-19 to 2021-22. The average area per farmer under CNF has increased from 0.48 hectares per during Kharif of 2018-19 to 1.07 hectares in Kharif of 2021-22. While the state witnessed more than double the area under CNF during the reference period, the agroclimatic zones experienced wide variations, ranging from a nominal decline of 2 percent in Godavari zone to 700 percentage growth in Krishna zone. Among different farmers' categories, only tenants have a modest growth of 20% during last four years. All other remaining categories have more than 100 percent growth between Kharif 2018-19 and Kharif 2020-21 (Table 5.1). The steep increase in area under CNF indicates that the farmers interest is increasing in CNF.

Table 5.1: Agroclimatic zones wise and farmers' category wise average area allocated for CNF during last four Kharif seasons of 2018-19 to 2020-21

Agroclimatic Zones & Farmers' Categories		In hectares				Percentage of change in 2021-22 over 2018-19
		2018-19	2019-20	2020-21	2021-22	
AP	**AP**	**0.48**	**0.85**	**0.94**	**1.07**	**123**
Agroclimatic zone	HAT	0.21	0.59	0.68	0.76	262
	North coastal	0.25	0.5	0.58	0.58	132
	Godavari	1.31	1.32	1.27	1.29	-2
	Krishna	0.12	0.98	0.98	0.96	700
	Southern	0.42	0.79	1.07	1.49	255
	Scarce rainfall	0.68	0.8	0.95	0.98	44
Farm categories	Marginal	0.35	0.79	0.83	0.89	154
	Small	0.57	0.9	0.97	1.14	100
	Others	0.66	0.98	1.33	1.68	155
Tenurial categories	Tenants	1.1	1.25	1.33	1.33	21
	Owner-cum-tenants	0.52	0.82	0.9	1.15	121
	Owners	0.46	0.83	0.92	1.04	126
Social	SC	0.55	0.9	1.05	1.13	105

Agroclimatic Zones & Farmers' Categories		In hectares				Percentage of change in 2021-22 over 2018-19
		2018-19	2019-20	2020-21	2021-22	
	ST	0.4	0.79	0.76	0.87	118
	BC	0.48	0.83	0.9	0.96	100
	OC	0.45	0.91	1.11	1.44	220

Source: IDSAP Survey 2021-22

Another impact of CNF on land use in agriculture is the increase in cropping intensity. CNF is positively impacting the cropping intensity through PMDS and 365 days green cover strategy. Compared to non-CNF farmers, the PMDS+CNF enabled CNF farmers to cover their cultivated land with crops for longer days. The details are shown in Figure 5.2. At the state level, the CNF fields have 187 days crop cover compared to 152 days crop cover on non-CNF field, i.e., 35 (23 percent) days more crop cover. There are wide variations across the Agroclimatic zones, ranging from a fewer number of (-4 percent) days in HAT zone, to 7% more number of days in North coastal zone to 53 percent and 59% more number of days in Scarce rainfall zone and Southern zones respectively. Among different farmers' categories, the tribal farmers have lower number of days (-5 percent) of crop cover on their CNF fields compared to non-CNF fields of their counterparts. The remaining categories of farmers have a greater number of days of crop cover on their CNF fields ranging from 14 percent for medium and large farmers to 51 percent to SC farmers (Table 5.2).

Crop cover for longer periods implies taking more than one crop on the same piece of land. This has multiple benefits: firstly, the availability of more biomass consisting of green manure, fodder, foodgrains, vegetables, and leafy vegetables. Secondly, the soil would be protected from the sunlight and heat, thus preserving the soil moisture and the microbes in the soil. Thirdly, plants prepare their own food through photosynthesis and exudate a part of it into the soil, which nourish the microbes in the soil. Additionally, the longer the crop cover means the microbes would be nourished for longer periods of time.

Table 5.2: Agroclimatic zone wise and farmers' category wise number of days crops covered in CNF and non-CNF fields during March to Nov 2021-22

Zones and Categories		*Number of days*			Percentage difference between CNF and non-CNF
		PMDS+ CNF	Non-CNF	Difference between CNF & non-CNF	
AP	**AP**	**187**	**152**	**35**	**23**
Agroclimatic zone	HAT	214	224	-10	-4
	North coastal	213	199	14	7
	Godavari	181	145	36	25
	Krishna	171	155	15	10
	Southern	172	109	64	59
	Scarce rainfall	213	139	74	53
Farm categories	Marginal	189	147	43	29
	Small	189	147	42	29
	Others	181	159	22	14
Tenurial categori	Tenants	174	129	45	35
	Owner-cum-tenants	186	154	32	21
	Owners	188	153	35	23

Social category	SC	186	123	63	51
	ST	204	214	-10	-5
	BC	190	137	52	38
	OC	179	148	31	21

Source: IDSAP Survey 2021-22

5.3. Impact of CNF on labour use and labour markets

The earlier studies conducted by IDSAP on assessing the Impact of APCNF, have clearly shown that the CNF is labour intensive over non-CNF. This was found to be true in the case of almost all the crops considered for the analysis. The total labour days (family labour plus hired labour) per hectare for CNF crops are higher than that on non-CNF crops in seven out of nine crops covered, in the range of 9 to 55 days per hectare. In the case of Cotton and Maize, the total labour use under CNF is less than that of non-CNF by small margin of 7 and 5 days respectively (Table 5.3). Though CNF crops need a greater number of human labour days, most of those labour days have come from family labour only. The use of family labour has been high in CNF vis-à-vis non-CNF in all nine crops covered, in the range of 1 day in Maize to 33 days in Chillies (Table 5.3). Family labour days as percentage of total labour days used is higher in CNF than non-CNF in eight of nine crops considered here. The differences vary from 4 percentage points in Maize to 14 percentage points in Chillies. But, in the case of Black gram, it is -11 percentage points (Table 5.3).

