

Assessing the Impact of APCNF
[Andhra Pradesh Community Managed Natural Farming]
A Comprehensive Approach Using Crop Cutting Experiments
Third Interim [Rabi Season] Report 2022-23

Submitted To

Rythu Sadhikara Samstha

Department of Agriculture, Government of AP

IDSAP

Madhurawada, Visakhapatnam 530041

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Research Team

Prof S. Galab
Dr G. Bhaskara Rao
Prof C. Samba Murty
Dr D. Sree Rama Raju
Dr P. Prudhvikar Reddy
Prof C. Ravi
Prof E. Nagabhushana Rao
Prof J. Ramunaidu
Dr K. Ananda Rao

IDSAP

Madhurawada, Visakhapatnam 530041; www.idsap.in

☎ +91 9949 219 613; ☎ +91 7093 219 613

✉ directoridsap@gmail.com; ✉ director@idsap.in

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Acronyms

APCNF	: Andhra Pradesh Community Managed Natural Farming
BC	: Backward Class
CACP	: Commission for Agriculture Costs and Prices
CAs	: Cluster Assistants/ Activist
CCEs	: Crop Cutting Experiments
CNF	: Community Managed Natural Farming
CRPs	: Community Resource Persons
CSR	: Corporate Social Responsibility
CSs	: Case Studies
DES	: Directorate of Economics and Statistics
DGC	: Days Green Cover
DPMs	: District Project Managers
FCI	: Food Corporation of India
FGDs	: Focus Group Discussions
FPCs	: Farmers Producer companies
FPOs	: Farmers Producer Organizations
FYM	: Farm Yard Manure
GCA	: Gross Cropped Area
GDP	: Gross Domestic Product
GoI	: Government of India
GPs	: Gram Panchayats
HAT	: High Altitude Tribal Areas
HDI	: Human Development Index
IASRI	: Indian Agricultural Statistical Research Institute
ICRPs	: Internal Community Resource Persons
ICWD	: Integrated Child Development Service
IDSAP	: Institute for Development Studies Andhra Pradesh
MA	: Mandal Anchor
MF	: Master Farmer
MGNREGS	: Mahatma Gandhi National Rural Employment Guarantee Scheme

MPCF	: Monthly Per Capita Expenditure
MSP	: Minimum Support Price
MT	: Master Trainer
NGOs	: Non-Governmental Organizations
NSA	: Net Sown Area
NSO	: National Statistical Officer
NSSO	: National Sample Survey Organization
OC	: Open Categories
PMDS	: Pre-Monsoon Dry Sowing
PNPIs	: Plant Nutrient and Protection Inputs
PRDS	: Pre-Rabi Dry Sowing
RP s	: Resource Persons
RySS	: Rythu Sadhikara Samstha
SC	: Scheduled Caste
S2S	: Seed to Seed
SEAG	: Self Employed households in Agriculture
SHGs	: Self-Help Groups
SIs	: Strategic Interviews
SRI	: System of Root Intensification
ST	: Scheduled Tribe
TTD	: Tirumala Tirupati Devasthanam
VOs	: Village Organizations
ZBNF	: Zero Budget Natural Farming

Executive Summary

0.1. Introduction

1. The current study is a continuation of the “Assessing the Impact of APCNF” studies for 2019-20, 2020-21, and 2022-23, undertaken by IDSAP, Visakhapatnam. This is the third interim report of 2022-23 study, covering the Rabi 2022-23 season.

0.2. Objectives

2. The overall objectives of the annual study are to assess the impact of APCNF in terms of its economic sustainability¹, social sustainability² and environmental sustainability³ and to delineate its contributions to enhancing the wellbeing of farmers and people in the state. Specific objectives of this report are:
 - a. To estimate and compare the cost of cultivation, cost structure, crop yields, gross and net value of output from crop cultivation under CNF and under chemical-based farming, referred as non-CNF.
 - b. To estimate and compare the crop yields obtained under CNF and non-CNF, independently and also scientifically through crop cutting experiments (CCEs).
 - c. To understand the impact of CNF on the input use, especially, the natural resources used and consequent environmental implications.
 - d. To know the impact of CNF on farmers’ wellbeing.
 - e. To understand the issues and challenges in adoption of CNF and provide insights for the more effective implementation of the program.

0.3. Methodology and sample sizes

3. 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

¹Economic sustainability means that APCNF is profitable, i.e., able to generate surpluses after covering the entire cost of cultivation

² Social sustainability implies that the poor and vulnerable sections are able to adopt and get benefitted from APCNF.

³ Environmental sustainability implies that APCNF is environmentally benign (non-damaging). That is, the programme is expected to halt and reverse the degradation of the natural resources, especially the soil. It is also expected to make the agriculture resilient to the climate change.

inputs. Costs and returns data for the crops considered for the analysis were obtained from the farmers through farmer household survey. Crop Cutting Experiments (CCEs) have been conducted to assess the yields of the crops scientifically and independently.

4. As per the sample design, the same set of sample households consisting of 1,331 CNF and 731 non-CNF HHs, selected in the beginning of the study and survey during PMDS and Kharif seasons, have been surveyed again in the Rabi season also.
5. But only 47 and 43 percent of CNF and non-CNF sample farmers were engaged in cultivation during Rabi season.
6. Therefore, an additional sample of 557 HHs, including 288 CNF and 269 non-CNF HHs have been selected, exclusively for collecting the cost and returns data in Rabi season.
7. Seven crops are covered for detailed analyses in this report. These crops are: (1) Paddy, (2) Groundnut, (3) Bengal gram, (4) Black Gram, (5) Maize, (6) Green gram and (7) Ragi.
8. The number of sample observations varies from 49 each for CNF Bengal gram and CNF Green gram to 198 for CNF Paddy and 208 CNF Maize. In the case of non-CNF, the sample observations vary from 58 and 59 for Bengal gram and Green Gram respectively to 122 each for Paddy and Maize (Table 0.1).

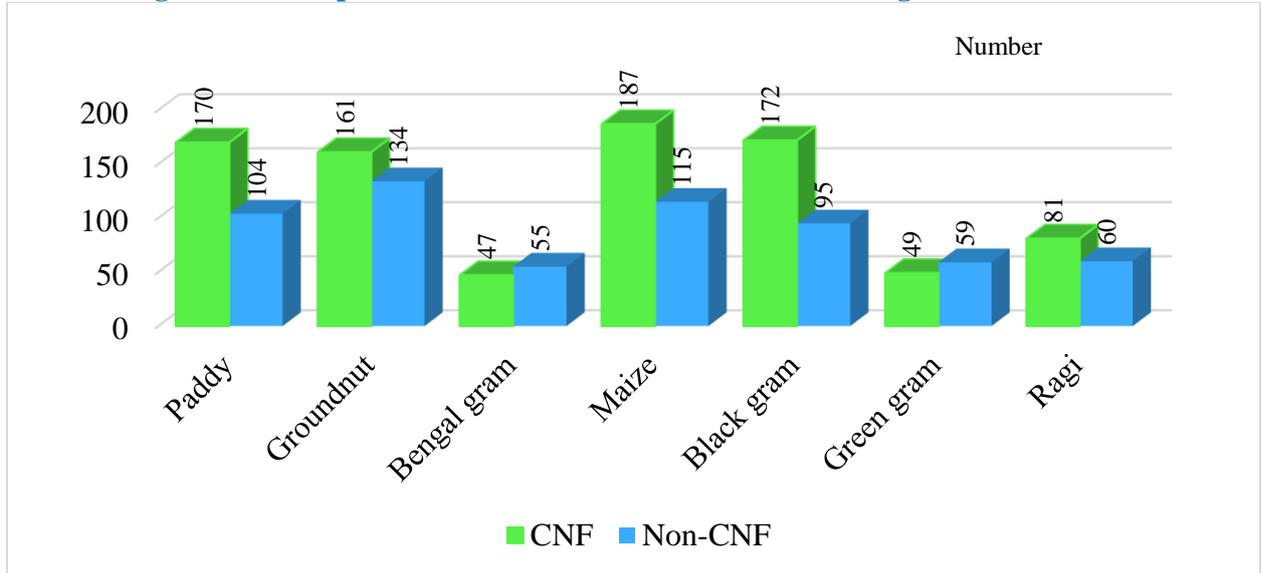
Table 0.1: Crop wise sample observations for cost estimates during Rabi 2022-23

Crop	CNF	Non-CNF
Paddy	198	122
Groundnut	162	126
Bengal gram	49	58
Maize	208	122
Black gram	181	97
Green gram	49	59
Ragi	87	60
Others	34	32
Total	968	676

9. In all 1,814 CCEs have been conducted during the study period. The number includes 909 for CNF farmers, 654 for non-CNF farmers and 251 for panel farmers. This is the result of additional sample selection for the season (Table 1.2).

10. The number of CNF CCEs ranged from a minimum of 47 for Bengal gram to a maximum of 187 for Maize. The number for non-CNF CCEs ranged from 55 for Bengal gram to 115 for Maize (Figure 0.1).

Figure 0.1: Crop wise number of CCEs conducted during Rabi 2022-23



0.4. Impact of CNF on farming conditions

11. On average CNF farmers saved ₹6,636 (53 percent) in their expenditure on PNPIs vis-à-vis non-CNF farmers (Table 3.1).
12. the average savings in paid-out cost is just ₹3,810 (7 percent) under CNF vis-à-vis non-CNF (Table 3.2). This is on lower side compared to earlier studies. One of possible reasons could be the composition of sample crop. Most of the sample crops, especially three pulses crops and Ragi are, usually, cultivated with less agrochemical inputs under non-CNF. Hence, there will be less cost on input application also.
13. The yields arrived at based on crop cutting experiments (CCEs) turned out to be same for both CNF and non-CNF, i.e., no different statistically, in five out of seven crops. In the other two crops, viz., Maize and Groundnut, the yields under CNF are, statistically, higher than that of non-CNF (Table 3.5).
14. The prices commanded by CNF and non-CNF output are, statistically, different in four out of seven crops considered in this report. Out of those four crops, the prices received by CNF farmers are higher in three crops (Table 3.6).

15. On an average the gross value of CNF output is larger than that of non-CNF by three percent. The differences between the gross value of CNF and non-CNF output are statistically significant in six out of seven crops. Out of those six crops, the gross value of CNF output are larger in four crops (Table 3.7).
16. On an average, the net value of CNF output is larger than that of non-CNF by 13 percent. Of seven crops covered, the differences between the net value of CNF and non-CNF output are statistically significant in five crops. In four out of those five crops, the net value of CNF output are larger.
17. The results of disaggregated analyses indicate that the state level trends have been reflected by majority of agroclimatic zones and farmers' categories, in all crops, with some notable exceptions. The analyses, further, suggest that the resource poor agroclimatic zones and farmers too can get equal benefits from CNF in general. If the farmers are provided access to marketing infrastructure like storehouses and FPCs, they can get more benefits.

0.5. Impact of CNF on input use

18. As both CNF and non-CNF sample is drawn based on the uniform cropping pattern, the changes in land use pattern are not conspicuous (in terms of percentage of operated area cultivated in Rabi season), in this study. However, there is an increase in area allocated to CNF.
19. On an average 21 additional labour days or 17 percent more labour is used under CNF during the Rabi season. Out of these, over 16 days are own labour and about 4 days⁴ are hired labour; and nine are male days and 12 are female days. However, in relative terms 20 percent more male labour is used compared to 15 percent female labour.
20. In almost all agriculture operations, a greater number of labour days are used under CNF.
21. In all 351 of CNF farmers have purchased 784 livestock because of CNF.
22. On an average the CNF farmers have avoided 4.82 quintals of fertilizers per hectare during the study season. On an average the CNF farmers have avoided ₹12.50 thousand expenditure on agrochemicals per hectare, including ₹7.94 thousand on fertilizers and ₹4.64 thousand on pesticides.

⁴ Both do not add to 21 days due to rounding up problem.

23. On an average the CNF farmers borrowed ₹61,701 vis-à-vis ₹84,886 by non-CNF HHs for agriculture and other purposes (Table.4.10).
24. These positive changes may, in turn, improve the farmers wealth and wellbeing.

0.6. Issues, challenges and way forward

25. Major challenges faced by RySS are: (1) Increasing the rate of enrolment of farmers into the program, and (2) Encouraging and facilitating the participating farmers to allocate their entire operated area to CNF.
26. The current rate of enrolment of farmers in CNF is impressive. But to cover all farmers and entire GCA in the state, RySS has to adopt a different strategy.
27. It appears that RySS is focusing on model building and want to expand the program through demonstration effect. This appears to be a laudable strategy. However, RySS may think about channelizing a part of Government funds meant for farm subsidies, for the benefit of CNF farmers. More importantly the CNF farmers need and want higher prices for CNF output. Even a nominal premium price to CNF output can give a big boost to the program.
28. Labour scarcity can be addressed by linking Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) with agriculture operations.
29. Given criticality of the field staff in implementation and expansion of the programme, RySS has to strengthen the field staff. The vacancies need to be filled. Apart from filling the vacancies and strengthening the cadre, RySS may consider to provide flexible and focussed working conditions so that the staff can optimally use their time, resources and energy balancing their professional and personal responsibilities.
30. RySS may take up the evidence-based advocacy to convince the farmers to take up the CNF on a large scale; and other stakeholders to support the CNF expansion and replication. Needless to say, such evidence would come from more impact assessment studies, like the present study.

Chapter 1: Context, Objectives and Methodology

1.1. Context

To overcome the challenges of contemporary agriculture in the state, the Government of AP adopted the natural farming, (now) known as Andhra Pradesh Community Managed Natural Farming (APCNF) in 2016. The generic principles, those govern APCNF are summarized in Box 1. The Government has provided a dedicated institutional structure, known as Rythu Sadhikara Samstha (RySS) to implement APCNF in the state. As per the latest information available from RySS, about five percent of farmers in the state are adopting the complete package of CNF, known as seed to seed (S2S) farmers, i.e., growing crops with only CNF inputs and practices without applying any agrochemicals [fertilizers and biocides], at least on a part of his/ her holding. Another six percent farmers in the state are adopting CNF inputs and practices along with agrochemicals and related practices. Recently RySS made one of the major breakthroughs in Andhra Pradesh Community Managed Natural Farming (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 with raising of 8 to 15 diverse crops creates some special conditions, which enable seed germination with very little water/ moisture. PMDS is mostly practiced before the advent of monsoon, during summer and also before the beginning of the Rabi season crops. 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.

While the benign microbes are introduced into soils through biological stimulants, under CNF, which convert the natural elements available in the soils and atmosphere into plant nutrients; PMDS provides food⁵ and shade to the microbes, especially during the hot summer months.

⁵It is well known that through photosynthesis, plants convert sunlight, water and carbon dioxide (CO₂) into sugar, called Glucose. Plants store about 40 percent of Glucose in above ground biomass and 30 percent in roots and the other 30 percent is exudated into the soil, for feeding vast microbial population. It is interesting to note that there is a

Because of these reasons, PMDS became an integral part of CNF. The present study focused on CNF fields/ plots, which were put under PMDS during pre-monsoon period of 2022. The study selected CNF farmers who have raised PMDS during 2022. More details about APCNF and PMDS can be seen at APCNF website <https://apcnf.in/about-apcnf/> and in the earlier studies, by IDSAP, which are available at <https://apcnf.in/about-apcnf/> and <https://www.idsap.in/reports.html>. To know the impact of APCNF through a third-party assessment, RySS has been assigning these studies to Institute for Development Studies Andhra Pradesh (IDSAP or IDS in short). APCNF is being implemented with multiple objectives and strategies:

- Improvement in the profitability of crop cultivation, soil quality, crop quality, crop resistance to weather anomalies, food quality, health of farmers and consumers, etc.
- Promotion of poor people's and women's participation, integrated farming, crop diversification and intensification, community ownership, utilization of local resources, etc.

But the studies by IDS have limited mandate, i.e., to assess the impact of CNF on farming conditions at the state level with the help of a few major crops. Over the years the scope is being enlarged with supplementary objectives such as impact of CNF on household income, input use, non-monitory benefits (soil quality, crop quality, etc.), farmers' wellbeing, disaggregate analysis, wherever possible, profiling of sample farmers/ households, etc.

Box 1: The Generic principles that govern APCNF

1. A healthy soil microbiome is critical for optimal soil health and plant health, and thereby animal health and human health,
2. Soil should always be covered with crops (the living roots principle), throughout the year. Soil should not be bare. In those months, where cropping is not possible, there should be at least crop residue mulch cover.
3. Across a farm or larger field/ collection of fields should have diverse crops, a minimum of 8 crops over the year is recommended. The greater the diversity, the better.
4. Minimum disturbance of soils is critical, hence no till farming or shallow tillage is recommended.

direct relation between the diversity on above the ground and below the ground; i.e., diverse crops/ plants in the field contribute to the more diverse life in sub-soils/ below the ground.

5. Animals should be incorporated into farming. Integrated farming systems are critical for promoting natural farming.
6. Healthy soil microbiome is the key to retaining and enhancing soil organic matter. Bio-stimulants are necessary to catalyse this process. There are different ways of making bio-stimulants. In India, the most popular bio-stimulants are based on fermentation of animal dung and urine, and uncontaminated soil.
7. Increasing the amount and diversity of organic residues returned to the soil is very important. These include crop residues, cow-dung, compost, etc.
8. Pest management should be done through better agronomic practices (as enshrined in IPM) and through botanical pesticides (only when necessary).
9. Use of synthetic fertilizers and other biocides is harmful to this process of regeneration and is not allowed.

Source: Extracted from NITI Ayog website on 21 November 2023

<https://naturalfarming.niti.gov.in/andhra-pradesh/#:~:text=The%20Andhra%20Pradesh%20Community%2DManaged,Agriculture%2C%20Government%20of%20Andhra%20Pradesh.>

1.2. Objectives of present report

The current study is a continuation of the Assessing the Impact of APCNF studies for 2019-20, 2020-21, and 2022-23, undertaken by IDSAP, Visakhapatnam. This is the third interim report of 2022-23 study, covering the Rabi 2022-23 season.

The overall larger objectives of the annual study are to assess the impact of APCNF in terms of economic sustainability⁶, social sustainability⁷ and environmental sustainability⁸ and to delineate its contributions in enhancing the wellbeing of farmers and people in the state. Specific objectives of this report are:

- i. To estimate and compare the cost of cultivation, cost structure, crop yields, gross and net value of output from crop cultivation under CNF and under chemical-based farming, referred as non-CNF in this report and also in all studies.

⁶Economic sustainability means that APCNF is profitable, i.e., able to generate surpluses after covering the entire cost of cultivation

⁷ Social sustainability implies that the poor and vulnerable sections are able to adopt and get benefitted from APCNF.

⁸ Environmental sustainability implies that APCNF is environmentally benign (non-damaging). That is, the programme is expected to halt and reverse the degradation of the natural resources, especially the soil. It is also expected to make the agriculture resilient to the climate change.

- ii. To estimate and compare the crop yields obtained under CNF and non-CNF, independently and also scientifically through crop cutting experiments (CCEs).
- iii. To understand the impact of CNF on the input use, especially, the natural resources used and consequent environmental implications.
- iv. To know the impact of CNF on farmers' wellbeing.
- v. To understand the issues and challenges in adoption of CNF.

1.3. Methodology

1.3.1. The Basic Approach

This study is a continuation of the previous impact studies conducted in 2018-19⁹, 2019-20, 2020-2021 and 2022-23 on APCNF. Earlier studies assessed the effectiveness of APCNF (also known as Seed to seed [S2S] Farming) with 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 2022-23.¹⁰

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 data for the crops considered for the analysis were obtained from the farmers through farmer household survey. Crop Cutting Experiments (CCEs) have been conducted to assess the yields of the crops scientifically and independently.

