

# Assessing the Impact of APCNF

[Andhra Pradesh Community Managed Natural Farming]

A Comprehensive Approach Using Crop Cutting Experiments

*Final Report 2022-23*

Submitted To

**Rythu Sadhikara Samstha**

Department of Agriculture, Government of AP

**IDSAP**

**Madhurawada, Visakhapatnam 530041**

**April 2024**



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## Acknowledgments

Many persons and agencies have helped us in the completion of the study titled “Assessing the Impact of Andhra Pradesh Community Managed Natural Farming: A Comprehensive Approach Using Crop Cutting Experiments”. First and foremost, we are grateful to Shri. T. Vijay Kumar, IAS (Retired), Executive Vice Chairman, Rythu Sadhikara Samstha (RySS), Government of Andhra Pradesh for entrusting us with this project and reposing faith in us. We are thankful to Sri. B. Rama Rao IAS, (Retired), Chief Executive Officer (CEO), RySS, and Dr. (Smt.) Poonam Malakondiah, IAS, Special Chief Secretary, Department of Agriculture and Cooperation, Government of Andhra Pradesh, for their constant backing of the study. We owe our gratitude to Dr. D.V.Raidu, IAS (Retired), Senior Consultant, Sri. G. Muralidhar, Senior Consultant, APPI/ RySS, Dr. C.P. Nagi Reddy, Senior Consultant, RySS for their active involvement, suggestions, and continuous support in the execution and successful completion of this project. We are also thankful to other members of the Andhra Pradesh Community Managed Natural Farming (APCNF) team, who have provided us with variety of support services at different stages of project, at the RySS headquarters.

A number of RySS officials at the field level have extended their cooperation and facilitated our fieldwork. The District Project Managers (DPMs) in all thirteen districts with their staff gave all the support we needed to complete the fieldwork. We are thankful to the DPMs, Mandal Anchors (MAs), Cluster Coordinators (CCs) Cluster Assistants (CAs), Community Resource Persons (CRPs), Internal Community Resource Persons (ICRPs), and other staff in every district for their help and for sharing their insights with us, while conducting the field survey.

We acknowledge the services rendered by Mr. P. Appa Rao, Mr. D. Satish, and Mr. L. Ravichandra Reddy in different stages of the project. We appreciate the contribution of Sri. C. M. Reddy, and his colleagues from NSSO for their support in their respective geographical locations in conducting the crop cutting experiments (CCEs).

i for Development (i4D) Parishkaar Technologies Ltd. has helped us in digitalization of the field data. Mr. Naveen Chand and Mrs. Varsha Sai Geetha and their team extended excellent support and cooperation in Realtime. We record our appreciation for the same.

We would like to record our appreciation to all the field supervisors and investigators, who have actively participated in the field work with all devotion, commitment, and sincerity.

*Lastly, but most importantly, we are indebted to the farmers of Andhra Pradesh, whose betterment is the reason for this study. The study team gratefully acknowledges the contributions of the farmers, who have given us their valuable time and educated us with their rich experience and inherent knowledge.*

***Project Team***

April, 2024,  
Visakhapatnam.

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## Acronyms

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

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

# Executive Summary

## 0.1. Introduction

1. The current study is a continuation of the “Impact Assessment” studies of APCNF conducted in 2019-20, 2020-21, and 2021-22, by IDSAP, Visakhapatnam. This is the final report of 2022-23 study, covering both the Kharif and the Rabi 2022-23 seasons.

## 0.2. Objectives

2. The overall objectives of the annual study are to assess the impact of APCNF in terms of its economic sustainability<sup>1</sup>, social sustainability<sup>2</sup> and environmental sustainability<sup>3</sup> and to delineate the contribution of APCNF in enhancing the wellbeing of farmers in particular and people of the state, in general. Specific objectives of this report are:
  - a. To estimate and compare the cost of cultivation, cost structure, crop yields, gross and net values 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 through crop cutting experiments (CCEs).
  - c. To understand the impact of CNF on the input use, especially, on the use of natural resources and consequent environmental implications.
  - d. To arrive at the impact of CNF on the household income
  - e. To estimate the potential benefits to the state, if the entire GCA were put under APCNF
  - f. To know the impact of CNF on farmers’ wellbeing.
  - g. To understand the issues and challenges in adoption of CNF and to offer possible solutions.

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

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

<sup>3</sup> 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.

### 0.3. Methodology and sample size

3. The study used 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 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.
4. To know the holistic impact of CNF on participating households, it was planned to fix the sample units throughout the year. That is the same set of sample farmers have to be surveyed during PMDS, Kharif and Rabi season. But in the past, it was observed only about 50 percent sample CNF and non-CNF farmers, selected at the beginning of the study, cultivate any crop during Rabi season. As a result, the study could not get adequate number of sample observations and CCEs for certain crops during the Rabi season. To overcome this challenge, the study included additional samples to collect only the cost of cultivation data and to conduct CCEs of the crops, which have inadequate representation in the regular sample, during Rabi season.
5. As expected, only 47 and 43 percent of CNF and non-CNF sample farmers were engaged in cultivation during the 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 the Rabi season.
7. The annual study is focussed on 12 major crops that are identified based on the cropped area in the state. For these 12 crops, detailed data about costs, yield and returns are collected. 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.
8. Subsequently, because of a peculiar reason, Jowar crop<sup>4</sup> was left out. Therefore, only 11 out of 12 crops are covered in this report.
9. The number of sample observations varies from 51 for CNF Green Gram to 1,044 for CNF Paddy. In the case of non-CNF, the sample observations vary from 46 in Ragi to 442 for Paddy (Figure 1.1).

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<sup>4</sup> In some districts most of the farmers used Jowar as fodder. Hence no yield data is available.



10. About 3,500 CCEs have been conducted during both seasons. Leaving aside the CCE of the Jowar crop and the CCEs of Panel farmers' CCEs, the results of 3,152 CCEs are utilized in this report. The number includes 1,979 CCEs of CNF crops and 1,173 CCEs of non-CNF crops.
11. The number of CNF CCEs varies from a minimum of 41 for Red gram to a maximum of 631 for Paddy. The number of non-CNF CCEs varies from 37 for Tomato to 311 for Paddy (Figure 1.2). This became possible because of the inclusion of additional sample during the Rabi season.
12. The additional sample was included only to conduct CCEs for select crops, which fall short of 40-50 observations and to collect the costs and returns data of such crops. The data with respect to household income, perceptions about input use, farmers' wellbeing, etc., was not collected from the additional sample farmers.

#### **0.4. Impact of CNF on farming conditions**

13. On an average, CNF farmers saved ₹8,997 (50 percent) in their expenditure on PNPIs vis-à-vis non-CNF farmers (Table 3.2). As observed in the previous studies, here also, the CNF farmers have obtained larger savings in PNPIs in input intensive crops (under non-CNF) like Chillies, Tomato, Cotton, Paddy and Maize.
14. Paid-out cost, considered in this study, consists of the expenditure on (1) seeds, (2) PNPI, (3) hired labour, (4) farm yard manure (FYM), (5) machinery, (6) bullocks, (7) implements, (8) irrigation and (9) miscellaneous items, including supervision and emergencies. This cost closely approximate to "Cost concept of A1" of owner cultivator.
15. Other cost items which are not included in the studies are (1) actual rent paid to the land, (2) imputed rental value of own land, (3) imputed value of own labour, (4) interest paid on the borrowed funds, (5) depreciation of agriculture assets, excluding land. In a sense the paid-out cost used is a narrow concept. Needless to say, all these inclusions and exclusions are common to both CNF and non-CNF farmers.
16. On an average, the savings of CNF farmers in the paid-out cost is ₹6,303 (9 percent) under CNF vis-à-vis non-CNF (Table 3.3).
17. By and large, the paid-out cost structure remained the same in both CNF and non-CNF methods. The only notable difference is that the share of PNPIs is less under CNF, which is the result of a significant reduction in the expenditure on PNPIs under CNF. As a result, the share of human labour and machine labour are relatively high under CNF (Figure 3.2 and Table 3.4).

18. The expenditure on FYM under CNF is more than that of non-CNF in all crops considered (Table 3.5). In a sense, application of FYM is inevitable under CNF, because of two reasons. Firstly, the farmers store the Jeevamrutham in the form of Ghanajeevamrutham by mixing the Jeevamrutham with FYM. Secondly, as livestock farming becomes an integral part of CNF, the farmers automatically get the FYM (waste from the livestock sector), and apply the same in their fields.
19. The data indicates that under CNF the paid-out costs are not only less but also diversified.
20. There is a keen interest, among the different stakeholders, about the impact CNF on crop yields. Given the importance of yields, the study is mandated to conduct CCEs to estimate independently and scientifically the crop yields under CNF and non-CNF.
21. The yields arrived at, based on crop cutting experiments (CCEs), turned out to be the same, i.e., no difference statistically, in eight out of 11 crops included in this report. In the remaining three crops, viz., Bengal gram, Maize and Tomato, the yields under CNF are, statistically, higher than that of non-CNF (Table 3.6).
22. The prices are critical for the expansion of CNF in the state. The CNF farmers think that their CNF output is quality output and expect higher prices for the same.
23. The prices obtained for CNF and non-CNF are statistically the same in eight out of 11 crops. In the remaining three crops, viz., Paddy, Groundnut and Chillis, the CNF output got significantly higher prices (Table 3.7).
24. The difference between the CNF and the non-CNF in respect of the gross value of output per hectare is positive in case of 10 out of the 11 crops studied in this report. The only exception is Green Gram (Table 3.8). On an average, the gross value of CNF crops is higher than that of non-CNF crops by ₹11,284 (8 percent) per hectare.
25. In two crops, the net value of output is negative under non-CNF, i.e., -10,965 and -91 per hectare in Tomato and Red Gram respectively. The net value of non-CNF Cotton output is just ₹44 per hectare. These figures reflect the status of non-CNF in the state. The non-CNF farmers are not able to recover a narrowly defined cost of cultivation- (A1) paid-out costs in those three crops. On an average, the net value of CNF crop output is ₹17,587 (27 percent), per hectare, higher than that of non-CNF. Out of this, ₹6,303 is due to savings in the paid-out costs (see Table 3.3) and ₹11,284 is due to higher gross value of output (see Table 3.8).

## **0.5. Impact of CNF on farming conditions at disaggregate level**

26. The results of disaggregated analysis indicate that the state level picture is reflected in majority of Agroclimatic Zones and farmers categories, in all crops.
27. The analysis, suggest that the resource poor Agroclimatic Zones and farmers too equally benefited from CNF in general. In other words, CNF is a scale neutral technology.
28. The variations in the impact of CNF on farming conditions are higher across the Agroclimatic Zones, compared to those of among farmers' categories. This needs agroclimatic zone specific CNF packages. It was learned that RySS is aware of this issue and working on it.
29. Another broad inference, which is somewhat related to the previous insight, is that CNF has better performed in southern part of the state, particularly in less canal irrigation intensive areas. However, CNF needs special attention in the Scarce rainfall zone, which has also relatively low soil quality fields.

## **0.6. Impact of CNF on input use**

30. 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 are clear signs of improvement in land use.
31. CNF farmers cultivated about 20 percent land during the study period. There is an increase in area allocated to CNF over the years, both in absolute and relative terms. About 40 percent of CNF farmers allocated their entire operated area to CNF in Rabi season.
32. On an average, 22 and 21 days of additional labour are used under CNF during Kharif and Rabi seasons respectively. Overwhelming part of additional labour was met from own labour in both seasons. Majority of additional labour is female labour.
33. Majority of CNF farmers of all the categories have reported that the water requirement for crop cultivation has come down.
34. Out of 1,331 sample HHs, 373 have purchased livestock because of CNF. The average number of livestock acquired per household is 2.
35. On an average, the CNF farmers have avoided 4.82 quintals of fertilizers per hectare during the Rabi season. Apart from reducing the cost of cultivation, avoidance of fertilizers would lead to an improvement in soil quality; and in reduction of the fertilizers'

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

36. 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 in Rabi 2022-23. 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.
37. Instead of agrochemicals, CNF farmers have used different CNF practices and inputs/ stimulants. Total 100 percent of farmers have adopted PMDS, and nearly 100 percent adopted Beejamrutham and Drava Jeevamrutham. Around 90 percent of farmers have adopted Kashayams, Ghana Jeevamrutham, Border crops and Asthrams. Over 40 to 70 percent of farmers adopted Bund crops, Inter-cropping and Other practices like Pheromone traps, sticky-pads, etc.
38. On an average, the CNF farmers borrowed ₹61,701 vis-à-vis ₹84,886 by non-CNF HHs for agriculture and other purposes.
39. These positive changes may, in turn, improve the farmers wealth and wellbeing.

## **0.7. Impact of CNF on Farming and Other Household Incomes**

40. Apart from improving the farming income, CNF is expected to have a positive impact on sources of household income. In the previous studies also, it was observed that there was slight shift in the composition of CNF households' income from wage labour to livestock and agriculture.
41. Apart from 12 sample crops (major crops), both CNF and non-CNF farmers, usually, cultivate other crops. Livestock rearing is also becoming an integral part of CNF.
42. While 100 percent of CNF and non-CNF farmers have cultivated major crops during the study period, only 31 percent of non-CNF household cultivated other crops vis-à-vis of 68 percent of CNF households. About 59 percent of CNF and 50 percent of non-CNF household have obtained income from livestock farming during the study period (Table 6.1).
43. On an average the CNF farmers got ₹1,77,812 vis-à-vis ₹1,62,173 from agriculture, including crop cultivation and livestock rearing; i.e., a 10 percent or ₹15,639 more income. From crop cultivation alone, the CNF farmers got ₹13,061 or 9 percent higher income.

44. Unlike in previous years, this year the income of CNF farmers from major crops is less than that of non-CNF farmers. Apart from smaller plot sizes under CNF, another possible reason is the crop wise sample selection. A farmer selected for one sample crop may be cultivating another sample crop also. As a result, the composition of sample crops for CNF and non-CNF farmers is not uniform. Among six high value crops, viz., Paddy, Groundnut, Cotton, Maize, Chillis and Tomato, the percentage of CNF sample is high in one crop, viz., Paddy and the share of non-CNF sample is high in three crops, viz., Groundnut, Cotton and Chillis<sup>5</sup> (Table 6.3).
45. As expected relatively less proportion of CNF farmers (60 percent) reported wages as source of income compared to 65 percent by non-CNF farmers. Further, only 9 percent CNF farmers reported salary income vis-à-vis 14 percent by non-CNF farmers.
46. CNF farmers got higher income of ₹904 (88 percent) only from other sources (which is mostly poultry), along with agriculture income. On the other hand, non-CNF households, got higher income in six out of eight sources included in the analysis (Table 6.6).
47. Non-CNF farmers got ₹6,586 (3 percent) higher household income than CNF. This is the first time, that non-CNF households got higher income. In all previous years' studies since 2019-20, CNF farmers got higher household income. In some of the previous studies, though the non-CNF farmers got higher income in non-farm activities, higher farm incomes of CNF farmers used to compensate their shortfall in non-farm incomes. But this year, higher farm income of CNF farmers is not able to compensate the shortfall in non-farm income.

## **0.8. Potential impact of APCNF on agriculture in the state**

48. If the entire GCA is put under CNF, the state would have saved ₹6,636 crore (50 percent) in PNPI, ₹4,648 crore (16 percent) in paid-out costs; and would have attained ₹8,823 crore (8 percent) additional gross value of crop output and ₹12,971 crore (27 percent) higher net value of crop output (Table 7.2).
49. Since the yield differences are not statistically significant, in eight crops, the output of those eight crops would remain the same if the entire GCA is allocated to CNF. At the same time, the output of Maize, Bengal gram and Tomato would have been increased by 9.1 percent, 9.5 percent and 24.3 percent respectively (7.3).

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<sup>5</sup> This issue will be addressed in 2024-25 study.

50. If the entire GCA is put under CNF, the state would have avoided the use of 38.22 lakh tons of fertilizers in 2022-23. In the same year, the state would have avoided ₹13,197.10 crore expenditure on agrochemicals, including ₹8,069.98 crores on fertilizers and ₹5,127.12 crores on pesticides (Table 7.4).
51. Shortage of labour is often cited as one of major constraints in the expansion of CNF. In total 5.5 lakh persons (19 percent) of additional labour are required, if the entire area is put under CNF. These include 3.34 lakh persons of own labour and 2.25 persons of hired labour. On the other hand, CNF requires 4.08 lakh persons (22 percent) of female and 1.52 lakh persons of male additional labour (Table 7.5). Given the overall size of agriculture workers, additional requirement can easily be met. In addition, CNF can reduce the disguised unemployment and increase agricultural workers' productivity. As CNF is focusing on mixed cropping, crop rotation and crop diversity, the peak time demand for agriculture labour would reduce considerably. It would enable the CNF farmers to optimize their labour use.

## **0.9. Wellbeing of farmers**

52. Over 65 percent of the farmers, at the state level, claimed that the stress they endure has diminished 'considerably' or 'moderately' due to CNF.
53. Over two-thirds of CNF farmers reported an improvement in their financial position.
54. 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.
55. About 54 percent of CNF farmers experienced a considerable or moderate increase in new market channels.
56. Over 94 per cent of the farmers, at the state level, expressed their interest in farming due to CNF.
57. 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.
58. About 24 percent of CNF farmers, at the state level, have witnessed 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.

59. About 83 percent of sample CNF farmers reported that they are getting respect from friends and relatives because of their adherence to CNF.
60. Over 82 percent famers, at the state level, said that they are getting considerable or moderate respect in the markets.

### **0.10. Issues, challenges and way forward**

61. 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.
62. Shortage of suitable equipment such as mixers, blenders, stirrers, drums, etc., is cited as problem by 59 percent of farmers.
63. Output marketing is a generic problem in Indian agriculture. In the case of CNF output, selling is not a problem, is the real issue for the CNF farmers.
64. Scarcity of labour and scarcity of family labour have been encountered by 46 and 34 percent of the farmers respectively.
65. 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.
66. 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 year' survey compared to previous years' results. It reflects improvement in the RySS's extension and support services as well as farmers' increased ability to master the new techniques and practices of CNF.
67. 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.

# 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 Government has provided a dedicated institutional structure, known as Rythu Sadhikara Samstha (RySS) to implement APCNF in the state. The Government intends to cover the entire 80 lakh hectares of gross cropped area (GCA) and all 60 lakh farmers under CNF. 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) package, 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; and such farmers are known as S2S farmers. Yet another six percent of farmers in the state are adopting CNF inputs and practices along with agrochemicals and related practices in same plots, known as partial farmers.

APCNF is based on Dr Subhash Palekar's spiritual farming model, known as zero budget natural farming (ZBNF), which was developed on the ecological principles of forests evolution<sup>6</sup>. However, RySS is contextualizing and improving the original ZBNF (henceforth referred as APCNF or CNF in short) model continuously. For example, RySS recommended the use of any cattle dung and urine, in place of Desi-cow dung and urine, as recommended by Palekar. Recently RySS made one of the major breakthroughs in 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 underlying PMDS 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

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<sup>6</sup> Palekar pointed out that natural forests grow profusely and perpetually without application of any nutrients from outside. He argues that plants get 98 to 98.5 required nutrients from air, water & solar energy through photosynthesis. Only 1.5 to 2.0% nutrients are taken from soil, which can be made available through microbes. According to Palekar there are four artefacts followed in natural farming: **Beejamrutham**: Microbial seed coating through cow urine and dung -based formulations; **Jeevamrutham**: Enhance soil microbiome through an 'inoculum' of cow dung, cow urine and other ingredients; **Achhadana**: Ground to be kept covered with crops and crop residues as mulching; and **Waaphasa**: Fast buildup of soil humus through ZBNF leading to soil aeration and water vapor harnessing. See <https://zbnf.org.in/>



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.<sup>7</sup> This system is based on belief that land should always be covered with vegetation and farmers should not depend on rainy season alone for growing crops.

While the benign microbes are introduced into soils through biological stimulants under CNF, which converts the natural elements available in the soils and atmosphere into plant nutrients; PMDS provides food<sup>8</sup> and shade to the microbes, especially during the hot summer months. 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. Such as:

- 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 incidentally 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.

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<sup>7</sup> It is noticed in the field those farmers, who just cultivate Rabi crops, started covering their fields with PMDS for the entire period from April/ May to October/ November.

<sup>8</sup>It is well known that through photosynthesis, plants convert sunlight, water and carbon dioxide (CO<sub>2</sub>) 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 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.

## 1.2. Objectives of present report

The current study is a continuation of the Impact studies of APCNF for 2019-20, 2020-21, and 2021-22, undertaken by IDSAP, Visakhapatnam. This is the final report of 2022-23 study, covering the data of both Kharif and Rabi seasons of 2022-23.

The overall objectives of the annual study are to assess the impact of APCNF in terms of economic sustainability<sup>9</sup> 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 values of output from crop cultivation under CNF and under chemical-based farming, referred as non-CNF.
- ii. To estimate and compare the crop yields obtained under CNF and non-CNF, independently through crop cutting experiments (CCEs).
- iii. To understand the impact of CNF on the input use, especially, on the use of natural resources and consequent environmental implications.
- iv. To arrive at the impact of CNF on the household income
- v. To estimate the potential benefits to the state, if the entire GCA were put under APCNF
- vi. To know the impact of CNF on farmers' wellbeing.
- vii. To understand the issues and challenges in adoption of CNF and to offer possible solutions.

## 1.3. Methodology

In this sections the issues related to the basic approach, sample design and selection and data collection and management are discussed briefly. More details about these issues can be seen in IDSAP, (2023) and (2023a)

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<sup>9</sup>Economic sustainability means that APCNF is profitable, i.e., able to generate surpluses after covering the entire cost of cultivation

### *1.3.1. The Basic Approach*

The study uses the “*with and without*” method to assess the impact of CNF. In this method the outcomes of CNF farmers<sup>10</sup>, cultivating a particular crop are compared with the outcomes of the non-APCNF farmers cultivating the same crop but using chemical inputs.<sup>11</sup> 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.

The annual study is focussed on 12 major crops that are identified based on the cropped area in the state. For these 12 crops, detailed data about costs, yield and returns are collected. 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 of the cropping pattern in the state, a set of seven seasonal crops, viz., Paddy, Groundnut, Cotton, Maize, Red gram, Chillies and Tomato were covered in Kharif report and another set of seven seasonal crops, viz., (1) Paddy, (2) Groundnut, (3) Bengal gram, (4) Black Gram, (5) Maize, (6) Green gram and (7) Ragi were covered in the Rabi season reports<sup>12</sup>. In this final report 11 out of 12 crops are covered. Only Jowar is left out.

### *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

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<sup>10</sup> The CNF sample has been selected from the CNF farmers who cultivated PMDS during 2022 and cultivated at least one of the 12 focused/ sample crops on those PMDS plots under S2S method.

<sup>11</sup> 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.

<sup>12</sup> Though Ragi is cultivated mostly in Kharif season, we could not get non-CNF Ragi cultivators in Kharif season. Therefore, it was covered in the Rabi report. Additional sample of CNF and non-CNF farmers were included for Rabi survey.

second interim reports of 2022-23 study (IDSAP 2023 and 2023a). The same is summarised below:

1. The study proposed to cover 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.
2. The 130 sample GPs were allocated to the 30 strata<sup>13</sup> (of Agroclimatic Zones X districts) in proportion to the number of CNF farmers in each stratum. Similarly, the 65 non-CNF sample GPs were allocated across the 30 strata in proportion to number of non-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 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. Almost all the insights, from the qualitative data have been incorporated in this report.

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

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<sup>13</sup> If a district falls in two zones, it is treated as two strata. In total 30 strata were found.

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 predominantly Rabi crops such as Bengal gram, Green gram, Black gram, etc. This 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, for the Rabi season survey. The additional sample was included only to conduct CCEs for select crops, which fall short of 40-50 observations and to collect 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 sample farmers. Those estimates were made with the original sample only. As also observed in previous surveys, only 47 percent of CNF and 43 percent of non-CNF sample household have cultivated crops during the Rabi season. Original sample size, actual cultivators in the original sample in Rabi season and additional sample included in Rabi survey for different Agroclimatic Zones and for farmers' categories are shown in Table 1.1.