Table 5.3: Crop wise total labour days used under CNF and non-CNF in Kharif 2021-22

Crops	Total labour (in days/ hectare)			Own labour (in days per hectare)			Own labour as % of total labour		
	CNF	non-CNF	Difference in %	CNF	non-CNF	Difference in %	CNF	non-CNF	Difference in % points
Paddy	133	119	14	76	61	15	57	52	6
Groundnut	73	64	9	33	24	8	45	37	7
Cotton	113	121	-7	42	39	4	37	32	5
Black gram	68	34	34	31	19	12	45	56	-11
Maize	72	77	-5	34	33	1	47	43	4
Red gram	45	27	18	26	13	13	59	49	10
Chillies	204	187	16	95	62	33	47	33	14
Ragi [24]	217	199	18	149	125	24	69	63	6
Tomato	197	142	55	86	55	31	43	39	5

Source: IDSAP Survey 2021-22

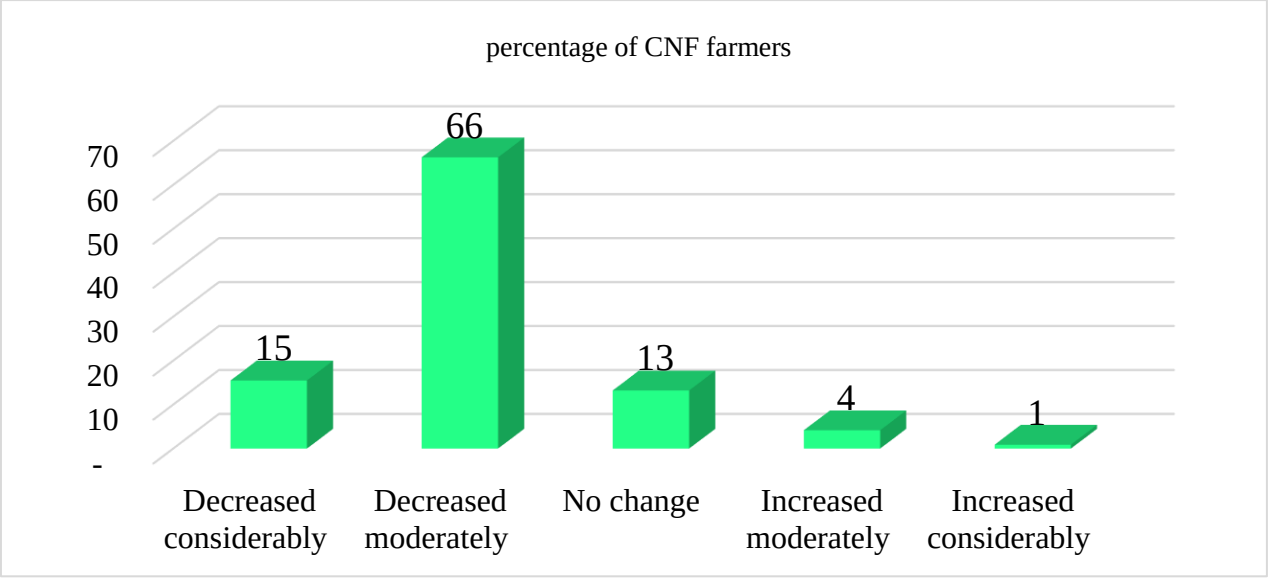
Preparation of biological stimulants, collection of intermittent fodder, food items from the bund, boundary, mixed, and model crops, rearing of livestock, etc., have to be performed, in general, by the family labour. Hence, family labour use, in person days per hectare, is found to be higher for CNF farmers than for non-CNF farmers across all the crops considered.

[24] Labour days in Ragi for both CNF and non-CNF appear to be a little high. It needs further probe in the field

5.4. Impact of CNF on water use for irrigation

Various CNF practices are expected to soften the soil and increase the carbon content in the soil. These changes in turn would increase the water/ rainfall percolation into the soils and increase the water/ moisture holding capacity of the soils. Farmers were asked about their experiences with respect to changes in water consumption in crop cultivation after the introduction of CNF. As high as 81 per cent of farmers have reported that water use for irrigation under CNF has been reduced in the state. While 15 percent CNF farmers reported a considerable decline in the water use, 66 percent reported a moderate decline in water use in the state (Figure 5.6).

Figure 5.1: CNF farmers response about change in water use in crop cultivation due to CNF in kharif season 2020-21 in AP



Source: IDSAP Survey 2021-22

The decline in water use in crop cultivation is experienced by CNF farmers across all agroclimatic zones with wider variations and with moderate variations across the different farmers categories. About 0 percent CNF farmers in Scarce rainfall zone to 41 percent CNF farmers in Godavari zone have experienced considerable decline in the water requirement in CNF. But the same is moderately varied across different farmers' categories ranging from 15 percent to 16 percent among farm size categories, 15 percent to 28 percent among tenurial categories, and 10 percent to 23 percent among the social categories. About 38 percent farmers in North coastal zone and 94 percent farmers in scarce rainfall zone have witnessed a moderate decline in the water requirement for CNF crops vis-à-vis non-CNF crops. Again, these variations are relatively sober among the farmers' categories; in the range of 58 percent to 69 percent among farm size categories, 59 percent to 67 percent among the tenurial categories, and 55 percent to 79 percent among the social categories (Table 5.4). The obvious reasons for such differences, in the wider variations across the agroclimatic zones compared to moderate variations across the farmers' categories, are the geographical factors such as soil type, terrain, quality, rainfall, etc., and variations in the agriculture infrastructure (irrigation type and availability) across the zone.

Table 5.4: Agroclimatic zone wise and farmers' category wise farmers' response about change in water use in the crop cultivation due to CNF in kharif season 2020-21 (in %)