The annual study is focussed on 12 major crops that are identified based on the cropped area in the state. For these 12 crops, costs, yield and returns are analysed. 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. These crops together account for more than 75% of the gross cropped area (GCA) in the state. Given the seasonality the

⁹ Though 2018-19 study was conducted by the Centre of Economics and Social Studies (CESS), Hyderabad, almost all members of the present team have conducted that study also. All subsequent studies are being conducted by IDSAP with almost same team of professionals.

¹⁰ In this study the words PMDS+APCNF, APCNF and CNF are use as interchangeably. Similarly, the works non-APCNF and non-CNF are also use as interchangeably.

cropping pattern in the state, the survey could not get adequate sample for some crops. Therefore, some of sample crops were not included in this report. Out of total 12 sample crops, survey could not get adequate number of observations for Red gram, Cotton, Chillies, Jowar and Tomato.¹¹ Therefore, only seven crops are covered for detailed analyses in this report. These crops are: (1) Paddy, (2) Groundnut, (3) Bengal gram, (4) Black Gram, (5) Maize, (6) Green gram and (7) Ragi.

1.3.2. Sample Design

The study was conducted in the entire 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 Gram Panchayats (GPs), where CNF practices are followed, constituted the sample frame for drawing CNF samples. The list of CNF-GPs, with number of cultivators, who adopted CNF in PMDS plots (referred as PMDS+CNF), as of May 2022 is the sample frame. The remaining GPs, where APCNF is yet to begin, form the sample frame for non-CNF sample or control sample. The detailed description of sample selection process was given in the first and second interim reports of 2022-23 study. The same is summarised below:

1. The study proposed a total sample of 195 GPs, including 130 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.
2. The total 130 of sample GPs were allocated to the 30 strata¹² (of agroclimatic zones X districts) in proportion to the number of CNF farmers in each stratum. Similarly, total 65 non-CNF sample GPs were allocated across the 30 strata in proportion to number of CNF farmers in that stratum. A household listing was conducted in each of sample CNF and non-CNF GPs.
3. The sample size fixed at state level for Paddy is 300, for Groundnut and Cotton 200 each, for Maize, Black gram, Red gram, Tomato, and Ragi, 100 each and for Chillies 150. For two crops, i.e., Bengal gram and Green gram which are predominantly Rabi crops, no samples are allocated as the reporting itself is very low. The non-CNF sample is also selected based on the same principles, but proportionately a smaller number of crop observations. The crop specific sample size is spread across the GPs uniformly to ensure

¹¹ All, but one, crops are predominantly Kharif crops. Though Jowar is grown mostly in Rabi, it is often cultivated as fodder crop.

¹² If a district falls in two zones, it is treated as two strata. In total 30 strata were found.

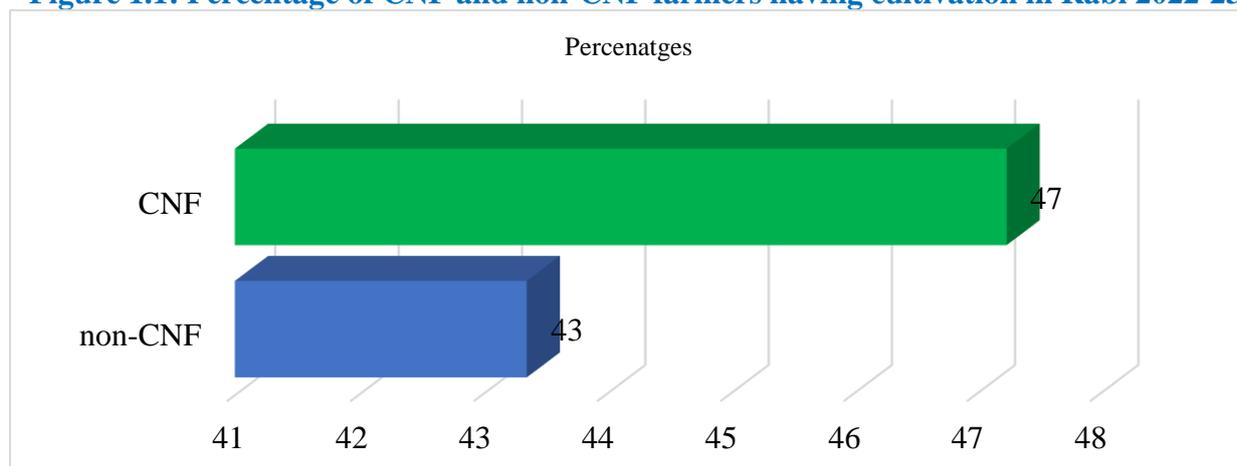
that the samples are not concentrated in few GPs. It is obvious that in this procedure a cultivator selected for one crop may also be selected for another. All such duplicate cultivators were deleted from the final set of sample cultivators.

4. A total of 1,331 CNF and 731 non-CNF farmers are selected.
5. Further, it was planned to collect the qualitative information through three methods, viz. 65 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. Some of the insights, from the qualitative data have been incorporated in this report. The remaining insights will be incorporated in the Final reports.

As per the sample design, the same set of sample households, selected in the beginning of the study and surveyed during PMDS and Kharif seasons, have been surveyed again in the Rabi season also. In the design it was proposed to visit, each sample household including CNF, non-CNF and Panel HHs, six to eight times to know the full impact of APCNF on household income and other factors. That is same set of households have been surveyed multiple times throughout the year. But in previous years' surveys, it was noted that many sample farmers, selected during Kharif season, do not cultivate any crop during Rabi season. As a result, the study could not get adequate number of sample observations for many crops, especially, for six predominantly Rabi crops. This practice has adversely affected the crop wise analysis, which is the major objective of the study. Therefore, additional sample of 557 HHs, including 288 CNF and 269 non-CNF HHs have been selected, exclusively for collecting the cost and returns data in Rabi season. In all six crops, viz., Bengal gram, Maize, Black gram, Green gram, Jowar and Ragi, have been focussed on, while selecting the additional sample.¹³ The additional sample was included only to conduct CCEs for select crops, which fall short of 40-50 observations and to gather the costs and returns data of such crops. The data with respect to household incomes, perceptions about input use, farmers' wellbeing, etc., was not collected from the additional farmers. Those estimates were made with the original sample only. As anticipated only 47 percent of CNF and 43 percent of non-CNF sample household have cultivated crops during the Rabi season (Figure 1.1).

¹³ All, but one, are predominately Rabi crops. Though Ragi is mostly cultivated in Kharif, the study could not find adequate number of non-CNF Ragi cultivators in the listing data. Therefore, the CNF Ragi data collected in Kharif season could not be used in the Kharif 2022-23 report. Therefore, additional sample, especially the CNF Ragi farmers have been included.

Figure 1.1: Percentage of CNF and non-CNF farmers having cultivation in Rabi 2022-23



Source: *IDSAP, Field Survey 2022-23*

Agroclimatic zone wise and farmers categories wise original sample size, actual cultivators in the original sample and additional sample are shown in Table 1.1.

Table 1.1: Sample size, Rabi cultivators and additional sample during 2022-23

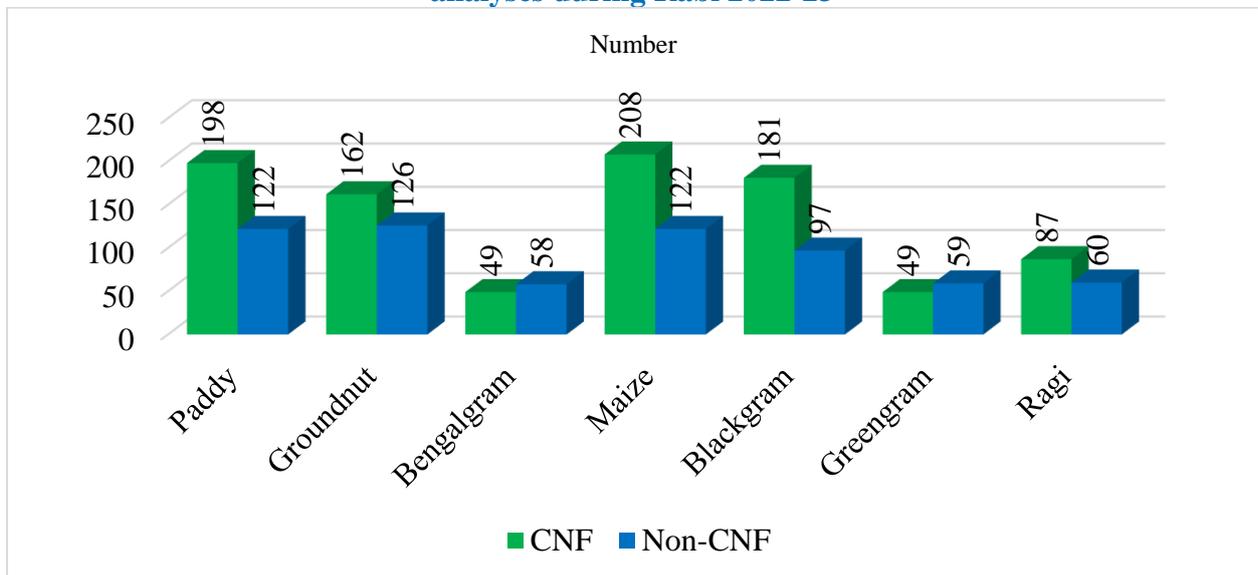
Agroclimatic zones & farmers' categories		Original sample		Cultivators in Rabi		Additional sample	
		CNF	non-CNF	CNF	non-CNF	CNF	non-CNF
State	AP	<u>1,331</u>	<u>731</u>	<u>629</u>	<u>317</u>	<u>288</u>	<u>269</u>
Agroclimatic zones	HAT	215	59	46	43	52	26
	North coastal	97	51	69	30	42	21
	Godavari	83	31	80	31	2	30
	Krishna	232	92	130	33	144	128
	Southern	369	180	199	88	10	25
	Scarce rainfall	335	318	105	92	38	39
Farm size category	Marginal	784	534	379	169	227	202
	Small	387	163	164	102	45	57
	Others	160	34	86	46	16	10
Tenurial status	Tenant	31	23	22	12	7	3
	Owner-tenant	56	21	40	12	2	15
	Owner	1,244	687	567	293	279	251
Social category	SC	238	64	128	21	69	35
	ST	231	55	48	50	54	29
	BC	512	388	269	147	102	128
	OC	350	224	184	99	63	77

Source: *IDSAP, Field Survey 2022-23*

1.4. Selection of crops and observations

As mentioned in all previous reports that most of the crops, in the state and also in the country, are seasonal crops. Hence it is not possible to cover all sample crops in any one season's report. Based on the available crop wise observations, the study covered only seven crops in this report. Because of additional sample, the study got a good number of observations to provide not only most reliable estimates, but also to provide disaggregate results to most of the crops covered in the reports. The crops covered, the number of available observations for the estimation of crop wise costs of cultivation, (reported) yields, prices and gross and net value of crop output is shown in Figure 1.2. The number of sample observations varies from 49 each for CNF Bengal gram and CNF Green gram to 198 for CNF Paddy and 208 CNF Maize. In the case of non-CNF, the sample observations vary from 58 and 50 for Bengal gram and Green Gram respectively to 122 each for Paddy and Maize (Figure 1.2). It may be noted that each of crops has a good number of observations to provide robust estimates. This is due to crop wise sample selection strategy that was adopted for this year and 557 additional sample selected for this season.

Figure 1.2: Crop wise CNF and non-CNF sample observations for the cost and returns analyses during Rabi 2022-23



Source: *IDSAP Field Survey 2022-23*

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

Crop Cutting Experiments (CCEs) were conducted scientifically to get independent estimates of crop yields under CNF and non-CNF. For each of the selected farmer, a plot where the farmer is

growing the sample crop was identified. From this parcel of land, a plot of *size¹⁴ 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 developed and recommended by Indian Agricultural Statistical Research Institute (IASRI), which is followed by National Statistical Office (NSO) and Directorate of Economics and Statistics (DES) of all states, including Andhra Pradesh, for conducting the CCEs.

One of the interesting features about CCEs is that total number of CCEs is more than adequate for all seven crops covered in this report, to provide reliable estimates. In all 1,814 CCEs have been conducted during the study period. The number include 909 for CNF farmers, 654 for non-CNF farmers and 251 for panel farmers. This is the result of additional sample selection for the season. The crop wise number of CCEs conducted during Rabi 2022-23 are shown in the Table 1.2 below. The number of CNF CCEs varies from minimum of 47 for Bengal gram to maximum of 187 for Maize. The number of non-CNF CCEs varies from 55 for Bengal gram to 115 for Maize. This year the CCEs of panel framers are adequate enough to provide the cost and returns estimated for all crops covered in this report.¹⁵

Table 1.2: Crop wise and type of farming wise number of CCEs conducted during Rabi 2022-23

Crop	CNF	Non-CNF	Panel	Total
Paddy	170	104	80	354
Groundnut	161	134	35	330
Bengal gram	47	55	16	118
Maize	187	115	36	338
Black gram	172	95	50	317
Green gram	49	59	16	124
Ragi	81	60	18	159
Others five crops	42	32		74
Total	909	654	251	1,814

Source: *IDSAP Field Survey 2022-23*

1.6. Data Collection and Management Process

This is a year-long survey. In all, eleven research tools, were used, and they are: (1) Household listing schedule for the CNF GPs, (2) Household listing schedule for the non-CNF GPs, (3) Village

¹⁴ Normally, 5 metres by 5 metres, (5²metres) 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.

¹⁵ The panel results will be provided in the final report 2022-23.

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. ***Further, the Kharif CNF and non-CNF households' schedules were revised for the Rabi survey.*** The quantitative field-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 two training programs were organized to train the field investigators and supervisors at IDSAP, Visakhapatnam during the middle of July 2022 and the second half of September 2022. 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 six to eight times by the field staff to collect data about farmer household's details and farming throughout the agriculture year (AY) 2022-23, with minimum time lapse.

The household survey for the Rabi season of 2022-23 was conducted from November 2022, and it was more intensively conducted from early- February 2022 till the end of May 2023. 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 collected and filled and participated in data collection processes; conducted SIs with DPMs and a few field staff of RySS; and also participated in the FGDs, by visiting fields, especially of the model farmers and social entrepreneurs, for obtaining information on various farm practices

Since 2021-22, the field data is being digitalized with the help of a technical agency - "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 and provided the digital data to IDSAP in an excel form. The data was collated and processed using the R programme and Excel software. Descriptive statistics, frequency distributions and cross

tabulation are generated at state level, agroclimatic zone¹⁶wise, farm-size category wise, tenorial category wise and social category wise.

1.7. Structure of the Report

The context, objectives and methodology of the study have been presented in chapter 1. Chapter 2 summarizes profiles of CNF (PMDS+CNF) and non-CNF households, which was discussed in detail in the previous Kharif season report 2022-23.¹⁷ Chapter 3 covers the impact of APCNF on farming conditions. The impact of CNF on agriculture input uses and related issues are discussed in chapter 4. The issues of the farmers wellbeing, which was covered in extensively in previous Kharif 2022-23, is summarized in chapter 5. The issues and challenges in implementation of APCNF and way forward are covered in chapter 6. Apart from these six chapters, an Executive Summary of the study is also presented at the beginning of the Report.

¹⁶ A list of agroclimatic zones and their demarcations are shown at the appendix 1 below.

¹⁷ All previous reports can be seen at <https://www.idsap.in/reports.html>

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 erstwhile Srikakulam district; seven mandals, viz., (9) Gummalakshmipuram, (10) Komarada; (11) Kurupam, (12) Makkuva, (13) Pachipenta, (14) Parvathipuram, and (15) Saluru of erstwhile 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 erstwhile 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 erstwhile East Godavari district. ¹⁸
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

¹⁸ Information was provided by Associate Director of Research (ADR), Chintapalle.

Chapter 2: Profiles of CNF and non-CNF farmers

2.1. Introduction

In the Second Interim (Kharif Season) 2022-23 Report, the profiles of CNF and non-CNF farmers were discussed in detail. The profiles chapter in that report has compared the profiles of the sample households (HHs) and farmers of CNF with those of non-CNF.¹⁹ The profile is characterized through parameters such as social categories of farmers [Scheduled Castes (SC), Scheduled Tribe (ST), Backward Castes (BCs), and Other Castes (OC)], 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 tenants²⁰, owner-tenants²¹ and owner farmers²²). 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). In this chapter, apart from summarizing the profiles chapter of the Second Interim (Kharif Season) 2022-23 Report, the average area cultivated by CNF farmers vis-à-vis non-CNF farmers during Rabi is presented.

2.2. Profiles of CNF and non-CNF farmers

The major findings of the profiles chapter of the Second Interim (Kharif Report) 2022-23 are:

1. The representation of SCs, and STs is two times higher in CNF compared to their percentage in non-CNF. SCs among CNF households form 18 percent compared to 9 percent among non-CNF households and the corresponding figures for STs are 17 percent and 8 percent respectively.
2. Among all sample households, the number of farmers, i.e., the household members, who devote most of their working days/ hours to cultivation, were identified and analysed. Each sample family may have more than one person dependent on cultivation. In total, there are 1,884 cultivators in the 1,331 CNF sample households and 987 cultivators in 731 non-

¹⁹ It may be noted that the study has taken households (HHs)/ family as sample. In each household/ family, there may be more than one cultivator. In this profile chapter the words household/ family and farmers/ cultivators are used separately. In some indicators such as social category and land ownership, operational holding, etc., HHs is used. In case of some indicators such as age, education, gender, etc., individual cultivators', in each HHs, data is used. In all other chapters the words sample HHs and sample farmers are used interchangeably.

²⁰Pure tenants, who do not own any land, but cultivate only leased-in land.

²¹ Owner-tenants, who cultivate own land and also leased-in land.

²² Owner farmers, who cultivate their own land.

CNF sample households. It implies that there are 142 and 135 cultivators for every 100 CNF and non-CNF sample households respectively. Out of 1,884 CNF cultivators, 607 or 32 percent are female farmers. The same is 30 percent among the non-CNF cultivators. There 46 female farmers for every 100 CNF sample households. The same is 40 for non-CNF households.

3. In total, the marginal and small farmers together account for 88 percent in CNF sample and 95 percent in non-CNF sample.
4. There is no difference between CNF and non-CNF households in the land lease-in.
5. It is found that those of 40 years or below constitute 38.85 per cent of all farmers²³ in the sample CNF households, vis-à-vis 32.62 per cent of all cultivators²⁴ in the non-CNF sample households. On the other hand, those who are 61 years and above form 6.05 per cent of all cultivators²⁵ in the sample CNF households; and 11.25 per cent among the non-CNF HHs.
6. The data shows that education has not had any significant impact on adoption of CNF.

2.3. Average operational area

It may be noted that in the state as a whole the cropping intensity is less than 130 percent; i.e., less than 30 of net sown area (NSA) is put under cultivation more than once. The remaining area is cultivated either in Kharif or in Rabi season. In some regions, farmers may not put their entire area under cultivation during Kharif season. In some other regions, farmers may not cultivate their entire area during Rabi season. It implies that the operated area of a farmer may or may not equal to his/ her operated area in Kharif and/ or operated area in Rabi season. Factors like rainfall, irrigation status, availability of family labour, soil type, soil quality, local cropping pattern, etc., influence the extent of area cultivated in each season. CNF can alter these factors; but over a period of time. During Kharif 2022-23, on an average, CNF farmers have cultivated 1.04 hectares per farmer compared to 0.80 hectares per farmer by non-CNF farmers.