**Table 1.1: Distribution of Sample farmers across Agroclimatic Zones and category of Farmers in Kharif and Rabi seasons during 2022-23**

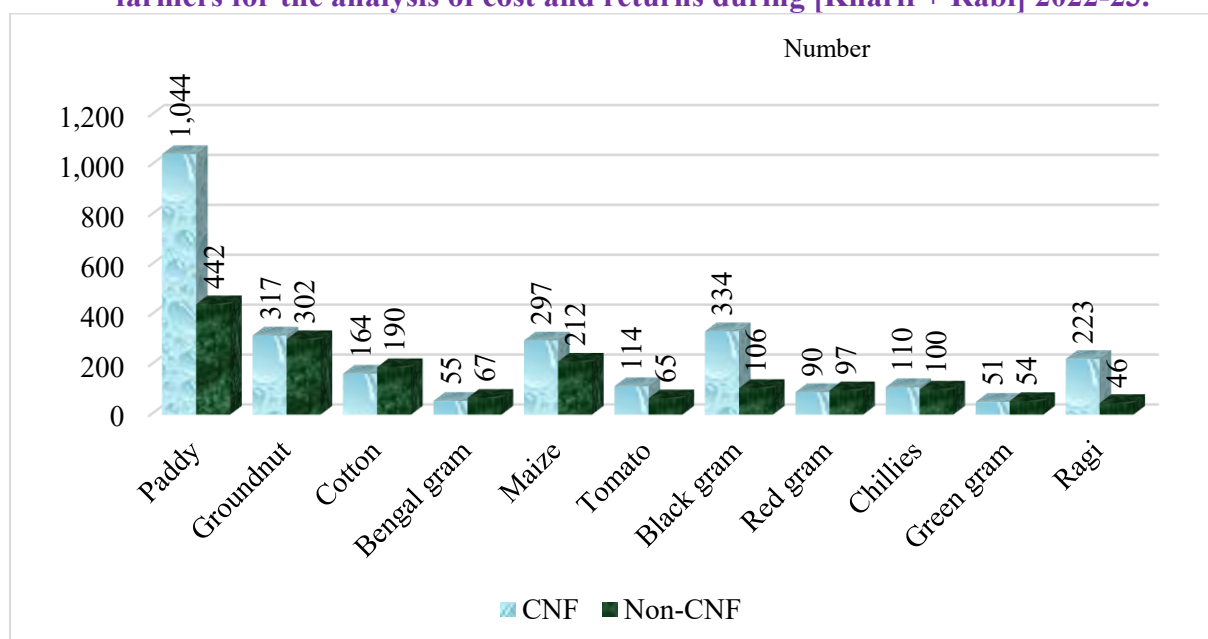
Agroclimatic Zones & farmers' categories		Original/ Kharif sample		Sample cultivators in Rabi		Additional sample in Rabi		Total sample for Rabi costs & returns estimation	
		CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	CNF	non-CNF
State	AP	1,331	731	629	317	288	269	917	586
Agro-climatic zones	HAT	215	59	46	43	52	26	98	69
	North coastal	97	51	69	30	42	21	111	51
	Godavari	83	31	80	31	2	30	82	61
	Krishna	232	92	130	33	144	128	274	161
	Southern	369	180	199	88	10	25	209	113
	Scarce rainfall	335	318	105	92	38	39	143	131
Farm size category farmers	Marginal	784	534	379	169	227	202	606	371
	Small	387	163	164	102	45	57	209	159
	Others	160	34	86	46	16	10	102	56
Tenurial category farmers	Tenant	31	23	22	12	7	3	29	15
	Owner-tenant	56	21	40	12	2	15	42	27
	Owner	1,244	687	567	293	279	251	846	544
Social category farmers	SC	238	64	128	21	69	35	197	56
	ST	231	55	48	50	54	29	102	79
	BC	512	388	269	147	102	128	371	275
	OC	350	224	184	99	63	77	247	176

Source: *IDSAP, Field Survey 2022-23*

### 1.3.3. Selection of crops and observations

As mentioned in all previous reports that most of the crops, in the state and are seasonal crops. Hence it is not possible to cover all sample crops in any one season's report. However, by pooling both the Kharif and Rabi data, almost all crops can be covered in the final report. But because of a peculiar reason, Jowar crop<sup>14</sup> could not be included in this report. Based on the available crop wise observations, the study covered eleven crops in this report. Because of additional sample, the study got a good number of observations to arrive at disaggregate results for most of the crops covered in the report. The crops covered, the number of available observations for the estimation of crop wise costs and returns are shown in Figure 1.1. The number of sample observations varies from 51 for CNF Green Gram to 1,044 for CNF Paddy. In the case of non-CNF, the sample observations vary from 46 in Ragi to 442 for Paddy (Figure 1.1). It may be noted that each of the crops has a good number of observations to arrive at reliable estimates. This became possible due to crop wise sample selection strategy that was adopted for this year and the 557 additional sample selected during the Rabi season.

**Figure 1.1: Distribution of sample observations across crops for CNF and Non-CNF farmers for the analysis of cost and returns during [Kharif + Rabi] 2022-23.**



Source: *IDSAP Field Survey 2022-23*

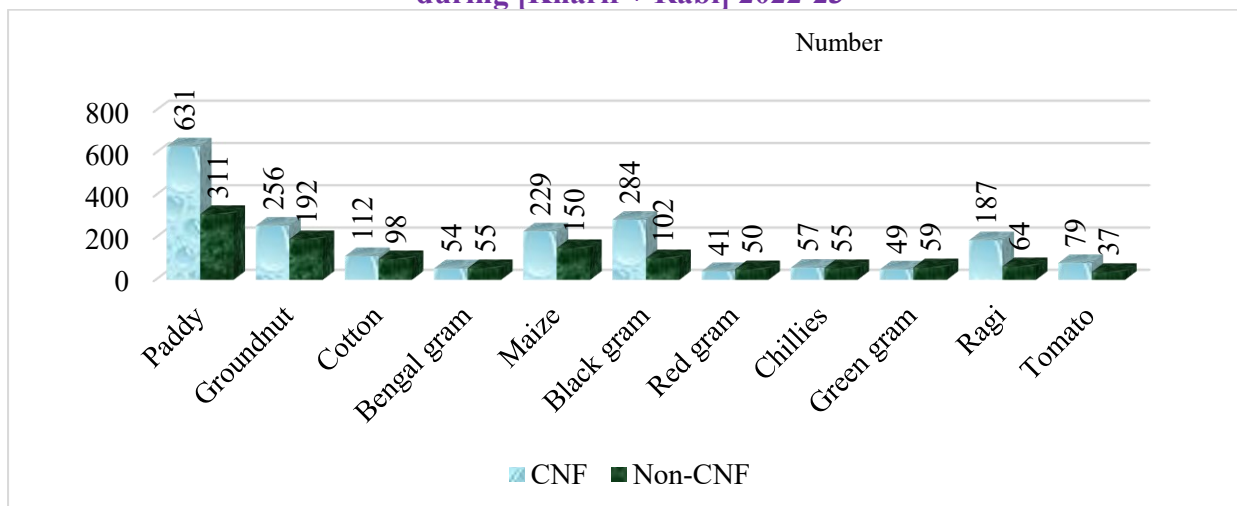
<sup>14</sup> In some district most of the farmers used Jowar as fodder. Hence no yield data is available.

### 1.3.4. 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 the *size<sup>15</sup>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 11 crops covered in this report, to come up with reliable yield estimates. About 3,500 CCEs have been conducted during both seasons. Leaving aside the Jowar crop CCEs and Panel farmers' CCEs<sup>16</sup>, the results of 3,152 CCEs are utilized in this report. The number includes 1,979 CCEs of CNF crops and 1,173 CCEs of non-CNF crops. The crop wise number of CCEs used in this report are shown in the Figure 1.2 The number of CNF CCEs varies from a minimum of 41 for Red gram to a maximum of 631 for Paddy. The number of non-CNF CCEs varies from 37 for Tomato to 311 for Paddy (Figure 1.2). This became possible because of the inclusion of additional sample during the Rabi season.

**Figure 1.2: Distribution of number of CCEs across crops for CNF and Non- CNF farmers during [Kharif + Rabi] 2022-23**



Source: IDSAP Field Survey 2022-23

<sup>15</sup> Normally, 5 metres by 5 metres, (5<sup>2</sup>metres) 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.

<sup>16</sup> The results of Panel farmers CCEs are being used in a separate Panel farmers study report.

### ***1.3.5. 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 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 filed-based instruments have in-built checks with appropriate skip patterns over and above the supporting 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 was conducted from September 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. They have also visited fields, especially the model farmers and social entrepreneurs, for obtaining information on various farm practices; and prepared a few case studies.

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, for agroclimatic zone<sup>17</sup>wise, for farm-size categories, for tenurial categories and for social categories.

## 1.4. 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 Kharif season report 2022-23.<sup>18</sup> Chapter 3 covers the impact of APCNF<sup>19</sup> on farming conditions. The CNF on farming conditions at the disaggregate levels are discussed in Chapter 4. The impact of CNF on agriculture input/ natural resources uses and related issues are discussed in chapter 5. The impact of CNF on farming incomes and household incomes are covered in Chapter 6. The potential impact of CNF on state agriculture and related issues are deliberated 7. The issues of the farmers wellbeing, which was covered extensively in previous Kharif 2022-23, is summarized in chapter 8. The issues and challenges in implementation of APCNF are covered in chapter 9. Apart from these nine chapters, a detailed Executive Summary of the study is also presented at the beginning of the Report.

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<sup>17</sup> A list of agroclimatic zones and their demarcations are shown at the appendix 1 below.

<sup>18</sup> All previous reports can be seen at <https://www.idsap.in/reports.html>

<sup>19</sup> 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.

***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. <sup>20</sup>
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

<sup>20</sup> 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 a comparison of the profiles of the sample households (HHs) of CNF and non-CNF.<sup>21</sup> The parameters included in the profiles are 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 tenants, owner-tenants and owner farmers). The profiles also include 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). As the same sample farmers are tracked throughout the study period, the profiles of sample will remain the same. Therefore, in this chapter, the profiles chapter of the Second Interim (Kharif Season) 2022-23 Report, is summarized. The related tables are presented in Appendix Tables of Chapter 2.

### 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-

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<sup>21</sup> 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, the term 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.

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 are 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 leased-in.
5. It is found that those of 40 years or below constitute 38.85 per cent of all farmers<sup>22</sup> in the sample CNF households, vis-à-vis 32.62 per cent of all cultivators<sup>23</sup> in the non-CNF sample households. On the other hand, those who are 61 years and above form 6.05 per cent of all cultivators<sup>24</sup> 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 impact on adoption of CNF.

### **2.3. Conclusions**

Larger presence of SC and ST farmers, women cultivators and young 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.

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<sup>22</sup> Household members who devote most of their working hours/ days to cultivation.

<sup>23</sup> Ibid

<sup>24</sup> Ibid

## Appendix tables of chapter 2

The following tables have been reproduced from Kharif 2022-23 Report, for the ready reference and use.

**Appendix Table 2.1: Distribution of sample farmers belonging to different Social Groups between CNF and Non-CNF farmers.**

Social Category	CNF	Non-CNF	CNF	Non-CNF
	Number		Percentage	
SC	238	64	18	9
ST	231	55	17	8
BC	512	388	38	53
OC	350	224	26	31
All	1,331	731	100	100

Source: APCNF Field Survey 2022-23

**Appendix Table 2.2: Number of female farmers in CNF and non-CNF sample households**

Indicator	CNF	Non-CNF
Number of sample households	1,331	731
Number of farmers in sample households*	1,884	987
Total farmers as percentage of sample families	142	135
Number of female farmers in sample households	607	295
Female farmers as % of all farmers	32	30
Female farmers as percentage of sample households	46	40

\* Farmers as reported by the respondent. Farmer here mean, a person, who devote most of his/her working days/ hours on cultivation. Each sample family may have more than one farmer or cultivator.

Source: APCNF Field Survey 2022-23

**Appendix Table 2.3: Distribution of sample farmers according to Farm-size category among of CNF and non-CNF households**

Farm size categories	Number		Percentage	
	CNF	Non-CNF	CNF	Non-CNF
Marginal	787	535	59	73
Small	387	162	29	22
Others	157	34	12	5
All	1,331	731	100	100

Source: APCNF Field Survey 2022-23

**Appendix Table 2.4: Distribution of sample farmers according to Tenurial Status among CNF and non-CNF sample households**

Tenurial categories	Number		Percentage	
	CNF	Non-CNF	CNF	Non-CNF
Pure tenants	31	23	2.33	3.15
Owner-tenants	56	21	4.21	2.87
Owner farmers	1,244	687	93.46	93.98
All	1,331	731	100	100

Source: APCNF Field Survey 2022-23

**Appendix Table 2.5: Distribution of sample farmers according to Agroclimatic Zones and Tenurial Status between CNF and non-CNF households during Kharif 2022-23**

Agroclimatic Zones	Unit	CNF				NON-CNF			
		Tenants	Owner-tenants	Owners	All	Tenants	Owner - tenants	Owners	All
HAT	Number	-	1	214	215	-	1	58	59
	Percentage	-	0	100	100	-	2	98	100
North coastal	Number	-	2	95	97	-	1	50	51
	Percentage	-	2	98	100	-	2	98	100
Godavari	Number	9	11	63	83	6	2	23	31
	Percentage	11	13	76	100	19	6	74	100
Krishna	Number	18	28	186	232	13	13	66	92
	Percentage	8	12	80	100	14	14	72	100
Southern	Number	2	7	360	369	1	2	177	180
	Percentage	1	2	98	100	1	1	98	100
Scarce rainfall	Number	2	7	326	335	3	2	313	318
	Percentage	1	2	97	100	1	1	98	100
AP	Number	31	56	1,244	1,331	23	21	687	731
	Percentage	2	4	93	100	3	3	94	100

Source: APCNF Field Survey 2022-23

**Appendix Table 2.6: Average Operated area among sample farmers of CNF and non-CNF according to Agroclimatic Zones and farmers' category**

Agroclimatic zone & farmers' categories		Average operated area (in hectares)		Percentage difference between CNF and non-CNF
		CNF	non-CNF	
1	2	3	4	$5 = ((3-4)/4) * 100$
State	AP	1.04	0.80	30
	HAT	0.94	0.61	55

Agroclimatic Zones	North coastal	0.83	0.48	75
	Godavari	1.00	0.76	30
	Krishna	1.00	0.89	12
	Southern	1.14	0.71	59
	Scarce rainfall	1.09	0.92	19
Farm size categories	Marginal	0.54	0.55	-1
	Small	1.35	1.29	5
	Others	2.79	2.50	12
Tenurial categories	Pure tenants	0.74	0.89	-17
	Owner-tenants	1.41	1.95	-28
	Pure owners	1.03	0.76	35
Social categories	SC	0.85	0.77	10
	ST	0.93	0.61	53
	BC	1.04	0.78	33
	OC	1.25	0.90	38

Source: APCNF Field Survey 2022-23

**Appendix Table 2.7: Distribution of sample cultivators according to their age among the CNF and non-CNF households in Kharif 2022-23**

Age-group	Number		Percentage	
	CNF	Non-CNF	CNF	Non-CNF
Up to 40 Year	732	322	38.85	32.62
41 to 60 years	1,038	554	55.1	56.13
61 years and above	114	111	6.05	11.25
All	1,884	987	100	100

Source: APCNF Field Survey 2022-23

**Appendix Table: 2.8: Distribution of sample farmers according to Literacy levels for CNF and Non-CNF households**

Education level	Number		Percentage	
	CNF	Non-CNF	CNF	Non-CNF
Illiterates	740	343	39	35
Primary (1-5)	337	197	18	20
Middle (6-8)	214	139	11	14
Secondary (9-10)	335	181	18	18
Inter	153	71	8	7
Diploma	8	2	0	0
Degree and above	97	54	5	5
All	1884	987	100	100

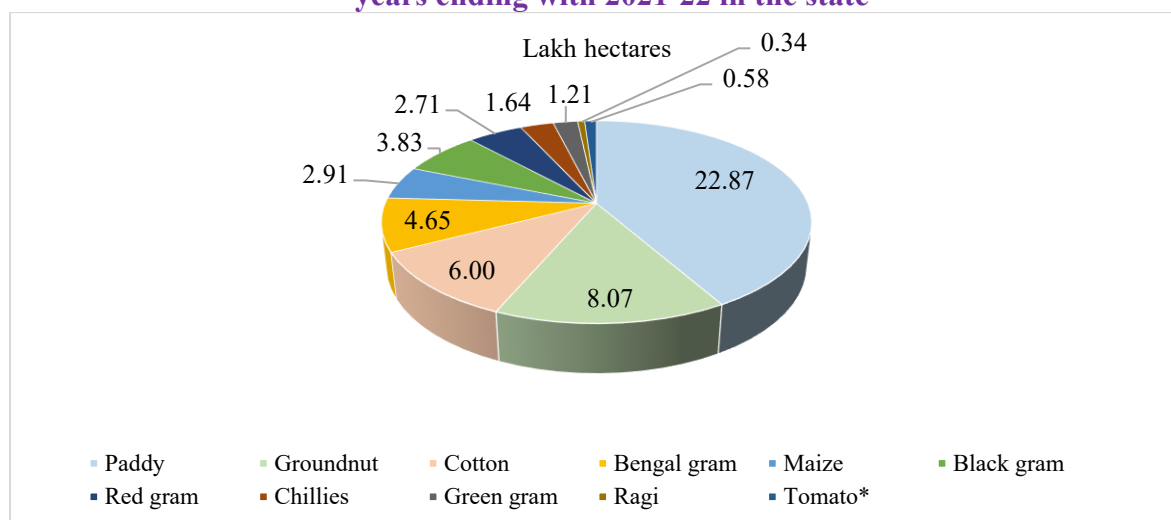
Source: APCNF Field Survey 2022-23

# Chapter 3: Impact of CNF on the farming conditions

## 3.1. Introduction

This chapter covers the impact of CNF on the farming conditions. The parameters considered in this chapter are expenditure on Plant Nutrients and Protection Inputs (PNPIs)<sup>25</sup>, paid-out costs, crop yields, prices, gross value of crop output and net value of crop output. As mentioned in chapter one, 11 crops are covered in this chapter. These 11 crops together account for 54.82 lakh hectares. It is equal to 74.33 percent of GCA area in the state. The area under each crop varies from 0.34 lakh hectares under Ragi and 0.58 lakh hectares under Tomato to 8.07 lakh hectares under Groundnut and 22.87 lakh hectares under Paddy (Figure 3.1). Using these areas as the weights, the average costs and returns of these 11 crops are calculated and used in this chapter.

**Figure 3.1: Average area under 11 selected crops during Kharif + Rabi seasons of five years ending with 2021-22 in the state**



*DES AP: Seasons and Crop Report 2021-22*

## 3.2. Crop wise number of sample observations and CCEs

The crops covered, the number of available sample observations and CCEs for the estimation of crop wise costs and returns in this chapter are shown in Table 3.1. The number of sample observations varies from 51 for CNF Green gram to 1,044 for CNF Paddy. In the case of non-

<sup>25</sup> For the sake of comparison, the biological stimulants (also referred as biological inputs) like Beejamrutham, Dravajeevamrutham, Ghanajeevamrutham, Kashayams, and Astras under CNF and the agrochemical inputs such as fertilizers, pesticides and herbicides, together denoted as Plant Nutrient and Protection Inputs (PNPIs).



CNF, the sample observations vary from 46 in Ragi to 442 for Paddy (Figure 1.1). The number of CNF CCEs varies from a minimum of 41 for Red gram to a maximum of 631 for Paddy. The number of non-CNF CCEs varies from 37 for Tomato to 311 for Paddy. It may be noted that each of the crops has a good number of observations and CCEs to arrive at robust estimates.

**Table 3.1: Crop wise CNF and non-CNF sample observations and CCEs for the cost and returns analysis in (Kharif plus Rabi) 2022-23**

Crop	Number of observations		Number of CCEs	
	CNF	Non-CNF	CNF	Non-CNF
Paddy	1,044	442	631	311
Groundnut	317	302	256	192
Cotton	164	190	112	98
Bengal gram	55	67	54	55
Maize	297	212	229	150
Black gram	334	106	284	102
Red gram	90	97	41	50
Chillies	110	100	57	55
Green gram	51	54	49	59
Tomato	114	65	187	64
Ragi	223	46	79	37
<b>Total</b>	<b>2,823</b>	<b>1,712</b>	<b>1,979</b>	<b>1,173</b>

Source: *IDSAP, Field Survey 2022-23*

### 3.3. Plant Nutrient and Protection Inputs (PNPIs)

For the sake of comparison, the biological stimulants (also referred as biological inputs) such as Beejamrutham, Dravajeevamrutham, Ghanajeevamrutham, Kashayams, and Astrams under CNF and the agrochemical inputs such as fertilizers, pesticides and herbicides, are together, denoted as Plant Nutrient and Protection Inputs (PNPIs). The major intervention under CNF is the replacement of agrochemicals with biological stimulants. The biological stimulants are being prepared by the farmers themselves or other local people with locally available inexpensive raw materials such as cattle dung, urine, Jagghery, Bengal gram-flour, wild-trees' parts/ products, etc. Needless to say, they are inexpensive and give a boost to the local economy.<sup>26</sup> On the other hand, fertilisers and pesticides are: factory made; expensive; involve huge fertilizer subsidy and other related subsidies; and side-effects on soil health. Thus, from the very beginning of the production process, the CNF farmer is on a better footing – he/ she requires to spend little on the critical inputs. This was seen to be true in all previous studies

<sup>26</sup> In some villages the market for cattle dung and urine are developing, albeit, slowly.

and now it is again the case in 2022-23. On an average, CNF farmers saved ₹8,997 (50 percent) in their expenditure on PNPIs vis-à-vis non-CNF farmers (Table 3.2). As observed in the previous studies, here also, the CNF farmers have obtained larger savings in PNPIs in input intensive crops (under non-CNF) like Chillies, Tomato, Cotton, Paddy and Maize. In absolute terms, the savings are over ₹.72,000 per hectare in Chillies and over ₹.9,000 per hectare in other four input intensive crops. On the other hand, the savings are negative, but marginal in Ragi and positive but small in four pulses crops, which are usually cultivated with less inputs (agrochemicals) under non-CNF.

**Table 3.2: Expenditure on PNPI<sup>@</sup> for each of the sample crops among CNF and Non-CNF farmers in [Kharif + Rabi] 2022-23**

Crop	₹/ hectare		Difference between CNF & non-CNF		
	CNF	Non-CNF	₹/ hectare	Percentage	Significance
Paddy	8,298	17,450	-9,152	-52	**
Groundnut	8,031	12,803	-4,772	-37	**
Cotton	14,745	24,519	-9,774	-40	**
Bengal gram	3,980	7,639	-3,659	-48	**
Maize	8,670	18,516	-9,846	-53	**
Black gram	8,200	10,063	-1,863	-19	*
Red gram	6,989	9,758	-2,769	-28	**
Chillies	20,429	92,921	-72,492	-78	**
Green gram	4,333	6,406	-2,073	-32	*
Ragi	5,597	4,820	778	16	ns
Tomato	16,880	25,915	-9,035	-35	**
Average	8,896	17,893	-8,997	-50	

<sup>@</sup> PNPI means plant nutrients and protection inputs, which include the biological stimulants under CNF and agrochemical inputs under non-CNF

Note: ‘\*\*’, ‘\*’ and ns indicate significance at ‘1%’, ‘5%’ and ‘not significance’ respectively

Source: IDSAP, Field Survey 2022-23

### 3.3. Paid-out Costs:

Paid-out cost, considered in this study, consists of the expenditure on (1) seeds, (2) PNPI, (3) hired labour, (4) farm yard manure (FYM), (5) machinery, (6) bullocks, (7) implements, (8) irrigation and (9) Miscellaneous items, including the supervision and emergencies. This cost closely represents “Cost concept of A1” of owner cultivator. Other cost items which are not included in the present studies are (1) actual rent paid to the land, (2) imputed rental value of own land, (3) imputed value of own labour, (4) interest paid on the borrowed funds, (5) depreciation of agriculture assets, excluding land. In a sense the paid-out cost used is a narrow concept. Needless to say, all these inclusions and exclusions are common to both CNF and

non-CNF farmers. By adding all the above-mentioned items, crop wise paid-out costs under CNF and non-CNF are estimated. The same are presented in Table 3.3.