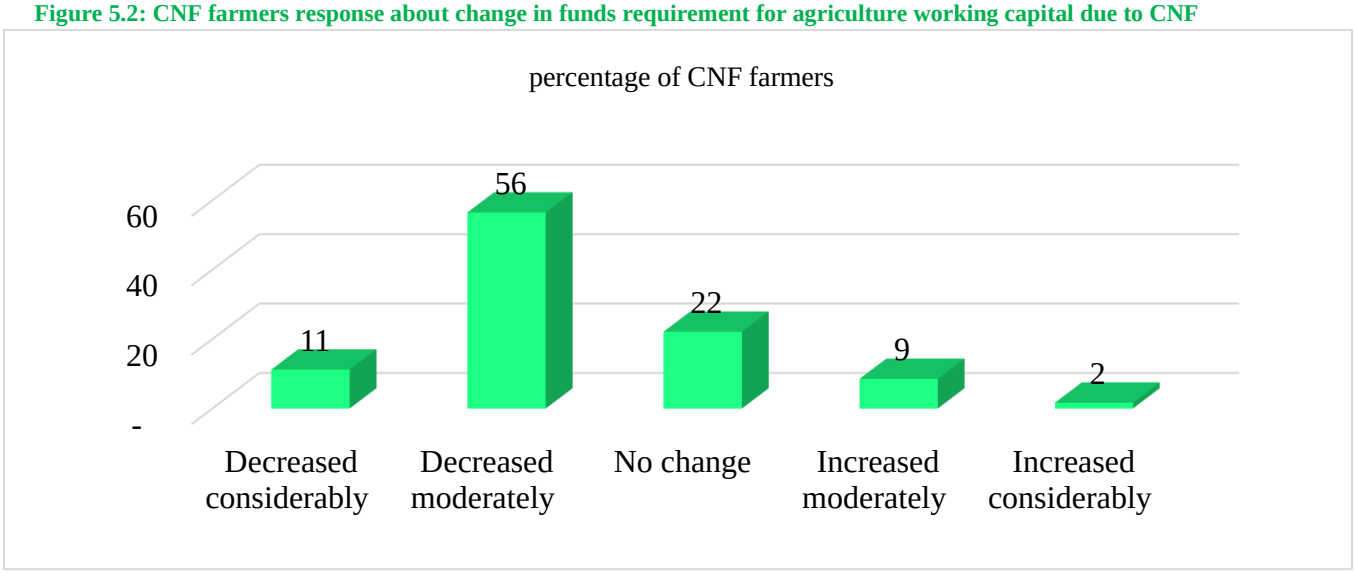
Groups	Zones & categories	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
	AP	15	66	13	4	1
Zone	HAT	11	56	31	3	-
	North coastal	14	38	45	3	-
	Godavari	41	56	-	3	-
	Krishna	20	76	1	3	-
	Southern	16	56	14	11	4
	Scarce rainfall	-	94	6	-	-
Farm size category	Marginal	15	69	11	4	1
	Small	16	58	18	7	1
	Others	15	68	15	1	0
Tenurial categories	Tenants	28	59	7	7	-
	Owner-cum-tenants	20	62	13	4	1
	Owners	15	67	14	4	1
Social category	SC	10	79	3	7	1
	ST	23	55	19	3	-
	BC	14	66	16	3	1
	OC	15	68	9	6	1

Source: IDSAP Survey 2021-22

5.5. Impact of CNF on credit

A noteworthy reduction in the paid-out cost of cultivation in almost all crops is expected to reduce the working capital requirements for CNF, which in turn, is expected to result in a reduction in the CNF farmers' borrowing for agriculture and other uses. At the aggregate level, 11 percent of CNF farmers have reported that the funds required for agricultural working capital has come down considerably. Further, 56 percent of CNF farmers have experienced a moderate reduction (Figure 5.2).

Figure 5.2: CNF farmers response about change in funds requirement for agriculture working capital due to CNF



Source: IDSAP Survey 2021-22

Farmers across all the zones have reported the decrease of working capital requirements. A considerable decrease in working capital requirement is reported by 39 percentage of farmers in Godavari zone, 13 percent in Krishna zone and 11 percent in Southern zone. Further, 87 percent farmers in Scarce rainfall zone, 65 percent in Krishna zone and 53 percent in Godavari zone have reported a moderate decline in the fund's requirement for agriculture. But the decrease in requirement of agricultural working capital in High-altitude and tribal and North Coastal zones has been reported by fewer percentage of farmers. A comparison across farmers' categories has revealed that the variations across the different farmers' categories are less compared to that across the zones. Interestingly, among all categories, a relatively higher percentages of 'owner-cum-tenant' (22 percent), 'tenant' farmers (18 percent), and ST farmers (18 percent) have reported a considerable decline in the fund's requirement for cultivation due to CNF. In addition, 69 percent of tenant farmers, 64 percent of BC farmers, 63 percent of OC farmers and 62 percent of SC farmers have reported a moderate decline in the agriculture working capital requirement (Table 5.5).

Table 5.5: Agroclimatic zones and farmers' category wise CNF farmers response about change in funds requirement for agriculture working capital due to CNF (%)

Groups	Zones & Categories	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
AP	**AP**	**11**	**56**	**22**	**9**	**2**
Zone	HAT	4	19	73	4	-
	North coastal	6	40	45	10	-
	Godavari	39	53	6	1	-
	Krishna	13	65	3	10	9
	Southern	11	47	23	17	1
	Scarce rainfall	0	87	9	4	-
Farm size category	Marginal	11	58	21	8	2
	Small	12	52	26	10	1
	Others	11	58	21	8	2
Tenurial categories	Tenants	18	69	4	9	-
	Owner-cum-tenants	22	54	16	8	1
	Owners	10	56	24	9	2
Social categories	SC	7	63	12	14	5
	ST	18	28	49	5	-
	BC	9	64	18	8	1
	OC	13	62	13	10	2

Source: IDSAP Survey 2021-22

A reduction in the credit requirement for agriculture and other purposes for CNF farmers, is also established by the study of actual borrowings by the CNF and non-CNF farmers. At the time of survey (end of survey period is January 2022 as taken as the reference period), 1,186 CNF sample farmers had 1,075 number of loans adding up to ₹8,53,49,102; and 748 non-CNF sample farmers with 837 number of loans adding up to ₹7,71,45,416. This turns out to be 91 loans per 100 CNF farmers and 112 for 100 non-CNF farmers. The average loan amount is ₹71,964 for each CNF farmer and ₹1,03,136 for each non-CNF farmer. The average outstanding loan amount is ₹36,606 per CNF farmers and ₹52,335 per non-CNF farmers. The loan details of CNF and non-CNF farmers are shown as per the year of borrowing (age of loan) in Table 5.6, the rate of interest range in Table 5.7, sources of loan in Table 5.8, and as per purpose in Table 5.9. Non-CNF

farmers have relatively more older loans compared to CNF farmers mainly in 2020 (Table 5.6). Compared to the non-CNF farmers, the CNF farmers have a greater number of loans (per every 100 farmers) and larger average loan amount with interest rate of less than 10 percent, though both have more or less equal number of loans in the range of 10-12 percent interest rate (Table 5.7). CNF farmers have a smaller number of loans (per 100 farmers) and lesser average loan amount from almost all sources of credit (Table 5.8). In terms of the purpose of loans, CNF farmers have a relatively smaller number of loans (per 100 farmers) and a smaller loan amount for agricultural purpose vis-à-vis non-CNF farmers. The per farmer agricultural loan for CNF was ₹58,946 as against ₹89,856 for non-CNF (Table 5.9). That is, the average agricultural loan taken by CNF farmer is only 65 percent of the average agricultural loan taken by non-CNF farmer.