As pointed in chapter 1, only 47 and 43 percent of CNF and non-CNF sample farmers have cultivated in Rabi 2022-23. The average area cultivated during Rabi per each sample CNF farmer (including who cultivated and did not cultivate during the Rabi season) is 0.47 hectares. The same for non-CNF sample farmers is 0.46 hectares. However, the average operated area per CNF farmer,

²³ Household members who devote most of their working hours/ days to cultivation.

²⁴ Ibid

²⁵ Ibid

who cultivated during Rabi is 0.99 hectares; the same for non-CNF farmers is 1.07 hectares. The disaggregate data did not show any trend (Table 2.1). One of the possible reasons for lack of clear trend of an increase in area cultivated by CNF farmers vis-à-vis non-CNF farmers is that the study has been focussing on single crop growing farmers, which is the major practice in the state, to compare the farming conditions. Further, it may take some time to see a notable impact of CNF on cropping intensity.

Table 2.1: Average operated area by CNF and non-CNF farmers across agroclimatic zones and farmers' categories during Rabi 2022-23

Agroclimatic zones & farmers' categories		per each sample farmer*			Per every Rabi cultivator		
		CNF	non-CNF	% difference	CNF	non-CNF	% difference
State	AP	0.47	0.46	0.81	0.99	1.07	-7.49
Agroclimatic zones	HAT	0.20	0.50	-60.88	0.92	0.69	33.25
	North coastal	0.71	0.61	16.03	1.00	1.04	-4.05
	Godavari	1.00	0.86	16.27	1.04	0.86	20.63
	Krishna	0.60	0.38	59.32	1.07	1.05	1.99
	Southern	0.48	0.43	10.28	0.89	0.89	-0.03
	Scares rainfall	0.33	0.43	-23.37	1.06	1.50	-29.27
Farm size category	Marginal	0.28	0.21	34.52	0.58	0.58	-0.47
	Small	0.56	0.71	-21.40	1.32	1.13	16.07
	Others	1.16	3.28	-64.61	2.16	4.65	-53.52
Tenurial status	Tenant	1.66	0.85	95.53	2.34	1.63	43.75
	Owner-tenant	0.27	0.62	-55.94	0.38	1.08	-64.75
	Owner	0.45	0.44	0.09	0.98	1.04	-6.34
Social category	SC	0.42	0.44	-4.76	0.78	1.33	-41.90
	ST	0.18	0.61	-70.85	0.86	0.67	27.52
	BC	0.53	0.41	29.07	1.01	1.09	-6.93
	OC	0.59	0.52	14.09	1.13	1.18	-4.08

* Include both cultivators and non-cultivators in the Rabi season.

Source: *IDSAP Survey 2022-23*

2.4. Conclusions

Larger presence of SC and ST farmers, women cultivators and young-age cultivators in CNF compared to non-CNF, is indicative of the positive inclusive policy of RySS. It also indicates that APCNF is attracting the marginalised sections and youth. It may take some time to see a notable impact of CNF on cropping intensity.

Chapter 3: Impact of CNF on the farming conditions

3.1. Introduction

In this chapter we put together results pertaining to the impact of CNF on farming conditions in the Rabi season of the agricultural year 2022-23. Climatic conditions differ as between Kharif and Rabi. Besides, unlike the Kharif season which depends upon monsoon, the Rabi season is shaped by irrigation and soil moisture and accordingly there will be differences between the two seasons in respect of crops grown, the use of inputs and the resultant output. We present below the unit values of costs and returns, crop-wise, under CNF and juxtapose them against those under non-CNF. The crops covered in the survey are Paddy, Maize, Groundnut, Black gram, Green gram, Bengal gram, and ragi. The analysis presented here will first deal with expenditure on Plant Nutrient and Protection Inputs (PNPIs) and paid-out costs and their structure. It will be followed by an analysis of yields - as noted from crop cutting experiments; prices realised for the output, gross value of output and net value of output. Since inter-regional and inter-personal differences are likely in costs and returns, we will provide a disaggregate analysis for 6 zones of the state (High Altitude, North Coastal, Godavari, Krishna, Southern and Scarce Rainfall), 3 size-classes of farmers (Marginal, Small and Others), 3 tenure groups (Pure tenants, Owner-tenants, and Pure Owners), and 4 social categories (SCs, STs, BCs, and OCs).

A brief note on the Kharif 2022-23 study conducted by us may be apt here. Cost of cultivation as seen from the expenditure on PNPIs and the paid-out costs were lower for CNF relative to non-CNF. Crop yields were about the same or higher for 4 of the 7 crops considered in the study. Chillies crop fared badly under CNF. CNF farmers could secure higher prices for their output. Net value of output is higher under CNF as compared to non-CNF in case of 5 of the 7 crops. The crops doing badly are Chillies and Groundnut. There is no definite pattern across crops in the performance of weaker sections including marginal farmers, pure tenants and SCs and STs.

3.2. Plant Nutrient and Protection Inputs (PNPIs)

The PNPIs relevant under CNF include biological inputs like Beejamrutham, Dravajeevamrutham, Ghanajeevamrutham, Kashayams for plant growth, and Asthrams for plat

protection. Preparation of these inputs involve much labour time but little cost as they can be prepared from items locally available. In contrast, PNPIs under non-CNF include fertilisers and pesticides and are costly as they are factory made. Thus, from the very beginning of the production process, the CNF farmer is on a better footing – she/ he requires to spend little on inputs. This was seen to be true in Kharif 2022-23 and now it is again the case in Rabi 2022-23. On average CNF farmers saved ₹6,636 (53 percent) in their expenditure on PNPIs vis-à-vis non-CNF farmers (Table 3.1). This is on lower side compared to previous years' results. One of possible reasons could be the composition of sample crop. Most of the sample crops, especially three pulses crops and Ragi are, usually, cultivated with less agrochemical inputs under non-CNF. This could be due to: (1) Higher expenditure by CNF farmers compared previous years. It reflects a growing confidence in CNF by the farmers and/ or an increase in cashflows with CNF farmers. (2) Secondly, it may be due to a reduction in the expenditure by non-CNF farmers on PNPIs, due to variety of reasons. Irrespective of the crop considered, the expenditure on PNPIs under CNF is about half of that under non-CNF. The expenditure on PNPIs is particularly low in case of Maize (58% less), Black gram (58%). In case of Paddy, the most predominant crop in the state, it is 50% less.

Table 3.1: Crop wise PNPI* Expenditure in Rabi 2022-2023

Crop	CNF	non-CNF	Difference between CNF & non-CNF		
	₹/ hectare		₹/ hectare	in %	Significance
Paddy	7,598	15,252	-7,654	-50	**
Groundnut	7,800	13,647	-5,847	-43	**
Bengal gram	3,717	8,386	-4,669	-56	**
Maize	8,723	20,948	-12,225	-58	**
Black gram	3,901	9,378	-5,477	-58	**
Green gram	3,742	6,406	-2,663	-42	**
Ragi	2,185	4,820	-2,635	-55	**
Average ²⁶	5,910	12,546	-6,636	-53	

* PNPI means plant nutrients and protection inputs, which include the biological stimulants under CNF and agrochemical inputs under non-CNF

Note: ** indicates significant at 1%.

Source: IDSAP, Field Survey 2022-23

²⁶ This is the weighted average of seven crops considered in the report and given in the table. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

3.3. Paid-out Costs

Besides spending on PNPIs, farmers, both CNF and non-CNF farmers, may require to spend on such inputs as seed, human labour, machine labour, bullock labour, farm yard manure (FYM), implements, irrigation and such others. In this study, the monetary values of all these inputs (both own and purchased/ hired inputs); and value of own and purchased PNPIs are included in the paid-out costs of cultivation.²⁷ We, however, did not consider the interest paid on the borrowed funds, depreciation of agriculture machinery²⁸ and other capital items, imputed value of the family labour, actual rent paid on lease-in land and the imputed rental value of owned land. Using exactly same method, we have arrived at estimates of the paid-out costs of the two groups of farmers.

Our village survey data clearly shows that the paid-out costs are higher under non-CNF compared to CNF in respect of all the seven crops that figured in the study (Table 3.2). In respect of Black gram, the cost is particularly higher under non-CNF – it is in excess of 20 per cent. The difference is almost non-existent in case of Ragi and Groundnut. It is prudent to look at the absolute values of the paid-out costs here because they reflect as to which of the seven crops are input intensive (the understanding is that the higher the absolute value of paid-out cost per hectare the higher is the input intensity of the crop). However, the average savings in paid-out cost is just ₹3,810 (7 percent) under CNF vis-à-vis non-CNF. This is on lower side compared to earlier studies. One of possible reasons could be the composition of sample crop. Most of the sample crops, especially three pulses crops and Ragi are, usually, cultivated with less agrochemical inputs under non-CNF. Hence, there will be less cost on input application also. Further, a quick analysis of previous years studies indicate that compared to CNF, the farming conditions under non-CNF fluctuate more widely in terms of expenditure on PNPIs, paid-out costs, yields and value of crop output. Farm investment is influenced by the annual weather, farmers expectations, availability of funds and credit, etc. It seems that during the current season of study, the non-CNF farmers have underinvested compared to their normal investment levels, in general and Paddy and Maize in particular.

Thus, we notice that among the seven crops, Groundnut is the most input intensive crop involving an expenditure of ₹68,788 per hectare under CNF and ₹69,587 per hectare under

²⁷ The paid-out cost used in the study is close to the cost concept of “cost A1” under Farm Management Surveys.

²⁸ All cost items are uniformly included and/ or excluded for both CNF and non-CNF farmers.

non-CNF – a difference of merely ₹799. Next, Paddy is also an input intensive crop with an expenditure of ₹58,240 per hectare and ₹61,306 per hectare under CNF and non-CNF respectively. Here the difference in expenditures amount to ₹3,066 or 5 per cent. The marginal differences in paid-out costs of Groundnut and Paddy between CNF and non-CNF come as a surprise because the difference in the expenditure on PNPIs in respect of the two crops is large, with CNF involving much less expenditure – a difference of 43 per cent in case of the former crop and 50 per cent in respect of the latter crop, between the two farming systems. This makes us to look at the structure or the relative shares of individual components of paid-out costs.

Table 3.2: Crop wise Paid-out Cost under CNF and non-CNF in Rabi 2022-2023

Crop	CNF	non-CNF	Difference between CNF & non-CNF		
	₹/ hectare	₹/ hectare	₹/ hectare	in %	Significance
Paddy	58,240	61,306	-3,066	-5	**
Groundnut	68,788	69,587	-799	-1	ns
Bengal gram	44,647	47,794	-3,147	-7	ns
Maize	57,984	64,875	-6,891	-11	**
Black gram	26,164	32,513	-6,348	-20	**
Green gram	24,379	25,183	-804	-3	ns
Ragi	25,861	26,192	-331	-1	*
Average ²⁹	47,837	51,647	-3,810	-7	

Note: **, *, ns indicates 1%,5% and non-significant respectively

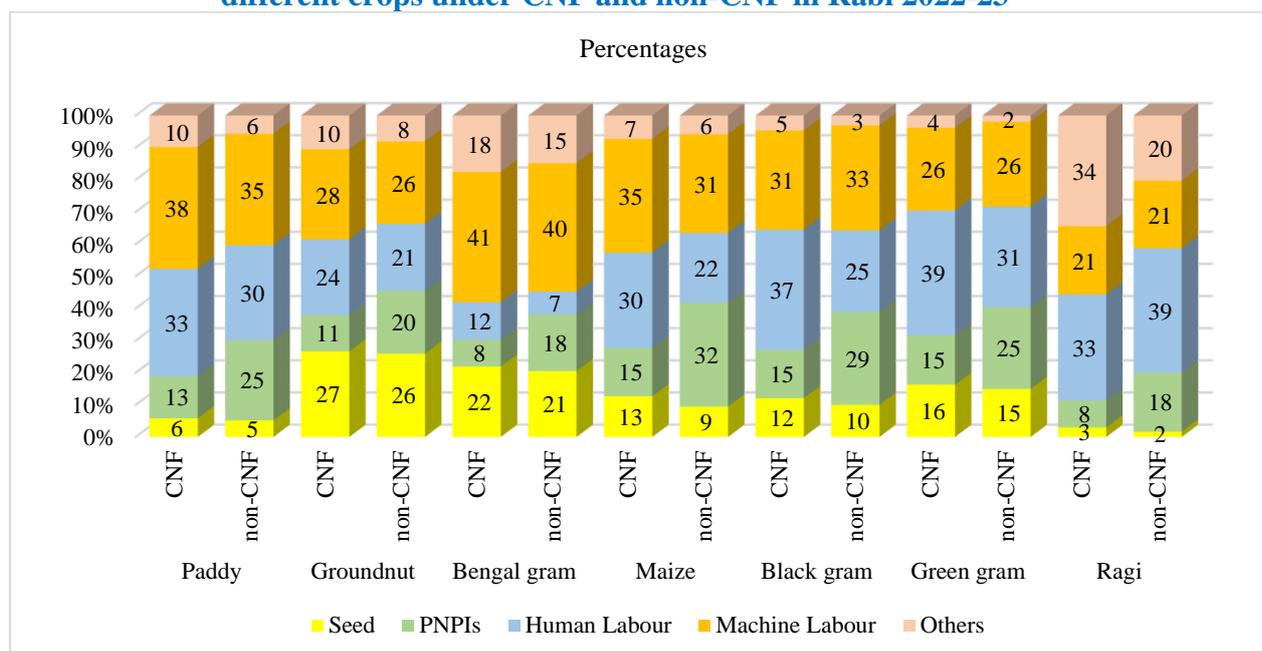
Source: IDSAP, Field Survey 2022-23

3.3.1. Structure of Paid-out Costs

The structure of paid-out costs by crop clearly shows the significance of human labour in the cost calculations of the farmers (Table 3.3). In respect of the crops that figure in the study the percentage share of human labour in the total paid-out cost is higher for CNF as compared to non-CNF. Thus, in respect of the Paddy, an input intensive crop, the percentage share of human labour is 33 percent for CNF farmers and 30 percent for the non-CNF farmers. For Groundnut, another input intensive crop, the corresponding percentages are 24 and 21. In respect of machine labour too Paddy and Groundnut account for a higher share in case of CNF farmers relative to non-CNF farmers.

²⁹ This is the weighted average of seven crops considered in the report and given in the table. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

Figure 3.1: Percentage shares of major agriculture inputs in the paid-out costs of different crops under CNF and non-CNF in Rabi 2022-23



Source: *IDSAP, Field Survey 2022-23*

Table 3.3: Percentage shares of major agriculture inputs in the paid-out costs of different crops under CNF and non-CNF in Rabi 2022-23

Input ↓	Paddy		Groundnut		Bengal gram		Maize		Black gram		Green gram		Ragi	
	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF
Seed	6	5	27	26	22	21	13	9	12	10	16	15	3	2
PNPIs	13	25	11	20	8	18	15	32	15	29	15	25	8	18
Human Labour	33	30	24	21	12	7	30	22	37	25	39	31	33	39
Machine Labour	38	35	28	26	41	40	35	31	31	33	26	26	21	21
Others	10	6	10	8	18	15	7	6	5	3	4	2	34	20
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: *IDSAP, Field Survey 2022-23*

Absolute expenditures on human and machine labour show the intensity of use of the two inputs in the production process both under CNF and non-CNF (Table 3.4). It is only in case of PNPIs that the CNF farmers are at a distinct advantage as their expenses towards the two inputs are practically zero. What emerges from the cost calculations is that it is possible for the CNF farmers to cut down on the paid-out costs provided they substitute paid human labour with unpaid family labour, which may be in the realm of possibility because the biological inputs that are used under CNF could be prepared with intermittent supply of family labour and not necessarily through the use of full-time and paid hired labour. This may require extension support to train the family labour in the nuances of preparing the biological inputs.

Table 3.4: Expenditure on major inputs in the paid-out costs of select crops under CNF and non-CNF in Rabi 2022-23

Crop → Units →	Paddy				Groundnut				Bengal gram				Maize	
	₹/hectare		Difference between CNF & non-CNF		₹/hectare		Difference between CNF & non-CNF		₹/hectare		Difference between CNF & non-CNF		₹/hectare	
Input ↓	CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>
Seed	3,398	3,191	207	6	18,319	18,036	283	2	9,790	9,806	-15	-0	7,357	6,126
PNPIs	7,598	15,252	-7,654	-50	7,800	13,647	-5,847	-43	3,717	8,386	-4,669	-56	8,723	20,948
H. Labour	19,479	18,134	1,345	7	16,178	14,475	1,704	11	5,201	3,422	1,779	34	17,198	14,108
Machinery	22,071	21,268	803	4	19,273	17,838	1,435	7	18,097	19,099	-1,002	-6	20,501	19,929
Others	5,694	3,460	2,233	39	7,218	5,592	1,626	23	7,841	7,081	760	10	4,205	3,765
Total	58,240	61,306	-3,066	-5	68,788	69,587	-799	-1	44,647	47,794	-3,147	-7	57,984	64,875

Source: IDSAP, Field Survey 2022-23

Table 3.4 Cont.

Crop → Units →	Maize		Black gram				Green gram				Ragi			
	Difference between CNF & non-CNF		₹/hectare		Difference between CNF & non-CNF		₹/hectare		Difference between CNF & non-CNF		₹/hectare		Difference between CNF & non-CNF	
Input ↓	₹/ hectare	In %	CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	₹/ hectare	In %
<i>1</i>	<i>16</i>	<i>17</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>	<i>23</i>	<i>24</i>	<i>25</i>	<i>26</i>	<i>27</i>	<i>28</i>	<i>29</i>
Seed	1,231	17	3,163	3,253	-90	-3	3,963	3,757	206	5	764	434	331	43
PNPIs	-12,225	-58	3,923	9,378	-5,455	-58	3,742	6,406	-2,663	-42	2,185	4,820	-2,635	-55
H. Labour	3,090	18	9,796	8,270	1,526	16	9,478	7,887	1,591	17	8,518	10,128	-1,610	-19
Machinery	572	3	8,069	10,618	-2,549	-32	6,263	6,647	-384	-6	5,499	5,503	-4	-0
Others	440	10	1,213	994	220	18	933	486	447	48	8,895	5,308	3,587	40
Total	-6,891	-12	26,164	32,513	-6,348	-24	24,379	25,183	-804	-3	25,861	26,192	-331	-1

Source: IDSAP, Field Survey 2022-23

3.4. Crop Yields

The yields arrived at based on crop cutting experiments (CCEs) turned out to be same, i.e., no difference statistically, in five out of seven crops. In other two crops, viz., Maize and Groundnut, the yields under CNF are, statistically, higher than that of non-CNF (Table 3.5). In respect of Maize CNF yields are substantially higher (12.05%) followed by Groundnut (7.37%).