On an average, the CNF farmers savings in the paid-out cost is ₹6,303 (9 percent) under CNF vis-à-vis non-CNF. This is on lower side compared to earlier studies. Apart from usual factors which influence farm investment, especially under non-CNF, such as annual weather, farmers expectations, availability of funds and credit, etc., the composition of sample crops explain lower savings in paid-out costs for CNF farmers. Out of 11 crops considered in this report, all four pulses crops and Ragi are usually grown with less inputs under non-CNF.<sup>27</sup> But the CNF farmers, usually, apply the recommended doses of inputs.<sup>28</sup> As a result, the paid-out cost under CNF is higher than that of non-CNF in all these five crops. It seems that during the current season of study, the non-CNF farmers have underinvested compared to their normal investment levels, in general and Tomato and Maize in particular. Out of 11 crops, the difference in the paid-out costs of CNF and non-CNF crops is not statistically significant in eight crops. In three crops in which the difference is significant, the paid-out cost under CNF is less in two crops, viz., Paddy and Maize and in Black gram, the paid-out cost under CNF is larger than that of non-CNF.<sup>29</sup>

**Table 3.3: Paid-out Cost for each sample crop under CNF and non-CNF in Kharif and Rabi 2022-2023**

Crop	₹/ hectare		Difference between CNF & non-CNF		
	CNF	Non-CNF	₹/hectare	Percentage	Sign.
Paddy	59,915	69,255	-9,341	-13	**
Groundnut	64,759	63,401	1,358	2	ns
Cotton	75,347	76,266	-918	-1	ns
Bengal gram	44,517	46,744	-2,226	-5	ns
Maize	53,500	59,828	-6,328	-11	**
Black gram	41,221	34,140	7,081	21	*
Red gram	34,035	33,706	328	1	ns
Chillies	2,23,787	3,10,148	-86,361	-28	ns
Green gram	27,594	25,183	2,411	10	ns
Ragi	31,260	26,192	5,068	19	ns

<sup>27</sup> Especially Black gram, Green Gram and Ragi in Rabi season, which are, usually, cultivated on the Paddy fallow fields with very little inputs.

<sup>28</sup> Another reason could be an increase in cash flows in CNF households, which enables them to invest more on agriculture, among others.

<sup>29</sup> One possible reason is, in Black gram and Ragi the share of Kharif sample is significantly higher in CNF sample vis-à-vis in non-CNF sample.

Crop	₹/ hectare		Difference between CNF & non-CNF		
	CNF	Non-CNF	₹/hectare	Percentage	Sign.
Tomato	1,00,791	1,00,056	736	1	ns
Average	62,532	68,834	-6,303	-9	

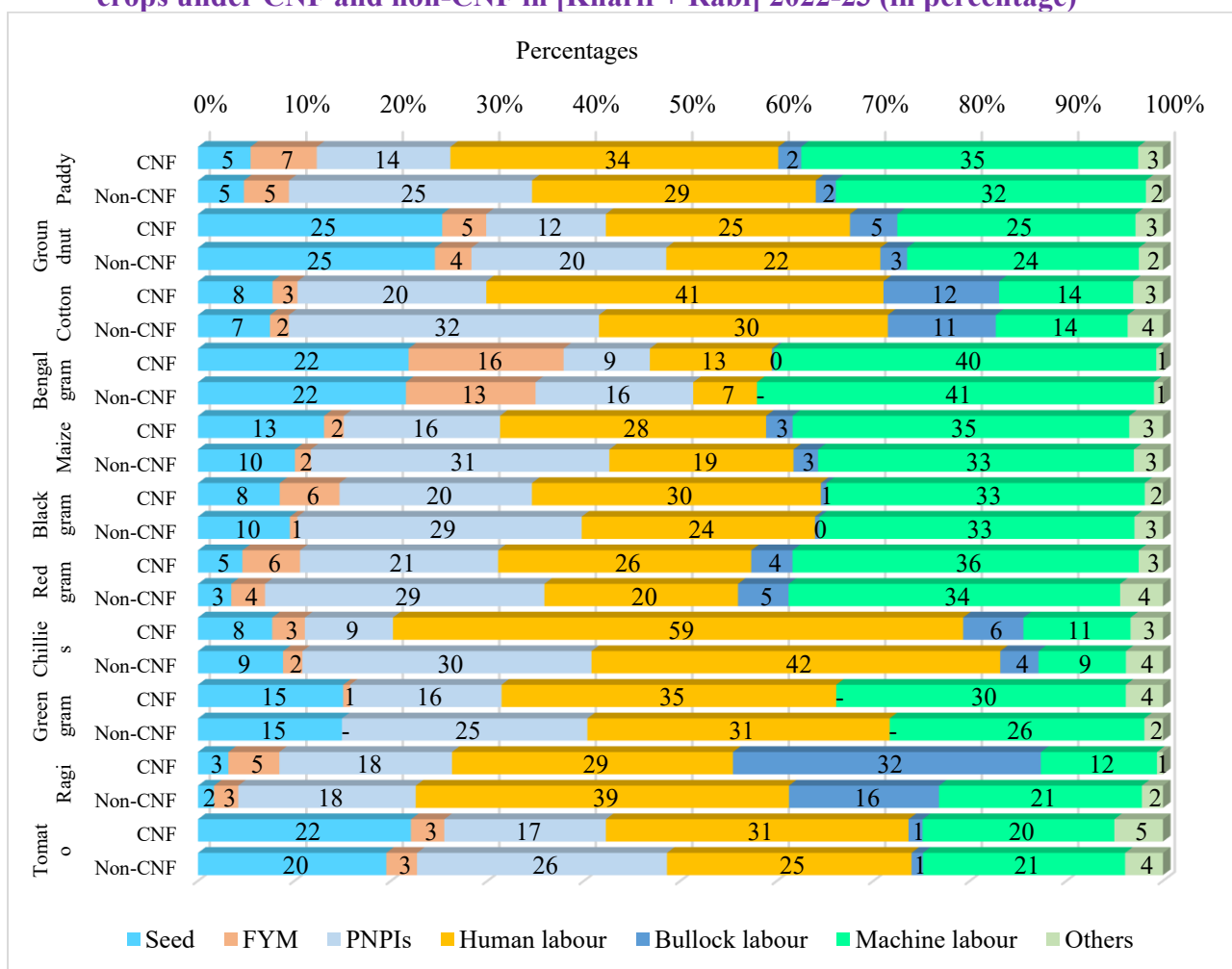
Note: '\*\*', '\*', 'ns' indicate '1%', '5%' and 'not-significance' respectively

Source: IDSAP, Field Survey 2022-23

### 3.3.1. Structure of Paid-out Costs

As mentioned above the study collected data of nine cost items, viz., (1) seeds, (2) PNPI, (3) hired labour, (4) farm yard manure (FYM), (5) machinery, (6) bullocks, (7) implements, (8) irrigation and (9) Miscellaneous items; and included them in the paid-out cost. However, very little expenditure is incurred on last three cost items mentioned above. Hence those three items were clubbed under 'other' items/ expenditure. The percentage share of each of seven cost items in the paid-out cost of each crop under CNF and non-CNF are shown in Figure 3.1 and Table 3.4. Four items viz., PNPIs, Human labour, Machine labour and Seeds occupy top four positions in the paid-out costs, in different orders in different crops across the state. Bullock labour and FYM are used in the notable proportions in a few crops/ regions. By and large, the paid-out cost structure remained same in both CNF and non-CNF methods. The only notable difference is the share of PNPIs is less under CNF, which is the result of a significant reduction in the expenditure on PNPIs under CNF. As a result, the share of human labour and machine labour are relatively higher under CNF.

**Figure 3.2: Shares of major agriculture inputs in the paid-out costs of different sample crops under CNF and non-CNF in [Kharif + Rabi] 2022-23 (in percentage)**



Source: IDSAP, Field Survey 2022-23

**Table 3.4: Shares of major agriculture inputs in the paid-out costs of sample crops under CNF and non-CNF in [Kharif +Rabi] 2022-23**

Crop →	Paddy		Groundnut		Cotton		Bengal gram		Maize	
	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF
Seed	5	5	25	25	8	7	22	22	13	10
FYM	7	5	5	4	3	2	16	13	2	2
PNPIs	14	25	12	20	20	32	9	16	16	31
Human labour	34	29	25	22	41	30	13	7	28	19
Bullock labour	2	2	5	3	12	11	0	-	3	3
Machine labour	35	32	25	24	14	14	40	41	35	33
Others	3	2	3	2	3	4	1	1	3	3

Crop →	Paddy		Groundnut		Cotton		Bengal gram		Maize	
Input ↓	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF
Paid-out cost	100	100	100	100	100	100	100	100	100	100

Source: *IDSAP Field Survey 2022-23*

Table 3.4 Cont.

Crop →	Black gram		Red gram		Chillies		Green gram		Ragi		Tomato	
Input ↓	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF	CNF	Non-CNF
Seed	8	10	5	3	8	9	15	15	3	2	22	20
FYM	6	1	6	4	3	2	1	-	5	3	3	3
PNPIs	20	29	21	29	9	30	16	25	18	18	17	26
Human labour	30	24	26	20	59	42	35	31	29	39	31	25
Bullock labour	1	0	4	5	6	4	-	-	32	16	1	1
Machine labour	33	33	36	34	11	9	30	26	12	21	20	21
Others	2	3	3	4	3	4	4	2	1	2	5	4
Paid-out cost	100	100	100	100	100	100	100	100	100	100	100	100

Source: *IDSAP, Field Survey 2022-23*

An analysis of the absolute expenditures on each cost item under CNF and non-CNF may give additional insights. The expenditure on FYM under CNF is more than that of non-CNF in all crops considered (Table 3.5). In a sense, application of FYM is inevitable under CNF, because of two reasons. Firstly, the farmers store the Jeevamrutham in the form of Ghanajeevamrutham by mixing the Jeevamrutham with FYM. Secondly, as livestock farming becomes an integral part of CNF, the farmers automatically get the FYM (waste from the livestock sector), and apply the same in their fields. As anticipated the expenditure on human labour under CNF is higher than that of non-CNF in nine out of 11 crops. Though the expenditure on machine labour appeared to be high in relative terms under CNF, in absolute terms, it is less than that of non-CNF in six out of 11 crops. The data indicates that under CNF the paid-out costs are about the same or less than under non-CNF, besides they are diversified.

**Table 3.5: Expenditure on major inputs in the paid-out costs of select crops under CNF and non-CNF in [Kharif + Rabi] 2022-23**

Crop → Input ↓	Paddy				Groundnut				Cotton				Bengal gram			
	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %
<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>	<i>16</i>	<i>17</i>
Seed	3,267	3,297	-30	-1	16,390	15,566	824	5	5,819	5,691	128	2	9,713	10,070	-357	-4
FYM	4,111	3,229	882	27	2,949	2,403	546	23	1,951	1,491	460	31	7,154	6,280	874	14
PNPIs	8,298	17,450	-9,152	-52	8,031	12,803	-4,772	-37	14,745	24,519	-9,774	-40	3,980	7,639	-3,659	-48
Human labour	20,354	20,360	-7	-0	16,385	14,059	2,326	17	31,009	22,818	8,192	36	5,625	3,089	2,536	82
Bullock labour	1,422	1,442	-21	-1	3,178	1,759	1,419	81	9,028	8,540	488	6	108	-	108	
Machine labour	20,922	22,255	-1,333	-6	15,986	15,229	757	5	10,472	10,414	59	1	17,627	19,227	-1,600	-8
Implements	590	637	-47	-7	384	423	-39	-9	1,038	2,043	-1,005	-49	135	163	-28	-17
Irrigation	494	251	242	96	425	160	265	165	470	166	303	182	61	11	50	471
Miscellaneous	459	334	125	37	1,032	1,000	31	3	815	584	231	40	114	265	-151	-57
Paid-out cost	59,915	69,255	-9,341	-13	64,759	63,401	1,358	2	75,347	76,266	-918	-1	44,517	46,744	-2,226	-5

Source: IDSAP Field Survey 2022-23

**Table 3.5 Cont.**

Crop → Input ↓	Maize				Black gram				Red gram				Chillies			
	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %
<i>1</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>	<i>30</i>	<i>31</i>	<i>32</i>	<i>33</i>
Seed	6,988	6,009	979	16	3,487	3,252	236	7	1,565	1,162	403	35	17,199	27,343	-10,145	-37
FYM	1,090	981	109	11	2,556	262	2,293	874	2,032	1,180	852	72	7,585	6,223	1,362	22
PNPIs	8,670	18,516	-9,846	-53	8,225	10,063	-1,838	-18	6,989	9,758	-2,769	-28	20,429	92,921	-72,492	-78
Human labour	14,748	11,416	3,332	29	12,337	8,248	4,089	50	8,926	6,762	2,164	32	1,32,225	1,31,366	859	1
Bullock labour	1,471	1,523	-51	-3	246	167	79	47	1,459	1,771	-312	-18	13,990	12,300	1,690	14
Machine labour	18,665	19,580	-915	-5	13,589	11,137	2,452	22	12,209	11,576	633	5	24,831	28,075	-3,244	-12
Implements	678	747	-69	-9	248	528	-280	-53	606	742	-136	-18	4,798	7,883	-3,085	-39
Irrigation	363	77	286	370	290	222	68	31	51	12	38	319	923	830	93	11

Crop →	Maize				Black gram				Red gram				Chillies			
	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %
Miscellaneous	826	978	-153	-16	242	260	-18	-7	199	744	-546	-73	1,807	3,205	-1,399	-44
<b>Paid-out cost</b>	<b>53,500</b>	<b>59,828</b>	<b>-6,328</b>	<b>-11</b>	<b>41,221</b>	<b>34,140</b>	<b>7,081</b>	<b>21</b>	<b>34,035</b>	<b>33,706</b>	<b>328</b>	<b>1</b>	<b>2,23,787</b>	<b>3,10,148</b>	<b>-86,361</b>	<b>-28</b>

Source: IDSAP Field Survey 2022-23

**Table 3.5 Cont.**

Crop →	Green gram				Ragi				Tomato			
	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %	CNF	Non-CNF	Diff.* in ₹	Diff.* in %
<i>I</i>	<i>34</i>	<i>35</i>	<i>36</i>	<i>37</i>	<i>38</i>	<i>39</i>	<i>40</i>	<i>41</i>	<i>42</i>	<i>43</i>	<i>44</i>	<i>45</i>
Seed	4,153	3,757	396	11	983	434	550	127	22,243	19,520	2,723	14
FYM	194	-	194		1,650	659	992	150	3,479	3,192	287	9
PNPIs	4,333	6,406	-2,073	-32	5,597	4,820	778	16	16,880	25,915	-9,035	-35
Human labour	9,571	7,887	1,684	21	9,099	10,128	-1,029	-10	31,611	25,356	6,254	25
Bullock labour	-	-	-		9,975	4,074	5,901	145	1,476	1,186	290	24
Machine labour	8,280	6,647	1,633	25	3,760	5,503	-1,743	-32	20,026	20,957	-931	-4
Implements	641	354	287	81	60	-	60		282	1,067	-785	-74
Irrigation	71	70	2	2	35	-	35		796	664	132	20
Miscellaneous	350	62	288	463	99	575	-476	-83	3,999	2,198	1,801	82
<b>Paid-out cost</b>	<b>27,594</b>	<b>25,183</b>	<b>2,411</b>	<b>10</b>	<b>31,260</b>	<b>26,192</b>	<b>5,068</b>	<b>19</b>	<b>1,00,791</b>	<b>1,00,056</b>	<b>736</b>	<b>1</b>

Source: IDSAP, Field Survey 2022-23



### 3.4. Crop Yields:

There is a keen interest, among the different stakeholders, about the impact CNF on crop yields. Given the importance of yields, the study is mandated to conduct CCEs to estimate independently and scientifically the crop yields under CNF and non-CNF. As shown in Table 3.1 the crop wise number of CNF CCEs varies from minimum of 41 for Red gram to maximum of 631 for Paddy. The number of non-CNF CCEs varies from 37 for Tomato to 311 for Paddy. The yields arrived at, based on crop cutting experiments (CCEs), turned out to be same, i.e., no difference statistically, in eight out of 11 crops included in this report. In all remaining three crops, viz., Bengal gram, Maize and Tomato, the yields under CNF are, statistically, higher than that of non-CNF (Table 3.6). The data clearly indicate that yields under CNF are either the same or a little more than that under non-CNF. PMDS is the major contributory factor behind this situation.

**Table 3.6: CCE Yields under CNF and non-CNF and their differences for each crop in [Kharif + Rabi] 2022-2023**

Crop	Yield (q/ha)		Difference between CNF & non-CNF		
	CNF	Non-CNF	quintals/ ha	Percentage	Significance
Paddy	53.00	53.36	-0.36	-0.68	ns
Groundnut	25.91	25.50	0.41	1.60	ns
Cotton	11.37	10.86	0.51	4.67	ns
Bengal gram	17.92	16.37	1.55	9.44	*
Maize	73.75	67.57	6.18	9.15	**
Black gram	14.36	13.44	0.92	6.84	ns
Red gram	6.39	5.77	0.62	10.72	ns
Chillies	51.88	54.37	-2.50	-4.59	ns
Green gram	13.01	13.78	-0.77	-5.61	ns
Ragi	14.51	14.75	-0.24	-1.64	ns
Tomato	180.73	145.39	35.34	24.31	*

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

Source: IDSAP, Field Survey 2022-23

### 3.5. Prices of CNF Output vis-à-vis non-CNF output

The prices are critical for the expansion of CNF in the state. The CNF farmers are of the opinion that their CNF crop output is quality output and hence expect higher prices for the same. Crop wise average prices obtained by CNF and non-CNF farmers and their differences are presented in Table 3.7. The prices obtained for CNF and non-CNF are statistically same in eight out of

11 crops. In remaining three crops, viz., Paddy, Groundnut and Chillis<sup>30</sup>, the CNF output got significantly higher prices. Apart from local marketing factors such as supply-demand and marketing infrastructure, higher prices realized for CNF crops, reflect the growing interest for CNF output. Further, facilitations by RySS such as bulk buying by Tirumala Tirupathi Devasthanam (TTD), exclusive stalls in Rythu Bazars, exhibition-cum-sales events, etc., are also helping the CNF farmers, in realizing better marketing support for CNF output, especially for food and horticulture crops.

**Table 3.7: Prices obtained for each sample crop by farmers for their CNF and non-CNF output in [Kharif + Rabi] 2022-23**

Crop	₹/quintal		Difference between CNF & non-CNF		
	CNF	Non-CNF	₹/quintal	Percentage	Significance
Paddy	1,958	1,900	58	3	**
Groundnut	6,176	5,966	210	4	**
Cotton	7,039	7,008	31	0	ns
Bengal gram	6,365	6,518	-153	-2	ns
Maize	1,946	1,904	41	2	ns
Black gram	6,892	6,911	-19	-0	ns
Red gram	5,600	5,552	48	1	ns
Chillies	22,116	17,670	4,446	25	**
Green gram	6,934	6,985	-52	-1	ns
Ragi	2,734	2,679	55	2	ns
Tomato	604	612	-8	-1	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 ‘the average yield of a crop’, obtained through CCEs, with ‘average price of that crop’, as reported by the farmers and adding ‘the average of value of by-product of that crop’, as reported by the farmers. Thus, yield and prices of a 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 10 out of the 11 crops studied in this report. The only exception is Green Gram (Table 3.8). On an average the gross value of CNF crops is higher than that of non-CNF crops by ₹11,284 (8 percent) per hectare. It implies that CNF crops are able to make up any losses in the yields through better prices in almost all crops.

<sup>30</sup> The prices of Chillis fluctuate wide geographically and temporally. In one of the previous surveys, it was observed that prices obtained by non-CNF farmers are significantly higher than that of CNF farmers. Therefore, the big difference obtained in this study need to be taken cautiously.

**Table 3.8: Gross value of output for each sample crop under CNF and non-CNF in [Kharif + Rabi] 2022-2023**

Crop	₹/hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	₹/hectare	Percentage
Paddy	1,11,095	1,07,016	4,080	4
Groundnut	1,74,074	1,65,080	8,993	5
Cotton	80,281	76,310	3,971	5
Bengal gram	1,15,961	1,07,633	8,328	8
Maize	1,45,050	1,29,688	15,362	12
Black gram	1,00,108	93,692	6,416	7
Red gram	37,319	33,616	3,703	11
Chillies	11,47,278	9,60,758	1,86,520	19
Green gram	90,476	96,363	-5,887	-6
Ragi	40,635	39,914	720	2
Tomato	1,09,265	89,091	20,173	23
Average	1,44,880	1,33,596	11,284	8

Source: IDSAP, Field Survey 2022-23

### 3.7. Net Value of Output

The net value of crop output per hectare is calculated by deducting the paid-out costs from the gross value of the same crop. Crop wise net value of output per hectare under CNF and non-CNF and the differences are presented in Table 3.9. In two crops, the net value of output is negative under non-CNF, i.e., -10,965 and -91 per hectare in Tomato and Red gram respectively. The net value of Cotton output is just ₹44 per hectare. These figures reflect the status of non-CNF in the state. The non-CNF farmers are not able to recover a narrowly defined cost of cultivation- (A1) paid-out costs in those three crops. On an average, the net value of CNF crop output is ₹17,587 (27 percent), per hectare, higher than that of non-CNF. Out of this, ₹6,303 is due to savings in the paid-out costs (see Table 3.3) and ₹11,284 is due to higher gross value of output (see Table 3.8). In recent years it is observed that the paid-out costs and gross value of output are both increasing under CNF. While the increase in the former has a dampening effect on net value of output, the increase in the latter has an enhancing effect on it. This may be due to PMDS. It may be noted that PMDS involves additional costs. The farmers may be reporting at least a part of that cost in Kharif/ Rabi survey as cost of green manure or other costs under PNPIs. At the same time, PMDS may be contributing to the higher yields, and in turn to higher gross value of output.

**Table 3.9 Net value of each of sample crops under CNF and non-CNF output in [Kharif + Rabi] 2022-23**

Crop	₹/hectare		Difference between CNF & non-CNF	
	CNF	Non-CNF	₹/hectare	%
Paddy	51,180	37,760	13,420	36
Groundnut	1,09,315	1,01,679	7,636	8
Cotton	4,934	44	4,890	11,106
Bengal gram	71,444	60,890	10,555	17
Maize	91,550	69,860	21,691	31
Black gram	58,887	59,552	-665	-1
Red gram	3,284	-91	3,375	+ve large
Chillies	9,23,491	6,50,610	2,72,881	42
Green gram	62,883	71,180	-8,298	-12
Ragi	9,375	13,722	-4,347	-32
Tomato	8,473	-10,965	19,438	+ve large
Average	82,348	64,761	17,587	27

Source: *IDSAP, Field Survey 2022-23*

### 3.8. Conclusions

In this chapter, the differences between CNF and non-CNF in PNPIs, paid-out costs, yields and prices have been statistically tested. These tests have added value to the analysis and provided additional insights. It is seen that paid-out costs are either less or about the same in respect of crops under consideration for CNF and non-CNF farmers. Yields turned out favourably – CNF yields are on par with non-CNF or greater. Prices followed the same pattern as yields. Gross value of output as well as net value of output are greater on an average under CNF relative to its level under non-CNF. PMDS seems to be impacting positively on yields and returns.

## Chapter 4: Impact of CNF on farming conditions at disaggregate level

### 4.1. Introduction

The major objective of disaggregate analysis is to see whether all regions and farmers' categories are getting benefitted from the APCNF. The sample size is large enough to carry out a disaggregate analysis of farming conditions across the Agroclimatic Zones and farmers' categories for seven crops, viz., Paddy, Groundnut, Cotton, Bengal gram, Maize, Black gram and Chillis. As mentioned in chapter one, the disaggregate analysis are carried out for six Agroclimatic Zones, viz., High-altitude and Tribal areas (HAT) zone, North coastal zone, Godavari zone, Krishna zone, Southern zone and Scarce rainfall zone; and ten farmers' categories – three Farm size categories, three Tenurial categories and four Social categories. In each crop, the Agroclimatic Zones and farmers' categories with a minimum of 10 CNF and 10 non-CNF sample observations/ CCEs are included. For the sake of brevity, the crop wise analysis are limited to the paid-out costs, crop yields, gross value output and net value of crop output. The CCE yields are used in these analysis. The number of CCEs in each zone, for each category of farmers are given in Table 4.1. Wherever, there are no data or less than 10 observations/ CCEs for any crop, those zones and farmers categories are deleted from the analysis of that crop.

### 4.2. Paddy

Because of large number of sample observations and CCEs of both CNF and non-CNF, each agroclimatic zone and farmer category could be included in the analysis of the section. Agroclimatic zone and farmer category wise number of sample observations and CCEs are shown in Table 4.1. Among the Agroclimatic Zones, the number of CNF sample observations varies from 40 in Scarce rainfall zone to 388 in Southern zone. The minimum number non-CNF CCEs are 26 in Scarce rainfall zone among Agroclimatic Zones, 17 for other farmers in farm size category, 20 for owner-cum-tenant farmers among tenurial category and 18 for SC farmers in social categories (Table 4.1).