Table 5.6: Year wise number of loans, total, average and outstanding loan amount for CNF and non-CNF farmers as on January 2022

Year	CNF farmers					Non-CNF farmers				Percentage difference of CNF over non-CNF		
	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans per 100 farmers	Average loan per farmer	Average outstanding loan per farmer
Before 2018	27	2	26,62,000	2,245	1,243	28	4	38,40,000	5,134	2,894	-50	-56	-57
2019	45	4	51,20,000	4,317	2,432	44	6	36,30,000	4,853	2,821	-33	-11	-14
2020	129	11	96,23,002	8,114	4,381	192	26	1,43,40,008	19,171	8,799	-58	-58	-50
2021	849	72	6,56,41,100	55,347	27,389	548	73	5,37,22,408	71,821	36,972	-1	-23	-26
2022	25	2	23,03,000	1,942	1,161	25	3	16,13,000	2,156	848	-33	-10	37
All	**1,075**	**91**	**8,53,49,102**	**71,964**	**36,606**	**837**	**112**	**7,71,45,416**	**1,03,136**	**52,335**	**-19**	**-30**	**-30**

Source: IDSAP Survey 2021-22

Table 5.7: Rate of interest wise number of loans, total, average and outstanding loan amount for CNF and non-CNF farmers as on January 2022

Interest rate (%)	CNF farmers					Non-CNF					Percentage difference of CNF over non-CNF		
	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Outstanding loan per farmer (₹)	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Outstanding loan per farmer (₹)	No. of loans per 100 farmers	Average loan per farmer	Average outstanding loan per farmer
Up to 10.00	242	20	2,30,24,500	19,414	11,504	70	9	96,71,508	12,930	9,628	122	50	19
10.01 to 12	539	45	4,02,36,102	33,926	18,214	544	73	4,91,10,108	65,655	34,514	-38	-48	-47
12.01 to 15.00	11	1	6,50,000	548	242	1	0	80,000	107	-		412	
15.01 to 18.00	46	4	64,26,500	5,419	3,059	15	2	18,35,000	2,453	1,734	100	121	76
18.01 to 24.00	218	18	1,42,27,000	11,996	3,323	193	26	1,47,47,800	19,716	6,198	-31	-39	-46
24.01 to 36.00	19	2	7,85,000	662	264	14	2	17,01,000	2,274	260	-	-71	2
All	**1,075**	**91**	**8,53,49,102**	**71,964**	**36,606**	**837**	**112**	**7,71,45,416**	**1,03,136**	**52,335**	**-19**	**-30**	**-30**

Source: IDSAP Survey 2021-22

Table 5.8: Sources wise number of loans, total, average and outstanding loan amount for CNF and non-CNF farmers as on January 2022

Source	CNF farmers					Non-CNF farmers					Percentage difference of CNF over non-CNF		
	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans per 100 farmers	Average loan per farmer	Average outstanding loan per farmer
Commercial ban	363	31	3,74,66,502	31,591	17,803	291	39	3,45,76,008	46,225	28,851	-21	-32	-38
Co-operative society/ Bank	126	11	1,07,17,100	9,036	4,350	121	16	1,09,94,500	14,699	8,507	-31	-39	-49
Microfinance institutions	4	0	2,40,000	202	49				-				
SHGs	287	24	1,53,44,500	12,938	7,121	167	22	1,07,65,108	14,392	5,305	9	-10	34
NGOs	2	0	2,50,000	211	58				-				
Relatives and friends	238	20	1,77,14,000	14,936	5,802	192	26	1,59,49,800	21,323	6,662	-23	-30	-13
Money lenders	26	2	17,87,000	1,507	573	25	3	15,75,000	2,106	1,031	-33	-28	-44
Landlords/ employer	3	0	2,00,000	169	109	1	0	3,70,000	495	450		-66	-76
Local traders	23	2	15,00,000	1,265	664	8	1	6,60,000	882	482	100	43	38
Others	3	0	1,30,000	110	76	32	4	22,55,000	3,015	1,047	-100	-96	-93
All	**1,075**	**91**	**8,53,49,102**	**71,964**	**36,606**	**837**	**112**	**7,71,45,416**	**1,03,136**	**52,335**	**-19**	**-30**	**-30**

Source: IDSAP Survey 2021-22

Table 5.9: Purpose wise number of loans, total, average and outstanding loan amount for CNF and non-CNF farmers as on January 2022

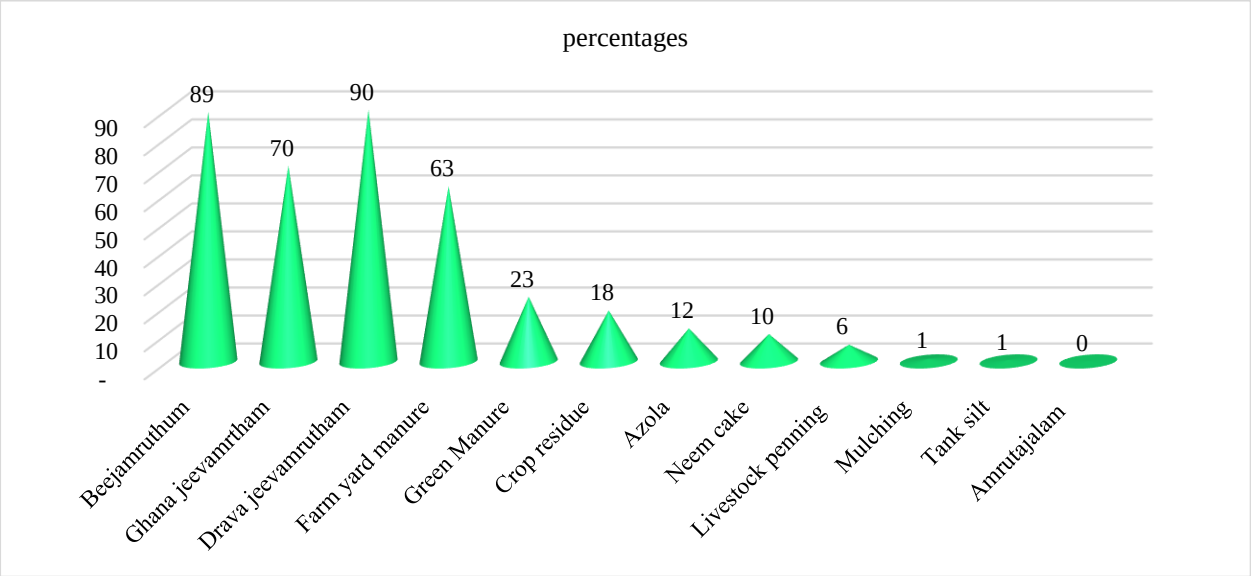
Purpose	CNF farmers					Non-CNF					Percentage difference of CNF over non-CNF		
	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans	No. of loans per 100 farmers	Total loan amount (₹)	Average loan per farmer (₹)	Average outstanding loan per farmer (₹)	No. of loans per 100 farmers	Average loan per farmer	Average outstanding loan per farmer
Consumption	55	5	40,56,000	3,420	2,143	23	3	15,40,000	2,059	761	67	66	182
Agriculture	895	75	6,99,09,602	58,946	29,101	719	96	6,72,12,316	89,856	45,734	-22	-34	-36
Assets/ land purchase	12	1	33,50,400	2,825	1,642	7	1	11,30,000	1,511	979	-	87	68
Livestock purchase	30	3	21,14,000	1,782	933	36	5	30,01,600	4,013	1,943	-40	-56	-52
Business	7	1	3,70,000	312	50	2	0	1,50,000	201	100		55	-50
Education	11	1	6,98,000	589	338	5	1	1,90,000	254	70	-	132	383
Health	37	3	26,83,100	2,262	1,264	21	3	17,84,500	2,386	1,031	-	-5	23
Festivals' celebration	1	0	1,00,000	84	27	1	0	1,50,000	201	160		-58	-83
Life cycle events	26	2	20,38,000	1,718	1,091	15	2	6,97,000	932	352	-	84	210
Others	1	0	30,000	25	16	8	1	12,90,000	1,725	1,203	-100	-99	-99
All	**1,075**	**91**	**8,53,49,102**	**71,964**	**36,606**	**837**	**112**	**7,71,45,416**	**1,03,136**	**52,335**	**-19**	**-30**	**-30**