Table 3.5: Crop-wise CCE Yields under CNF and non-CNF and their differences in Rabi 2022-2023

Crop	quintals/ hectare		Difference between CNF & non-CNF		
	CNF	non-CNF	quintals/ha	in %	Significance
Paddy	55.34	57.95	-2.61	-4.50	ns
Groundnut	27.32	25.45	1.88	7.37	*
Bengal gram	17.27	16.37	0.90	5.51	ns
Maize	77.35	69.03	8.32	12.05	**
Black gram	12.65	13.12	-0.47	-3.59	ns
Green gram	13.01	13.78	-0.77	-5.61	ns
Ragi	14.06	14.80	-0.74	-5.00	ns

Note: **, *, ns indicates 1%,5% and non-significant respectively

Source: IDSAP, Field Survey 2022-23

3.5. Prices Commanded by CNF Output

The prices commanded by CNF and non-CNF output are, statistically, different in four out of seven crops considered in this report. Out of those four crops, the prices received by CNF farmers are higher in three crops. In case of Paddy the price is 7.64% higher. This makes up to some extent for the lower yield of Paddy under CNF by 4.50%. The prices of Maize (3.44%) and Groundnut (3.26%) are also higher under CNF. This is on top of the higher yields of the two crops under CNF relative to non-CNF. Only in Black gram the prices of non-CNF are higher than that of CNF (Table 3.6). Apart from growing interest for CNF output, bulk buying by Tirumala Tirupathi Devasthanam (TTD), besides Rythu Bazar outlets could be the reasons for higher prices obtained for CNF output.

Table 3.6: Crop wise prices obtained by CNF and non-CNF output in Rabi 2022-23

Crop	₹/quintal		Difference between CNF & non-CNF		
	CNF	non-CNF	₹/quintal	in %	Significance
Paddy	2,051	1,905	146	7.64	**
Groundnut	6,512	6,307	206	3.26	*
Bengal gram	6,316	6,486	-170	-2.62	ns
Maize	1,954	1,889	65	3.44	**
Black gram	6,678	6,901	-222	-3.22	*
Green gram	6,888	6,985	-97	-1.40	ns
Ragi	2,677	2,679	-2	-0.08	ns

Note: **, *, ns indicates 1%,5% and non-significant respectively

Source: IDSAP, Field Survey 2022-23

3.6. Gross Value of Output

The gross value of output has been obtained by multiplying yield with prices and adding value of by-product of the crop. Thus, yield and prices of crop are crucial in determining the gross value of output. The difference between the CNF and the non-CNF in respect of the gross value of output per hectare is positive in case of four out of the seven crops viz., Paddy (2.89%), Maize (15.90%), Groundnut (10.87%) and Bengal gram (2.74%); all these are statistically significant (Table 3.7). And it is negative in respect of Black gram (6.69%), Green gram (6.93%) and Ragi (5.08%). But the difference is not statistically significant in case of Green gram.

Table 3.7: Crop wise gross value output under CNF and non-CNF in Rabi 2022-2023

Crop	₹/ ha.		Difference between CNF & non-CNF		
	CNF	non-CNF	₹/ ha.	in %	Significance
Paddy	1,11,155	1,08,031	3,123	3	*
Groundnut	1,77,941	1,60,494	17,447	11	*
Bengal gram	1,09,101	1,06,188	2,913	3	*
Maize	1,51,172	1,30,429	20,743	16	**
Black gram	84,458	90,515	-6,057	-7	**
Green gram	89,591	96,262	-6,670	-7	ns
Ragi	37,644	39,659	-2,015	-5	**
<i>Average</i> ³⁰	<i>1,11,445</i>	<i>1,08,175</i>	<i>3,270</i>	<i>3</i>	

Note: ‘**’, ‘*’, ‘ns’ indicates 1%, 5% and non-significant respectively

Source: IDSAP, Field Survey 2022-23

3.7. Net Value of Output per Hectare:

In the ultimate analysis, it is the net value, defined as the gross value minus paid-out costs, of per acre output that counts (Table 3.8). Since the CNF farmers have a distinctly lower paid-out costs per hectare they are better placed to secure higher net return per hectare even if yields are not always higher for them by virtue of higher unit price commanded by CNF output. We notice that the net return is higher under CNF in case of five out of seven crops – the crops being Paddy (13.25%), Maize (42.15%), Groundnut (20.07%), Black gram (0.50%), and Bengal gram (10.38%). Out of these five crops the differences are statistically significant in the four crops. The net value in case of the two crops are lower under CNF by 8 % in Green gram and 13% in Ragi. But only in Ragi, the net value of CNF output is significantly less than that of non-CNF. Note that it is in respect of Paddy and Maize the net value are clearly higher under CNF both in the Kharif and Rabi seasons.

³⁰ This is the weighted average of seven crops considered in the report and given in the table. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

Table 3.8: Crop wise net value of CNF and non-CNF output in Rabi 2022-23

Crop	CNF ₹/ hectare	non-CNF	Difference between CNF & non-CNF		Significance
			₹/ hectare	in %	
Paddy	52,915	46,726	6,190	13	**
Groundnut	1,09,152	90,907	18,245	20	**
Bengal gram	64,455	58,395	6,060	10	ns
Maize	93,187	65,554	27,634	42	**
Black gram	58,294	58,002	292	1	*
Green gram	65,212	71,079	-5,867	-8	ns
Ragi	11,783	13,467	-1,684	-13	**
Average ³¹	63,608	56,529	7,080	13	

Note: **, *, ns indicates 1%, 5% and non-significant respectively

Source: IDSAP, Field Survey 2022-23

3.8. Crop-wise disaggregate analysis of farming conditions

The major objective of disaggregate analyses is to see whether the resource poor regions/ zones and farmers categories are getting benefitted from CNF or not. Our sample size is reasonably big to carry out a disaggregate analysis of farming conditions across the agroclimatic zones and farmers' categories. For the sake brevity, the crop wise analyses are limited to crop yields and net value of crop output. The CCE yields are used in these analyses. The number of CCEs in each zone, for each category of farmers are given in the corresponding tables below. Wherever, there are no counterfactual data, those zones and farmers categories are deleted from the analyses. In a few cases, the number of CCEs/ observations are too small. The results in such instances may be treated as indicative evidence.

3.8.1. Paddy

The farming conditions of Paddy under CNF and non-CNF, at the disaggregate level, along with the number of sample observations/ CCEs are presented in Table 3.9. As the Paddy yields under CNF are less than that of non-CNF, at the aggregate level, almost all agroclimatic zones and farmers' categories reflected the same. The exceptions are North coastal and Scarce rainfall zones. Both have relatively a small number of sample observations. On the other hand, barring HAT zone, all agroclimatic zones recorded a greater net value of output under CNF, again reflecting the state's trend. Though both marginal and small farmers got lower yields under CNF, marginal farmers got 32 percent larger net value and small farmers got 28 percent lower

³¹ This is the weighted average of seven crops considered in the report and given in the table. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

net value under CNF. All three tenurial categories have lower yields and greater net value under CNF. Among four social categories, SCs and STs have lower yields and net value of output under CNF. At the same time, BCs have higher yields and higher net value under CNF. On the other hand, OCs have lower yields and substantially higher net value under CNF. It implies that OCs have an edge in marketing their CNF output.

Table 3.9: Agroclimatic zone and farmers' category wise farming conditions of Paddy under CNF and non-CNF in Rabi 2022-23

Agroclimatic zones & farmers' categories	Number of samples		Crop yields				Net Value of output			
			(quintals/hectare)		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quinta l/ ha.	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
HAT	12	11	27.77	41.50	-13.73	-33	8,144	20,449	-12,305	-60
North coastal	3	12	56.79	56.06	0.73	1	73,925	68,192	5,733	8
Godavari	47	37	61.52	66.95	-5.43	-8	62,231	52,356	9,875	19
Southern	103	38	55.67	56.53	-0.86	-2	51,734	47,314	4,421	9
Scarce rainfall	2	6	59.16	45.41	13.75	30	66,454	33,028	33,425	101
Total	170	104	55.34	57.95	-2.62	-5	55,235	49,101	6,190	13
Farm size category										
Marginal	123	80	56.83	57.57	-0.74	-1	56,656	42,990	13,666	32
Small	35	23	48.03	59.82	-11.80	-20	34,141	47,685	-13,545	-28
Others	12	1	61.36	45.47	15.90	35	72,123	54,475	26,647	59
Total	170	104	55.34	57.95	-2.62	-5	55,235	49,101	6,190	13
Tenurial status										
Tenants	12	8	54.58	62.16	-7.58	-12	41,769	38,461	3,308	9
Owner-tenants	10	3	57.08	57.49	-0.40	-1	59,930	49,779	5,151	10
Owners	148	93	55.28	57.61	-2.33	-4	53,272	48,332	4,940	10
Total	170	104	55.34	57.95	-2.62	-5	55,235	49,101	6,190	13
Social category										
SC	33	5	49.92	61.35	-11.43	-19	42,968	60,180	-17,212	-29
ST	13	17	29.84	47.07	-17.23	-37	22,717	25,204	-2,487	-10
BC	53	41	59.77	58.59	1.18	2	55,364	42,448	8,186	19
OC	71	41	59.21	61.41	-2.20	-4	48,378	31,726	16,651	52
Total	170	104	55.34	57.95	-2.62	-5	55,235	49,101	6,190	13

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.2. Groundnut

Disaggregate data of Groundnut farming conditions are shown in Table 3.10. The state level trend has reflected in all, but one, agroclimatic zones and all size-classes, tenure groups and social categories. CNF yields and net value of output are greater than that of non-CNF for every farmer category and in two out of three zones. The results once again confirm that every region,

including resource poor Scarce rainfall zone and every farmer, irrespective his/ her farm size, tenurial and social status, can get benefitted by the CNF.

Table 3.10: Agroclimatic zone and farmers' category wise farming conditions of Groundnut under CNF and non-CNF in Rabi 2022-23

Agroclimatic Zones & Categories of farmers	Number of sample/ CCEs		CCE yields				Net value			
			(quintals/ hectare)		Difference between CNF & non-CNF		(₹/ hectare)		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	(qntl/ ha.)	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
North coastal	5	5	13.78	17.73	-3.95	-22	87,504	1,07,118	-19,614	-18
Southern	92	60	29.13	26.37	2.76	10	1,25,219	1,03,623	21,596	21
Scarce rainfall	64	69	25.79	25.21	0.58	2	89,596	77,989	11,607	15
Total	161	134	27.32	25.45	1.88	7	1,09,152	90,907	18,246	20
Farm size category										
Marginal	101	71	26.40	25.24	1.16	5	1,02,238	92,616	9,621	10
Small	32	47	30.44	26.21	4.24	16	1,32,545	95,729	36,817	38
Others	28	16	27.10	24.16	2.94	12	1,05,832	70,680	35,152	50
Total	161	134	27.32	25.45	1.88	7	1,09,152	90,907	18,246	20
Tenurial status										
Owners	149	131	26.70	25.49	1.21	5	1,05,293	91,153	14,140	16
Total	161	134	27.32	25.45	1.88	7	1,09,152	90,907	18,246	20
Social category										
SC	20	2	27.59	26.05	1.54	6	1,13,035	63,978	49,057	77
BC	82	95	26.05	25.66	0.39	2	1,03,280	94,454	8,826	9
OC	54	37	29.52	24.87	4.65	19	1,20,866	84,146	36,720	44
Total	161	134	27.32	25.45	1.88	7	1,09,152	90,907	18,246	20

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.3. Bengal gram

The farming conditions of Bengal gram at the disaggregated level are presented in Table 3.11. In respect of Bengal gram, CNF fared well in all zones in which the crop is grown; and for all farmers' categories, who cultivated the crop. Simply, the disaggregated results mirrored the state level performance of the crop. However, there are a couple of interesting factors to note. Firstly, the Scarce rainfall, the resource poor, zone did much better than the average performance in the state. The zone recorded 70 and 53 percent greater yields and net value respectively under CNF. The same are 6 and 10 percent at the state level. Given the small size of sample in this zone, the results may be considered as indicative results. Another interesting factor is that the better off sections such as other farmers in farm size category, owner farmers in tenurial category and OC farmers in social category, of CNF got relatively a greater net value of output over the remaining categories in CNF and counterparts in non-CNF. These are

generic marketing problems for both CNF and non-CNF farmers. However, the results indicate that if the farmers have access to storage facilities and a bit bargaining power³², the CNF could be more beneficial. It implies that RySS may also focus on linking the CNF farmers with rural warehouses and farmers producers' companies (FPCs).

Table 3.11: Agroclimatic zone and farmers' category wise farming conditions of Bengal gram under CNF and non-CNF in Rabi 2022-23

Agroclimatic zones & farmers' categories	Number of sample (number)		Crop (CCE) yields				Net Value			
			quintals/hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	(₹/ ha.)	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
Krishna	39	39	16.50	16.05	0.44	3	64,677	57,078	7,598	13
Scarce rainfall	8	2	21.06	12.39	8.67	70	50,369	32,875	17,494	53
Total*	47	55	17.27	16.37	0.90	6	64,455	58,395	6,060	10
Farm size category										
Marginal	38	31	17.12	16.86	0.26	2	60,108	58,135	1,973	3
Small	7	15	18.10	15.92	2.18	14	90,916	74,574	16,342	22
Others	2	9	17.37	15.45	1.92	12	78,416	44,913	33,503	75
Total*	47	55	17.27	16.37	0.90	6	64,455	58,395	6,060	10
Tenurial status										
Owners	38	43	17.46	16.65	0.81	5	56,435	47,632	8,802	18
Total*	47	55	17.27	16.37	0.90	6	64,455	58,395	6,060	10
Social category										
BC	11	22	18.61	16.68	1.93	12	68,179	61,784	6,396	10
OC	34	33	17.32	16.17	1.15	7	66,374	56,104	10,270	18
Total*	47	55	17.27	16.37	0.90	6	64,455	58,395	6,060	10

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.4. Maize

The disaggregated farming conditions data of Maize under CNF and non-CNF are presented in Table 3.12. The data clearly indicates that resource poor zones and categories of farmers too can get equally benefitted. While resource rich Godavari and moderately resource rich North coastal zones fared badly under CNF, moderately resource rich Krishna and resource poor Scarce rainfall zones performed better. Among farm size category, the marginal farmers obtained highest benefits under CNF, followed by small and other farmers. The owner-tenants among tenurial category and SCs and STs in social category got highest benefits under CNF.

³² Which are the characteristics of the better of farmers.

Table 3.12: Agroclimatic zone and farmers' category wise farming conditions of Maize under CNF and non-CNF in Rabi 2022-23

Agroclimatic Zones & farmers' categories	Number of samples		Crop [CCE] yields				Net value			
			quintals/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between of CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quintals/ hectare	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
North coastal	36	15	61.61	78.69	-17.07	-22	63,203	76,209	-13,006	-17
Godavari	10	8	65.34	78.02	-12.68	-16	67,093	80,455	-13,362	-17
Krishna	109	35	85.50	78.63	6.87	9	1,11,159	66,824	44,335	66
Scarce rainfall	32	37	71.06	67.71	3.35	5	81,633	74,518	7,116	10
Total*	187	115	77.35	69.03	8.32	12	93,187	65,554	27,634	42
Farm size category										
Marginal	111	76	73.92	65.75	8.17	12	85,133	58,167	26,967	46
Small	46	32	81.16	73.84	7.31	10	99,405	74,302	25,104	34
Others	30	7	84.21	82.62	1.59	2	1,14,247	1,06,521	7,725	7
Total*	187	115	77.35	69.03	8.32	12	93,187	65,554	27,634	42
Tenurial status										
Tenants	25	2	84.09	93.20	-9.10	-10	1,16,088	1,00,649	15,439	15
Owner-tenants	13	8	71.88	52.89	18.99	36	75,807	33,920	41,887	123
Owners	149	105	76.70	69.80	6.90	10	91,530	67,466	24,064	36
Total*	187	115	77.35	69.03	8.32	12	93,187	65,554	27,634	42
Social category										
SC	52	14	87.34	72.78	14.56	20	1,11,206	57,285	53,920	94
ST	3	11	86.62	58.27	28.35	49	1,15,056	62,480	52,576	84
BC	94	66	67.89	67.54	0.35	1	77,405	61,362	16,043	26
OC	38	24	86.34	75.87	10.47	14	1,03,479	73,273	30,205	41
Total*	187	115	77.35	69.03	8.32	12	93,187	65,554	27,634	42

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.5. Black gram

At the state level, the Black gram yields under CNF are less than that of non-CNF by 4 percent; but the net value of CNF output is larger than that of non-CNF by 1 percent. However, there are mixed trends across the agroclimatic zones and farmers categories (Table 3.13). While the CNF farmers, in relatively better-off (resource rich) zones, viz., Godavari and Krishna, underperformed in terms of yields and net value of Black gram, the CNF farmers in resource poor zones, viz., North coastal, Southern and Scarce rainfall zones, have accomplished higher yields and net value of output over non-CNF farmers. Except BCs and OCs, all other farmers' categories of CNF farmers got lower yields. Only marginal, owner and BC CNF farmers got higher net value of output.

Table 3.13: Agroclimatic zone and farmers' category wise farming conditions of Black gram under CNF and non-CNF in Rabi 2022-23

Agroclimatic zones & farmers' categories			CCE yields				Net value			
	Number of samples		quintals/hectare		Difference between CNF & non-CNF		Net value of output (₹./ hectare)		Difference between NF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quintals/hectare	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
North coastal	54	24	10.42	6.08	4.35	72	55,900	25,170	30,730	122
Godavari	19	33	16.35	16.61	-0.26	-2	70,563	83,820	-13,257	-16
Krishna	68	28	13.09	14.44	-1.35	-9	61,123	72,323	-11,200	-15
Southern	5	2	20.17	18.57	1.59	9	1,00,091	70,358	29,733	42
Scarce rainfall	14	8	16.44	13.85	2.59	19	88,180	48,447	39,734	82
Total*	172	95	12.65	13.12	-0.47	-4	58,294	58,002	292	1
Farm size category										
Marginal	110	71	12.39	12.85	-0.45	-4	57,721	53,229	4,492	8
Small	45	17	12.86	13.44	-0.58	-4	60,126	69,342	-9,215	-13
Others	17	7	13.72	15.06	-1.34	-9	58,595	63,049	-4,454	-7
Total*	172	95	12.65	13.12	-0.47	-4	58,294	58,002	292	1
Tenurial status										
Tenants	19	13	13.30	14.39	-1.10	-8	70,729	90,085	-19,356	-21
Owner cum tenants	13	5	13.27	17.66	-4.39	-25	72,024	83,850	-11,825	-14
Owners	140	77	12.50	12.61	-0.11	-1	56,360	51,520	4,840	9
Total*	172	95	12.65	13.12	-0.47	-4	58,294	58,002	292	1
Social category										
SC	40	15	13.53	17.71	-4.18	-24	62,200	76,540	-14,340	-19
BC	88	42	11.86	10.38	1.47	14	55,499	36,790	18,709	51
OC	33	38	14.49	14.32	0.17	1	70,356	74,270	-3,914	-5
Total*	172	95	12.65	13.12	-0.47	-4	58,294	58,002	292	1

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.6. Green gram

At the state level the CNF farmers got less yields and net value of output of Green gram compared to their counterparts in non-CNF. The same is true in all zones, where data is available; and almost all farmers categories presented in Table 3.14. The only exceptions are BC farmers, who got higher yield and net value of Green gram under CNF and SC farmers, who attained higher net value under CNF.