**Table 4.1: Distribution of number of CNF and non-CNF Paddy sample observations and CCEs across Agroclimatic Zones and farmers' category in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers' categories		No. of crop observations		Number of CCEs	
		CNF	non-CNF	CNF	non-CNF
State	AP	1,044	442	631	311
Agroclimatic Zones	HAT	253	83	138	54
	North coastal	144	80	99	53
	Godavari	119	83	116	68
	Krishna	100	48	65	42
	Southern	388	114	190	68
	Scarce rainfall	40	34	23	26
Farm size categories	Marginal	658	320	421	227
	Small	282	86	158	67
	Others	104	36	52	17
Tenurial categories	Tenants	52	28	42	23
	Owner- tenants	65	18	44	20
	Owners	927	396	545	268
Social categories	SC	137	25	80	18
	ST	255	84	139	47
	BC	356	186	235	153
	OC	296	147	177	93

Source: IDSAP Field Survey 2022-23

The data on paid-out cost and yields of Paddy under CNF non-CNF and their differences are given at the disaggregate level in Table 4.2. Out of the six zones, the paid-out cost of Paddy under CNF is less than that of non-CNF in five zones; in the range of 3 percent in Godavari zone to 34 percent HAT zone. In absolute terms, Krishna zone has the highest savings of ₹26,627 per hectare in paid-out cost, followed by HAT zone (₹21,385). Only in Southern zone the paid-out cost of CNF Paddy is higher than that of non-CNF by about 2 percent. Relatively poorer regions like HAT zone, North coastal zone and Scarce rainfall zone have obtained considerable savings in paid-out costs. Among 10 farmers' categories studied, the paid-out cost of Paddy under CNF is less than that of non-CNF in nine categories; the only exception is other farmers, consists of medium and large holding farmers. The resource poor sections like ST, SC, marginal and small farmers have got benefitted, in terms of lower paid-out costs.

Though the CNF Paddy yields are more or less equal to that of non-CNF at the state level, majority of zones got higher yields under CNF. Relatively resource poor zone like North coastal zone (14 percent), Scarce rainfall zone (8 percent) and HAT zone (7 percent) got higher

Paddy yields under CNF. Among farmers' categories the results are mixed. While ST farmers got 10 percent higher yields, SC farmers got 15 percent lower yields under CNF.

**Table 4.2: Paid-out costs and yields of Paddy under CNF non-CNF across Agroclimatic Zones and category of farmers in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	59,915	69,252	-9,337	-13	53.00	53.36	-0.36	-1
Agroclimatic Zones	HAT	42,159	63,544	-21,385	-34	47.09	43.83	3.26	7
	North coastal	55,370	63,254	-7,884	-12	54.54	48.02	6.51	14
	Godavari	66,869	69,059	-2,190	-3	57.05	63.52	-6.47	-10
	Krishna	66,312	92,939	-26,627	-29	55.63	53.55	2.08	4
	Southern	68,803	67,179	1,624	2	52.98	55.95	-2.98	-5
	Scarce rainfall	50,647	59,387	-8,739	-15	54.34	50.43	3.90	8
Farm size categories	Marginal	59,639	72,220	-12,581	-17	53.54	53.30	0.24	0
	Small	59,583	63,104	-3,521	-6	51.03	54.27	-3.24	-6
	Others	62,441	56,660	5,781	10	54.69	50.67	4.02	8
Tenurial categories	Tenants	69,384	70,402	-1,017	-1	56.60	56.91	-0.31	-1
	Owner-tenants	62,905	70,816	-7,911	-11	56.09	53.67	2.42	5
	Owners	59,424	68,825	-9,401	-14	52.48	53.04	-0.56	-1
Social categories	SC	63,011	65,605	-2,595	-4	52.34	61.37	-9.03	-15
	ST	44,018	63,415	-19,397	-31	47.16	42.81	4.35	10
	BC	60,415	68,146	-7,732	-11	54.89	53.39	1.50	3
	OC	70,609	73,089	-2,479	-3	55.38	57.11	-1.73	-3

Source: IDSAP Field Survey 2022-23

The gross and net value of Paddy output under CNF and non-CNF, at the disaggregate level, during the study period are presented in Table 4.3. Compared to state average of 4 percent higher gross value of CNF Paddy output, relatively resource poor zones including HAT zone (21 percent), North coastal zone (16 percent) and Scarce rainfall zone (13 percent) fared better. On the other hand, relatively resource rich zones, particularly Godavari (-2 percent) and Krishna zone (3 percent) did not get higher gross value under CNF as expected. Nine out of 10 farmers' categories have obtained higher gross value under CNF. However, there are no noticeable patterns to record. While SC farmers obtained 10 percent lower gross value, ST farmers obtained 21 percent higher gross value due to CNF. Due to the effect of savings in the paid-out costs and higher gross value, almost all Agroclimatic Zones and farmers' categories, particularly the resource poor zones and categories, got higher net value of output due to CNF.

**Table 4.3: Gross and net value of Paddy output under CNF and non-CNF across Agroclimatic Zones and category of farmers in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹1,000/ hectare		Difference between CNF & non-CNF		₹1,000/ ha		Difference between CNF & non-CNF	
		CNF	non-CNF	₹1,000/ ha	in %	CNF	non-CNF	₹1,000/ ha	in %
State	AP	111.10	107.02	4.08	4	51.18	37.76	13.42	36
Agroclimatic Zones	HAT	98.52	81.72	16.80	21	56.36	18.17	38.19	210
	North coastal	110.35	95.04	15.32	16	54.98	31.79	23.20	73
	Godavari	121.33	123.74	-2.41	-2	54.46	54.68	-0.22	-0
	Krishna	110.72	108.00	2.72	3	44.40	15.06	29.35	195
	Southern	112.76	118.94	-6.17	-5	43.96	51.76	-7.80	-15
	Scarce rainfall	122.52	108.45	14.07	13	71.87	49.07	22.81	46
Farm size categories	Marginal	111.96	108.35	3.61	3	52.32	36.13	16.19	45
	Small	108.94	104.35	4.59	4	49.36	41.25	8.11	20
	Others	110.77	99.31	11.46	12	48.33	42.65	5.68	13
Tenurial categories	Tenants	118.50	104.08	14.42	14	49.12	33.68	15.44	46
	Owner-tenants	115.53	99.39	16.14	16	52.63	28.58	24.05	84
	Owners	110.09	107.42	2.67	2	50.67	38.59	12.08	31
Social categories	SC	112.23	124.69	-12.46	-10	49.22	59.08	-9.87	-17
	ST	101.06	83.22	17.84	21	57.04	19.81	37.23	188
	BC	112.17	107.64	4.53	4	51.75	39.49	12.26	31
	OC	116.20	115.54	0.65	1	45.59	42.45	3.13	7

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

Source: IDSAP, Field Survey 2022-23

### 4.3. Groundnut

Agroclimatic Zones and farmers' categories wise number of CNF and non-CNF Groundnut sample observations and CCEs are shown in Table 4.4. Groundnut is predominantly cultivated in the Rayalaseema districts only. As a result, majority of sample observations came from Southern and Scarce rainfall zones only. The tenant farmers, owner-cum-tenant farmers, SC and ST farmers do not have adequate sample observations and/ or CCEs to be included in this crop's analysis.

**Table 4.4: Distribution of number of CNF and non-CNF Groundnut sample observations and CCEs according to Agroclimatic Zones and farmers' categories in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations [number]		Number of CCEs [number]	
		CNF	non-CNF	CNF	non-CNF
State	AP	317	302	256	192
Agroclimatic Zones	HAT	5			
	North coastal	5	4	5	4
	Godavari	5		2	



Agroclimatic Zones & farmers categories		Number of sample observations [number]		Number of CCEs [number]	
		CNF	non-CNF	CNF	non-CNF
	Krishna				
	Southern	139	134	128	73
	Scarce rainfall	163	164	121	115
Farm size categories	Marginal	148	184	148	104
	Small	108	87	66	63
	Others	61	31	42	25
Tenurial categories	Tenants	3	1	3	1
	Owner-tenants	4		4	
	Owners	310	301	249	191
Social categories	SC	44	15	27	5
	ST	14		10	
	BC	157	202	147	133
	OC	102	85	72	54

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

Source: IDSAP, Field Survey 2022-23

As mentioned above, the Groundnut crop is analysed with two Agroclimatic Zones and six farmers' categories. The paid-out cost and yields of groundnut under CNF and non-CNF, at disaggregate level during the study period are shown in Table 4.5. One interesting aspect observed in the data is that the paid-out cost under CNF remained about the same across the Agroclimatic Zones and farmers categories in the range of ₹63,905 to ₹67,769. On the other hand, the paid-out cost under non-CNF varied widely across the Agroclimatic Zones and farmers categories in the range of ₹51,394 to ₹70,950. This indicates that: under non-CNF, farmers may be investing as per their resource position and/ or local conditions; and under CNF farmers may be investing as per the requirement and/ or influenced by their increased cash flows. Though the CNF yields are marginally higher than that of non-CNF at the state level, it varied across the Agroclimatic Zones and farmers categories. While CNF yields are higher by 11 percent in Southern zone, the same is 4 percent less in Scarce rainfall zone. Apart from low rainfall, the soil quality is relatively poor in most of fields in the Scarce rainfall zone. CNF needs special efforts in such fields. Across the farmers' categories also the difference between CNF and non-CNF yields varied randomly. While marginal farmers, other farmers, and OC farmers got higher yields, small farmers, owner farmers and BC farmers obtained lesser yields under CNF.

**Table 4.5: Paid-out costs and yields of Groundnut under CNF non-CNF, across Agroclimatic zones and farmers category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	64,761	63,401	1,360	2	25.91	25.50	0.41	2
Agroclimatic Zones	Southern	66,554	55,899	10,655	19	27.24	24.65	2.59	11
	Scarce rainfall	65,585	70,950	-5,365	-8	25.24	26.38	-1.14	-4
Farm size categories	Marginal	63,905	63,949	-44	-0	24.68	24.30	0.38	2
	Small	64,392	61,468	2,925	5	27.31	27.70	-0.39	-1
	Others	67,769	66,396	1,373	2	28.07	25.01	3.06	12
Tenurial categories	Owners	64,669	63,496	1,173	2	25.39	25.61	-0.22	-1
Social categories	BC	64,756	65,011	-254	-0	24.36	25.57	-1.21	-5
	OC	67,513	61,754	5,759	9	29.18	24.98	4.20	17

Source: *IDSAP Field Survey 2022-23*

Agroclimatic zone and farmer categories wise gross and net value of Groundnut output under CNF and non-CNF at disaggregate level during the study period is shown in Table 4.6. The gross value of CNF output is considerably high in Southern zone (18 percent) and marginally low in Scarce rainfall zone (-2 percent). In five out of six farmers' categories considered here, the gross value of CNF output is higher than that of non-CNF; and marginally less in remaining one category, viz., BC (-1 percent). By and large, the net value of CNF Groundnut has similar pattern of gross value of output, with a couple of minor exceptions. While the Scarce rainfall zone improved from negative 2 percent gross value to positive 2 percent net value; the small farmers experienced a decline from 1 percent positive gross value to -1 percent net value. Overall, the data indicates that the relatively better off zone (Southern zone) and other farmers and OC farmers fared better under CNF<sup>31</sup>. The possible reasons could be good soil quality. It was pointed out in one of the previous reports, that Groundnut is mostly cultivated on degraded and marginal soils, especially in Anantapur district (Scarce rainfall zone). CNF needs more time to improve the soil quality and yields in such soils.

<sup>31</sup> It is broadly known that the soil quality is better in most parts of Southern zone compared to most parts of Scarce rainfall zone, especially in Anantapur, where Groundnut is widely cultivated. It is also known that in general the medium and large farmers own/ cultivate fields with better quality soils.

**Table 4.6: Gross and net value of Groundnut output under CNF and non-CNF across Agroclimatic Zones and Category of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	1,74,074	1,65,080	8,994	5	1,09,313	1,01,679	7,633	8
Agroclimatic Zones	Southern	1,90,002	1,60,600	29,402	18	1,23,449	1,04,701	18,747	18
	Scarce rainfall	1,66,330	1,69,238	-2,908	-2	1,00,745	98,288	2,457	2
Farm size categories	Marginal	1,66,970	1,57,543	9,428	6	1,03,065	93,594	9,471	10
	Small	1,82,912	1,80,703	2,209	1	1,18,520	1,19,235	-716	-1
	Others	1,86,184	1,57,690	28,494	18	1,18,416	91,295	27,121	30
Tenurial categories	Owners	1,70,932	1,65,730	5,202	3	1,06,263	1,02,234	4,029	4
Social categories	BC	1,63,879	1,66,041	-2,162	-1	99,122	1,01,030	-1,907	-2
	OC	1,98,779	1,60,722	38,058	24	1,31,266	98,968	32,299	33

Source: IDSAP Field Survey 2022-23

#### 4.4. Cotton

Agroclimatic Zones and farmers' categories wise number of CNF and non-CNF Cotton sample observations and CCEs in [Kharif + Rabi] 2022-23 are given in Table 4.7. Given the sample size and CCEs number, the analysis are limited to two zones viz., Krishna and Scarce rainfall zones and six farmers' categories, viz., marginal, small, other farmers; owner farmers; BC and OC farmers.

**Table 4.7: Distribution of number of CNF and non-CNF Cotton sample observations and CCEs across Agroclimatic Zones and farmers' category in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations		Number of CCEs	
		CNF	non-CNF	CNF	non-CNF
State	AP	164	190	112	98
Agroclimatic Zones	HAT	14	11	14	4
	North coastal	3	3	3	2
	Godavari				
	Krishna	38	50	34	33
	Southern	30	12	6	9
	Scarce rainfall	79	114	55	50
Farm size categories	Marginal	76	107	57	45
	Small	65	50	38	31
	Others	23	33	17	22
Tenurial categories	Tenants	7	14	5	7
	Owner-tenants	9	12	9	12
	Owners	148	164	98	79
	SC	34	17	28	7

Agroclimatic Zones & farmers categories		Number of sample observations		Number of CCEs	
		CNF	non-CNF	CNF	non-CNF
Social categories	ST	14	10	14	1
	BC	60	108	44	66
	OC	56	55	26	24

Source: IDSAP Field Survey 2022-23

Agroclimatic Zones and farmers' categories wise paid-out cost and yields of Cotton under CNF, non-CNF and their differences during the study period are shown in Table 4.8. Out of two zones analysed here, one zone (Krishna) has 9 percent saving in the Cotton paid-out cost during the study period. On the other hand, the CNF farmers in Scarce rainfall zone have incurred 3 percent more paid-out cost. While the marginal farmers saved 10 percent, small and other farmers incurred 11 percent and 7 percent, respectively, additional paid-out cost under CNF. Similarly, BC farmers have some marginal savings of 1 percent and OC farmers have incurred additional 2 percent higher paid-out costs due to CNF. Interestingly, both Agroclimatic Zones and all, but one, farmers' categories got higher yields under CNF.

**Table 4.8: Paid-out costs and yields of Cotton under CNF and non-CNF, across Agroclimatic Zones and Category of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	75,344	76,264	-920	-1	11.37	10.86	0.51	5
Agroclimatic Zones	Krishna	70,762	77,635	-6,872	-9	15.16	11.92	3.24	27
	Scarce rainfall	80,776	78,656	2,120	3	10.59	9.83	0.76	8
Farm size categories	Marginal	72,618	80,587	-7,969	-10	12.84	10.50	2.33	22
	Small	77,903	70,356	7,547	11	10.04	9.94	0.10	1
	Others	77,293	72,022	5,271	7	9.44	12.90	-3.47	-27
Tenurial categories	Owners	75,401	77,945	-2,544	-3	11.11	10.55	0.55	5
Social categories	BC	79,824	80,762	-938	-1	11.90	10.25	1.66	16
	OC	76,912	75,443	1,469	2	15.09	13.31	1.78	13

Source: IDSAP Field Survey 2022-23

Gross and net value of Cotton output under CNF and non-CNF at disaggregate level and their differences during [Kharif + Rabi] 2022-23 have been presented in Table 4.9. The gross value of output under CNF is larger than that of non-CNF in both zones and five out of six farmers' categories, covered in this section. Compared to 5 percent difference at the state level, the differences in gross value of Cotton varied widely across the Agroclimatic Zones- from 2

percent in Scarce rainfall zone to 47 percent in Krishna zone, and across the farmers' categories- from -25 percent of other farmers to 27 percent of marginal farmers. These results indicate that farmers with small holdings can also take full advantage of CNF. However, the Scarce rainfall, which has degraded soils, need more time including special efforts like PMDS to take full advantage of CNF.

A negative net value of any crop output under CNF, at the state level was not observed in any of previous studies. But a negative net value of output of one crop or the other, under non-CNF, at the state level have been observed in most of the previous studies. However, negative net value of any crop at the disaggregate level has been observed even under CNF, albeit less frequently compared to that of non-CNF. In the present context, the net value of Cotton output is negative in three cases under CNF and four cases under non-CNF. Under CNF, Krishna zone has got ₹43,785 per hectare more net value, followed by marginal framers (₹26,9646), OC farmers (₹20,481) and BC farmers (₹12,598). On the other hand, other farmers and small farmers obtained larger net value of ₹.29,791 and ₹.10,159 respectively under non-CNF

**Table 4.9: Gross and net value of Cotton output under CNF and non-CNF across Agroclimatic Zones and Category of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	80,281	76,310	3,972	5	4,937	46	4,892	10,747
Agroclimatic Zones	Krishna	1,15,133	78,221	36,913	47	44,371	586	43,785	7,473
	Scarce rainfall	73,779	72,196	1,583	2	-6,997	-6,460	-537	-Ve small
Farm size categories	Marginal	90,303	71,326	18,977	27	17,685	-9,261	26,946	+Ve large
	Small	69,148	71,760	-2,612	-4	-8,755	1,404	-10,159	-Ve large
	Others	72,098	96,618	-24,521	-25	-5,195	24,596	-29,791	-Ve large
Tenurial categories	Owners	77,692	74,156	3,536	5	2,291	-3,788	6,080	+Ve large
Social categories	BC	86,158	74,498	11,660	16	6,334	-6,264	12,598	+Ve large
	OC	1,10,978	89,027	21,950	25	34,066	13,585	20,481	151

Source: IDSAP Field Survey 2022-23

## 4.5. Bengal gram

Bengal gram is predominantly cultivated during Rabi season. The data used in this section is predominantly Rabi data. Only a handful of Kharif observations are included. Number of sample observations and CCE of Bengal gram at the disaggregated level are presented in Table 4.10. Since the sample observations at the state level are relatively less (50 and odd), only limited number of disaggregated units of analysis are available for discussion under this crop.

The crop is predominantly grown in Krishna zone, particularly in the erstwhile Guntur and Prakasam district. Though it is also cultivated in Southern and Scarce rainfall zones, the study did not get minimum (10) number of CNF and/ or non-CNF observations and CCEs. Hence, only Krishna zone is included in the analysis, and four farmer categories, viz., marginal farmers, owner farmers, BC and OC farmers are included.

**Table 4.10: Distribution of number of sample observations of Bengal Gram under CNF and Non-CNF according to Agroclimatic zone and farmers' during (Kharif + Rabi) 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations (number)		Number of CCEs (number)	
		CNF	non-CNF	CNF	non-CNF
State	AP	55	67	54	55
Agroclimatic Zones	HAT				
	North coastal				
	Godavari				
	Krishna	39	40	39	39
	Southern		22		14
	Scarce rainfall	16	5	15	2
Farm size categories	Marginal	46	43	45	31
	Small	7	15	7	15
	Others	2	9	2	9
Tenurial categories	Tenants		2		2
	Owner-tenants	9	7	9	7
	Owners	46	58	45	46
Social categories	SC	2	1	2	
	ST				
	BC	18	28	17	22
	OC	35	38	35	33

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

Source: IDSAP, Field Survey 2022-23

Paid-out cost and yields of Bengal gram under CNF and non-CNF, at disaggregate level during the study period are presented in Table 4.11. In four out of five disaggregate unit of analysis, the paid-out cost of Bengal gram is less under CNF vis-à-vis non-CNF, in the range from 8 percent to 11 percent. Only the BC farmers incurred 1 percent higher paid-out cost under CNF. The yields under CNF are higher than that of non-CNF for every unit of analysis. Compared to 9 percent higher CNF yields at the state level, the lone Krishna zone in the analysis witnessed only a 3 percent higher yields under CNF. It implies that other zones, as a whole, have performed better in terms of yields. BC farmers, who incurred 1 percent higher paid-out cost, obtained 20 percent higher yields under CNF.

**Table 4.11: Paid-out costs and yields of Bengal gram under CNF non-CNF, according to Agroclimatic Zones and Category of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	44,516	46,741	-2,225	-5	17.92	16.37	1.55	9
Zones	Krishna	47,411	53,291	-5,880	-11	16.50	16.05	0.44	3
Farm size categories	Marginal	45,827	51,371	-5,544	-11	17.91	16.86	1.05	6
Tenurial categories	Owners	44,516	48,182	-3,666	-8	18.21	16.65	1.55	9
Social categories	BC	43,186	42,630	557	1	20.05	16.68	3.37	20
	OC	45,050	50,130	-5,080	-10	17.38	16.17	1.22	8

Source: *IDSAP Field Survey 2022-23*

Gross and net value of Bengal gram output under CNF and non-CNF at disaggregate level during the study period are presented in Table 4.12. The CNF farmers have higher gross value of Bengal gram over non-CNF farmers in all disaggregate levels of analysis, in the range of ₹299 (0 percent) per hectare to ₹15,824 (15 percent) per hectare, the average being ₹8,328 (8 percent) per hectare. The BC farmers under CNF, who incurred marginally higher paid-out cost of 1 percent and obtained 20 percent higher yields, are far head of the other cases and state average in terms of additional gross value of output. On the other hand, the gap between BC farmers and other disaggregate units of analysis is relatively small in terms of additional net value of Bengal gram output, due to CNF. Compared to 24 percent higher net value of output of BC farmers, OC and Owner farmers obtained 19 percent higher net value under CNF. Needless to say, that every disaggregate unit of analysis got higher net value of output under CNF. The results indicate that farmers under CNF can get benefitted either through savings in cost of cultivation or higher yields or higher prices or any of two or all three factors.

**Table 4.12: Gross and net value of Bengal Gram output under CNF and non-CNF across Agroclimatic Zones and farmer's category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	1,15,961	1,07,633	8,328	8	71,445	60,892	10,553	17
Zones	Krishna	1,13,547	1,11,487	2,060	2	66,136	58,196	7,940	14
Farm size categories	Marginal	1,14,664	1,14,365	299	0	68,837	62,994	5,843	9
Tenurial categories	Owners	1,17,810	1,09,821	7,989	7	73,294	61,639	11,655	19
Social categories	BC	1,21,564	1,05,740	15,824	15	78,378	63,110	15,267	24
	OC	1,15,875	1,09,839	6,035	5	70,825	59,710	11,115	19

Source: *IDSAP Field Survey 2022-23*

## 4.6. Maize

The number of sample observations and CCEs of Maize at the disaggregate level are presented in Table 4.13. The crop is cultivated mostly in Krishna and Scarce rainfall zones. It is also cultivated in both seasons, but mostly in Rabi season. Given good number of sample observations and CCEs under both CNF and non-CNF, four Agroclimatic Zones and eight farmers' categories are included in the analysis. The left-out units of analysis are Godavari and Southern zones and tenant and owner-cum-tenant farmers, in which number of sample observations and/ or CCEs are less than 10 either under CNF or non-CNF or both.

**Table 4.13: Distribution of number of sample observations and CCEs of Maize under CNF and non-CNF across Agroclimatic zone and farmer category during (Kharif + Rabi) 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations (number)		Number of CCEs (number)	
		CNF	non-CNF	CNF	non-CNF
State	AP	297	212	229	150
Agroclimatic Zones	HAT	14	21	13	20
	North coastal	40	31	40	30
	Godavari	16	8	10	8
	Krishna	110	37	109	35
	Southern	4	1		
	Scarce rainfall	113	114	57	57
Farm size categories	Marginal	173	136	132	100
	Small	83	63	63	39
	Others	41	13	34	11
Tenurial categories	Tenants	26	3	26	3
	Owner-tenants	17	9	13	8
	Owners	254	200	190	139
Social categories	SC	71	27	57	18
	ST	16	23	16	11
	BC	152	123	110	92
	OC	58	39	46	29

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

Source: IDSAP, Field Survey 2022-23

Paid-out cost and yields of Maize under CNF and non-CNF, at disaggregate level during study period are presented at 4.14. In three out of four zones covered under Maize crop, the paid-out costs under CNF are less than that of non-CNF in the range of ₹14,662 per hectare in Krishna zone to ₹28,087 per hectare in North coastal zone. However, in relative terms the HAT zone experienced highest savings of 43 percent in paid-out cost due to CNF. On the other hand, the CNF farmers in Scarce rainfall zone have incurred additional paid-out cost of ₹418 (1 percent)



per hectare. Out of eight farmers' categories considered here, seven categories have incurred lower paid-out cost under CNF vis-à-vis non-CNF, in the range of 2 to 30 percent. Only 'other' farmer category incurred 17 percent larger paid-out cost under CNF.