Source: IDSAP Survey 2021-22

5.6. Adoption and application of CNF inputs and practices

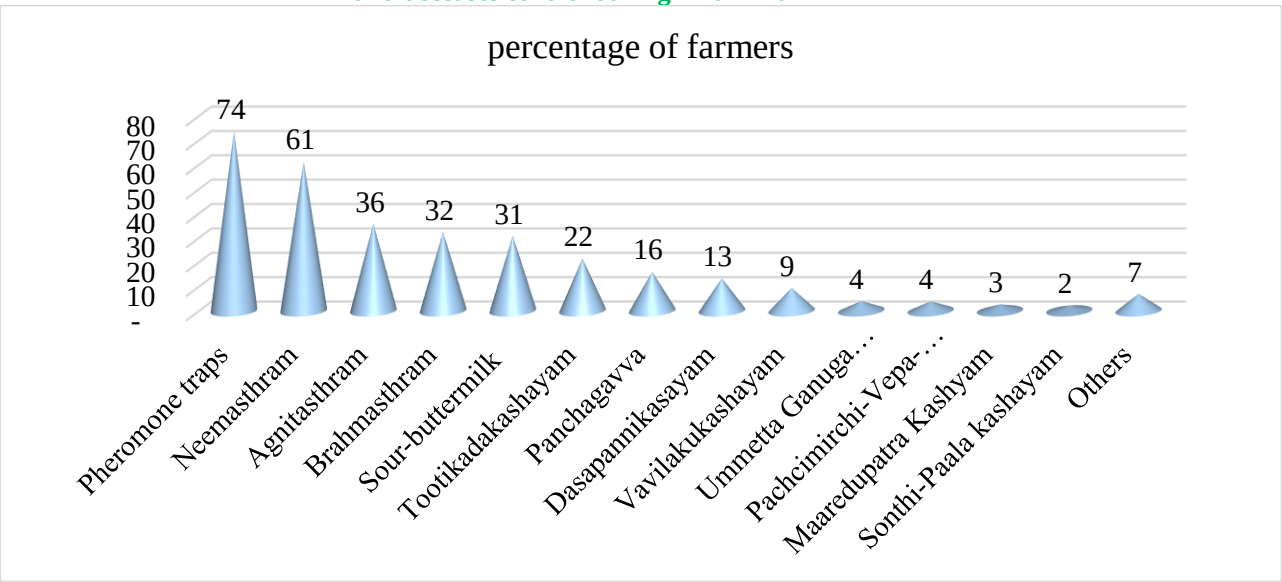
As mentioned in the Chapter 1, one of the major interventions under CNF is the introduction of microbes into the soil through biological stimulants. As soil naturally regenerates under CNF, there is no need to apply any chemical inputs. In this section, the rate of adoption and application of different biological stimulants and natural inputs is discussed. Over 90 percent of CNF farmers have used Drava Jeevamrutham, over 89 percent have applied Beejamrutham and 70 percent have applied Ghana Jeevamrutham. Farm yard manure (FYM), which consists of waste from livestock and domestic sectors is applied by 63 percent. Green manure and crop residue are used by 23 percent and 18 percent farmers respectively. Other natural inputs used by CNF farmers include Azola, Neem cake, Livestock penning, Mulching, Tank silt, etc. (Figure 5.3).

Figure 5.3: Percentage of CNF farmers applied different biological stimulates and natural inputs for the plant growth and improvement during Kharif 2021-22



Biological stimulants, viz., Beejamrutham, and Ghana and Drava Jeevamruthams not only improve soil quality but also the crop quality. They improve the crops' health and resistance to pests. Further, CNF has prescribed and introduced many locally prepared pest-specific and disease-specific non-chemical pest management (NPM) methods and inputs known as Kashayams and Asthrams. About 74 percent of CNF farmers have used Pheromone traps to control pests in their fields. Neemasthram is the second most widely used input, used by 61 percent farmers. Agnitasthram and Brahmasthram are used by 36 percent and 32 percent farmers respectively. Five different kashayams are also used: Tootokada kashayam is applied by the maximum at 22 percent CNF farmers, while Sonti-paala kashayam is being adopted the least by the at 2 percent of CNF farmers. (Figure 5.4).