Table 3.14: Agroclimatic zone and farmers' category wise farming conditions of Green gram under CNF and non-CNF in Rabi 2022-23

Agroclimatic zones & Categories of farmers			CCE yields				Net value of output			
	Number of samples		(quintals/ hectare)		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quintals/ hectare	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
Godavari	6	19	11.28	12.66	-1.38	-11	78,402	85,957	-7,556	-9
Krishna	41	40	13.07	14.31	-1.24	-9	60,184	60,109	75	0
Total*	49	59	13.01	13.78	-0.77	-6	65,212	71,079	-5,867	-8
Farm size category										
Marginal	44	48	12.88	13.63	-0.75	-5	63,876	64,679	-803	-1
Small	4	11	12.89	14.46	-1.57	-11	73,382	86,987	-13,604	-16
Total*	49	59	13.01	13.78	-0.77	-6	65,212	71,079	-5,867	-8
Social category										
SC	34	10	12.82	13.92	-1.10	-8	58,489	54,194	4,295	8
BC	6	25	14.45	13.35	1.10	8	65,828	63,059	2,769	4
OC	9	24	12.76	14.17	-1.41	-10	83,138	84,393	-1,254	-1
Total*	49	59	13.01	13.78	-0.77	-6	65,212	71,079	-5,867	-8

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.8.7. Ragi

As the CNF Ragi yields and net value of output are lower than that of non-CNF, at the state level, none among the CNF farmers growing Ragi performed better than non-CNF farmers well in general, in terms of yields (Table 3.15). The only exception is small farmers, who obtained 1 percent higher yields under CNF. On the other hand, the HAT zone, where Ragi cultivation is concentrated, and consequently ST farmers obtained higher net value of output under CNF.

Table 3.15: Agroclimatic zone and farmers' category wise farming conditions of Ragi under CNF and non-CNF in Rabi 2022-23

Agroclimatic zones & farmers' categories			Crop (CCE) yields				Net value of output			
	Number of samples		quintals/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quintals/ hectare	in %	CNF	non-CNF	(₹/ ha.)	in %
Agroclimatic zones										
HAT	73	54	14.27	14.87	-0.60	-4	13,600	11,392	2,208	19
North coastal	8	6	12.17	14.20	-2.03	-14	2,615	41,495	-38,879	-94
Total*	81	60	14.06	14.80	-0.74	-5	11,783	13,467	-1,684	-13
Farm size category										
Marginal	44	33	13.26	14.26	-1.00	-7	7,674	24,788	-17,114	-69
Small	33	20	15.18	15.06	0.13	1	16,496	4,773	11,723	246
Others	4	7	13.59	16.63	-3.04	-18	25,113	20,629	4,484	22

Agroclimatic zones & farmers' categories	Number of samples		Crop (CCE) yields				Net value of output			
			quintals/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	CNF	non-CNF	quintals/ hectare	in %	CNF	non-CNF	(₹/ ha.)	in %
Total	81	60	14.06	14.80	-0.74	-5	11,783	13,467	-1,684	-13
Tenurial status										
Owners	81	60	14.06	14.80	-0.74	-5	11,473	13,467	-1,994	-15
Total*	81	60	14.06	14.80	-0.74	-5	11,783	13,467	-1,684	-13
Social category										
ST	73	54	14.27	14.87	-0.60	-4	13,451	11,392	2,059	18
BC	8	5	12.17	15.77	-3.60	-23	2,615	48,486	-45,871	-95
Total*	81	60	14.06	14.80	-0.74	-5	11,783	13,467	-1,684	-13

* Totals include the left-out data of other zones and other farmers' categories.

Source: IDSAP, Field Survey 2022-23

3.9. Conclusions

In this report the differences in farming conditions between CNF and non-CNF have been tested for their statistical significance. The tests have added value to the analysis and provided additional insights.

The average difference in the expenditure on PNPIs between CNF and non-CNF is ₹6,636 (53 percent) per hectare. This is on lower side compared to previous years' results. This could be due to two reasons. (1) Firstly, a higher expenditure on PNPIs by CNF farmers compared previous years. It reflects a growing confidence in CNF by the farmers and/ or an increase in cashflows with CNF farmers. (2) Secondly, it may be due to a reduction in the expenditure by non-CNF farmers on PNPIs, due to variety of reasons.

The average savings in paid-out cost is just ₹3,810 (7 percent) under CNF vis-à-vis non-CNF. This is on lower side compared to earlier studies. One of possible reasons could be the composition of sample crop. Most of the sample crops, especially three pulses crops and Ragi are, usually, cultivated with less agrochemical inputs under non-CNF. Hence, there will be less cost on input application also. Further, a quick analysis of previous years studies indicate that compared to CNF, the farming conditions under non-CNF fluctuate more widely in terms of expenditure on PNPIs, paid-out costs, yields and value of crop output. Farm investment is influenced by the annual weather, farmers expectations, availability of funds and credit, etc. It seems that during the current season of study, the non-CNF farmers have under invested compared to their normal investment levels, in general and Paddy and Maize in particular.

There are no yield differences, statistically, in five out of seven crops. In other two crops, viz., Maize and Groundnut, the yields under CNF are, statistically, higher than that of non-CNF.

The gross value of CNF output are significantly greater than that of non-CNF in four crops and significantly less in two crops. The differences between the net value of CNF and non-CNF outputs are statistically significant in five out of seven crops considered in this report. Out of these five crops, the net value of CNF output are greater than non-CNF output in four crops.

The results of disaggregated analyses indicate that the state level trends have been reflected by majority of agroclimatic zones and farmers categories, in all crops, with some notable exceptions. The analyses, further, suggest that the resource poor agroclimatic zones and farmers too can get equal benefits from CNF in general. If the farmers provided access to marketing infrastructure like storehouses and FPCs, the CNF farmers can get more benefits.

Chapter 4: Impact of CNF on resource-use

4.1. Introduction:

Apart from improving the farming conditions, as discussed in the previous chapter, CNF is expected to positively impact the use of various farm inputs. The inputs dealt with in the analysis in the chapter are land, human labour, water, livestock, agriculture technologies/practices and credit. These changes, in turn, are expected to improve the farmers' wealth and wellbeing. For example, the land quality and productivity are expected to increase; further the land is expected to be used more intensively and extensively under CNF. All these change may improve the value of land and annual returns from the land. As land is used throughout the years and put under multiple crops instead of monocropping, the family labour could be utilized optimally in small quantities over a long period. This, in turn, will reduce the incidence of disguised unemployment and need for distress employment in agriculture families; and labour productivity of the family labour. Since CNF is based on cattle dung and urine, farmers are compelled to rear livestock. It will enable CNF farmers to reap the potential benefits from the symbiotic relation between crop cultivation and livestock rearing. The savings in expenditure on agrochemicals would not only improve the financial conditions of the farmers, but also save them from the agony of their dependency on input and credit markets, which are often unfair to the farmers and exploitative.

4.2. Impact of CNF on land use

It is possible that land use could differ between the CNF and non-CNF farmers – the percentage of operated area put to cultivation by the two groups of farmers may differ because of differences in input use and requirement such as irrigation, PNPIs, and working capital. But as the sample is drawn on the basis of identical cropping pattern, the difference could be limited in the present study. As mentioned in chapter 1, only 47 and 43 percent of sample drawn at the beginning of the annual study, have cultivation in Rabi 2022-23. The average area cultivated by CNF and non-CNF sample farmers and actual Rabi cultivators are shown in Table 4.1. On average cultivated area during Rabi 2022-23 is 0.47 and 0.46 hectares for CNF and non-CNF sample farmers (including both cultivators and non-cultivators during the survey season) respectively. On the other hand, the average area cultivated is 0.99 and 1,07 hectares for CNF and non-CNF cultivators respectively during Rabi 2022-23 season. There are marked variations across the agroclimatic zones due to variations in local conditions. Command over resources

is not appeared to be the influencing factors. For example, while CNF landless tenant farmers have larger operated area, the owner-tenants have less operated area compared to their counterparts in non-CNF. Similarly, the marginal and small farmers have shown contrasting scenarios. Same is case of SC and ST farmers.

Table 4.1: Agroclimatic zones & farmers' categories wise average operated area by CNF and non-CNF farmers in Rabi 2022-23 (ha.)

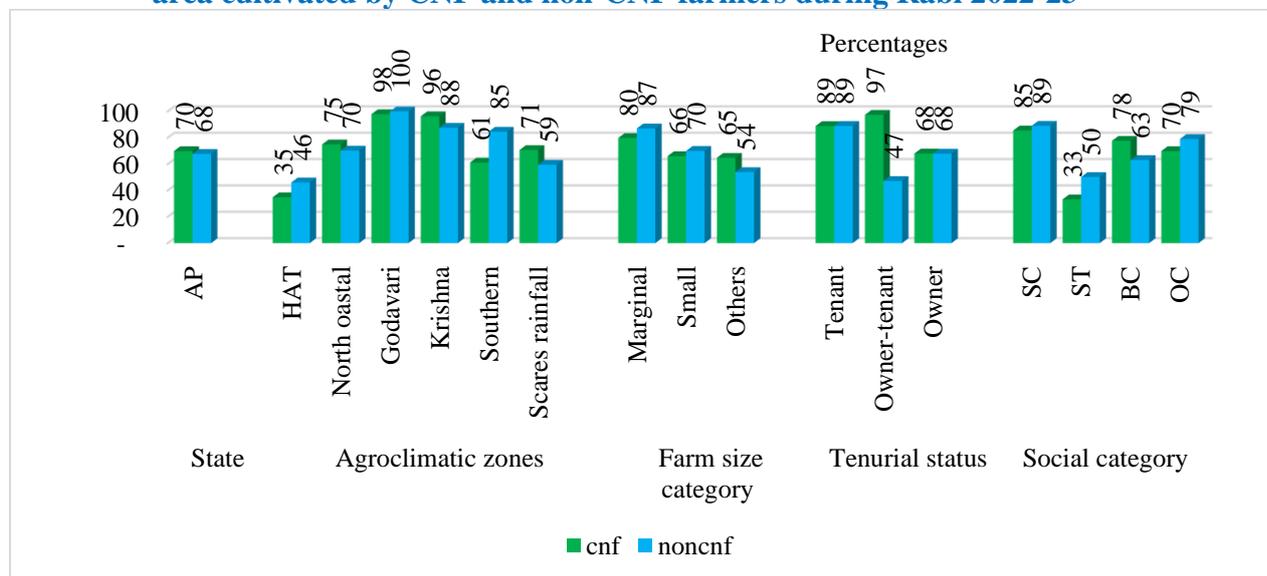
Agroclimatic zones & farmers' categories		Sample farmer			Actual Rabi cultivator		
		CNF	non-CNF	% difference	CNF	non-CNF	% difference
State	AP	0.47	0.46	0.81	0.99	1.07	-7.49
Agroclimatic zones	HAT	0.20	0.50	-60.88	0.92	0.69	33.25
	North coastal	0.71	0.61	16.03	1.00	1.04	-4.05
	Godavari	1.00	0.86	16.27	1.04	0.86	20.63
	Krishna	0.60	0.38	59.32	1.07	1.05	1.99
	Southern	0.48	0.43	10.28	0.89	0.89	-0.03
	Scares rainfall	0.33	0.43	-23.37	1.06	1.50	-29.27
Farm size category	Marginal	0.28	0.21	34.52	0.58	0.58	-0.47
	Small	0.56	0.71	-21.40	1.32	1.13	16.07
	Others	1.16	3.28	-64.61	2.16	4.65	-53.52
Tenurial status	Tenant	1.66	0.85	95.53	2.34	1.63	43.75
	Owner-tenant	0.27	0.62	-55.94	0.38	1.08	-64.75
	Owner	0.45	0.44	0.09	0.98	1.04	-6.34
Social category	SC	0.42	0.44	-4.76	0.78	1.33	-41.90
	ST	0.18	0.61	-70.85	0.86	0.67	27.52
	BC	0.53	0.41	29.07	1.01	1.09	-6.93
	OC	0.59	0.52	14.09	1.13	1.18	-4.08

Source: *IDSAP, Field Survey 2022-23*

Another indicator, which may reflect the impact of CNF on land utilization is the percentage of total operated area cultivated during any season. During Rabi 2022-23, while CNF farmers cultivated 70 percent of their operated area, non-CNF farmers cultivated 68 percent of their operated area. As mentioned, the samples are drawn from two lists of CNF and non-CNF farmers with similar cropping pattern, there is no big difference at the aggregate level. However, there are notable differences across the agroclimatic zones and farmers categories. But the differences are not so big within each agroclimatic zones and farmers categories (Figure

4.1). It indicates that local factors have larger influence on area cultivated during the study period.

Figure 4.1: Agroclimatic zone and farmers’ categories wise percentage of operational area cultivated by CNF and non-CNF farmers during Rabi 2022-23



Source: *IDSAP, Field Survey 2022-23*

Another indicator, which reflects the CNF impact on land use is the number of crop cover days over CNF vis-a-vis non-CNF fields during 2022-23. During the reference period - March 2022 to May 2023, CNF fields of CNF farmers have 187 days of crop cover, the non-CNF fields of non-CNF farmers have 167 days crop cover. That is, CNF fields have 20 days or 12 percent of additional crop cover compared to non-CNF fields (Table 4.2). Though at the difference at aggregate level is small, there are wider and surprising variations across the agroclimatic zones. In Krishna zone, the difference between CNF and non-CNF is the maximum in the crop cover on fields, 119%. On the other hand, North coastal and HAT zone, the non-CNF fields have more days of crop cover. Given the culture and traditions of these zones, the results may not be surprising. In some parts of these zones, the farmers grow three crops continuously every year (“Paddy → Pulses → Sesamum”). In some other parts, farmers grow green manure crops, invariably, before the Kharif crops. Apart from wider contrasting variations across the zones, one of the possible reasons for moderately (12%) higher crop cover over CNF fields vis-à-vis non-CNF fields, is the composition of CNF and non-CNF samples. As mentioned above that CNF and non-CNF samples were selected based on same cropping pattern. Given the uniform cropping pattern, the crop cover may not differ. The 12 percent longer crop cover over CNF fields could be attributed to the PMDS. Interestingly, the poorer sections, such as the marginal

farmers, tenant farmers, and SC farmers have considerably longer crop covers over their CNF fields. This results once again indicate that CNF (model/ technology) is scale-neutral and resource-neutral; and can be adopted by anyone.

Table 4.2: Agroclimatic zones and farmers categories wise number of crop cover days over CNF and non-CNF fields during March 2022 and May 2023

Agroclimatic zones and farmers categories	Number of days			% difference between CNF and non-CNF
	CNF	Non-CNF	Difference between CNF & non-CNF	
AP	187	167	20	12
Agroclimatic zones				
HAT	161	192	-31	-16
North coastal	174	210	-36	-17
Godavari	152	128	24	19
Krishna	228	104	124	119
Southern	183	159	24	15
Scarce rainfall	197	171	26	15
Farm categories				
Marginal	173	133	40	30
Small	187	186	1	0
Others	222	195	26	14
Tenurial categories				
Tenants	213	143	70	49
Owner -tenants	212	157	55	35
Owners	184	168	17	10
Social categories				
SC	203	157	46	30
ST	158	190	-32	-17
BC	196	167	29	17
OC	188	154	34	22

Source: *IDSAP, Field Survey 2022-23*

One of the important indicators, which reveals the beneficial potential of CNF to the farmers is increase in area allocation to CNF. If farmers perceive a sustained positive benefits from CNF, they would not only continue CNF, but also increase the area under CNF. The data pertaining to the last four Rabi seasons shows that the average area cultivated by CNF farmers under CNF increased from 0.40 ha. in 2019-20 to 0.47 ha. in 2022-23; i.e., 18 percent increase. The overall expansion appeared to be slow. The area allocation to CNF has declined in a couple of zones, increased in four zones, rather sharply in three zones. The silver lining is that eight out of ten farmers categories have increased their area allocation to CNF between 2019-20 and

2022-23. The only exception is marginal and ST farmers, who have marginally reduced their area allocation by three percent during the reference period (Table 4.3).

Table 4.3: Agroclimatic zones & farmers categories wise average area allocated for CNF during the last four Rabi seasons (ha)

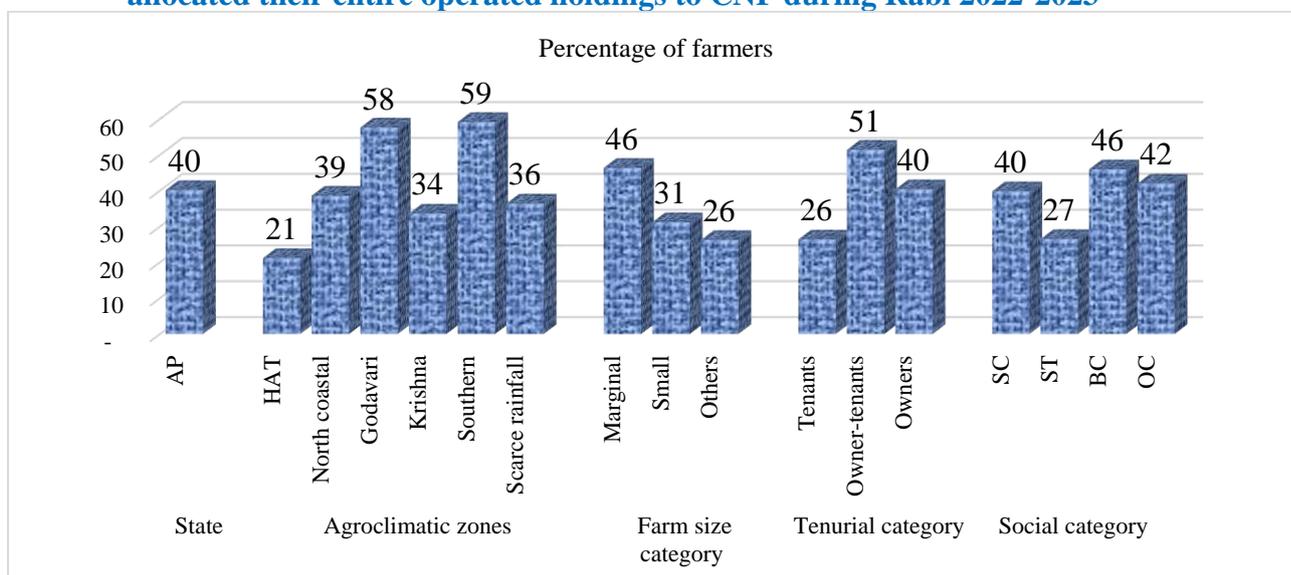
Agroclimatic zones & farmers categories	2019-20	2020-21	2021-22	2022-23	% change in 2022-23 over 2019-20
Agroclimatic zones					
HAT	0.38	0.40	0.40	0.35	-8
North Coastal	0.30	0.34	0.36	0.41	37
Godavari	0.89	0.45	0.45	0.46	-48
Krishna	0.44	0.45	0.46	0.46	5
Southern	0.30	0.45	0.57	0.57	90
Scarce Rainfall	0.31	0.40	0.45	0.46	48
Total	0.40	0.42	0.47	0.47	18
Farm size category					
Marginal	0.40	0.36	0.38	0.39	-3
Small	0.41	0.48	0.54	0.53	29
Others	0.44	0.59	0.70	0.69	57
Total	0.40	0.42	0.47	0.47	18
Tenurial status					
Tenant	0.37	0.40	0.42	0.42	14
Owner-Tenant	0.39	0.41	0.41	0.46	18
Owner	0.41	0.42	0.47	0.47	15
Total	0.40	0.42	0.47	0.47	18
Social category					
SC	0.33	0.38	0.43	0.43	30
ST	0.39	0.41	0.42	0.38	-3
BC	0.46	0.39	0.44	0.47	2
OC	0.39	0.50	0.56	0.55	41
Total	0.40	0.42	0.47	0.47	18

Source: *IDSAP, Field Survey 2022-23*

Yet another and related indicator about the impact of CNF on land use is the percentage of farmers, who allocated their entire operated area to CNF. As mentioned elsewhere in this report that allocation of more area to CNF by farmers indicate the beneficial potentials of CNF, in terms of profitability, which is experienced or perceived by the farmers. Secondly, increase in the area under CNF means increase in the size of quality soil/ land in the state. During Rabi 2022-23, about 40 percent of CNF farmers have allocated their entire operated land to CNF. This is an encouraging trend. Majority of farmers in Godavari zone (58 percent) and Southern

zone (59 percent) have allocated their entire land to CNF. About 46 percent of marginal farmers, 51 percent of owner-tenant farmers and 46 percent of BC farmers have allocated their entire operated area to CNF during the study period (Figure 4.2).