Out of four Agroclimatic Zones, only North coastal zone, which has over ₹28,000 savings in paid-out cost, got 19 per cent lower yields under CNF vis-à-vis non-CNF. All other zones got higher yields, under CNF, in the range of 4 to 9 percent. Among eight farmers categories, six have obtained higher yields, under CNF in the range of 2 to 32 percent. On other hand ST and BC farmers have obtained 9 percent and 1 percent less yields respectively under CNF.

**Table 4.14: Paid-out costs and yields of Maize under CNF non-CNF across different zones and categories of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	53,500	59,828	-6,328	-11	73.75	67.57	6.18	9
Agroclimatic Zones	HAT	26,180	45,683	-19,502	-43	45.41	43.85	1.56	4
	North coastal	55,353	83,440	-28,087	-34	60.92	75.53	-14.61	-19
	Krishna	56,753	71,415	-14,662	-21	85.50	78.63	6.87	9
	Scarce rainfall	50,870	50,452	418	1	68.25	63.46	4.79	8
Farm size categories	Marginal	53,512	61,828	-8,317	-13	71.58	65.71	5.86	9
	Small	57,133	58,291	-1,158	-2	74.40	71.52	2.88	4
	Others	51,648	44,320	7,328	17	81.02	70.53	10.49	15
Tenurial categories	Owners	52,651	59,980	-7,329	-12	72.50	68.22	4.28	6
Social categories	SC	55,108	64,482	-9,375	-15	84.86	67.32	17.55	26
	ST	33,824	49,428	-15,604	-32	53.14	58.27	-5.13	-9
	BC	56,198	60,080	-3,882	-6	67.18	67.68	-0.50	-1
	OC	55,363	61,601	-6,238	-10	82.88	70.93	11.95	17

Source: *IDSAP Field Survey 2022-23*

Gross and net value of Maize output under CNF and non-CNF at disaggregate level during study period are shown in Table 4.15. Out of four zones, in two zones, viz., Krishna (21 percent) and Scarce rainfall zones (12 percent), in which the crop is mostly concentrated, the gross value under CNF are larger than non-CNF. In remaining two zones, in which Maize is sporadically cultivated, the gross value of CNF output is less than that of non-CNF. In seven out of eight farmers' categories covered, the gross value of CNF output is larger than that of non-CNF, in the range of 2 percent for BC farmers to 32 percent for SC farmers. On the other hand, ST farmers got 25 percent less gross value under CNF.

As discussed in the previous chapter that net value of a crop is obtained by subtracting the paid-out cost of that from its gross value. In this way, the savings made by the CNF farmers in their paid-out costs are reflected in the net value of any crop. In other words the CNF farmers' net value margins are usually larger than those of gross value over non-CNF farmers. For example, while CNF farmers have only 12 percent larger gross value, they have 31 percent larger net value of Maize output over non-CNF farmers. The same pattern can be seen in every agroclimatic zone and all farmers' categories, with one exception of 'other' farmers, who incurred 17 higher paid-out costs under CNF. Out of four Agroclimatic Zones, the net value of CNF output is larger than that of non-CNF in three zones. Similarly, the net value of CNF output is larger than that of non-CNF for all, but one, farmers' categories. All these results once again confirm that CNF farmers get benefitted through any combination of the three positive factors, viz., savings in paid-out costs, higher yields and higher prices.

**Table 4.15: Gross and net value of Maize output under CNF and non-CNF across Agroclimatic Zones and categories of farmers during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	1,45,050	1,29,688	15,363	12	91,551	69,860	21,691	31
Agroclimatic Zones	HAT	69,006	85,558	-16,552	-19	42,826	39,875	2,950	7
	North coastal	1,17,749	1,49,883	-32,134	-21	62,396	66,443	-4,047	-6
	Krishna	1,67,617	1,38,349	29,268	21	1,10,864	66,934	43,930	66
	Scarce rainfall	1,38,032	1,23,505	14,527	12	87,161	73,053	14,108	19
Farm size categories	Marginal	1,39,651	1,25,074	14,577	12	86,139	63,246	22,893	36
	Small	1,47,616	1,38,585	9,032	7	90,483	80,293	10,190	13
	Others	1,61,692	1,40,644	21,047	15	1,10,043	96,324	13,719	14
Tenurial categories	Owners	1,42,031	1,31,286	10,746	8	89,380	71,305	18,075	25
Social categories	SC	1,67,118	1,26,310	40,809	32	1,12,011	61,827	50,184	81
	ST	84,080	1,12,701	-28,621	-25	50,257	63,274	-13,017	-21
	BC	1,35,271	1,31,968	3,303	3	79,074	71,888	7,185	10
	OC	1,61,341	1,31,008	30,333	23	1,05,978	69,407	36,571	53

Source: IDSAP Field Survey 2022-23

## 4.7. Black gram

Black gram is predominantly cultivated in the Rabi season, especially as a follow up crop of Paddy in the coastal districts. However, Black gram is being cultivated by some of the CNF farmers in Kharif season also. The study got some CNF data of Black Gram in the Kharif survey, but it could not be used due to lack of the corresponding data for non-CNF farmers in the Kharif report. All those data are used in this report. Agroclimatic zone and farmers' category wise number of observations and CCEs of Black gram under CNF and non-CNF are shown in Table 4.16. The study got adequate number of observations and CCEs in four Agroclimatic Zones and seven farmers' categories. The left-out units of analysis are HAT zone, Southern zone, other farmers, owner-cum-tenant farmers and ST farmers.

**Table 4.16: Distribution of number of sample observations and CCEs of Black gram under CNF and non-CNF across Agroclimatic zone and farmers' category in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations (number)		Number of CCEs (number)	
		CNF	non-CNF	CNF	non-CNF
State	AP	334	106	284	102
Agroclimatic Zones	HAT	14		12	
	North coastal	56	24	54	24
	Godavari	35	36	24	33
	Krishna	162	33	156	33
	Southern	26	2	14	2
	Scarce rainfall	41	11	24	10
Farm size categories	Marginal	214	76	183	76
	Small	79	23	69	18
	Others	41	8	32	8
Tenurial categories	Tenants	36	16	35	15
	Owner-tenants	26	6	22	5
	Owners	272	84	227	82
Social categories	SC	111	16	89	16
	ST	11		11	
	BC	148	47	132	47
	OC	64	43	52	39

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

Source: IDSAP, Field Survey 2022-23

Paid-out cost and yields of Black gram under CNF and non-CNF, at disaggregate level during the study period are shown in Table 4.17. Black gram is usually cultivated with less inputs under non-CNF. But farmers, usually, apply recommended inputs under CNF. May be motivated by RySS, some CNF farmers are cultivating Black gram in Kharif season as a main crop with recommended packages. Because of these reasons, the CNF farmers have incurred higher cost of cultivation over non-CNF. At the state level CNF farmers incurred additional paid-out cost of ₹7,076 (21 percent) per hectare. The same is true for each of seven farmers

categories covered here and two out of four Agroclimatic Zones included here. The yields of Black gram under CNF are higher than that of non-CNF at the state level and also in all, but one, Agroclimatic Zones and all, but one, farmers' categories covered for this crop. Additional efforts, which are reflected by the additional paid-out costs, by the CNF farmers may be one of reasons for relatively higher yields under CNF.

**Table 4.17: Paid-out costs and yields of Black gram under CNF non-CNF, across Agroclimatic zone and farmers' category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	41,218	34,142	7,076	21	14.36	13.44	0.92	7
Agroclimatic Zones	North coastal	6,518	8,703	-2,185	-25	10.42	6.08	4.35	72
	Godavari	39,253	29,913	9,340	31	15.87	16.61	-0.73	-4
	Krishna	51,550	36,933	14,616	40	15.66	15.17	0.48	3
	Scarce rainfall	31,670	48,828	-17,158	-35	16.10	13.95	2.16	15
Farm size categories	Marginal	39,506	35,001	4,505	13	14.33	13.16	1.17	9
	Small	43,664	27,861	15,803	57	14.05	13.72	0.33	2
Tenurial categories	Tenants	44,134	18,176	25,957	143	15.19	14.98	0.21	1
	Owners	40,224	36,515	3,708	10	14.18	12.91	1.28	10
Social categories	SC	50,475	41,660	8,815	21	15.12	17.79	-2.67	-15
	BC	35,711	32,914	2,797	8	14.04	11.22	2.83	25
	OC	42,371	32,446	9,924	31	14.76	14.34	0.42	3

Source: *IDSAP Field Survey 2022-23*

Gross and net value of Black gram output under CNF and non-CNF at disaggregate level during the study period are shown in Table 4.18. Apart from Godavari zone and SC farmers, who got less yield under CNF, Krishna zone, small farmers and tenant farmers got marginally less gross value of output compared to their counterparts. As the CNF farmers incurred higher paid-out cost at the state level and also in majority of units of analysis, all those units, who got lower gross value under CNF, also got less net value compared to that of non-CNF. Further, OC farmers also got less net value under CNF. Though majority of units of analysis got lesser net value of output under CNF, the differences are relatively low in the range of -11 percent to -30 percent. On the other hand, the differences between CNF and non-CNF in the units of analysis, in which the net value under CNF is large, vary widely and on higher side touching 122 percent and 63 percent. As a result, the difference at the state level is marginal, if not notional.

**Table 4.18: Gross and net value of Black gram output under CNF and non-CNF across Agroclimatic zone and farmers' category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	1,00,108	93,692	6,416	7	58,890	59,550	-660	-1
Agroclimatic Zones	North coastal	63,683	34,461	29,223	85	57,166	25,758	31,408	122
	Godavari	1,10,529	1,13,733	-3,204	-3	71,276	83,820	-12,543	-15
	Krishna	1,11,221	1,12,625	-1,404	-1	59,672	75,692	-16,020	-21
	Scarce rainfall	1,17,833	1,01,805	16,028	16	86,163	52,977	33,186	63
Farm size categories	Marginal	99,871	90,598	9,273	10	60,365	55,597	4,768	9
	Small	97,960	98,432	-472	-0	54,296	70,571	-16,275	-23
Tenurial categories	Tenants	1,10,262	1,12,873	-2,611	-2	66,128	94,696	-28,568	-30
	Owners	98,405	89,515	8,890	10	58,182	53,000	5,182	10
Social categories	SC	1,07,222	1,19,175	-11,953	-10	56,747	77,515	-20,768	-27
	BC	96,411	75,804	20,607	27	60,700	42,890	17,809	42
	OC	1,06,218	1,04,094	2,125	2	63,848	71,648	-7,800	-11

Source: IDSAP Field Survey 2022-23

#### 4.8. Chillis

Chilli is mostly cultivated in the Kharif season. As it is a long duration and multiple picks crop, its harvesting goes up to March, i.e., well into the Rabi season. As a result, very few farmers cultivate Chillis in the Rabi season. Chillis are cultivated predominantly in the Krishna and Scarce rainfall zones. Out of ten farmers' categories used in this report, the study got adequate number of samples and CCEs for the analysis for five farmers' categories, viz., marginal farmers, small farmers, owner farmers, BC farmers and OC farmers (Table 4.19).

**Table 4.19: Distribution of number of observations and CCEs of Chillis under CNF and non-CNF across According to Agroclimatic zone and farmers' category in [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Number of sample observations		Number of CCEs	
		CNF	non-CNF	CNF	non-CNF
State	AP	110	100	57	55
Agroclimatic Zones	HAT				
	North coastal				
	Godavari				
	Krishna	67	38	41	30
	Southern		16		3
	Scarce rainfall	43	46	16	22
Farm size categories	Marginal	77	66	38	35
	Small	19	26	12	14

Agroclimatic Zones & farmers categories		Number of sample observations		Number of CCEs	
		CNF	non-CNF	CNF	non-CNF
Tenurial categories	Others	14	8	7	6
	Tenants	2	9	2	9
	Owner-tenants	4	6	2	6
	Owners	104	85	53	40
Social categories	SC	26	9	14	2
	ST				
	BC	27	40	12	28
	OC	57	51	31	25

Source: *IDSAP Field Survey 2022-23*

The paid-out costs and yields of Chillis under CNF and non-CNF, at disaggregate level, during the study period are shown in Table 4.20. As Chillis is most input intensive crop, the CNF farmers have saved ₹86,361 in the paid-out costs at the state level. The same is true across all the zones and farmers categories considered under this crop. The savings are as high as ₹1.7 lakh in Krishna zone, but the Scarce rainfall zone experienced a moderate savings of ₹51,466. Similarly, in relative terms, the Scarce rainfall zone has highest savings of 22 percent in paid-out cost vis-à-vis 41 percent in Krishna zone. Compared to inter-zonal variations, different farmers categories experienced lesser variations, especially in absolute terms. Similar pattern was observed in previous years studies also.

The Chillis yields under CNF are less than that of non-CNF by 5 percent. But the variations are wide across the Agroclimatic Zones ranging from (minus) -34 percent in Scarce rainfall zone to 21 percent Krishna zone; and from -14 percent for OC farmers to 11 percent for BC farmers. Similar patterns were observed in some of the previous years' studies also. One of the reasons for the wider variations in crop yields are the differences in seeds used by CNF and non-CNF farmers in different locations. Another reason is pest attacks in different locations and in different time periods.<sup>32</sup> In case of Chillis yields, the impact of seed improvements and pest attacks/ plant diseases are, apparently, larger than the impact of CNF.

<sup>32</sup> If pests attacks or diseases are severe at the early stages, the farmers replace crop. If pests attacks or diseases are severe, they would abandon field for that season.

**Table 4.20: Paid-out cost and yields of Chillis under CNF non-CNF across Agroclimatic Zones and farmer's category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Paid-out costs				Yields			
		₹/ hectare		Difference between CNF & non-CNF		quintal/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ hectare	In %	CNF	non-CNF	quintal/ ha	In %
State	AP	2,23,787	3,10,148	-86,361	-28	51.88	54.37	-2.50	-5
Agroclimatic Zones	Krishna	2,50,660	4,21,598	-1,70,938	-41	55.58	45.95	9.63	21
	Scarce rainfall	1,82,837	2,34,303	-51,466	-22	42.39	64.14	-21.75	-34
Farm size categories	Marginal	2,40,014	3,15,439	-75,425	-24	47.09	51.51	-4.42	-9
	Small	2,10,801	2,69,207	-58,406	-22	54.08	62.41	-8.33	-13
Tenurial categories	Owners	2,18,445	2,98,720	-80,275	-27	53.66	55.57	-1.91	-3
Social categories	BC	2,02,599	3,34,952	-1,32,354	-40	61.05	55.12	5.93	11
	OC	2,62,004	3,30,681	-68,676	-21	46.67	53.96	-7.29	-14

Source: IDSAP Field Survey 2022-23

Gross and net value of Chillis output under CNF and non-CNF at disaggregate level during the study period are shown in Table 4.21. CNF farmers have obtained larger gross and net value of Chillis output over non-CNF at the state level and in all, but one, disaggregate units of analysis. The only exception is Scarce rainfall zone. Though Chillis yields are 5 percent less under CNF, the CNF output fetched 25 percent higher prices<sup>33</sup>. As a result, the CNF farmers obtained ₹1.87 lakh (19 percent) larger gross value of output over non-CNF, at the state level. But there are huge inter zone variations ranging from -30 percent in Scarce rainfall zone to 65 percent in Krishna zone and across the farmers' categories ranging from 3 percent for OC farmers to 42 percent for BC farmers. The net value of output also shows the same patterns. While the net value of CNF output is 42 percent larger than that of non-CNF, it ranges from (minus) -32 percent to 193 percent across the zones; and from 16 percent and 17 percent to 80 percent across farmers' categories. As pointed out in the previous chapter, the share of 'savings in paid-out costs' (₹86,361) is relatively less in the additional net value of output (₹2,72,881) vis-à-vis the contribution of 'gross value of output', which is the combined effect of yields and prices, (₹1,86,520).

<sup>33</sup> As mentioned in the previous chapter, the prices of Chillis fluctuate wide geographically and temporally. In one of the previous surveys, it was observed that prices obtained by non-CNF farmers are significantly higher than that of CNF farmers. Therefore, the big difference obtained in this study need to be taken cautiously.

**Table 4.21: Gross and net value of Chillis output under CNF and non-CNF across Agroclimatic Zones and farmer's category during [Kharif + Rabi] 2022-23**

Agroclimatic Zones & farmers categories		Gross value of output				Net value of output			
		₹/ hectare		Difference between CNF & non-CNF		₹/ hectare		Difference between CNF & non-CNF	
		CNF	non-CNF	₹/ ha	in %	CNF	non-CNF	₹/ ha	in %
State	AP	11,47,278	9,60,758	1,86,520	19	9,23,491	6,50,610	2,72,881	42
Agroclimatic Zones	Krishna	12,74,493	7,70,894	5,03,600	65	10,23,833	3,49,295	6,74,538	193
	Scarce rainfall	8,83,568	12,58,982	-3,75,414	-30	7,00,730	10,24,679	-3,23,948	-32
Farm size categories	Marginal	10,88,676	9,65,758	1,22,918	13	8,48,662	6,50,318	1,98,344	30
	Small	10,12,031	9,58,395	53,635	6	8,01,229	6,89,188	1,12,041	16
Tenurial categories	Owners	11,92,755	9,89,995	2,02,761	20	9,74,310	6,91,275	2,83,035	41
Social categories	BC	14,65,199	10,34,958	4,30,241	42	12,62,601	7,00,006	5,62,594	80
	OC	9,36,415	9,09,205	27,210	3	6,74,411	5,78,524	95,887	17

Source: *IDSAP Field Survey 2022-23*

## 4.9. Conclusions

The results of disaggregate analysis indicate that the state level picture obtains in majority of Agroclimatic Zones and farmers categories, in all crops, with some notable exceptions. The analysis, further, suggest that the resource poor Agroclimatic Zones and farmers too can get equally benefitted from CNF in general. If the farmers are provided access to marketing infrastructure like warehouses and farmers producers companies (FPCs), the CNF farmers can get more benefits. CNF has proved to be a scale neutral technology. However, a couple of broad patterns can be derived from the analysis.

1. The variations in the impact of CNF on farming conditions are higher across the Agroclimatic Zones, compared to that among farmers' categories. These trends were also observed in earlier studies also. This needs at the need for agroclimatic zone specific CNF packages. It was learned that RySS is aware of this issue and working on it.
2. Another broad inference, which is somewhat related to the previous insight, is that CNF has performed better in southern part of the state, particularly in less irrigation intensive areas. However, CNF needs special attention in the Scarce rainfall zone, which has also relatively low soil quality fields.



3. Another broad pattern observed is that relatively poorer sections such as tenant farmers, SC and ST farmers have confined to a few crops. They are conspicuously absent in commercial crops like Chillis and Cotton.

# Chapter 5: Impact of CNF on resources/ input use

## 5.1. Introduction:

Apart from improving the farming conditions, as discussed in the previous two chapters, CNF is also positively impacting on the use of various farm inputs, especially, the natural resources; and also farm output. 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 under CNF. All these changes may improve the value of land and annual returns from the land. As land is used throughout the year 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 migration in agricultural families. Since CNF is based on cattle dung and urine, farmers are obliged 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 their dependency on input and credit markets, which are often unfair, to the farmers. These issues are discussed in detail in Kharif 2022-23 and Rabi 2022-23 reports. The major issues from those reports are summarized below and some important Tables are given in the Appendix.

## 5.2. Impact of CNF on Input Use

The inputs covered in the surveys are land, human labour, water, livestock, agriculture technologies/ practices and credit.

### 5.2.1. *Impact of CNF on land use*

In this section three indicators, viz., (1) area cultivated, (2) area allocated to CNF and (3) crop cover over the fields, are analyzed. It is possible that land use could differ between the CNF and non-CNF farmers. But as the sample is drawn on the basis of identical cropping pattern, the difference could be limited in the present study. Still the differences are visible. CNF

farmers have cultivated 20 percent more land during the study period in the state<sup>34</sup> and in all Agroclimatic Zones, and in seven out of 10 farmers categories (Table 5.1).

**Table 5.1: Average operated area for CNF and non-CNF farmers across Agroclimatic Zones & farmers' category in [Kharif + Rabi] 2022-23 (in hectares)**

Agroclimatic zone & farmers' categories		Average operated area in Kharif		Average operated area in Rabi		Average operated area in Kharif + Rabi		Difference between CNF and non-CNF	
		CNF	non-CNF	CNF	non-CNF	CNF	non-CNF	in ha	in %
1	2	3	4	5	6	7	8	9	10
State	AP	1.04	0.80	0.47	0.46	1.51	1.26	0.25	20
Agroclimatic Zones	HAT	0.94	0.61	0.20	0.50	1.14	1.11	0.03	3
	North coastal	0.83	0.48	0.71	0.61	1.54	1.09	0.45	41
	Godavari	1.00	0.76	1.00	0.86	2.00	1.62	0.38	23
	Krishna	1.00	0.89	0.60	0.38	1.60	1.27	0.33	26
	Southern	1.14	0.71	0.48	0.43	1.62	1.14	0.48	42
	Scarce rainfall	1.09	0.92	0.33	0.43	1.42	1.35	0.07	5
Farm size categories	Marginal	0.54	0.55	0.28	0.21	0.82	0.76	0.06	8
	Small	1.35	1.29	0.56	0.71	1.91	2.00	-0.09	-4
	Others	2.79	2.50	1.16	3.28	3.95	5.78	-1.83	-32
Tenurial	Pure tenants	0.74	0.89	1.66	0.85	2.40	1.74	0.66	38
	Owner-tenants	1.41	1.95	0.27	0.62	1.68	2.57	-0.89	-35
	Pure owners	1.03	0.76	0.45	0.44	1.48	1.20	0.28	23
Social categories	SC	0.85	0.77	0.42	0.44	1.27	1.21	0.06	5
	ST	0.93	0.61	0.18	0.61	1.11	1.22	-0.11	-9
	BC	1.04	0.78	0.53	0.41	1.57	1.19	0.38	32
	OC	1.25	0.90	0.59	0.52	1.84	1.42	0.42	30

Source: *IDSAP, Field Survey 2022-23*

The CNF farmers' allocation of land to CNF has increased from an average of 0.35 hectares in Kharif 2019-20 to 0.53 hectares in Kharif 2022-23 (Appendix Table 5.1). Area allocated as percentage of total operated area has increased during last four Kharif seasons from 35 percent in 2019-20 to 54 percent in 2022-23 (Appendix Table 5.2). It is true across all Agroclimatic Zones and farmers' categories. Further, 40 percent of sample CNF farmers allocated their entire cropped area to CNF during Rabi 2022-23 (Appendix Figure 5.1). Such shift, apart from improving the soil quality, reflects the farmers' growing confidence and trust in CNF. 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

<sup>34</sup> The reasons could be less cost of cultivation and improved soil qualities.

fields have 20 days or 12 percent of additional crop cover compared to non-CNF fields (Appendix Table 5.3).

### ***5.2.2. Impact of CNF on labour use***

On an average 20 percent more labour is used under CNF vis-à-vis non-CNF during Kharif 2022-23. It includes 25 percent and 15 percent higher own and hired labour respectively (Appendix Table 5.4). On an average 22 percent higher female labour and 16 percent higher male labour are used under CNF. On an average 21 additional labour days are used in CNF crops vis-à-vis non-CNF crops in Rabi 2022-23. Out of these, over 17 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 labour is used (Appendix Table 5.5). 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 hand, as high as 52 percent more own female labour is used in CNF crops; the same is 16 percent for own male labour (Appendix Table 5.6).

### ***5.2.3. Impact of CNF on water use in crop cultivation***

Majority of CNF farmers of all the categories have reported that the water requirement for crop cultivation has come down. This is pronounced among farmers from all the Agroclimatic Zones except Krishna Zone. Among the social category of farmers, large percentage of ST farmers have reported that the water requirements for irrigation have come down (Appendix Table 5.7).

### ***5.2.4. Integration of livestock with agriculture***

APCNF is being developed on the symbiotic relationship between crop cultivation and livestock rearing. Apart from contributing to the development of agriculture, livestock can provide additional and diversified income sources to HHs. It was noticed, in some villages, that the markets are developing for livestock dung and urine also, due to CNF. Out of 1,331 sample HHs, 373 have purchased livestock because of CNF. The average number of livestock acquired is 2 (Appendix Table 5.8).

### ***5.2.5. 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 as border-crops, inter-crops, Pheromone traps, sticky-pads, etc.

On an average the CNF farmers have avoided 4.82 quintals of fertilizers per hectare in Rabi 2022-23. The avoided fertilizers are in the range of 0.40 quintals per hectare in Green gram to 8.50 quintals in Maize (Appendix figure 5.2). Apart from reducing the cost of cultivation, avoidance of fertilizers would lead to an improvement in soil quality; and in reduction of the fertilizers' subsidy of Government of India.<sup>35</sup> Needless to say, avoidance of fertilizers would also lead to healthy food, improved human health and so on.