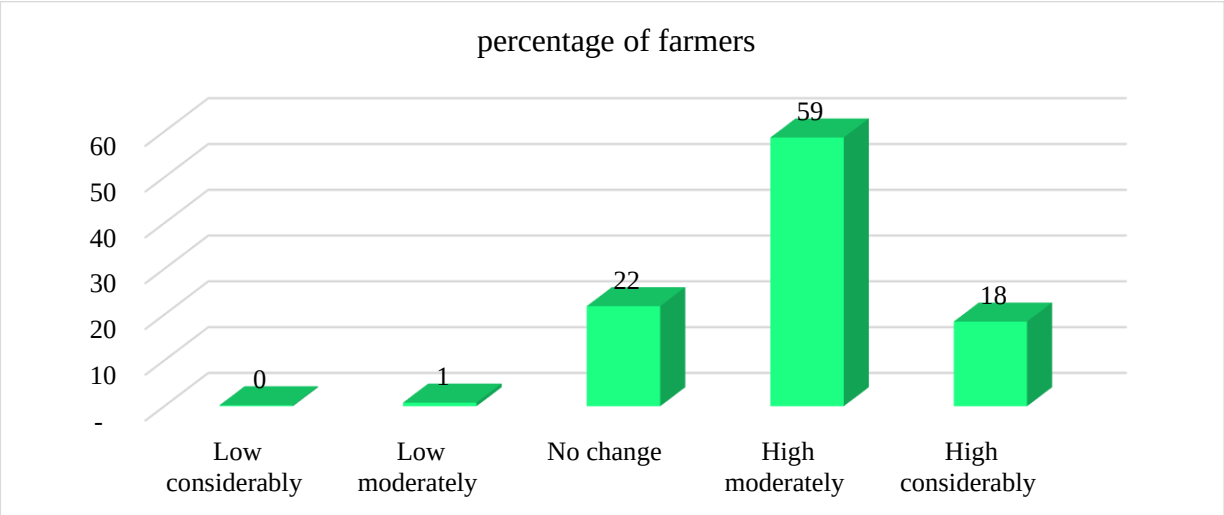
Figure 5.4: Percentage of CNF farmers applied different NPM methods and biological inputs for the pests and deceases control during Kharif 2021-22



5.7. Changes in output markets due to CNF products

Qualitative indicators have been used to assess the changes taking place in output markets due to CNF. Farmers responses have been captured to assess the changes in the output markets. More than three-fourths of CNF farmers have witnessed the people's interest in CNF outputs at the state level (Figure 5.5).

Figure 5.5: CNF farmers response with respect to changes in people's interest for CNF output in Kharif 2021-22



Source: IDSAP Survey 2021-22

CNF farmers across all the agroclimatic zones and farmers' categories have a near uniform experience of higher interest among the people/ consumers for CNF output. About one-third of farmers from Godavari zone (31 percent) and Krishna zone (36 percent) where relatively

higher doses of agrochemicals are used, have reported a considerably higher interest for CNF output. Among different farmers' categories, 27 percent of Owner-cum-tenant farmers and 24 percent of OC farmers have seen considerably higher interest for CNF output (Table 5.10)

Table 5.10: Agroclimatic zone wise and farmers category wise CNF farmers response with respect to changes in people's interest for APCNF output in Kharif 2021

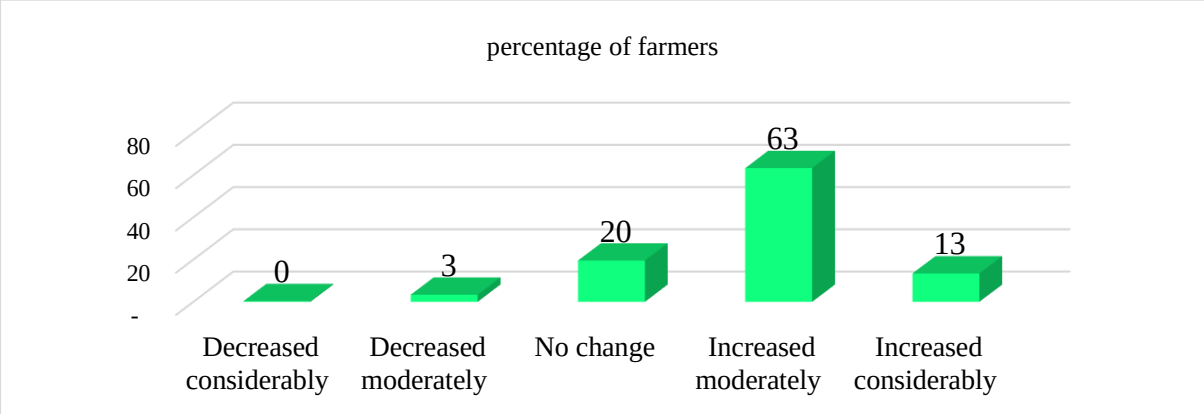
(n percentages)

Zones & Categories		Low considerably	Low moderately	No change	High moderately	High considerably
State	**AP**	**0**	**1**	**22**	**59**	**18**
Zone	HAT	1	-	34	59	6
	North coastal	-	1	24	54	21
	Godavari	-	-	4	65	31
	Krishna	0	1	16	47	36
	Southern	0	3	20	55	22
	Scarce rainfall	-	-	31	69	-
Farm size category	Marginal	0	1	26	55	19
	Small	1	1	18	63	18
	Others	-	1	15	67	17
Tenurial categories	Tenants	1	1	9	69	19
	Owner-cum-tenants	-	1	11	61	27
	Owners	0	1	23	58	18
Social category	SC	-	0	22	60	18
	ST	1	-	23	61	15
	BC	-	1	24	58	17
	OC	0	2	16	58	24

Source: IDSAP Field Survey 2021-22

More than three-fourths of CNF farmers reported that they are getting approvals of and respect from their relatives and friends for their CNF output. At the state level, 13 percent of CNF farmers have reported that they are commanding a considerably higher respect from people around them for their CNF produce. Further, 63 percent have reported that they are getting a moderate respect for their CNF output (Figure 5.6).

Figure 5.6: CNF farmers response with respect to changes in respect from the relatives and friends due to CNF in Kharif 2021-22



Source: IDSAP Survey 2021-22

There are variations in the percentage of farmers response with regard to the respect they are getting from the friends and relatives. There are wider variations across agroclimatic zones compared to farmers categories. Zero percent in the HAT zone to 27 percent of farmers in the

Godavari zone have reported that they are getting a considerable increase of respect due to growing CNF. The same is 14-percentage points across all farmers' categories. The difference in the percentage of farmers who commanded moderate respect from their friends and relatives due to CNF is at 45-91 percentage points across agroclimatic zones. Across the all-other farmers' categories, the same is 74 percent for owner-cum-tenants to 58 percent for OC farmers (Table 5.11).