Figure 4.2: Agroclimatic zone and farmer category wise percentage of farmers, who allocated their entire operated holdings to CNF during Rabi 2022-2023



Source: *IDSAP, Field Survey 2022-23*

4.3. Impact of CNF on labour use

The labour utilization pattern has been examined between CNF and non-CNF with regard to each major crop in terms of labour days per hectare. The human labour has been measured in terms of family (own), hired and total labour (family + hired labour). There could also arise differences between CNF and non-CNF in the composition of family and hired labour used on the farms and also in the male-female mix of labour. These differences would arise mainly because of the intermittent nature of work on the CNF farms – it necessitates female and family labour to take more active part. Therefore, labour utilization is also analyzed in terms of “own and hired” and “male and female” labour. The impact of CNF on labour use in different agriculture operations is also analyzed.

On an average 21 additional labour days or 17 percent more labour is used under CNF during the Rabi season. But there are wider fluctuations across the seven crops, included in this report. A greater number of labour days are used under CNF over non-CNF in five out of seven crops, viz., Paddy, Groundnut, Maize, Black gram and Green gram in the range of 14

percent to 32 percent (Table 4.4). On the other hand, a greater number of labour days are used under non-CNF in two crops, viz., Bengal gram (11 percent) and Ragi (21 percent)³³.

Table 4.4: Crop wise total labour used under CNF and non-CNF during 2022-23

Crop	Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %
Paddy	182	160	22	14
Groundnut	141	108	34	31
Bengal gram	59	67	-7	-11
Maize	238	186	52	28
Black gram	133	101	32	32
Green gram	163	124	39	32
Ragi	193	245	-52	-21
Average of above ³⁴	147	126	21	17

Source: IDSAP, Field Survey 2022-23

At the aggregate level, change in average³⁵ labour use across seven crops, due to CNF is 21 days or 17 percent. That is, on an average 21 additional days are used in CNF crops vis-à-vis non-CNF crops. Out of these, over 16 days are own labour and about 4 days are hired labour. In relative terms under CNF about 31 percent more own labour is used and only 6 percent hired labor is used. Out of 21 additional days employed in CNF, 12 are female days and 9 are male days. But in relative terms 20 percent more male labour is used compared to 15 percent more female labour. On the other as high 52 percent more own female labour is used in CNF crops; the same is 16 percent for own male labour (Table 4.5).

Table 4.5: Changes in the average* labour use due to CNF in different categories of labour in Rabi 2022-23

Indicator	Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %
Own male	35	30	5	16
Hire male	17	13	4	29
Own female	34	22	12	52

³³ In Ragi, the number of labour days used appeared to be on higher side in both CNF and non-CNF. Similar trend was observed in previous reports also. One of the possible reasons could be underreporting of the land/ plot size by the tribal farmers, who predominantly cultivate Ragi.

³⁴ Weighted average of seven crops covered in this report. The average area under each crop during last five Rabi seasons, at the state level, are used as weights

³⁵ Weighted average of seven crops covered in this report. The average area under each crop during last five Rabi seasons, at the state level, are used as weights

Indicator	Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %
Hire female	60	60	1	1
Total male	52	43	9	20
Total female	95	82	12	15
Total own	69	52	16	31
Total hired	78	73	4	6
Grand total	147	126	21	17

* Weighted average of seven crops covered in this report. The average area under each crop during last five Rabi seasons, at the state level, are used as weights

Source: IDSAP, Field Survey 2022-23

As mentioned above on an average the CNF crops utilized 21 additional labour days. Out of those 21 days, more than 16 days are family labour, and about four days are hired labour. However, there are wide inter-crop variations. A greater number of family labour is used under CNF, in six out of seven crops included in this report; only exception is Ragi. In the case of hired labour too, a greater number of days are used under CNF in five out of seven crops (Table 4.6).

Table 4.6: Crop wise own and hired labour used under CNF and non-CNF during 2022-23

Crop	Own labour				Hired labour			
	Days/ hectare		Difference between CNF & non-CNF		Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %	CNF	Non-CNF	Days/ hectare	in %
Paddy	82	64	18	29	99	96	3	3
Groundnut	60	44	15	35	82	63	18	29
Bengal gram	21	20	1	4	39	47	-8	-18
Maize	103	64	39	61	135	121	13	11
Black gram	77	59	18	31	56	42	14	34
Green gram	101	73	28	39	62	51	11	21
Ragi	110	143	-34	-23	83	101	-18	-18
Average ³⁶	69	52	16	31	78	73	4	6

Source: IDSAP, Field Survey 2022-23

³⁶ Weighted average of seven crops covered in this report. The average area under each crop during last five Rabi seasons, at the state level, are used as weights

As mentioned above on an average about 21 additional labour days have been utilized in CNF crops compared to non-CNF crops during the study season. Out of these, nine are male days and 12 are female days. However, in relative terms 20 percent more male labour is used compared to 15 percent female labour. More male labour is used under CNF in six out of seven crops covered in this report; in the range of 5 percent to 47 percent. More female labour is used under CNF in five out of seven crops; in the range 13 percent to 33 percent (Table 4.7).

Table 4.7: Crop wise male and female labour used under CNF and non-CNF in Rabi 2022-23

Crop	Male labour				Female labour			
	Days/ hectare		Difference between CNF & non-CNF		Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %	CNF	Non-CNF	Days/ hectare	in %
Paddy	64	56	8	15	117	104	13	13
Groundnut	56	38	18	47	86	70	16	23
Bengal gram	12	11	1	5	47	55	-8	-14
Maize	94	77	16	21	144	108	36	33
Black gram	51	39	12	31	82	62	20	32
Green gram	62	48	14	30	101	76	25	33
Ragi	90	121	-31	-26	103	124	-21	-17
Average ³⁷	52	43	9	20	95	82	12	15

Source: *IDSAP, Field Survey 2022-23*

The impact of CNF on agriculture operations wise is shown in Table 4.8. The Table shows Agriculture operations covered area (1) Land preparation, (2) Nursery raising, (3) Sowing and transplantation, (4) Weeding and interculture, (5) Irrigation, (6) Harvesting, (7) Threshing, and (8) Supervision/ others. In all, but one, operations, a greater number of labour days are used under CNF, in the range of less than 1 in land preparation to 7 in irrigation. This result is a counter intuitive result. In almost all previous reports, the CNF farmers said that the need for irrigation is less under CNF. But a greater number of labour days are used for irrigation under CNF. There could be many reasons for this counter intuitive result. The reasons including – need for more control of irrigation water, difference in the composition of irrigation sources of

³⁷ Ibid

CNF and non-CNF farmers, integrated application of irrigation and Jeevamruthams in CNF, etc. Another operation in which a greater number of labour days are used under CNF is interculture/ weeding. As CNF farmers do not use weedicides, they may have to manually do the weeding.

Table 4.8: Operation wise average* labour used under CNF and non-CNF in Rabi 2022-23

Operations	Days/ hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	Days/ hectare	in %
Land preparation	8	8	0	3
Nursery	6	3	4	150
Sowing/ transplantation	22	23	-1	-6
Interculture	22	17	5	32
Irrigation	25	19	7	37
Harvesting	33	30	3	9
Threshing	16	13	2	17
Supervision/ others	15	14	1	6
Total	147	126	21	17

* Weighted average of seven crops covered in this report. The average area under each crop during last five Rabi seasons, at the state level, are used as weights

Source: IDSAP, Field Survey 2022-23

4.4. Impact of CNF on water use in crop cultivation

Another dimension of resource use is water required for irrigation in growing crops. This issue was covered extensively in Kharif survey and report. But section was not repeated in the Rabi survey. Given the criticality of the issue, the Kharif findings are summarized in this section. Majority of CNF farmers of all the categories have reported that the water requirement for crop cultivation has come down. Almost all CNF farmers, who experienced the impact of CNF on water use in crop cultivation, reported a considerable or moderate reduction in water requirement in each crop cultivation. For example, over 82 percent of Ragi cultivators reported a considerable decrease in water requirement in Ragi cultivation after CNF; and 45 percent Paddy cultivators also perceived a considerable reduction in water requirement in the cultivation of that crop. About 80 plus percentage of farmers have reported a reduction in water requirement in 11 out of 12 crops covered in that survey. This might have enabled the farmers to reduce dependency on ground water.

4.5. Impact of CNF on livestock rearing

It is well known fact that livestock used to be an integral part of Indian agriculture. However, the symbiotic relationship was forgotten or ignored and livestock rearing became an independent sector or source of income. Due to various reasons, the livestock farming has been declining in the rural and agriculture households. APCNF is being developed on the symbiotic relationship. Apart from contributing to the development of agriculture, livestock can provide additional and diversified income sources to HHs. In all 351 have purchased 784 livestock because of CNF. As on date of survey, the average number of livestock purchased, exclusively for CNF, is 2 (Table 4.9). There are wide inter-zone variations. While 41 to 65 percentage of sample farmers in Sothern, Scarce rainfall and Godavari zone purchased livestock for meeting the CNF needs, the same is less than 5 percent other three zones. There are no such variations across three farm size classes. In case of tenurial categories, 34 percent of landless tenants have purchased vis-à-vis 24 percent at the state level. It does not mean that they are not getting any other benefits from livestock. Economic gains through milk and calves would be substantial gains, though incidental in this context. Further, it was noticed, in some villages, that the markets are developing for livestock “dung and urine”, due to CNF.

Table 4.9: Number of CNF farmers purchased livestock exclusively for CNF and number of livestock purchased in Rabi 2022-23

Agroclimatic zones & farmers' categories	Percentage of sample farmers purchased livestock	Number of farmers purchased livestock	Number of livestock purchased	Average no. of livestock purchased per farmer
Agroclimatic zones				
HAT	3	9	11	1.2
North coastal	4	6	9	1.5
Godavari	65	55	63	1.1
Krishna	5	19	29	1.5
Southern	41	153	434	2.8
Scarce rainfall	41	109	238	2.2
Total	24	351	784	2.2
Farm size category				
Marginal	23	211	464	2.2
Small	27	105	250	2.4
Others	22	35	70	2.0

Agroclimatic zones & farmers' categories	Percentage of sample farmers purchased livestock	Number of farmers purchased livestock	Number of livestock purchased	Average no. of livestock purchased per farmer
Total	24	351	784	2.2
Tenurial status				
Tenants	34	18	24	1.3
Owner cum tenants	17	6	6	1.0
Owners	23	327	754	2.3
Total	24	351	784	2.2
Social category				
SC	18	48	76	1.6
ST	6	16	30	1.9
BC	27	147	347	2.4
OC	35	140	331	2.4
Total	24	351	784	2.2

Source: *IDSAP, Field Survey 2022-23*

4.6. Avoidance of agrochemicals and adoption of CNF inputs

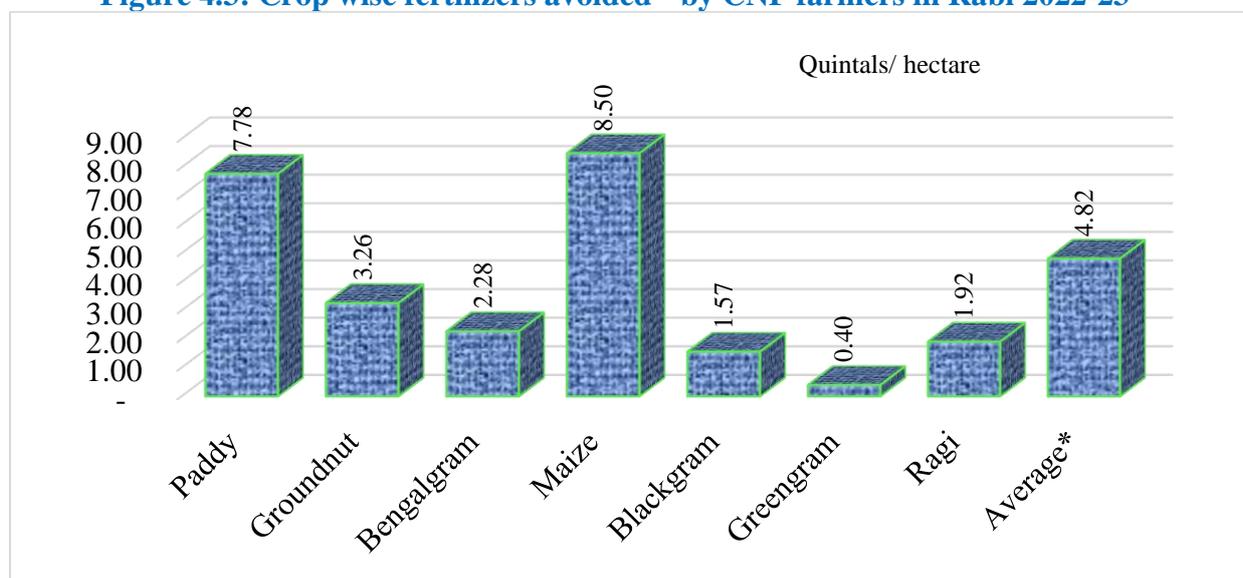
The major intervention under CNF is the replacement of agrochemicals with biological stimulants such as Beejamrutham and Jeevamruthams; botanical remedies such as Asthrams and Kashayams; and ecological principles such border-crops, inter-crops, Pheromone traps, sticky-pads, etc. In this section, avoided quantities of fertilizers and expenditure on agrochemicals, extent of adoption of CNF inputs and practices are discussed.

Crop wise quantities of fertilizers³⁸ applied by non-CNF farmers on their fields are shown in Figure 4.3. These can be considered as the fertilizers avoided by the CNF farmers in their S2S fields. On an average the CNF farmers have avoided 4.82 quintals of fertilizers per hectare. The CNF farmers avoided fertilizers is in the range of 0.40 quintals per hectare in Green gram to 8.50 quintals in Maize. Apart from reducing the cost of cultivation, avoiding of fertilizers would lead to an improvement in soil quality; and in reduction of the fertilizers' subsidy of

³⁸ As the pesticides vary vastly in terms of values, quantities, type (liquid and powder), etc., aggregating them is not desirable. Hence, only fertilizers are analysed in this section.

Government of India.³⁹ Needless to say, avoiding of fertilizers would also lead to healthy food, improved human health and so on.

Figure 4.3: Crop wise fertilizers avoided[®] by CNF farmers in Rabi 2022-23



[®] These are actual quantities used by non-CNF farmers. These are considered as quantities avoided by CNF farmers in every hectare under S2S

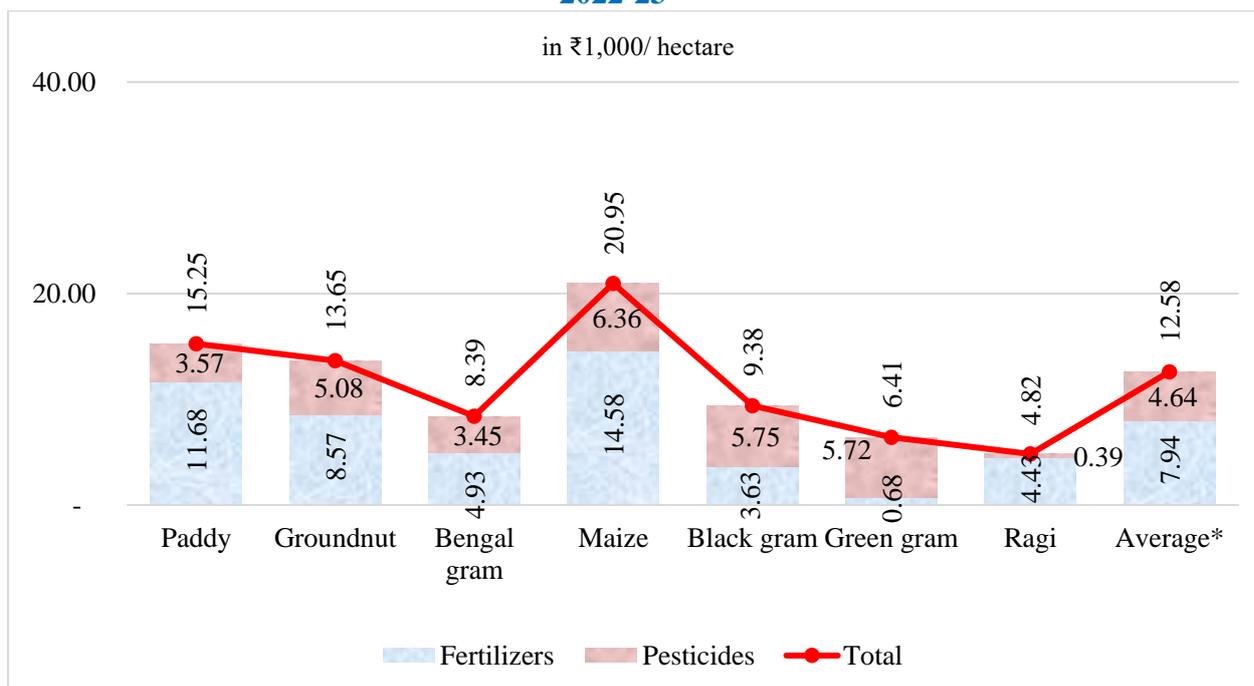
* This is the weighted average of seven crops considered in the report. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

Source: IDSAP, Field Survey 2022-23

Crop wise expenditure on agrochemicals, including fertilizers and biocides, applied by non-CNF farmers on their fields are shown in Figure 4.4. These can be considered as the expenditure avoided on agrochemicals by the CNF farmers in their S2S fields. On an average the CNF farmers have avoided ₹12.50 thousand expenditure on agrochemicals per hectare, including ₹7.94 thousands on fertilizers and ₹4.64 thousand on pesticides. The avoided expenditure on agrochemicals is in the range of ₹4.82 thousand per hectare in Ragi to ₹20.95 thousand per hectare in Maize. As mentioned in previous reports such savings in expenditure on agrochemicals, not only improve the financial conditions of the farmers, but also save them from the agony of their dependency on input and credit markets, which are often unfair to the farmers and exploitative.