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 in Rabi 2022-23. 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 (Appendix figure 5.3). Such savings in expenditure on agrochemicals, not only improves the financial conditions of the farmers, but also saves them from their dependency on input and credit markets which are often unfair to the farmers.

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-plates etc. All 100 percent of farmers have adopted PMDS, and nearly 100 percent adopted Beejamrutham and Drava Jeevamrutham. Around 90 percent of farmers have adopted Kashayams, Ghana Jeevamrutham, Border crops and Asthrams. Over 40 to 70 percent of farmers adopted Bund crops, Inter-cropping and Other practices like Pheromone traps, sticky-pads, etc., (Appendix figure 5.4). 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.

### **5.2.6. Credit**

Out of 1,331 sample CNF households, 1,079 have outstanding loans in 2022-23, i.e., 81 percent of CNF households have current loans. The same is 91 percent for non-CNF households (HHs).

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<sup>35</sup> 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/>

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 loans outstanding of 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 sample HHs respectively (Table 5.2). *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 5.2: 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

### 5.3. Conclusions

The evidence provided in this chapter clearly shows the positive impact of CNF on resources use and on farmers' wellbeing. This chapter is a gist of the corresponding chapters in Kharif and Rabi 2022-23 report. More details can be seen in those reports.

## Appendix Tables of Chapter 5

**Appendix Table 5.1: Average area allocated for CNF across Agroclimatic Zones and farmers' category during last four Kharif seasons (in hectares)**

Agroclimatic Zones & farmers categories		2019-20	2020-21	2021-22	2022-23
State	AP	0.35	0.46	0.53	0.53
Agroclimatic Zones	HAT	0.58	0.59	0.60	0.60
	North Coastal	0.27	0.32	0.34	0.36
	Godavari	0.4	0.4	0.41	0.41
	Krishna	0.36	0.41	0.44	0.45
	Southern	0.30	0.52	0.70	0.68
	Scarce rainfall	0.26	0.42	0.44	0.44
Farm size categories	Marginal	0.29	0.37	0.41	0.41
	Small	0.45	0.59	0.67	0.66
	Others	0.45	0.66	0.78	0.79
Tenurial categories	Tenants	0.36	0.41	0.43	0.42
	Owner-tenants	0.32	0.4	0.49	0.53
	Owner-farmers	0.35	0.47	0.53	0.53
Social categories	SC	0.31	0.39	0.44	0.46
	ST	0.57	0.58	0.6	0.6
	BC	0.28	0.40	0.46	0.47
	OC	0.34	0.53	0.63	0.61

Source: IDSAP: Field Survey, 2022-23

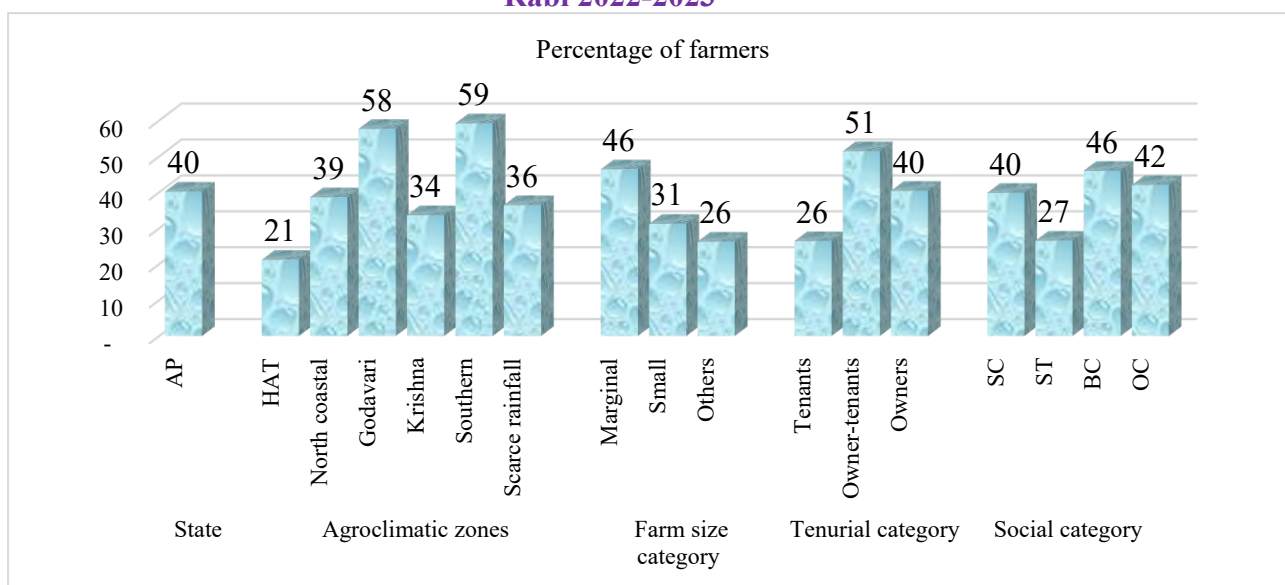
**Appendix Table 5.2: Percentage of cultivated area allocated for CNF across Agroclimatic Zones and farmers' category during last four Kharif seasons (in percentage)**

Agroclimatic Zones & farmers categories		2019-20	2020-21	2021-22	2022-23
State	AP	35	46	52	54
Agroclimatic Zones	HAT	64	63	63	64
	North Coastal	33	36	41	43
	Godavari	41	40	41	41
	Krishna	34	43	45	46
	Southern	30	48	65	68
	Scarce rainfall	25	40	41	42
Farm size categories	Marginal	50	65	73	74
	Small	36	45	51	52
	Others	18	26	31	33
Tenurial categories	Tenant	51	56	60	59
	Owner-tenant	29	36	42	41
	Owner	36	46	53	54

Social categories	SC	36	47	52	55
	ST	63	63	65	65
	BC	29	40	47	48
	OC	29	45	53	54

Source: IDSAP: Field Survey, 2022-23

**Appendix figure 5.1: Percentage of farmers, who allocated their entire operated holdings to CNF according to Agroclimatic zone wise & farmers' categories wise during Rabi 2022-2023**



Source: IDSAP, Field Survey 2022-23

**Appendix Table 5.3: Number of crop cover days over CNF and non-CNF fields according to Agroclimatic Zones and farmers categories wise 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
<b>Agroclimatic Zones</b>				
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
<b>Farm categories</b>				
Marginal	173	133	40	30
Small	187	186	1	0
Others	222	195	26	14



Agroclimatic Zones and farmers categories	Number of days			% difference between CNF and non-CNF
	CNF	Non-CNF	Difference between CNF & non-CNF	
<b>Tenurial categories</b>				
Tenants	213	143	70	49
Owner -tenants	212	157	55	35
Owners	184	168	17	10
<b>Social categories</b>				
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

**Appendix Table: 5.4: Own and hired labour used under CNF and non-CNF for each crop during Kharif 2022-23 (days/ hectare)**

Crops	CNF			non-CNF			Percentage difference		
	Own	Hired	Total	Own	Hired	Total	Own	Hired	Total
Paddy	69	57	125	66	57	123	4	-0	2
Groundnut	51	52	103	32	39	71	58	33	44
Cotton	71	100	170	37	76	113	91	31	50
Maize	65	33	99	36	28	64	83	18	54
Red gram	44	32	76	34	28	62	30	15	23
Chillies	110	127	237	113	99	212	-3	28	12
Tomato	93	110	203	59	91	150	58	21	35
Average <sup>36</sup>	65	64	130	52	56	108	25	15	20

Source: IDSAP: Field Survey, 2022-23

**Appendix Table: 5.5: Average use of male and female labour under CNF and non-CNF for each crop during Kharif 2022-23 (days/ hectare)**

Crops	CNF			non-CNF			Percentage difference		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Paddy	54	72	125	51	72	123	4	-0	2
Groundnut	35	68	103	24	47	71	44	44	44
Cotton	43	128	170	30	83	113	41	54	50
Maize	38	60	99	24	40	64	61	50	54
Red gram	30	46	76	23	39	62	31	19	23
Chillies	70	167	237	79	134	212	-11	25	12
Tomato	62	141	203	36	115	150	74	23	35
Average <sup>37</sup>	46	84	130	40	68	108	16	22	20

Source: IDSAP: Field Survey, 2022-23

<sup>36</sup> Weighted average of seven crops covered in this report. The area under each crop, at the state level, are used as weights.

<sup>37</sup> Weighted average of seven crops covered in this report. The area under each crop, at the state level, are used as weights.

**Appendix Table: 5.6: 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
Own female	34	22	12	52
Own Total	69	52	16	31
Hired male	17	13	4	29
Hired female	60	60	1	1
Hired total	78	73	4	6
Total male	52	43	9	20
Total female	95	82	12	15
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

**Appendix Table: 5.7: Farmers response about CNF impact (reduction) according to Agroclimatic zone and farmers categories' wise on water requirement in crop cultivation (%)**

Agroclimatic Zones & Categories of farmers		Yes	No	Cannot say
State	AP	54	41	4
Agroclimatic Zones	HAT	72	28	1
	North coastal	66	33	1
	Godavari	62	38	-
	Krishna	30	69	1
	Southern	48	49	4
	Scarce rainfall	62	25	13
Farm size category	Marginal	56	40	4
	Small	56	40	4
	Others	44	49	6
Tenurial categories	Tenants	38	62	-
	Owner cum tenants	39	51	10
	Owners	56	40	4
Social category	SC	41	52	7
	ST	70	29	1
	BC	56	40	5
	OC	51	45	4

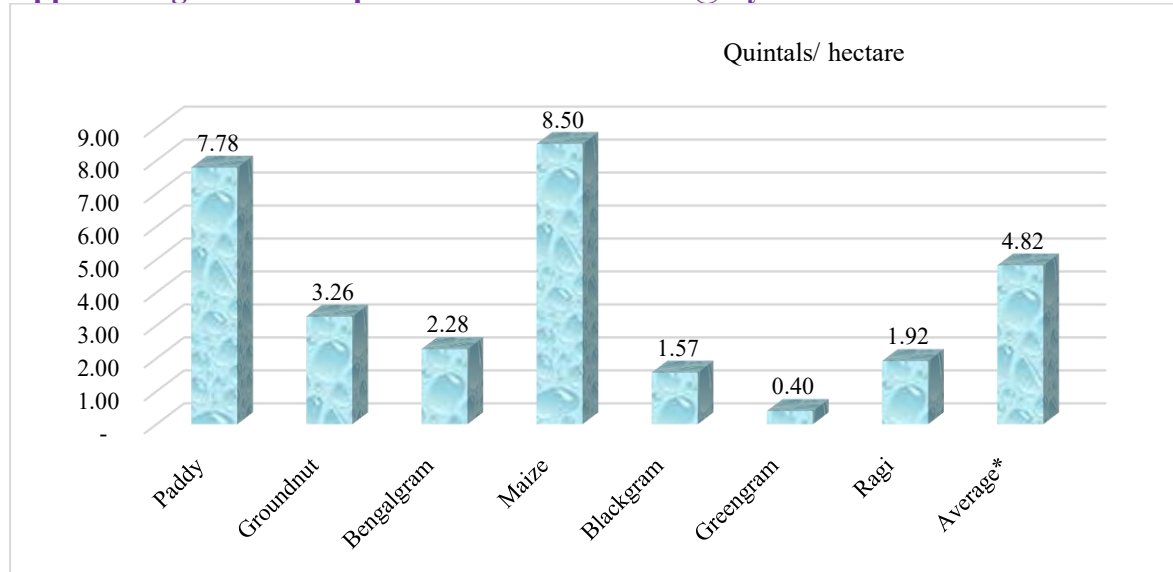
Source: IDSAP: Field Survey, 2022-23

**Appendix Table 5.8: Number of CNF farmers purchased livestock and number livestock acquired for CNF according to Agroclimatic zone and farmers categories' wise**

Agroclimatic Zones & farmers' categories	Number of farmers purchased livestock	Total number of livestock acquired	Average number of livestock acquired
<b>Agroclimatic Zones</b>			
HAT	13	14	1
North coastal	10	16	2
Godavari	35	43	1
Krishna	20	31	2
Southern	160	464	3
Scarce rainfall	135	331	2
AP	373	899	2
<b>Farm size categories</b>			
Marginal	222	530	2
Small	110	279	3
Others	41	90	2
All	373	899	2
<b>Tenurial categories</b>			
Tenants	7	8	1
Owner cum tenants	20	28	1
Owners	346	863	2
All	373	899	2
<b>Social categories</b>			
SC	50	90	2
ST	21	38	2
BC	162	416	3
OC	140	355	3
Total	373	899	2

Source: IDSAP: Field Survey, 2022-23

**Appendix figure 5.2: Crop wise fertilizers avoided@ by CNF farmers in Rabi 2022-23**

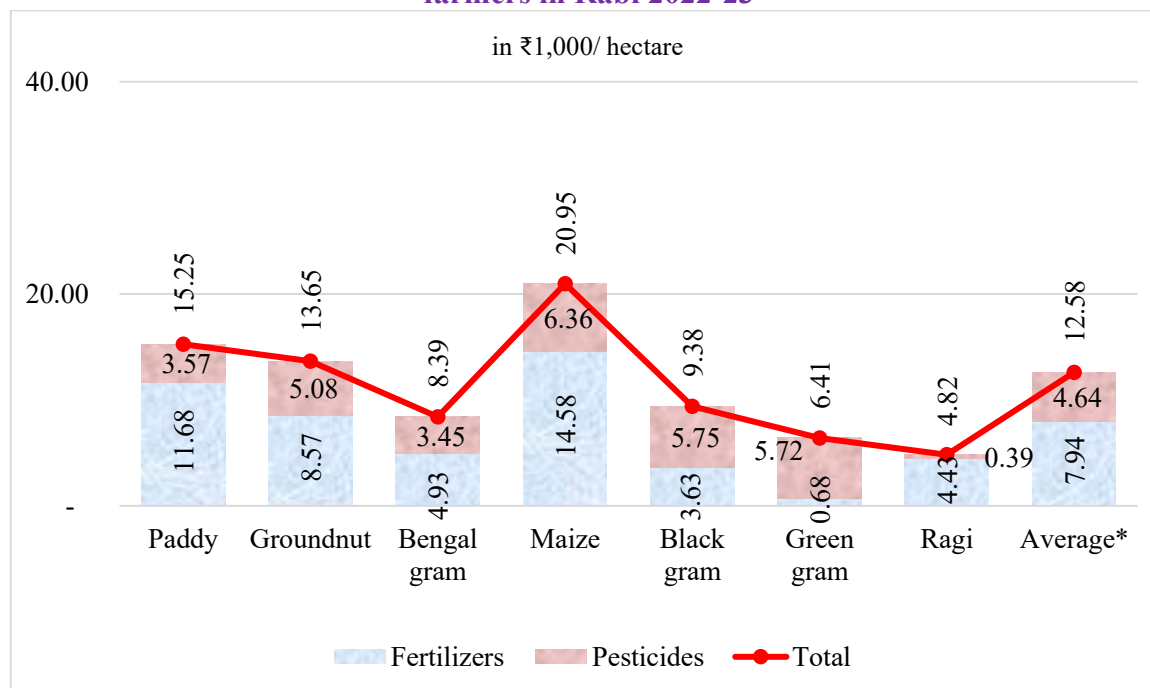


@ These are actual quantities used by non-CNF farmers. These are considered as quantities avoided by CNF farmers in every hectare under S2S

\* 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

**Appendix figure 5.3: Crop wise avoided expenditure on agrochemicals@ by CNF farmers in Rabi 2022-23**

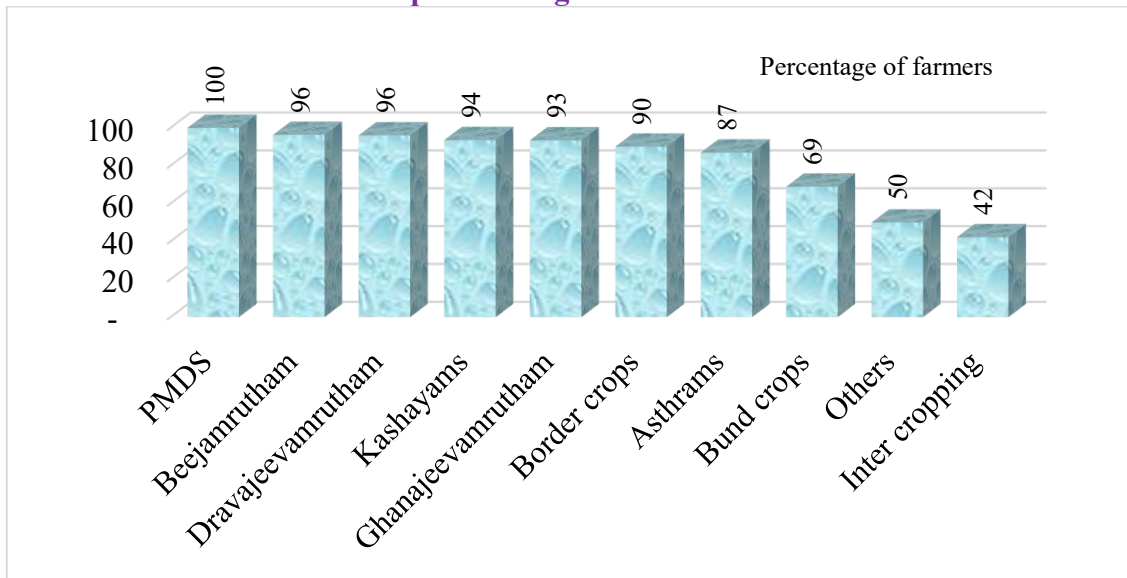


@ These are actual expenditure on agrochemicals by non-CNF farmers. These are considered as avoided expenditure on agrochemicals by CNF farmers in every hectare under S2S

\* 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

**Appendix figure 5.4: Percentage of CNF farmers adopting different CNF practices and inputs during Rabi 2022-23**



Source: *IDSAP, Field Survey 2022-23*

# Chapter 6: Impact of CNF on Farming and Other Household Incomes

## 6.1 Introduction

It is well known, that income from crop cultivation is one of many sources of agriculture households' (AHs) incomes. The AHs get the income from wages, salaries, self-employment, rental income from agriculture machinery, bullocks, implements, land, houses, buildings, remittances, transfers from government, etc. Chapters 3 and 4 indicated clearly that the CNF farmers have derived more crop income per hectare compared to non-CNF farmers from select crops. There may be differences in actual income derived from those crops, given the variations in area allocated to those crops. It may be noted that CNF and also non-CNF farmers do cultivate other crops along with 12 sample crops. The impact of CNF on cultivation of other crops will be analysed in this chapter. Further, slowly livestock is becoming an integral part of CNF. It has been observed in the field and also mentioned in some of the previous years' reports that markets for cattle dung and urine are also developing in some villages. Apart from providing higher income, APCNF is expected to have a positive impact on the structure/sources of income. However, such shifts take time. In the previous studies also, it was observed that there was slight shift in the composition of CNF households' income from wage labour to livestock and agriculture. In this chapter the household income from agriculture including the livestock is discussed first, before discussing the total household income from all sources. The rationale for such discussion is to know the impact of CNF on farm income which is the direct impact of CNF. The chapter covers the following issues.

1. Farming income during the agriculture year 2022-23
2. Impact of CNF on farming income across Agroclimatic Zones and farmer categories.
3. Source-wise composition of households' income of CNF and non-CNF farmers, in terms of number of households reporting and the amount earned.

In this chapter the farming and household incomes are estimated based on reported yields of CNF and non-CNF farmers. One of the reasons for using the reported yields is the data availability for each household and for each crop. Further, apart from yields of 12 sample crops considered in this report, reported yields of all other crops have been used. As CCEs are conducted only for the select 12 crops, there is no other alternative. Needless to say, uniform methods are used for both CNF and non-CNF farmers, in every aspect.

## 6.2. Household income from agriculture

As mentioned above, apart from cultivating 12 sample crops, which are major crops in the state, which are also referred as “major crops” in this chapter, farmers also cultivate different other crops in different regions. All those crops are referred to as “other crops” in this chapter. Data about those crops such as how many households are cultivating those crops, the cost of cultivation, yields, prices, gross and net value of output of those crops have been obtained. Further, in case of CNF farmers, the 12 sample crops cultivated under CNF are considered as **major crops**. If CNF farmers cultivate any of those 12 crops under non-CNF method or any other method, they are considered as **other crops**. In case of non-CNF farmers, the sample 12 crops cultivated under non-CNF method or chemical-based method are considered as **major crops**. The rest are **other crops**. In addition the net income from livestock has been collected.<sup>38</sup> Total income from these three sources is considered as income from agriculture. As CNF and non-CNF sample were selected based on major crops’ cultivation criterion, 100 percent of CNF and non-CNF farmers have cultivated major crops during the study period. On the other hand only 31 percent of non-CNF household cultivated other crops vis-à-vis of 68 percent of CNF households. About 59 percent of CNF and 50 percent of non-CNF household have obtained income from livestock farming during the study period (Table 6.1).

**Table 6.1: Distribution of Number of CNF and non-CNF households who reported different sources of income during 2022-23**

Source of income	Number		Percentage	
	CNF	non-CNF	CNF	non-CNF
Major crops	1,331	731	100	100
Other crops	906	223 <sup>39</sup>	68	31
Livestock	781	364	59	50
All sources	1,331	731	100	100

Source: *IDSAP Field Survey 2022-23*

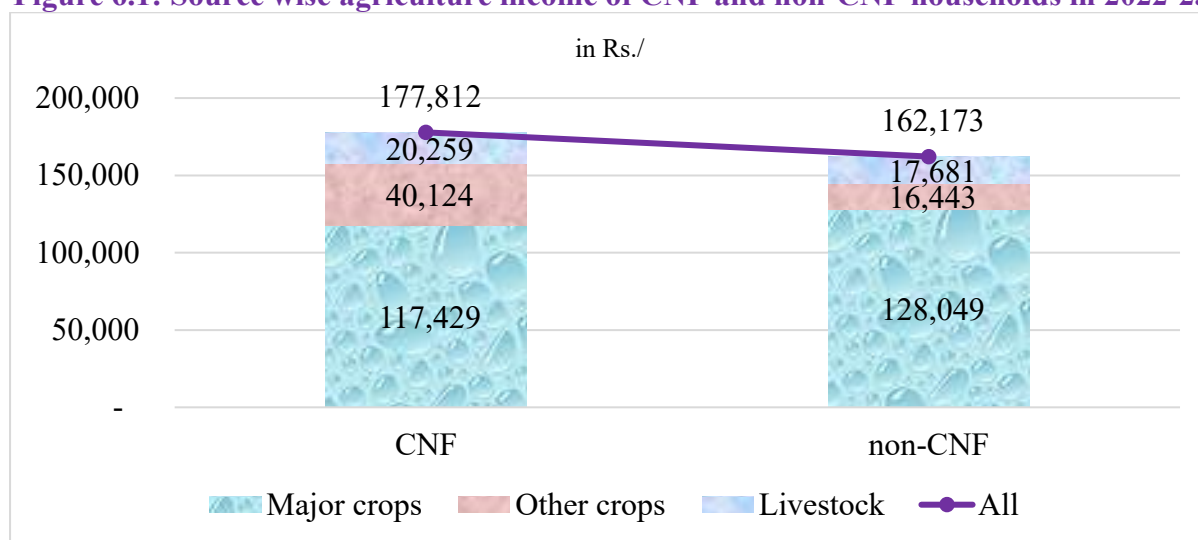
Average income obtained by CNF and non-CNF farmers from each of three components of agriculture, viz., major crops, other crops and livestock are shown in Table 6.2 and figure 6.1. On an average the CNF farmers got 10 percent or ₹15,639 more income than non-CNF farmers

<sup>38</sup> Traditionally livestock was an integral part of crop cultivation, mutually reinforcing each other. Byproduct of one sector used to be used as the input for another sector. This linkage was broken due to chemical-based agriculture and other factors. Under CNF, livestock is again becoming an integral part of crop cultivation.