Table 5.11: Agroclimatic zone and farmers category wise CNF farmers response about changes in experience of respect from the relatives and friends due to CNF in Kharif 2021-22

(In percentages)

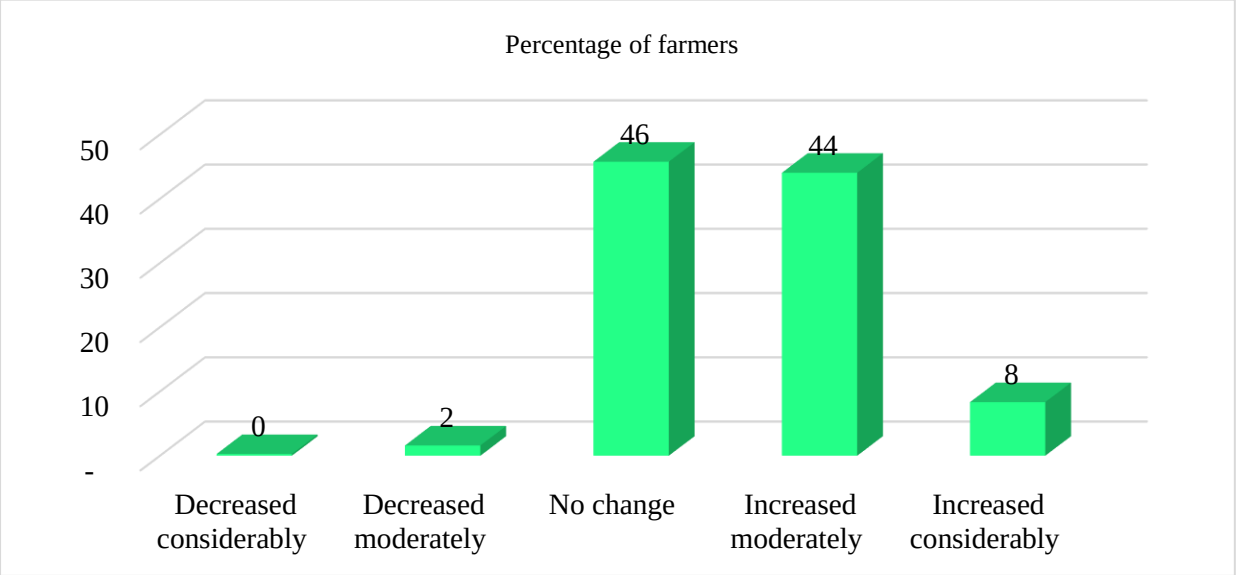
Zones and Categories		Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
AP	AP	0	3	20	63	13
Zone	HAT	1	-	33	67	-
	North coastal	-	1	32	66	1
	Godavari	-	-	9	65	27
	Krishna	0	14	22	46	18
	Southern	1	3	25	45	26
	Scarce rainfall	-	-	7	91	2
Farm size category	Marginal	0	4	21	63	12
	Small	0	2	19	65	13
	Others	0	1	17	63	19
Tenurial categories	Tenants	-	1	24	68	7
	Owner-cum-tenants	-	3	11	74	12
	Owners	0	4	20	62	14
Social category	SC	-	6	13	69	12
	ST	0	-	28	61	10
	BC	0	3	20	65	12
	OC	1	6	15	58	21

Source: IDSAP Survey 2021-22

Majority of CNF farmers reported that they are getting respect and favourable treatment[25] from market officials and other functionaries in each market, such as Market Yards, Rythu Bazars, etc. At the state level, 8 percent of farmers have experienced a considerable respect and 44 percent have got moderate respect, in the markets (Figure 5.7).

[25] As per the FGD in MV Palem in Guntur district (2020-21) the favourable treatment includes allocation preferred location in the market and priority for unloading, etc.

Figure 5.7: CNF farmers response about the respect they are getting in the markets during Kharif 2021-22



Source: IDSAP Survey 2021-22

About 90 percent of farmers in Godavari zone have reported that they are getting respect in the markets. But the same vary between 43 percent in HAT zone to 55 percent in Scarce rainfall zone. On the other hand, a majority of the poorer and vulnerable categories of farmers including 51 percent of Marginal farmers, 66 percent of Tenant farmers, and 53 percent of ST farmers, reported that they are getting respect in the markets due to CNF (Table 5.12).

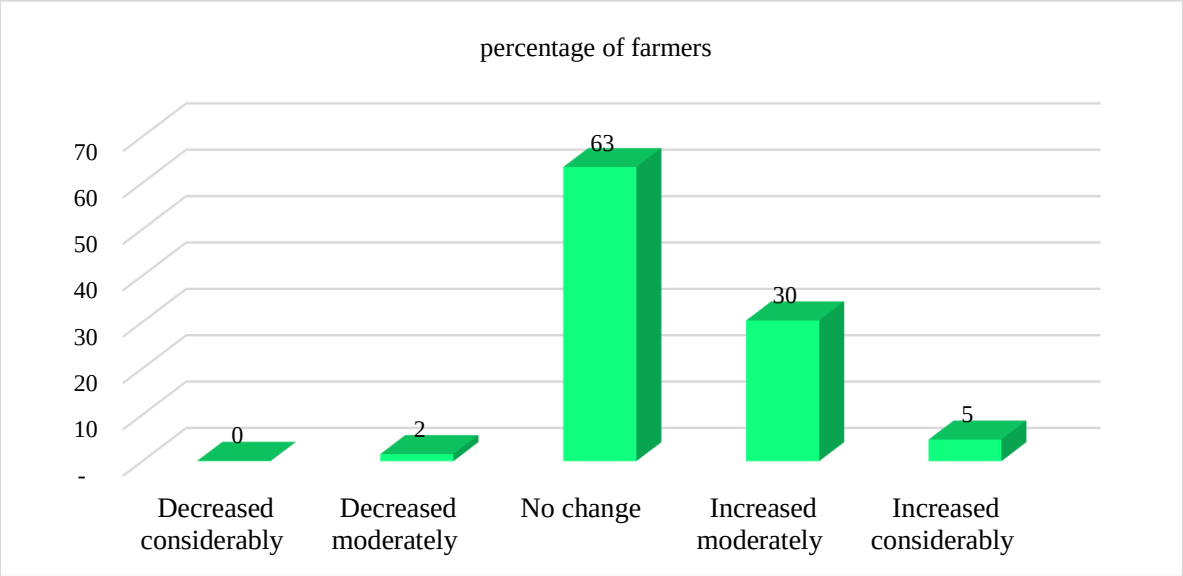
Table 5.12: Agroclimatic zone wise and farmers category wise CNF farmers response about the changes in the respect they get in the market in Kharif 2021-22 (in %)

Group	Zone & Categories	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
AP	AP	0	2	46	44	8
Agroclimatic zones	HAT	1	-	56	42	1
	North coastal	-	-	57	43	1
	Godavari	-	0	10	72	17
	Krishna	0	1	52	30	16
	Southern	0	5	52	30	12
	Scarce rainfall	-	-	46	54	1
Farm size categories	Marginal	0	2	48	41	10
	Small	1	2	47	44	7
	Others	-	1	36	57	6
Tenurial categories	Tenants	-	3	31	60	6
	Owner-cum-tenants	-	3	36	52	10
	Owners	0	1	47	42	8
Social categories	SC	-	2	50	35	13
	ST	1	0	47	48	5
	BC	0	1	44	46	8
	OC	0	3	45	43	9

Source: IDSAP Survey 2021-22

About 5 percent farmers have witnessed a considerable increase in the market channels for their CNF output. In addition, 30 percent of farmers have experienced moderate increase in the marketing outlets for the CNF output (Figure 5.8).