³⁹ According to the Union Budget 2023-24 documents, in 2021-22, the GoI has spent ₹2,88,968.54 crore on Food subsidy and ₹1,53,758.10 crore on Fertilizer subsidy. The total expenditure on these two items was equal to 11.67 percent of total expenditure (₹37,93,801.00 crore) of GoI. As per the revised estimates (RE) of 2022-23, the GoI's expenditure on food subsidy (₹2,87,194.05 crore) and fertiliser subsidy (₹2,25,220.16 crore), together, accounted for 12.24 percent of total expenditure (₹41,87,232.00 crore). These documents were accessed on 16 February 2023 from <https://www.indiabudget.gov.in/>

Figure 4.4: Crop wise avoided expenditure on agrochemicals[@] by CNF farmers in Rabi 2022-23



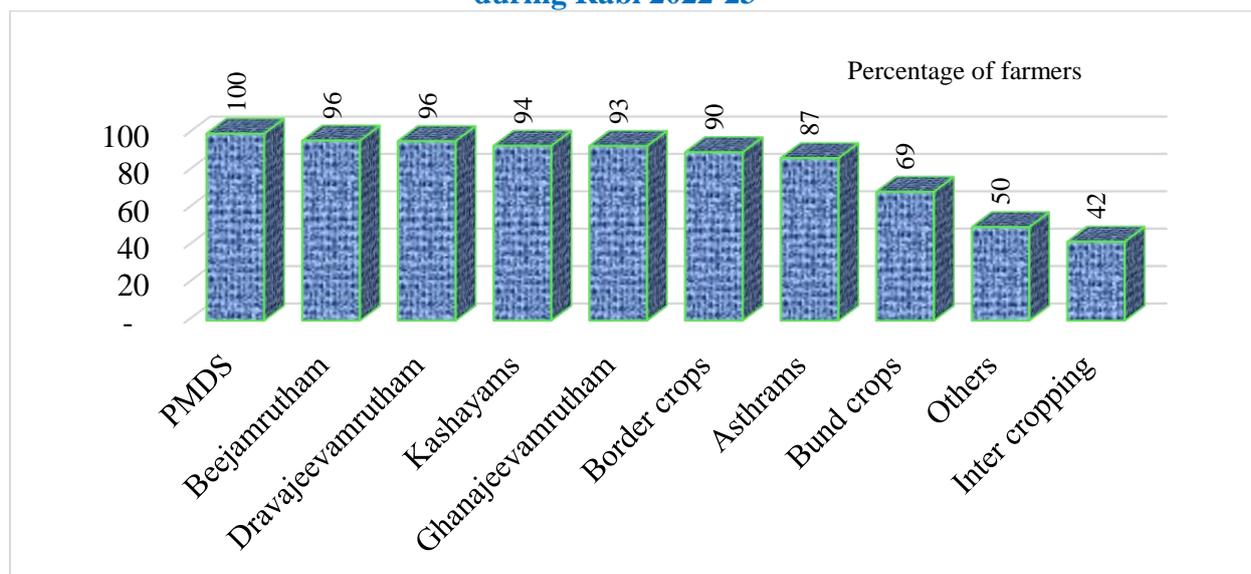
[@] These are actual expenditure on agrochemicals by non-CNF farmers. These are considered as avoided expenditure on agrochemicals by CNF farmers in every hectare under S2S

* This is the weighted average of seven crops considered in the report. The average area under each crop during last five Rabi seasons, in the state, are used as the weights.

Source: IDSAP, Field Survey 2022-23

Instead of agrochemicals, CNF farmers are using PMDS, biological stimulants such as Beejamrutham and Jeevamruthams; botanical remedies such as Asthrams and Kashayams; and ecological principles such border-crops, inter-crops, including Pheromone traps, sticky-pads, etc. Percentage of CNF farmers adopting these practices and inputs during the study period is shown in Figure 4.5. As anticipated, 100 percent of farmers have adopted PMDS, and nearly 100 percent adopted Beejamrutham and Dravajeevamrutham. Around 90 percent of farmers have adopted Kashayams, Ghanajeevamrutham, Border crops and Asthrams. Over 40 to 70 percent of farmers Bund crops, Inter-cropping and Other practices like Pheromone traps, sticky-pads, etc. It may be noted that some of the major purposes of PMDS, border crops, bund crops and inter-cropping are to protect and feed the microbes in the soil, to break the spread of diseases and pests and to repel pests and insects.

Figure 4.5: Percentage of CNF farmers adopting different CNF practices and inputs during Rabi 2022-23

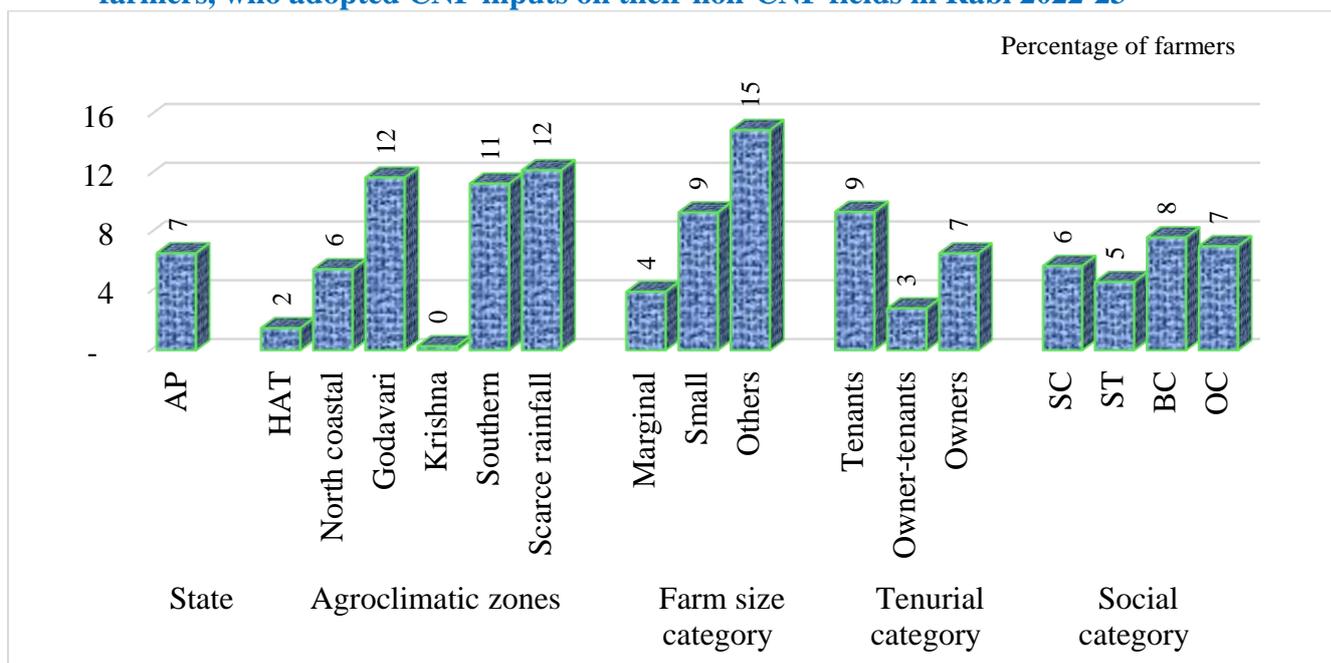


Source: *IDSAP, Field Survey 2022-23*

The above are the CNF farmers' practices in their S2S fields⁴⁰ to enrich their soil quality and productivity and to protect their crops. Further about seven percent of CNF farmers have used one or the other CNF inputs/ stimulants and practices in their non-CNF fields. In other words, about seven percent of farmers cultivated crops with the mix of CNF and non-CNF inputs and practices. The percentage of farmers, who used mix of CNF and non-CNF inputs across the agroclimatic zones and farmers' categories are presented in Figure 4.6. Among six agroclimatic zones, a greater percentage of farmers in Godavari zone, which is an input intensive cultivation zone, and Southern and Scarce rainfall zones, which have relatively a larger average holding sizes, adopted mixed method. Among three farm size categories, a greater percentage of 'other farmers' (15 percentage), who have larger size operated holdings, adopted the mixed method, followed by small farmers (9 percent). On the other hand, nine percent of tenant farmers adopted the mixed method followed by owner farmers (7 percent); and relatively a greater number of BC (8 percent) and OC (7 percent) have adopted the mixed method (Figure 4.6).

⁴⁰ S2S fields are the fields in which crops are grown with only CNF inputs/ stimulants and practices, without using any agrochemicals.

Figure 4.6: Agroclimatic zones and farmers' categories wise percentage of CNF farmers, who adopted CNF inputs on their non-CNF fields in Rabi 2022-23



Source: *IDSAP, Field Survey 2022-23*

4.7. Credit

As mentioned in previous Kharif 2022-23 report, indebtedness is one of the factors for agrarian distress in the state. Higher cost of cultivation and declining farm profitability, under non-CNF, is one of the major reasons for higher farmers indebtedness. In chapter 3 of this report, we have observed that paid-out cost for growing crops is lower under CNF in relation to non-CNF. As a result, borrowings for working capital for growing crops is expected to decline for CNF farmers relatively. The study has collected detailed data about household borrowings and loans outstanding, etc. The data was presented in detail in Kharif 2022-23. The same is summarized in this section⁴¹.

Out of 1,331 sample CNF households, 1,079 have current/ active loans in 2022-23, i.e., 81 percent of CNF households have current loans. The same is 91 percent for non-CNF households (HHs). The CNF farmers have total 1,112 current loans. It implies the CNF farmers have 84 loans for every 100 sample HHs; the same is 94 per non-CNF farmers. Total amount borrowed by CNF HHs and non-CNF HHs are ₹8.21 crores and ₹6.21 crores respectively. This turns out to be an average borrowed amounts of ₹61,701 and ₹84,886 for each of CNF and non-CNF

⁴¹ Normally, farmers borrow (crop loans) for agriculture once in a year. Therefore, the credit related block was deleted in the Rabi survey schedule. Therefore, the Kharif results are summarized here. More details can be seen in the Kharif Report 2022-23.

sample HHs respectively (Table.4.10). *The CNF HHs also have lower outstanding loan. The data clearly indicates that the incidence of debt is considerably less for CNF HHs compared to non-CNF HHs.*

Table 4.10: Summary of borrowings by CNF and non-CNF households in 2022-23

Indicators	Units	CNF	non-CNF
Total sample households	Number	1,331	731
Number of loanees	Number	1,079	667
Loanees as % of sample HHs.	%	81	91
Number of loans	Number	1,112	689
Loans as % of sample HHs.	%	84	94
Total loan amount	₹	8,21,24,536	6,20,52,029
Average loan amount per loanee	₹	76,112	93,032
Average loan amount per sample HH.	₹	61,701	84,886
Total loan outstanding amount	₹	6,75,51,776	5,38,86,690
Average loan outstanding per loanee	₹	62,606	80,790
Average loan outstanding per sample HH.	₹	50,753	73,716

Source: IDSAP: Field Survey, 2022-23

4.8. Conclusions

As both CNF and non-CNF sample is drawn based on the uniform cropping pattern, the changes in land use pattern are not conspicuous, in this study. However, there is an increase in area allocated to CNF. On an average 21 additional labour days or 17 percent more labour is used under CNF during the Rabi season. Out of these, over 16 days are own labour and about 4 days are hired labour; and nine are male days and 12 are female days. However, in relative terms 20 percent more male labour is used compared to 15 percent female labour. In almost all agriculture operations, a greater number of labour days are used under CNF. About 24 percent of CNF farmers, i.e., 351 have purchased 784 livestock because of CNF. On an average the CNF farmers have avoided 4.82 quintals of fertilizers per hectare during the study season. On an average the CNF farmers have avoided ₹12.50 thousand expenditure on agrochemicals per hectare, including ₹7.94 thousands on fertilizers and ₹4.64 thousand on pesticides.

The positive changes may, in turn, improve the farmers wealth and wellbeing. The land value and productivity would improve. The family labour productivity would improve. CNF farmers would get benefited from the synergy between crop cultivation and livestock rearing. The farmers would be saved from the unequal and unfair practices of input and credit markets.

Chapter 5: Wellbeing of CNF farmers

5.1. Introduction

By improving the financial conditions of participating households, and reducing their dependency on agrochemicals and credit markets, CNF has reduced the agrarian distress. CNF contributed to the health of the households and it has contained expenditure on household health, by making available chemical residue-free food. CNF adds prestige to farming as a vocation and farmers no longer feel that they are tied up in a frivolous agricultural activity. A lot of data about all these issues have been collected during the Kharif 2022-23 survey and a detailed analysis was included in Kharif 2022-23 report under Farmers Wellbeing⁴² chapter.⁴³ In this chapter the same is summarized.

5.2. Summary of farmers' wellbeing chapter of Kharif report

1. The stress that the farmers endure, under non-CNF, has diminished under CNF for the reasons that (1) they are likely to get higher net returns from farming, (2) they command respect among their peers, (3) they are less prone to exploitation in the market place, (4) there is an improvement in their health status and that (5) the CNF standing crop is less likely to be subjected to the vagaries of the monsoon. Over 65 percent of the farmers, at the state level, claimed that the stress they endure has diminished 'considerably' or 'moderately' due to CNF.
2. Over two-thirds of CNF farmers reported an improvement in their financial position.
3. The CNF farmers are able to avoid considerable expenditure on agrochemicals because of their adoption of CNF. Over 72 percent of CNF farmers reported a decrease in the funds' requirement. Over 77 percent farmers reported a reduction in borrowing for agriculture.
4. About 54 percent experienced or witnessed a considerable or moderate increase in new market channels.

⁴² Wellbeing is a broad subject. "Compendium of OECD Well-being Indicators" by OECD [<https://www.oecd.org/sdd/47917288.pdf>] has given two sets of wellbeing indicators, viz., (I) Quality of life consists of (1) Health status, (2) Work and life balance, (3) Education and skills, (4) Social connections, (5) Civic Engagement and Governance, (6) Environmental Quality, (7) Personal Security, and (8) Subjective well-being; (II) Material Living Conditions consists of (1) Income and wealth, (2) Jobs and earnings, and (3) Housing. Further, the Report pointed out that Sustainability of Well-Being Over Time requires preserving different types of capital viz., (1) Natural capital, (2) Economic capital, (3) Human capital, and (4) Social capital. APCNF can have a positive impact on many of the above listed indicators.

⁴³ That chapter did not address all indicators of wellbeing. Only a subset of wellbeing indicators relevant to CNF were analysed.

5. Over 94 per cent of the farmers, at the state level, expressed their interest in farming, due to CNF.
6. At the aggregate level (state level), as high as 96 percent of farmers reported that they consume CNF food. CNF food is not only healthy, but also tasty according to about 97 percent of the HHs, who consume CNF.
7. Minimum of 78 percent to maximum of 98 percent of farmers, across agroclimatic zones and category of farmers, have reported that their health status has improved either ‘considerably’ or at least ‘moderately’. Improvement in households’ health status, naturally, lead to a reduction in the households’ expenditure on health. About 73 percent of the farmers stated that their health expenditure has decreased either ‘considerably’ or ‘moderately’ due to CNF.
8. About 24 percent of CNF farmers, at the state level, have witnessed or experienced a considerable interest among the public for the CNF food/ output. Further, 58 percent farmers witnessed a moderate interest among the public towards CNF output.
9. People started looking CNF farmers not only as saviours of nature, biodiversity, innovators, model farmers, social entrepreneurs, etc., but also as sources of quality food and output. A noticeable phenomenon is that CNF farmers have now come to command respect from friends and relatives and in the market place for their adherence to CNF practices. About 83 percent of sample CNF farmers reported that they are getting respect from friends and relatives because of their adherence to CNF. CNF farmers are also getting respect and recognition in the markets. Some farmers said in FGDs, that they are getting priority in unloading their produces in the markets and also getting allocations of preferred slots and shop in the markets. Over 82 percent famers, at the state level, said that they are getting considerable or moderate respect in the markets.

5.3. Conclusions

The analysis clearly indicates that CNF has substantial positive impact on the farmers’ wellbeing. This is the need of hour. Apart from improving household income, it is positively impacting the health and education of the CNF households. CNF is freeing farmers from many compulsions and dependencies. The disaggregate analysis suggests that the project impact is evenly spread across all agroclimatic zones and farmer categories.

Chapter 6: Issues, challenges and way forward

6.1. Introduction

It may be noted that RySS has been implementing CNF without any incentives and subsidies to the farmers in the policy environment characterised by incentivized and subsidized chemical-based farming. This is a major challenge. At the same time, there are issues and challenges in the adoption and expansion of CNF. The challenges faced by the farmers need to be identified and resolved quickly. It may be noted that the chemical-based farming is mostly homogeneous farming with mono-cropping on a scale. The problems are common and solutions are standardized. But CNF is a heterogeneous model with diversified and intensive cropping. Each farmer faces a different set of issues and challenges. Further, CNF is evolving and challenges are also evolving. In this backdrop, this chapter addresses to the issues and challenges encountered in the adoption and expansion of CNF. It provides some insights as the way forward.

6.2. Inadequate progress

Strictly speaking this issue of progress is not in scope of present study. But to put the issues and challenges in a perspective, this issue is touched briefly. Though the number of S2S farmers are increasing at fast pace in recent years, in the larger context of covering the entire 80 lakh hectares of cropped lands and all 60 lakh farmers in the medium term of 8-10 years, the growth rates need to be further increased. Major challenges faced by RySS are: (1) Increasing the rate of enrolment of farmers into the program, and (2) Encouraging and facilitating the participating farmers to allocate their entire operated area to CNF.

6.2.1. Increasing the enrolment

As mentioned above, the current rate of enrolment is impressive, yet to cover all farmers and entire GCA in the state, RySS has to adopt a different strategy. From the present research team's general discussions with RySS officials and visits to the field⁴⁴, it appears that RySS is focussing on model building and want to expand the program through demonstration effect.

⁴⁴ APCNF is being implemented with multiple objectives and strategies, such as improvement in the profitability of crop cultivation, soil quality, crop quality, crop resilience to weather anomalies, food quality, health of farmers and consumers, etc.; promotion of poor people's and women's participation, integrated farming, crop diversification and intensification, community ownership, local economy, etc. But IDSAP studies (present study) have limited mandate- to assess the impact of CNF on farming conditions at the state level with the help of a few major crops.

This appears to be a laudable strategy. However, RySS may think about channelizing a part of Government funds meant for farm subsidies, for the benefit of CNF farmers. More importantly the CNF farmers need and want higher prices for CNF output. Even a nominal premium price to CNF output can give a big boost to the program.