<sup>39</sup> One non-CNF farmer in HAT zone, who operated over 10 acres, cultivated Strawberry on 10 acres and did some value addition and obtained over ₹50 lakh. He was considered as an outlier and omitted in the analysis in this chapter. It may be noted that even before he was omitted the CNF farmers got higher farm income.

from agriculture. But CNF farmers obtained ₹10,620 (8%) less income from major crops vis-a-vis non-CNF farmers. One of the reasons for relatively less income obtained by CNF farmers from major crops, is that CNF farmers usually allocate only a part of their operated holding for CNF crops. As a result the CNF farmers have relatively smaller size plots under major CNF crops compared to major crops of non-CNF farmers. Another possible reason is composition of crop wise observations (this issue is elaborated below). On the other hand, the CNF farmers got 144 percent and 15 percent higher income from other crops and livestock farming respectively, over non-CNF farmers. CNF farmers have obtained 66 percent of their agriculture income from major crops vis-à-vis 79 percent by non-CNF farmers. This indicates a considerable and healthy diversification<sup>40</sup> in agriculture income for CNF farmers. CNF not only provided higher income but also provided a healthy diversified agriculture income for participants. CNF is also contributing to a growing synergy between crop production and livestock rearing.

**Figure 6.1: Source wise agriculture income of CNF and non-CNF households in 2022-23**



Source: IDSAP Field Survey 2022-23

<sup>40</sup> Diversified income from different crops and allied sectors are assumed to be healthy because of climate change related uncertainties. On the other hand, a diversified income from agriculture wages for cultivators is assumed to be unhealthy.



**Table 6.2: Source wise agriculture income for CNF and non-CNF farmers in 2022-23**

Source	Amount in ₹		Difference between CNF & non-CNF		Percentage share of each source	
	CNF	non-CNF	in ₹./	in %	CNF	non-CNF
Major crops	1,17,429	1,28,049	-10,620	-8	66	79
Other crops	40,124	16,443	23,681	144	23	10
Livestock	20,259	17,681	2,578	15	11	11
All	1,77,812	1,62,173	15,639	10	100	100

Source: IDSAP Field Survey 2022-23

Unlike previous years, the income of CNF farmers from major crops is less than that of non-CNF farmers. Apart from smaller plot sizes under CNF, another possible reason is the sample composition. As mentioned in Chapter 1, that both CNF and non-CNF sample are drawn, based on crop wise to get a minimum number of sample observations for each crop. However, a farmer selected for one sample crop may be cultivating another sample crop also. As a result, the composition of sample crops for CNF and non-CNF farmers is not uniform. Among six high value crops, viz., Paddy, Groundnut, Cotton, Maize, Chillis and Tomato, the percentage of CNF sample is high in one crop, viz., Paddy and the share of non-CNF sample is high in three crops, viz., Groundnut, Cotton and Chillis (Table 6.3).<sup>41</sup> Given very high net value of Chillis output, which is more than 10 times of the average net value of all sample crops, a higher weightage of 6 percent of Chillis crop in non-CNF sample compared to 4 percent in CNF sample, worked in favour of non-CNF farmers' income.

**Table 6.3: Composition of sample crops for CNF and non-CNF farmers in 2022-23 survey (in percentage)**

Crop	CNF	Non-CNF
Paddy	37	26
Groundnut	11	18
Cotton	6	11
Bengal gram	2	4
Maize	11	12
Black gram	12	6
Red gram	3	6

<sup>41</sup> Such distribution is, at least partially, result of crop wise selection of sample. As the methodology of the study is evolving over the years, this issue would be addressed in the next years (2024-25) study.

Crop	CNF	Non-CNF
Chillies	4	6
Green gram	2	3
Tomato	4	4
Ragi	8	3
Total	100	100

Source: *IDSAP Field Survey 2022-23*

Though the difference between agriculture income of CNF and non-CNF farmers is 10 percent at the state level, it varied widely from (minus) -13 percent in Southern zone to (plus) 62 percent in North coastal zone, across the Agroclimatic Zones. But such variations are relatively moderate across the farmers' categories (Table 6.4). While relatively better off or resources rich zones such as North coastal, Godavari and Krishna zones got higher agriculture income under CNF, no such clear trend can be observed across the farmers categories. While marginal farmers got higher farm income, small farmers got less farm income under CNF. Similarly, while ST farmers got less income, SC farmers got higher income.

**Table 6.4: Agriculture income of CNF and non-CNF households across Agroclimatic Zones and category of farmers in 2022-23**

Agroclimatic Zones & farmers categories		Total agriculture income in ₹		Difference between CNF and non-CNF	
		CNF	non-CNF	in ₹	in %
State	AP	1,77,812	1,62,173	15,639	10
Agroclimatic Zones	HAT	81,395	80,429	966	1
	North coastal	1,30,652	80,745	49,907	62
	Godavari	2,26,409	1,81,424	44,985	25
	Krishna	3,31,127	2,13,862	1,17,265	55
	Southern	1,55,267	1,78,169	-22,902	-13
	Scarce rainfall	1,59,964	1,64,557	-4,593	-3
Farm size categories	Marginal	1,44,156	1,29,541	14,615	11
	Small	1,91,591	2,24,475	-32,885	-15
	Others	3,12,555	3,79,247	-66,691	-18
Tenurial categories	Tenants	1,75,065	2,38,503	-63,438	-27
	Owner- tenants	2,36,243	3,15,609	-79,366	-25
	Owners	1,75,250	1,54,927	20,323	13
Social categories	SC	1,86,652	1,55,314	31,338	20
	ST	84,623	89,724	-5,101	-6
	BC	1,71,402	1,52,566	18,836	12
	OC	2,42,682	1,98,632	44,050	22

Source: *IDSAP Field Survey 2022-23*

### 6.3. Annual income of Households

This issue is discussed in two parts. Firstly, the number of households engaged in or receiving income from different source and secondly, the amount obtained from each source.

#### 6.3.1. Composition of households by income source

Apart from agriculture, the farmer households obtain income from many other sources, such as agriculture wages, other wages, salary income from regular employment, self-employment in non-farm sectors, remittances, rental income, and so on. As mentioned above, CNF is expected to have a positive impact on the structure of CNF households' income. The previous section has confirmed that relatively a greater number of CNF households are engaged in the cultivation of other crops and livestock farming. This may adversely impact their participation in other income earning occupations. The study has collected data about different sources of households' incomes and the amount derived from each source, in 2022-23. The major sources of income included in the survey are agriculture income from major crops, consisting of 12 sample crops<sup>42</sup>, other crops<sup>43</sup> and income from livestock; wages, salary income, self-employment/ business income, rental income from agriculture machinery, implements, land, houses, buildings, commercial space, etc., remittances, cash assistance received from the government, and others. Percentage of farmers reporting different sources of income, during the study period, are presented in Table 6.5. After agriculture, government cash assistances/transfers are the second most widespread source of income reported by 96 percent of CNF farmers and 93 percent of non-CNF farmers. As expected relatively less proportion of CNF farmers (60 percent) reported wages as source of income compared to 65 percent by non-CNF farmers. Further, only 9 percent CNF farmers reported salary income vis-à-vis 14 percent by non-CNF farmers. On the other hand, relatively a higher proportion of CNF farmers reported self-employment/ business and others as sources of income during the study period. Interestingly as many as 36 percent of CNF and 23 percent of non-CNF households reported other income sources. Other income sources consist of predominantly poultry. Fisheries and NTFPs collections are also reported by a handful of households and they are included in others. It may be useful to note, that a greater number of households reporting an occupation does not

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<sup>42</sup> In case of CNF farmers, the sample 12 crops cultivated under CNF are considered as major crops. If CNF farmers cultivated the same 12 crops under non-CNF method or any other method, are considered as other crops. In case of non-CNF farmers, the sample crops cultivated under non-CNF method or chemical based method are considered as major crops. If those crops are cultivated under natural farming or organic farming or any other such method, are considered as other crops.

<sup>43</sup> Ibid

imply that they are allocating a greater number of labour days/ persons to that occupation and/ or getting more income from that occupation. For example, over one-third of CNF households reported poultry as source of income. They might not have allocated even a full single person day for that work. The overall results once again support the previous years' results that CNF, apart from increasing the farm income, also improves the quality of the sources of household income.

**Table 6.5: Percentage of CNF and non-CNF farmers' reporting different sources of their households' income (in percentage)**

Sources	Number		Percentage	
	CNF	non-CNF	CNF	non-CNF
Agriculture	1,331	731	100.0	100.0
Cash assistance from Govt.	1,276	678	95.9	92.7
Wage income	801	473	60.2	64.7
Self-employment/ Business	135	55	10.1	7.5
Salary	114	105	8.6	14.4
Rents	27	21	2.0	2.9
Remittances	8	9	0.6	1.2
Others	477	171	35.8	23.4
Total income	1,331	731	100.0	100.0

Source: IDSAP, Field Survey 2022-23

### 6.3.2. Amount of household income by source

Sources wise income obtained by CNF and non-CNF households and their differences in 2022-23 are presented in Table 6.6. As relatively a smaller number of CNF households are engaged in wage labour and salary employment, they got ₹4,886 (20 percent) and ₹11,680 less income from these two sources, respectively, compared to non-CNF households. Though relatively a greater number of CNF households reported self-employment in non-agriculture sector as source of income, they got ₹777 (-20 percent) less income than non-CNF households, from that occupation. In fact, CNF farmers got higher income of ₹904 (88 percent) only from other sources (which is mostly poultry), along with agriculture income. On the other hand, non-CNF households, got higher income in six out of eight sources included in Table 6.6. Further, non-CNF farmers got ₹6,586 (3 percent) higher household income than CNF. This is the first time, that non-CNF households got higher income. In all previous years' studies since 2019-20, CNF farmers got higher household income. In some of the previous studies, though the non-CNF farmers got higher income in non-farm activities, higher farm incomes of CNF farmers used to compensate for the shortfall in non-farm incomes. But this year, higher farm income of CNF farmers is not able to compensate for the shortfall in non-farm income. As mentioned above,

crop wise selection of sample appears to be a reason. Relatively a higher proportion of high value crops, especially Chillis, are found in non-CNF sample (see Table 6.6). This could be because of differences in farm size between CNF and non-CNF farmers. Further, CNF does not have any impact on some other sources of household income, such as remittances, cash transfers from the government, regular employment, etc. Households' eligibility and accessibility determine the income from these sources.

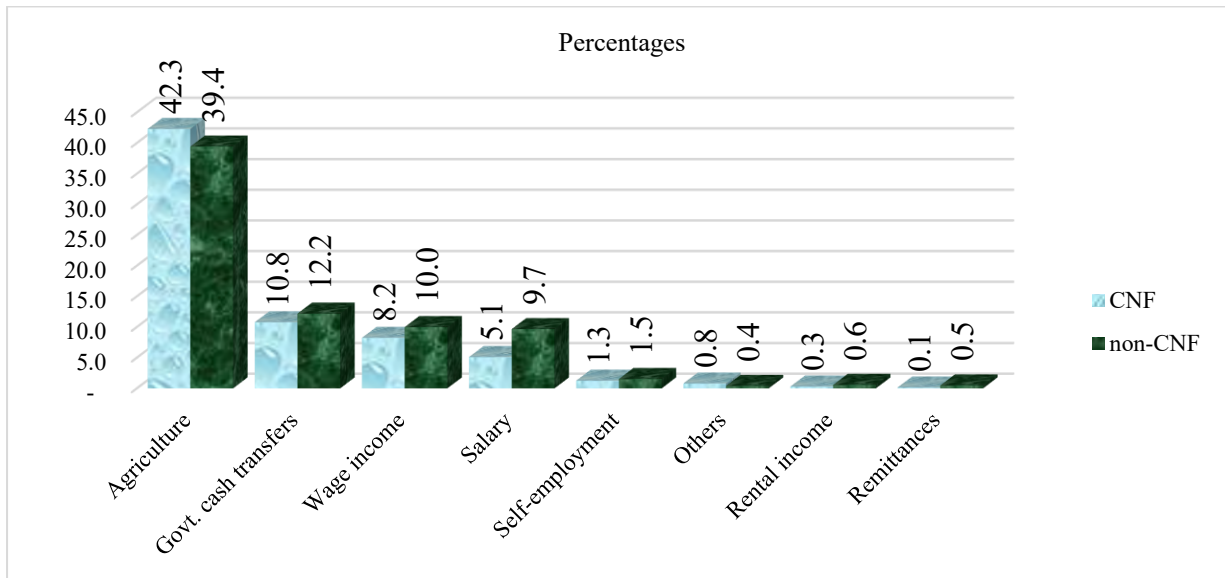
**Table 6.6: Sources wise income obtained by CNF and non-CNF households and their differences in 2022-23**

Sources	Amount in ₹		Difference between CNF & non-CNF		Percentage share	
	CNF	non-CNF	in ₹	in %	CNF	non-CNF
Agriculture	1,77,812	1,62,173	15,639	10	42	39
Remittances	359	1,224	-865	-71	0	0
Salary	12,410	24,090	-11,680	-48	5	10
Wage income	19,989	24,875	-4,886	-20	8	10
Self-employment/ Business	3,057	3,834	-777	-20	1	2
Cash assistance from Govt.	26,151	30,365	-4,215	-14	11	12
Rental income	744	1,452	-708	-49	0	1
Others	1,928	1,024	904	88	1	0
Total income	2,42,450	2,49,036	-6,586	-3	100	100

Source: IDSAP, Field Survey 2022-23

Percentage share of each source of income in total income of CNF and non-CNF households are given in Figure 6.2. Compared to non-CNF households, CNF farmers have higher percentage of income from agriculture and other sources (poultry), and less percentage of income from remaining six listed sources. It clearly indicates that CNF can impact the structure of household income. The trend may gather momentum in coming years.

**Figure 6.2: Share of households' income from different sources for CNF and non-CNF farmers in AY 2022-23**



Source: IDSAP, Field Survey 2022-23

## 6.4. Conclusions

The survey results in this chapter clearly indicate CNF's potential in enhancing the household farm income and bringing in a synergy between crop cultivation and livestock rearing. In the past studies the disaggregate analysis showed that CNF benefits are reaching almost all parts of the state, with some minor exceptions and almost all sections of farmers in the state. But the pattern in this years' results are not that much positive. These may be due to annual fluctuations which are wide and common in agriculture in the state and country. As mentioned above, structural changes, such as income sources of a household, take time. Even in these early days, the impact of CNF is visible.

# Chapter 7: Potential impact of APCNF on agriculture in the state

## 7.1. Introduction

The crop wise impact of CNF on farming conditions is analysed in chapter 3. The impact of CNF on individual households' income is discussed in chapter 6. The potential impact of CNF on crop production, agrochemicals' use and labour use in the state are deliberated in this chapter. In the previous years' studies, the impact was analysed at two levels, that is, the actual impact of APCNF at the project level and the potential impact of APCNF, if the entire cropped area were put under CNF. However, it was observed that in recent years, RySS is focusing on cropping pattern and encouraging and facilitating the participant to take up mixed crops, crop rotation and crop diversification. But adequate data is not available about actual cropping pattern of CNF farmers. Therefore, the project level impact is not assessed in this chapter. As mentioned in the consolidated report of the last year, the scope and methodology of this chapter has been evolving. Apart from covering the major farming indicators, such as paid-out costs, yields, gross value of crop output and net value of crop output, the potential use of fertilizers and potential changes in labour use are covered in this chapter.

## 7.2. Average CNF impact per hectare

In chapter 3, the impact of CNF on farming conditions is analysed for 11 crops individually. From that data, the weighted average values of these 11 crops, per hectare, were estimated, using the area under each of these 11 crops, in the state, as the weights in that chapter. Same (uniform) cropping pattern was used as weights for both CNF and non-CNF crops<sup>44</sup>. The average values of four indicators of farming conditions are presented in Table 7.1. On an average the CNF farmers spent ₹8,896 per hectare on PNPI and they saved ₹8,997 (50 percent) per hectare on PNPI, by avoiding non-CNF inputs. CNF farmers saved ₹6,303 (9 percent) per hectare in the paid-out cost. On an average, CNF farmers obtained ₹11,284 (8 percent) higher gross value of output per hectare and ₹ 17,587 (27 percent) higher net value of output per hectare. These 11 crops together account for 74.33 percent of gross cropped area (GCA) in the state. Hence the average values of these 11 crops can be assumed as the average values of all crops in the state.

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<sup>44</sup> The area under each of the 11 crops covered in this report are shown in Figure 3.1.

**Table 7.1: Average expenditure on PNPIs, paid-cost and gross and net value of output under CNF and non-CNF and differences in the state in AY 2022-23**

Farming Indicator	₹/ hectare		Difference between CNF & non-CNF	
	CNF	non-CNF	₹/ hectare	percentage
PNPIs	8,896	17,893	-8,997	-50
Paid-cost	62,532	68,834	-6,303	-9
Gross value of crop output	1,44,880	1,33,596	11,284	8
Net value of crop output	82,348	64,761	17,587	27

*Note:- Compiled from tables of chapter 3*

*Source: IDSAP, Field Survey 2022-23*

### 7.3. Potential benefits of APCNF

The potential benefits from APCNF that would accrue to the state, if the entire cropped area in the state is put under CNF are estimated. The estimation of potential benefits is simple and straightforward<sup>45</sup>. But this is just an academic exercise. The average benefits per hectare derived and presented in the Table 7.1 are extrapolated with last five years' average GCA of 73.76 lakh hectares in the state. It may be noted that the average benefits given in Table 7.1 are weighted averages of 11 sample crops, covered in this report. The area under each crop in the state is used as the weights. These 11 crops together cover 74.33 percent of GCA in the state during the last five years. With a simple and realistic assumption that average values of 74.33 percent of GCA, would hold good for 100 percent of GCA, the potential benefits are estimated and given in Table 7.2. If the entire GCA had been put under CNF, the state would have saved ₹6,636 crore (50 percent) in PNPI, ₹4,648 crore (16 percent) in paid-out costs; and would have attained ₹8,823 crore (8 percent) additional gross value of crop output and ₹12,971 crore (27 percent) higher net value of crop output. It is worth noting that contribution of gross value of crop output, in the incremental net value of crop output, is higher than that of the savings obtained in paid-out cost. This is the second time such phenomenon is observed. Last year also similar trend was observed<sup>46</sup> It implies that there is a positive impact of CNF on crop yields and output prices.

<sup>45</sup> But it is rough estimate as about 20 percent of GCA in the state is under horticulture. At least some those have different practices.

<sup>46</sup> In the previous reports, savings in the paid-out costs were major benefits in CNF



**Table 7.2: Potential benefits from APCNF in the state, if the entire GCA is put under CNF in 2022-23**

Farming Indicator	₹crores		Difference between CNF & non-CNF	
	CNF	non-CNF	₹crores	Percentage
PNPIs	6,561.30	13,197.10	-6,635.80	-50
Paid-cost	46,120.89	50,768.97	-4,648.08	-9
Gross value of crop output	1,06,857.19	98,534.61	8,322.59	8
Net value of crop output	60,736.31	47,764.90	12,971.41	27

Source: IDSAP, Field Survey 2022-23

### 7.3.1. Potential impact of CNF on crop output

The impact of CNF on crop output is analysed here. If the entire GCA is put under APCNF, the change in the output of 11 sample crops, covered in this report, in 2022-23 are shown in Table 7.3. As seen in chapter 3, out of 11 crops covered in this report, in eight crops, the yield differences are not statistically significant. Hence the output of those eight crops would have remained the same if the entire GCA had been allocated to CNF. At the same time, the output of Maize would have increased by 1.80 lakh tons (9.1 percent). The same would have increased by 0.72 lakh tons (9.5 percent) in Bengal gram and by 2.06 lakh tons (24.3 percent) in Tomato.

**Table 7.3: Potential impact of APCNF on crop output, if the entire GCA is put under CNF during AY 2022-23**

Crop	Output (lakh tons)		Difference between CNF & non-CNF		
	CNF	Non-CNF	Lakh tons	Percentage	Significance (of yields)
Paddy	121.22	122.04	-0.82	-0.7	ns
Groundnut	20.91	20.58	0.33	1.6	ns
Cotton	6.82	6.52	0.31	4.7	ns
Bengal gram	8.33	7.61	0.72	9.5	*
Maize	21.46	19.66	1.80	9.1	**
Black gram	5.50	5.15	0.35	6.8	ns
Red gram	1.73	1.57	0.17	10.7	ns
Chillies	8.51	8.92	-0.41	-4.6	ns
Green gram	1.57	1.67	-0.09	-5.6	ns
Ragi	0.49	0.50	-0.01	-1.6	ns
Tomato	10.56	8.49	2.06	24.3	*

Source: IDSAP, Field Survey 2022-23

### 7.3.2. Potential impact of CNF on the use of agrochemicals

If the entire GCA is put under CNF, the state would have avoided the use of 38.22 lakh tonnes of fertilizers in 2022-23. In the same year, the state would have avoided ₹13,197.10 crore

expenditure on agrochemicals, including ₹8,069.98 crores on fertilizers and ₹5,127.12 crores on pesticides (Table 7.4). As mentioned above the avoided use of agrochemicals has larger social (health) and environmental benefits (soil quality improvement and mitigation of climate change).

**Table 7.4: Potential impact of CNF on use of agrochemicals in the state in 2022-23**

Indicator	Units	Total avoided quantities and expenditure
Quantity of fertilizers	Lakh tons	38.27
Expenditure on fertilizers	Crore ₹	8,069.98
Expenditure on pesticides	Crore ₹	5,127.12
Expenditure on agrochemicals	Crore ₹	13,197.10

Source: IDSAP, Field Survey 2022-23

## 7.4. Impact of CNF on labour use

Shortage of labour is often cited as one of major constraints in the expansion of CNF. This issue is discussed in this section. A rough estimation of additional labour requirement, if the entire GCA is put under CNF, is made.<sup>47</sup> As given in Kharif and Rabi reports, on an average 23 and 21 additional person days per hectare are required in Kharif and Rabi season respectively under CNF vis-à-vis non-CNF. Using those field estimates and average area under each crop and season in the state during last five years, additional labour requirement, if the entire GCA is put under CNF, is estimated and presented in Table 7.5. In total 5.5 lakh persons<sup>48</sup> (19 percent) of additional labour are required, if the entire area is put under CNF. These include 3.34 lakh persons of own labour and 2.25 persons of hired labour. On the other hand, CNF requires 4.08 lakh persons (22 percent) of female and 1.52 lakh persons of male additional labour. As per Census 2011, there were 33.1 lakh farmers and 109.8 lakh agriculture labour. These days, the Government of AP is providing cash assistance under the Rythu Bharosa scheme to more than 52 lakh farmers. Given the total number of agricultural works, including farmers and agriculture labour, additional labour requirement is about 2 percent. Further, given seasonal nature of agriculture, there is huge disguised unemployment in agriculture. Given the overall size of agriculture workers, additional requirement can easily be met. In addition, CNF can reduce the disguised unemployment and increase agricultural

<sup>47</sup> The study is focussed on major seasonal crops. Apart from seasonal crops, about 15 lakh hectares of GCA is under horticulture crops, whose labour requirements are quite different. However, it is **assumed** that labour requirements of those crops are broadly on the lines of seasonal crops. The process provide a broad and rough estimation of CNF impact on labour use.

<sup>48</sup> The estimation was in person days. The person days are divided with 300 to get number of persons required.

workers' productivity. As CNF is focusing on mixed cropping, crop rotation and crop diversity, the peak time demand for agriculture labour would reduce considerable. It would enable the CNF farmers to optimize their labour use.

**Table 7.5: Additional labour requirement, if the entire cropped area is put under CNF in 2022-23**

Indicator	Lakh persons		Difference between CNF & non-CNF	
	CNF	Non-CNF	Lakh persons	in %
Own male	8.41	6.76	1.65	24
Hired male	2.86	3.00	-0.13	-4
Own female	7.11	5.42	1.69	31
Hired female	15.29	13.00	2.29	18
Total male	11.28	9.76	1.52	16
Total female	22.49	18.42	4.08	22
Total own	15.52	12.18	3.34	27
Total hired	18.25	15.99	2.25	14
Grand total	33.77	28.27	5.50	19

Source: *IDSAP Field Survey 2022-23*

## 7.5. Conclusions

The analysis indicates that the demand for chemical free food and other output is on the rise and it is also fetching higher prices for CNF farmers. Avoided use of agrochemicals has larger health and environmental benefits, along with the economic benefits. Additional labour required for CNF very less in comparison to size of manpower in state agriculture. Further, CNF enables participating farmers to optimize their labour use.

# Chapter 8: Wellbeing of CNF farmers

## 8.1. 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 Wellbeing<sup>49</sup> chapter.<sup>50</sup> In this chapter the same is summarized. The related Tables are provided in Appendix.

## 8.2. Farmers' wellbeing

1. Over two-thirds of CNF farmers reported an improvement in their financial position.
2. 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.
3. About 54 percent of CNF farmers experienced a considerable or moderate increase in new market channels.
4. Over 94 per cent of the farmers, at the state level, expressed their interest in farming, due to CNF.
5. 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.
6. From a minimum of 78 percent to a maximum of 98 percent of farmers, across Agroclimatic Zones and category of farmers, have reported that their health status has

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<sup>49</sup> 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.