Figure 5.8: CNF farmers response with respect to changes in market channels for APCNF output in Kharif 2021-22



Source: IDSAP Survey 2021-22

About 15 percent of farmers in Godavari zone and 8 percent of farmers in Krishna zone have experienced a considerable increase in the new market channels for the CNF output. Further, 64 percent of farmers in Krishna zone 37 percent of farmers in each of Godavari and Southern zones have got a moderate increase in the new marketing channels. Among the farmers categories, a greater number of Marginal farmers in the farm size categories, owner farmers among the tenurial categories and OC farmers among the social categories have experienced additional marketing channels for CNF output (Table 5.13).

Table 5.13: Agroclimatic zone wise and farmers category wise CNF farmers response with respect to changes in market channels for APCNF output in Kharif 2021-22

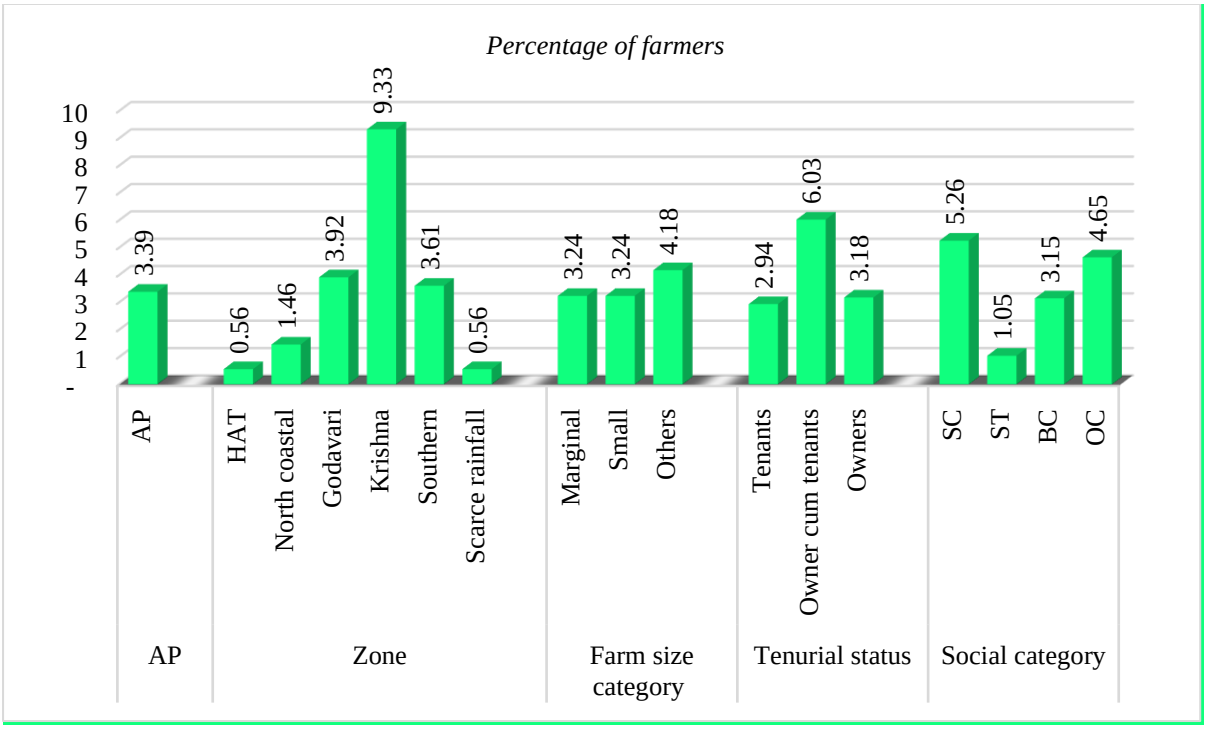
(In Percentages)

Zones and Categories		Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
AP	AP	0	2	63	30	5
Zone	HAT	1	-	74	25	-
	North coastal	-	-	79	21	-
	Godavari	-	-	48	37	15
	Krishna	-	-	28	64	8
	Southern	-	6	51	37	5
	Scarce rainfall	-	-	99	1	-
Farm size categories	Marginal	0	1	61	33	5
	Small	-	2	64	29	5
	Others	-	2	72	23	3
Tenurial categories	Tenants	-	3	71	22	4
	Owner-cum-tenants	-	3	68	21	9
	Owners	0	1	63	32	4
Social category	SC	-	4	58	29	9
	ST	0	0	62	31	7
	BC	-	1	70	27	2
	OC	-	2	56	37	5

Source: IDSAP Survey 2021-22

Just over three percent of farmers have reported that they got higher prices for CNF crops output. The variations in the percentage of farmers who realized higher prices across the agroclimatic zones are larger than that of farmers' categories. While only 0.56 percent of farmers in HAT zone realized higher prices, over 9 percent of farmers in Krishna zone have got higher prices for CNF output. These variations are relatively lower among the farmers' categories. Relatively, a higher percentage of Other (Medium and Large) farmers, owner-cum-tenant farmers and SC and OC farmers got higher prices for their prices for CNF crops output (Figure 5.9).

Figure 5.9: Agroclimatic zone wise and farmers category wise percentage of farmers received higher prices for CNF output during Kharif 2021-22



Source: IDSAP Survey 2021-22

5.8. Conclusion

The above analysis has brought to the fore very interesting insights on the impact of CNF on input use, input markets and output markets. The expansion of area under CNF has increased over years. But the rate of increase was higher in recent years, may be due to PMDS. This indicates that innovations of this type will increase the area under CNF. Innovations increase the area remarkably even without any cash and kind incentives for the farmers from the state. The increased adoption of CNF practices over years has reduced the use of water for growing crops, according to majority of CNF farmers. There are also other benefits like increased labour absorption for growing crops, reduction in the demand for working capital for growing crops under agriculture and, as a result, the availability of credit at flexible terms and conditions to the farmers has taken place. Indebtedness of farmers also decreased due to CNF. The demand for CNF outputs has also increased but the realised prices for CNF outputs by the farmers are not widely prevalent due to lack of market channels suitable to CNF outputs.

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