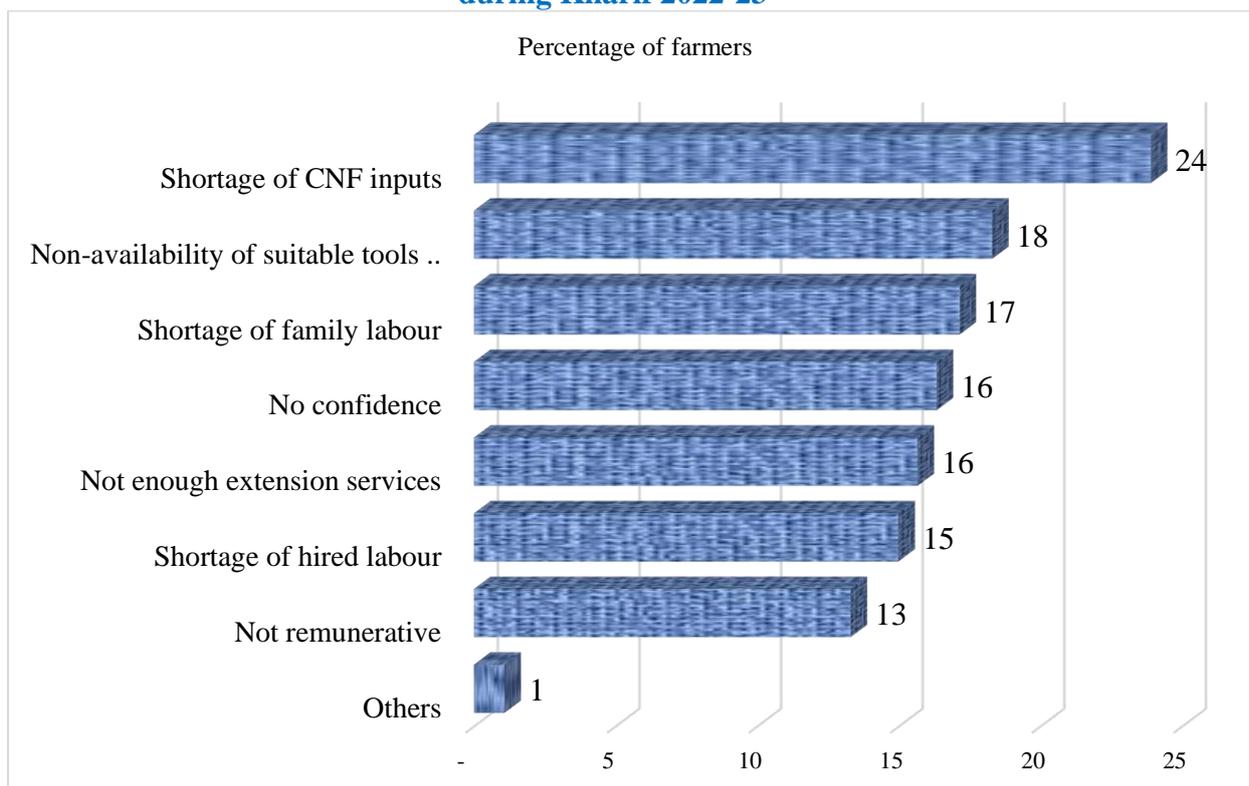
6.2.2. Allocation of entire area to CNF

The area allocated to CNF by participating farmers is increasing over the years, albeit, at a slow pace. As mentioned in the 4th chapter, only 40 percent of CNF farmers have allocated their entire operated area to CNF during Rabi 2022-23. Further, there are wide variations across the agroclimatic zones and farmers' categories. Only 21 percent of farmers in HAT zone, 34 and 36 percent of farmers in Krishna and Scarce rainfall zones respectively allocated their entire operated areas to CNF. Only 26 percent of other farmers, 26 percent of tenant farmers and 27 percent of ST farmers allocated their entire operated area. Further, only six percent of CNF farmers have used one or the other CNF input or practice in their non-CNF fields. The reasons for not allocating the entire operated area to CNF and other limiting factors are discussed in the remaining part of this chapter.

Reasons cited for not allocating their entire operated area to CNF is shown in Figure 6.1. Shortage of CNF inputs is a major reason as per 24 percent of farmers. In all previous surveys also, farmers cited this as one of the major impediments in adopting and expanding CNF. Farmers, under non-CNF, are habituated to the readymade inputs. Hence, they want such readymade inputs under CNF also. Further, there is need for readymade inputs, especially the Asthrams and Kashayams, for the real-time application, when needed. Non-availability suitable tools and equipment such as blenders, drums, big utensils, etc., to prepare CNF inputs/stimulants, is another serious challenge according to 18 percent farmers. Shortage of family and hired labour are the issues for 17 and 15 percent of farmers respectively. Inadequate extension services are another issue cited by 16 percent farmers. About 17 percent of farmers do not have confidence in CNF and another 13 percent of farmers thinks CNF is not remunerative. More evidence⁴⁵ based advocacy, and remunerative prices could be effective solutions to overcome these shortcomings. These and other related issues will be discussed below.

⁴⁵ IDSAP studies, including the present study, provide a lot of supporting data and insights for the evidence base advocacy at every level, from farming communities to policy makers at the state and national level, to the international bodies.

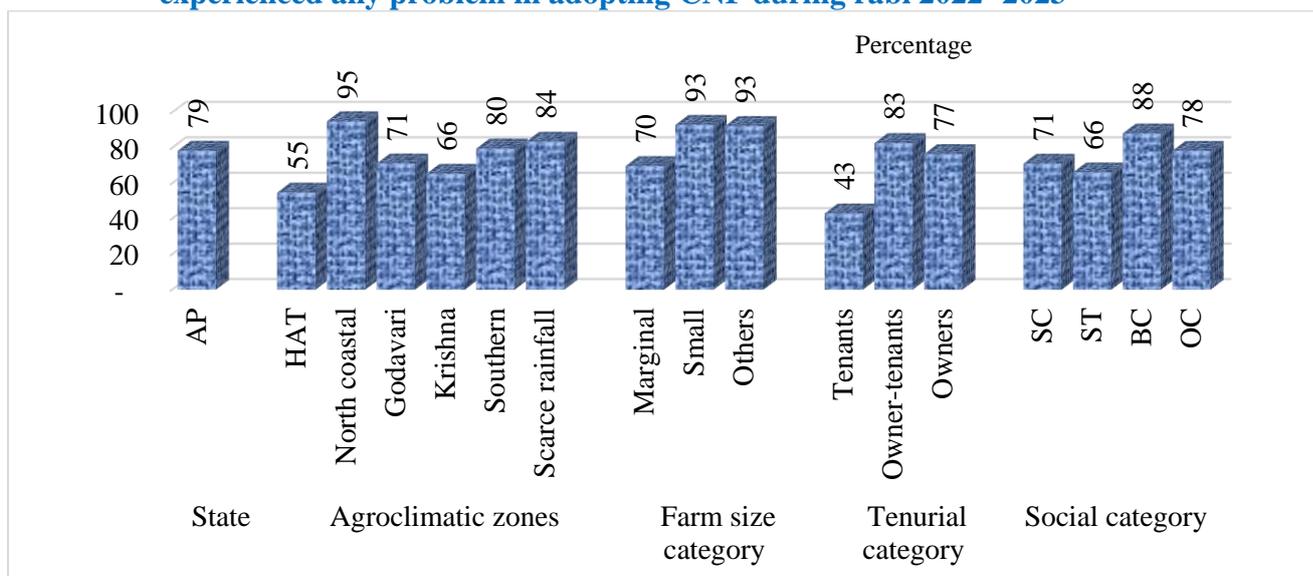
Figure 6.1: Farmers cited reasons for not allocating their entire operated area to CNF during Kharif 2022-23



6.3. Extent of problems

It is useful to know as to how many farmers are facing problems in adopting the CNF. Who are they? Where are they? As per the survey results, nearly 79 percent of farmers are facing one problem or the other in adopting the CNF. There are regional variations and also variations across farmers' categories. Thus, farmers experiencing the problems are the most in North coastal (95%) and surprisingly the least in HAT (55%). Next, farmers other than the marginal ones, owner-tenants, BCs and OCs form large proportions among those reporting to be facing problems (Figure 6.2). Thus, relatively better off sections seem to be complaining more, may be because their expectations are high and also because of possible labour shortage, especially the family labour.

Figure 6.2: Agroclimatic zone and farmer category wise percentage of farmers experienced any problem in adopting CNF during rabi 2022- 2023



Source: *IDSAP, Field Survey 2022-23.*

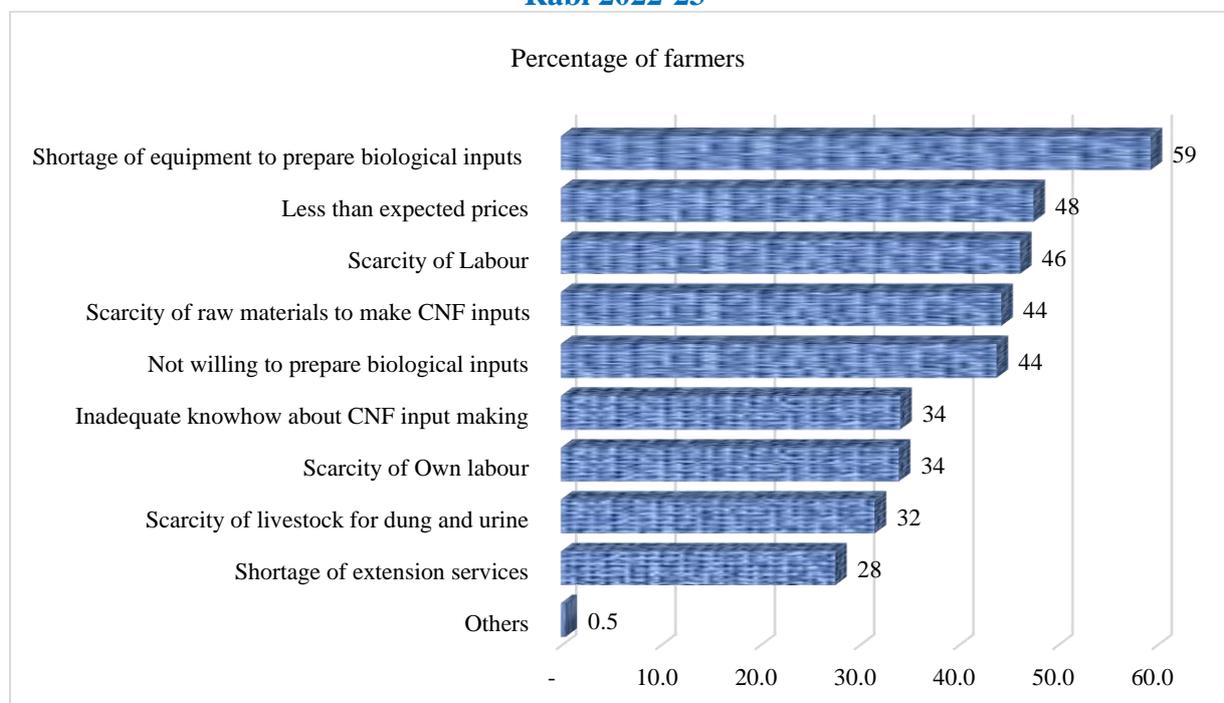
6.4. Major challenges encountered by farmers

The major challenges faced by farmers and number of farmers reported each of those challenges are presented in the Figure 6.3. Shortage of suitable equipment such as mixers, blenders, stirrers, drums, etc., is cited as problem by 59 percent of farmers. Output marketing is a generic problem in Indian agriculture. Apart from the generic problem of selling the output, CNF farmers' expectation for higher prices for CNF output is another issue. Among all the problems cited in the Figure 6.3, output marketing is a challenge as reported by 48 percent of CNF farmers. As mentioned above, in the case of CNF output, selling is not a problem, but getting a higher than non-CNF output price, is the real issue for the CNF farmers. This is also evident from the focus group discussions with the farmers. Scarcity of labour and scarcity of family labour have been encountered by 46 and 34 percent of the farmers respectively.⁴⁶ Scarcity of raw materials to make biological inputs and inadequate knowledge to prepare the biological inputs are the issues reported by 44 and 34 percent of farmers respectively. Scarcity of livestock for dung and urine has been reported by 32 percent of CNF farmers. It may be noted that in the initial stages, APCNF has prescribed the use of Desi (local) cow's dung in the preparation of Ghanajeevamrutham and Dravajeevamrutham. Now, RySS has changed this recommendation. Any cattle dung could be used. Therefore, relatively a small number (32

⁴⁶Whether the labour scarcity is due to CNF or due to local labour market conditions needs to be examined thoroughly.

percent) of farmers have scarcity of livestock for dung and urine as a constraint in adoption of CNF. About 28 percent of farmers reported shortage of extension services as a problem.

Figure 6.3: Major problems identified by the CNF farmers in adoption of CNF, during Rabi 2022-23



Source: *IDSAP, Field Survey 2022-23.*

It is important to note that though the problems remained common in all previous surveys, the number of persons reporting each of these problems has declined significantly in this survey compared to previous years' results. For example, in 2020-21 survey, 78 percent of farmers reported output marketing problem, 66 percent reported scarcity of Desi cow as the problem, 63 percent reported lack of adequate knowledge in preparation of CNF inputs, 60 percent reported scarcity of labour, 55 percent reported a scarcity of raw material to prepare CNF inputs and 52 percent reported scarcity of family labour.⁴⁷ Such reduction in the number of farmers reporting different challenges reflects the farmers' ability to master the new techniques and

⁴⁷IDSAP, 2022: *Assessing the Impact of APCNF (Andhra Pradesh Community Managed Natural Farming): [A Comprehensive Approach Using Crop Cutting Experiments] Final Report 2020-21*, Mimeograph, Institute for Development Studies Andhra Pradesh, Visakhapatnam. https://apcnf.in/wp-coFinal_Report,_2020-21tent/uploads/2022/05/IDS-2020-2021-APCNF-Consolidated-Report.pdf or <https://www.idsap.in/assets/reports/11%20Final%20Report%20Assessing%20the%20Impact%20of%20APCNF%202020-21.pdf>

practices. It also reflects beneficial potential of CNF, which might have enthused the farmers to master the art and science of CNF. It also reflects a considerable improvement in the RySS's extension and support services.

6.5. Extension services

As mentioned above, CNF is evolving. As it focuses on diversified and intensive cropping pattern, the issues and challenges in adopting CNF are also heterogeneous and are evolving. In this context, extension services are crucial. RySS provides awareness, extensions services, and technology transfer, through variety of institutions/ individuals and methods. These include placing a number of extension staff in the field at different levels, providing on the field training and exposures, through self-help groups (SHG), screening the subject specific videos, organizing training camps and training programmes at different levels, arranging exposure visits at different levels, distributing printed material, etc. Apart from RySS, some non-government organizations (NGOs) are also providing extension and replication services. The study has collected information about extension services in terms of sources of extension services, number of interactions the farmers have with different extension service providing agencies and persons; and satisfactory levels the farmers have from their interaction with those agencies and persons.

The master farmer (MF), who is also known as internal community resource person (ICRP) is a widely accessed source of extension service. Nearly all farmers utilized his/ her service during the study period. Each farmer on an average has eight interactions with ICRP. The farmers are 'more satisfied' with the outcomes of their interactions with ICRPs (Table 6.1). About 90 percent farmers have on an average five interactions with the field staff of RySS such as community resource persons (CRPs), cluster/ community assistant/ activist (CA), mandal anchor (MA), etc. Over 80 percent of farmers have on an average five interactions with their fellow farmers, which are 'more satisfying'. About one-third of farmers got advice and knowhow through electronic media, most of which are provided by RySS⁴⁸. Another one-third of farmers have interactions with SHG institutions, which are engaged by RySS. Over one-fourth of farmers got formal training and/ in exposure visits, arranged by RySS. Yet other five percent of farmers got acquainted with CNF practices through booklets and pamphlets, mostly provided by RySS.

⁴⁸ RySS prepare many videos on different aspects of APCNF and show them in the villages and place them on YouTube channels.

Table 6.1: Details of the Extension Services Received by CNF Farmers During Rabi 2022-2023

Source of advice/ extension services	Percentage of farmers availed services	Average Number of interactions*	Satisfaction level**
Master farmer/ ICRP	99	8	4
RySS staff -CRP, CA, MA, etc.	90	5	4
Fellow farmers	81	5	4
Electronic media TV/ Videos	34	5	3
SHG/ VO members/ leaders	33	3	3
Formal training by RySS	26	2	3
Newspapers and magazines	11	3	3
Exposure visits	7	1	3
Booklets given by RySS and others	5	3	3
NGO	1	9	4
Others	0	0	0

* Note: All the interactions need not be individual interactions. Some might be group interactions

** 5=highly satisfied; 4=; more satisfied 3=satisfied; 2=less satisfied; and 1= no use

Source: IDSAP, Field Survey 2022-23.

The above discussion indicates that RySS's field staff and other training and exposure programmes are major sources of extension and support services to the farmers in adopting CNF. It seems the field staff are playing a critical role extensively and 'more satisfactorily'. At the same time, some field staff pointed out about heavy workload and vacancies in their teams.

6.6. Way forward

In the above context, the following suggestions are made to implement the programme more effectively and to expand it at an accelerated pace.

1. RySS may think about channelizing a part of Government funds meant for farm subsidies, for the benefit of CNF farmers. More importantly the CNF farmers need and want higher prices for CNF output. Even a nominal premium price to CNF output can give a big boost to the program.
2. Another potential option is involvement of the corporate sector, with their Corporate Social Responsibility (CSR) funds in implementation of the programme in some villages

- or some program activities such as supply of equipment to prepare CNF inputs; supply of livestock at subsidized rates; and support in setting up of more CNF input shops.
3. RySS may explore a thorough integration with the State Agriculture Department. Utilizing the infrastructure and personnel of Agriculture Department, especially Rythu Bharosa Kendras (RBKs) can be one possible option. It may be noted the Government goal is to replace the non-CNF with CNF in the entire state in coming years.
 4. Labour scarcity can be addressed by linking Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) works with works on the farms.
 5. Given the criticality of the field staff in implementation and expansion of the programme, RySS has to strengthen the field staff. The vacancies need to be filled. Apart from filling the vacancies and strengthening the cadre, RySS may consider to provide flexible and focussed working conditions so that the staff can optimally use their time, resources and energy balancing their professional and personal responsibilities.
 6. RySS may take up the evidence-based advocacy to convince the farmers to take up the CNF on a large scale; and other stakeholders to support the CNF expansion and replication.
 7. RySS may also think about other methods to expand the programme. Involvement of Panchayat Raj Institutions (PRIs), which have larger and direct stake in agriculture development and farmers wellbeing in their villages, is one possible option.

6.7. Conclusions

As the CNF is evolving, the issues and challenges are also evolving. Therefore, majority of farmers reported that they have one problem or the other in adopting CNF. The major problems such as output marketing at higher prices, non-availability of raw materials to prepare the biological inputs, inadequate knowhow to prepare the biological inputs, scarcity of labour, etc., remained same over the years. Though the problems remained common in all previous surveys, the number of persons reporting each of these problems has declined in this survey. Such a reduction in the number of farmers reporting different challenges, reflects the farmers ability to master the new techniques and practices. It also reflects beneficial potential of CNF, which enthused the farmers to master the art and science of CNF. In terms of number of farmers interacted, average number interactions with the farmers and satisfaction levels stated by the farmers, the field staff is doing a good work. At the same time, some field staff pointed out about heavy workload and vacancies in their teams. All these indicate that RySS need to strengthen its field staff. But such increase may not be possible as the programme expands to the entire 80 lakh hectares cropped area and total 60 lakh farmers in the state. RySS may

explore other methods and options to expand the programme. Utilizing the infrastructure and personnel of Agriculture Department is one possible option. This would be a natural process, as the CNF is going to replace the non-CNF in the state in coming years. Involvement of Panchayat Raj Institutions, which have larger and direct stake in agriculture development and farmers wellbeing in their villages, is the other possible option.

About IDSAP

The Institute for Development Studies Andhra Pradesh is a leading institution for Economic and Social Studies focusing on Andhra Pradesh from national and global perspectives. It is an autonomous institute, supported and funded by Government of Andhra Pradesh. It undertakes development research, teaching, capacity building and policy advocacy. It serves as a Think Tank of Government of Andhra Pradesh and Government of India. It is registered under Andhra Pradesh Society Act 2001 vide Reg.No.101/2019. Centre for Tribal Studies has also been established as a part of IDSAP.

The vision of Development Studies is to build an inclusive society, ensuring that the people of Andhra Pradesh are free from hunger, poverty and injustice. It envisaged that IDS would emerge as a centre of excellence engaged in cutting edge policy research and creation of evidence-based knowledge for shaping social progress.

It conducts research on network mode involving eminent experts drawn from state, national and international centres of excellence to work towards social progress. It builds data base and documentation on Andhra Pradesh Economy accessible to researchers. Its faculty is a mix of core residential faculty, adjunct faculty, visiting faculty and affiliates drawn from other centres of excellence. The residential faculty is a mix of established senior scholars and potential and motivated young scholars.



Institute for Development Studies Andhra Pradesh
Madhurawada, Visakhapatnam 530041
www.idsap.in