<sup>50</sup> That chapter did not address all indicators of wellbeing. Only a subset of wellbeing indicators relevant to CNF were analysed.

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.

7. About 24 percent of CNF farmers, at the state level, have 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.
8. People started looking at CNF farmers not only as saviours of nature, saviour of 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 produce 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.
9. 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 (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.

### **8.3. Conclusions**

The analysis clearly indicates that CNF has substantial positive impact on the farmers’ wellbeing. This is the need of the hour. Apart from improving household income, it is positively impacting on the health and education of the CNF households. CNF is freeing farmers from many compulsions and dependencies.

## Appendix tables of chapter 8

**Appendix Table: 8.1: CNF farmers response about changes in farming related stress after CNF across Agroclimatic Zones and categories during Kharif 2022-23 (in %)**

Agroclimatic Zones & categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
<b>Agroclimatic Zones</b>					
HAT	12	46	18	7	16
North coastal	13	31	21	18	17
Godavari	22	32	25	4	17
Krishna	11	77	10	1	0
Southern	4	56	15	20	5
Scarce rainfall	5	66	26	3	-
AP	9	57	18	9	7
<b>Farm size category</b>					
Marginal	9	58	17	9	7
Small	10	56	18	9	7
Others	6	52	23	12	6
All	9	57	18	9	7
<b>Tenurial categories</b>					
Tenants	7	59	17	5	12
Owner cum tenants	5	71	15	6	3
Owners	9	56	18	10	7
All	9	57	18	9	7
<b>Social categories</b>		12	46	18	7
SC	9	66	18	5	3
ST	11	47	19	9	15
BC	10	56	19	10	6
OC	7	59	17	13	5
All	9	57	18	9	7

Source: IDSAP Field Survey, 2022-23.

**Appendix Table 8.2: CNF farmers response about the changes in their financial position across Agroclimatic Zones and category of farmers during Kharif 2022-23 (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
<b>Zone</b>					
HAT	9.43	29.92	55.74	3.69	1.23
North coastal	1.94	38.06	54.84	3.87	1.29
Godavari	9.92	54.96	32.06	2.29	0.76
Krishna	6.89	84.26	7.21	0.98	0.66

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
Southern	9.48	53.05	35.21	1.81	0.45
Scarce rainfall	9.57	81.65	6.12	1.60	1.06
Total	8.34	60.64	28.05	2.12	0.85
Farm size category					
Marginal	8.25	59.77	29.47	1.78	0.73
Small	8.33	60.98	26.83	2.64	1.22
Others	8.78	63.90	24.39	2.44	0.49
Total	8.34	60.64	28.05	2.12	0.85
Tenurial status					
Tenants	2.38	69.05	26.19	2.38	0.00
Owner cum tenants	5.00	72.50	16.25	5.00	1.25
Owners	8.68	59.79	28.72	1.96	0.85
Total	8.34	60.64	28.05	2.12	0.85
Social category					
SC	8.19	67.62	22.06	1.07	1.07
ST	8.91	34.32	50.83	3.96	1.98
BC	6.27	66.82	24.46	1.83	0.61
OC	11.30	65.38	21.15	1.92	0.24
Total	8.34	60.64	28.05	2.12	0.85

Source: IDSAP Field Survey, 2022-23.

**Appendix Table 8.3: Crop wise avoided\* expenditure on agrochemicals by CNF farmers during 2022-23 (₹/ hectare)**

Crop	Fertilizers	Pesticides	Total
Paddy	13,570	4,940	18,510
Groundnut	8,903	4,379	13,282
Cotton	14,331	10,805	25,136
Maize	11,057	4,025	15,082
Red gram	5,789	3,774	9,564
Chillies	30,593	17,551	48,144
Tomato	14,908	10,391	25,299
Average <sup>51</sup>	12,756	6,337	19,093

\* These are actual expenditure on agrochemicals by non-CNF farmer. These are considered as the avoided expenditure by CNF farmers.

Source: IDSAP: Field Survey, 2022-23

<sup>51</sup> This is the weighted average of seven crops considered in the report and given in the table. The area under each crop, in the state, are used as the weights. See Figure 3.1

**Appendix Table: 8.4: Avoided@ average expenditure on fertilizers and pesticides across Agroclimatic Zones and category of farmers during Kharif 2022-23 (in ₹/ hectare)**

Agroclimatic Zones & Categories of farmers	Fertilizers	Pesticides	Total
<b>Zone</b>			
HAT	10,649	2,122	12,771
North coastal	10,782	3,164	13,946
Godavari	11,335	5,451	16,786
Krishna	17,781	12,234	30,015
Southern	8,867	4,349	13,216
Scarce rainfall	14,888	8,595	23,483
AP*	13,589	7,345	20,934
<b>Farm size category</b>			
Marginal	15,841	7,912	23,753
Small	11,981	6,652	18,633
Others	11,278	7,164	18,442
All*	13,589	7,345	20,934
<b>Tenurial categories</b>			
Tenants	9,058	7,466	16,524
Owner cum tenants	9,636	7,806	17,442
Owners	13,975	7,317	21,292
All *	13,589	7,345	20,934
<b>Social category</b>			
SC	13,628	7,897	21,526
ST	8,212	2,994	11,206
BC	13,998	7,372	21,370
OC	14,267	8,384	22,651
All*	13,589	7,345	20,934

@ These are actual expenditure on agrochemicals by non-CNF farmer. These are considered as the avoided expenditure by CNF farmers

\* These figures are slightly different from the previous table due to difference in estimation methodology. While the figure in previous Table 5.3 were estimate crop wise and crop wise weighted average was calculated. In this table all crops data was simply aggregated at zone and farmers categories level.

Source: IDSAP: Field Survey, 2022-23

**Appendix Table 8.5: CNF farmers response about change in funds requirement for agriculture working capital due to CNF across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
<b>Zone</b>					
HAT	2	58	7	33	0



Agroclimatic Zones & Categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
North coastal	1	45	11	42	1
Godavari	42	58	-	-	-
Krishna	1	52	1	45	1
Southern	10	80	10	0	0
Scarce rainfall	2	75	24	-	-
AP	7	65	10	17	0
Farm size category					
Marginal	6	65	11	17	1
Small	7	64	11	17	0
Others	7	68	5	19	1
All	7	65	10	17	0
Tenurial status					
Tenants	5	68	-	27	-
Owner cum tenants	9	58	4	28	1
Owners	7	66	11	16	0
All	7	65	10	17	0
Social category					
SC	8	62	5	24	0
ST	5	60	6	29	0
BC	6	65	13	15	1
OC	8	73	12	8	0
All	7	65	10	17	0

Source: IDSAP Field Survey, 2022-23.

**Appendix Table: 8.6: CNF farmers response about change in borrowings for the agriculture working capital due to CNF across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
Zone					
HAT	-	59	20	15	6
North coastal	1	50	21	26	2
Godavari	8	92	-	-	-
Krishna	13	61	15	10	1
Southern	4	87	8	1	0
Scarce rainfall	14	66	16	4	-
Total	7	70	14	8	1
Farm size category					

Agroclimatic Zones & Categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
Marginal	6	73	13	6	2
Small	7	69	15	8	1
Others	14	58	16	12	0
Total	7	70	14	8	1
<b>Tenurial categories</b>					
Tenants	2	78	7	10	2
Owner cum tenants	9	63	20	6	1
Owners	8	70	14	8	1
Total	7	70	14	8	1
<b>Social category</b>					
SC	14	66	14	5	1
ST	1	62	20	13	5
BC	8	68	15	8	1
OC	6	82	8	4	-
Total	7	70	14	8	1

Source: IDSAP Field Survey, 2022-23.

**Appendix Table: 8.7: CNF farmers response with respect to changes in number of marketing channels for APCNF output across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
<b>Agroclimatic zone</b>					
HAT	13	75	11	-	0
North coastal	17	67	13	3	-
Godavari	16	9	76	-	-
Krishna	2	75	23	0	-
Southern	9	32	59	0	-
Scarce rainfall	6	16	77	1	0
AP	8	46	45	1	0
<b>Farm size categories</b>					
Marginal	8	46	45	1	0
Small	9	45	45	1	-
Others	9	46	44	2	-
All	8	46	45	1	0
<b>Tenurial categories</b>					
Tenants	3	43	54	-	-
Owner cum tenants	7	59	32	1	-
Owners	9	45	45	1	0

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
All	8	46	45	1	0
<b>Social categories</b>					
SC	6	52	41	0	-
ST	13	67	20	-	0
BC	9	38	52	2	0
OC	7	39	54	0	-
All	8	46	45	1	0

Source: IDSAP Field Survey, 2022-23.

**Appendix Table 8.8: CNF farmers response about changes in the health status of their families due to CNF across Agroclimatic Zones and category of farmers during Kharif 2022-23 (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
<b>Agroclimatic Zones</b>					
HAT	43	44	10	2	-
North coastal	27	63	7	2	1
Godavari	47	31	16	6	1
Krishna	9	89	1	0	2
Southern	16	66	13	5	0
Scarce rainfall	10	83	5	2	1
AP	21	68	8	3	1
<b>Farm size categories</b>					
Marginal	21	69	7	2	1
Small	21	64	10	4	1
Others	15	71	11	1	1
All	21	68	8	3	1
<b>Tenurial categories</b>					
Tenants	27	66	2	5	-
Owner cum tenants	16	68	6	5	4
Owners	21	68	8	3	0
All	21	68	8	3	1
<b>Social categories</b>					
SC	15	77	6	2	0
ST	38	48	11	3	0
BC	16	73	7	3	1
OC	19	68	9	3	0
All	21	68	8	3	1

Source: IDSAP: Field Survey, 2022-23

**Appendix Table: 8.9: CNF farmers response about the changes in their health expenditures after CNF across Agroclimatic Zones and category of farmers during Kharif 2022-23 (in percentage)**

Agroclimatic Zones & Categories of farmers	Decreased considerably	Decreased moderately	No change	Increased moderately	Increased considerably
<b>Agroclimatic Zones</b>					
HAT	15	48	23	11	3
North coastal	17	34	29	15	6
Godavari	48	30	13	5	4
Krishna	13	70	8	8	1
Southern	7	55	17	18	3
Scarce rainfall	22	71	5	2	0
AP	17	56	14	10	2
<b>Farm size category</b>					
Marginal	17	55	14	11	2
Small	17	58	13	10	2
Others	14	56	18	10	3
All	17	56	14	10	2
<b>Tenurial categories</b>					
Tenants	20	56	15	10	-
Owner cum tenants	16	67	6	8	3
Owners	17	56	15	11	2
All	17	56	14	10	2
<b>Social category</b>					
SC	20	60	11	6	1
ST	15	49	22	12	3
BC	19	56	12	11	2
OC	12	59	15	11	3
All	17	56	14	10	2

Source: IDSAP Field Survey, 2022-23.

**Appendix Table: 8.10: CNF farmers response with respect to changes in people's interest for APCNF output vis-à-vis non-CNF output across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
<b>Zone</b>					
HAT	60	35	4	1	-
North coastal	42	42	14	1	1
Godavari	24	76	-	-	-
Krishna	2	52	42	3	0
Southern	19	70	10	1	0

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
Scarce rainfall	17	69	13	1	-
AP	24	58	16	1	0
Farm size category					
Marginal	23	61	15	1	0
Small	26	58	16	1	-
Others	24	48	24	3	1
All	24	58	16	1	0
Tenurial status					
Tenants	11	62	27	-	-
Owner cum tenants	13	54	29	3	1
Owners	25	58	15	1	0
All	24	58	16	1	0
Social category					
SC	12	52	34	2	0
ST	53	40	6	1	-
BC	20	63	16	1	0
OC	18	68	13	1	-
All	24	58	16	1	0

Source: IDSAP: Field Survey, 2022-23

**Appendix Table: 8.11: CNF farmers response with respect to changes in respect they get from the relatives and friends due to CNF across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
Zone					
HAT	51	43	4	2	
North coastal	29	60	9	2	
Godavari	7	93	-	-	
Krishna	33	50	16	0	
Southern	26	55	17	3	
Scarce rainfall	11	63	17	10	
Total	27	56	13	4	
Farm size category					
Marginal	26	57	12	5	
Small	30	54	14	2	
Others	27	55	16	2	
Total	27	56	13	4	
Tenurial status					

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
Tenants	24	68	8	-	
Owner cum tenants	27	62	10	1	
Owners	27	56	13	4	
Total	27	56	13	4	
<b>Social category</b>					
SC	32	54	14	0	
ST	45	49	5	1	
BC	21	61	14	5	
OC	21	55	17	6	
Total	27	56	13	4	

Source: IDSAP Field Survey, 2022-23

**Appendix Table 8.12: CNF farmers response with respect to changes in the respect they get in the market across Agroclimatic Zones and category of farmers (in percentage)**

Agroclimatic Zones & Categories of farmers	Increased considerably	Increased moderately	No change	Decreased moderately	Decreased considerably
<b>Agroclimatic Zones</b>					
HAT	33	58	9	0	-
North coastal	29	59	10	1	-
Godavari	10	90	-	-	-
Krishna	9	77	14	-	0
Southern	9	62	29	0	-
Scarce rainfall	13	64	21	2	-
Total	16	66	18	1	0
<b>Farm size categories</b>					
Marginal	15	69	16	0	-
Small	17	64	19	1	-
Others	17	58	23	1	1
All	16	66	18	1	0
<b>Tenurial categories</b>					
Tenants	-	84	16	-	-
Owner cum tenants	14	79	7	-	-
Owners	16	65	18	1	0
All	16	66	18	1	0
<b>Social categories</b>					
SC	11	67	21	0	0
ST	29	58	13	0	-
BC	15	67	16	1	-
OC	10	69	21	1	-
Total	16	66	18	1	0

Source: IDSAP Field Survey, 2021-22.

## Chapter 9: Issues, challenges and way forward

### 9.1. Introduction

The issues and challenges in implementation of CNF have been identified and elaborated in Kharif and Rabi reports of 2022-23. Almost the same issues and challenges have been identified in both reports. Therefore, the issues and challenges of Rabi report, which is more recent and updated, is summarized below. The tables and figures used in that chapter are given at the appendix for the ready reference and use.

### 9.2. Issues and challenges

1. The rate of enrolment of farmers in CNF is impressive in the state.
2. About 40 percent of CNF farmers have allocated their entire operated area to CNF during Rabi 2022-23. Shortage of CNF inputs is a major reason as per 24 percent of farmers in allocating cultivated area under CNF. Farmers, under non-CNF, are habituated to the readymade inputs. Hence, farmers want such readymade inputs under CNF also. Further, there is need for readymade inputs, especially the Asthrams and Kashayams, for the real-time application. Non-availability suitable tools and equipment such as blenders, drums, big utensils, etc., to prepare CNF inputs is another serious challenge according to 18 percent of farmers. Shortage of family and hired labour are the issues for 17 and 15 percent of farmers respectively. Inadequate extension services are another problem cited by 16 percent of farmers. These constraints led to wide variations across the Agroclimatic Zones and the farmers' categories.
3. 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.
4. Shortage of suitable equipment such as mixers, blenders, stirrers, drums, etc., is cited as problem by 59 percent of farmers. Getting a higher price for CNF produce than that for non-CNF output is the real issue for the CNF farmers. Scarcity of labour and scarcity of family labour have been encountered by 46 and 34 percent of the farmers respectively.<sup>52</sup> 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.

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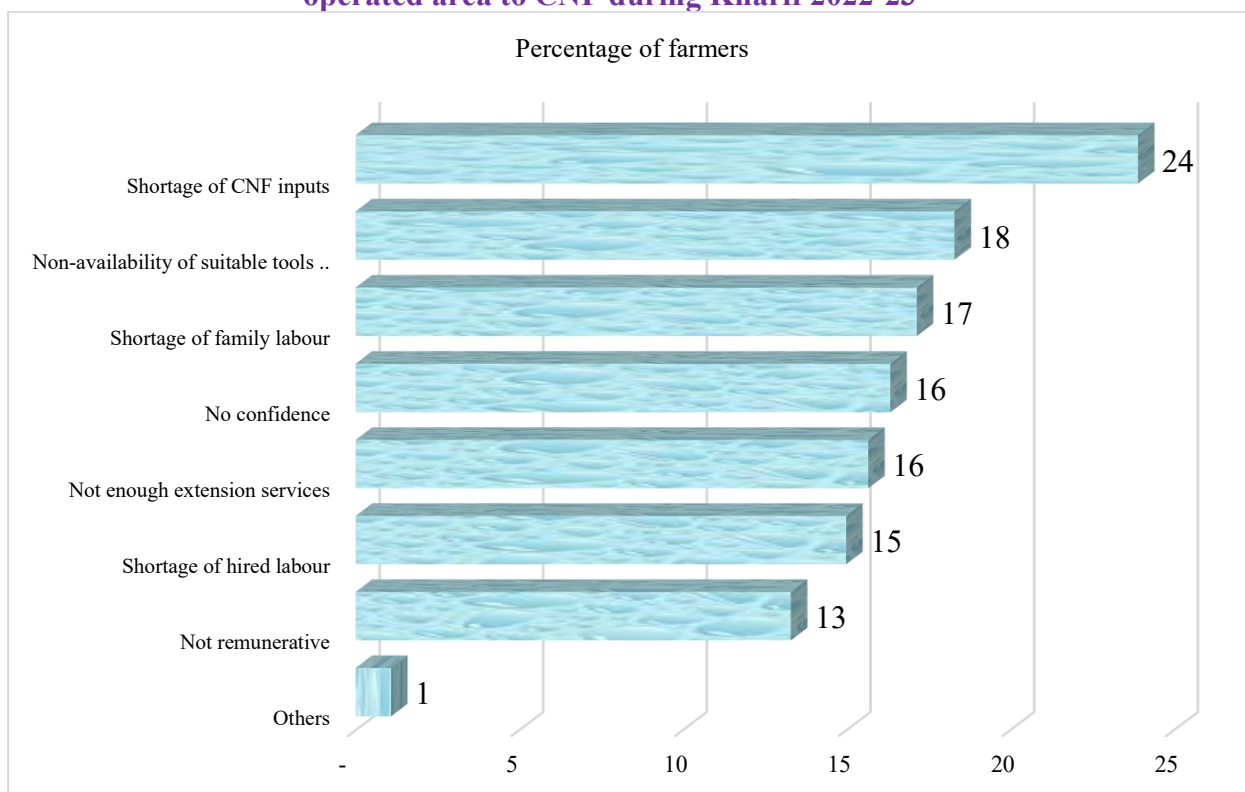
<sup>52</sup>Whether the labour scarcity is due to CNF or due to local labour market conditions needs to be examined thoroughly.

5. 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 year' survey compared to previous years' results. It reflects improvement in the RySS's extension and support services as well as farmers' increased ability to master the new techniques and practices of CNF.
6. 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.
7. RySS may strengthen 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.
8. Implementation of CNF without any incentives and subsidies to the farmers in the policy environment characterised by incentivized and subsidized chemical-based farming throws up challenges for the expansion of adoption of CNF by farmers in the state.

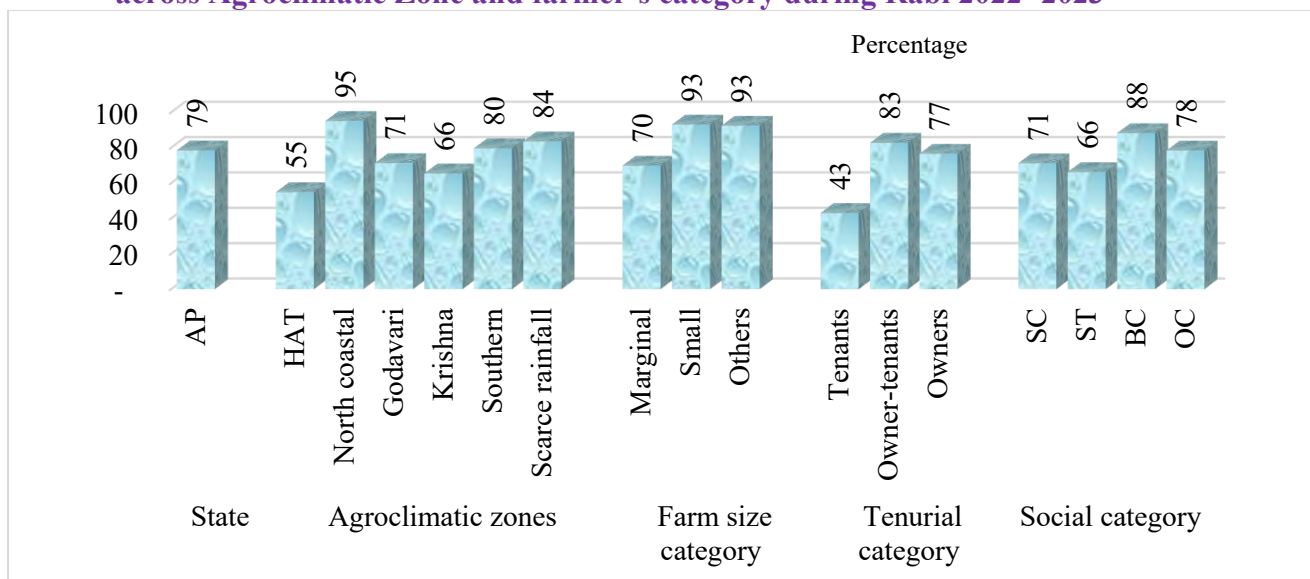


## Appendix tables and figures of chapter 9

**Appendix figure 9.1: Percentage of farmers cited reasons for not allocating their entire operated area to CNF during Kharif 2022-23**

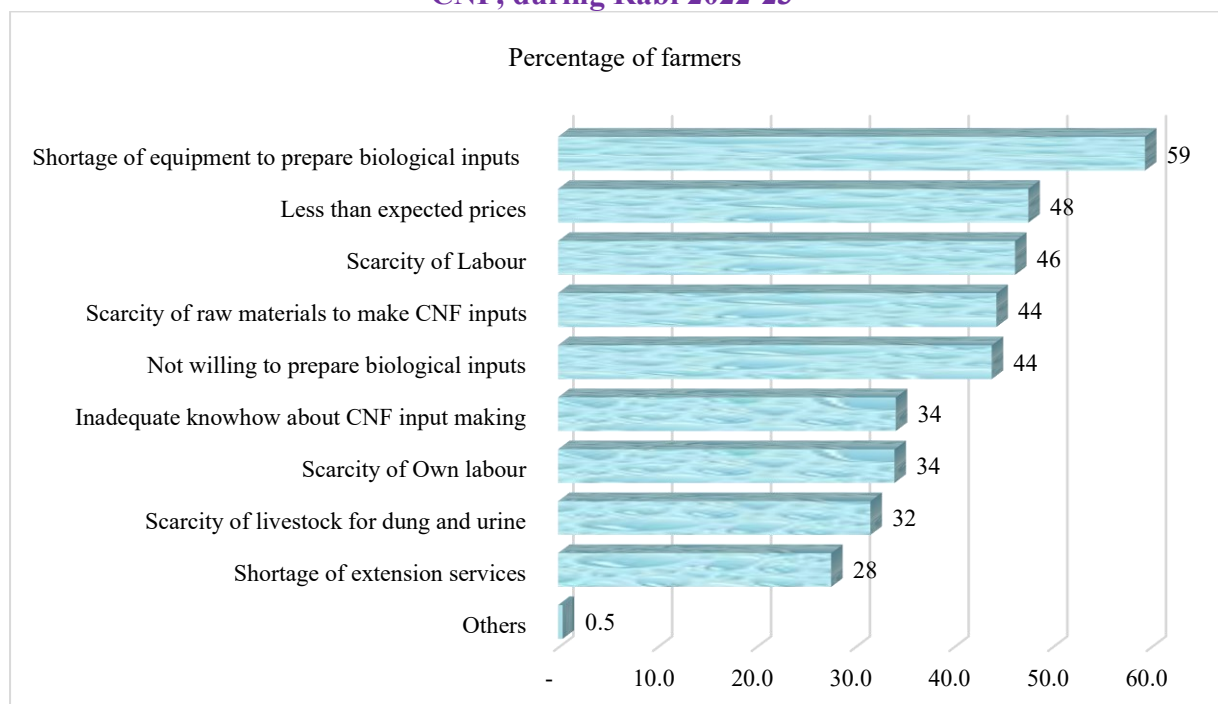


**Appendix figure 9.2: Percentage of farmers experienced any problem in adopting CNF across Agroclimatic Zone and farmer's category during Rabi 2022- 2023**



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

**Appendix figure 9.3: Major problems identified by the CNF farmers in adoption of CNF, during Rabi 2022-23**



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

**Appendix Table 9.1: Extension Services Received by CNF Farmers according to sources and quality of services 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.*

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