REPORT

Final Evaluation of "Climate Change Adaptation of Women Smallholders and Cotton Producers from Vidarbha Region, Maharashtra"

Abbreviations

ACI	Adaptive Capacity Index
ATMA	Agriculture Technology Management agency
BCI	Better Cotton Initiative
BPL	Below Poverty Line
BLOCC	Block Level Organic Cotton Committee
CCACP	Climate Change Adaptation and Cotton Production
CO2	Carbon Dioxide
Cu	Copper
EC	Electrical Conductivity
ESCRCPP	Environmentally-Sound and Climate -Resilient Cotton Production Practices
FYM	Farm Yard Manure
Fe	Iron
FGD	Focus Group Discussion
GM	Genetically Modified
GP	Gram Panchayat
IPM	Integrated Pest Management
IEC	Information Education Communication
IDI	In-depth Interview
KVK	Krishi Vigyan Kendra
K	Potash
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MPSSM	Mahatma Phule Samaj Seva Mandal
Mg	Magnesium
N	Nitrogen
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-Governmental Organisation

NSKE	Neem Seed Kernel Extract
OC	Organic Carbon
PKV	Punjabrao Krishi Vidyapeeth
PMAY	Pradhan Mantri Awas Yojana
P	Phosphorous
PPE	Personal Protective Equipment
PoP	Package of Practices
PH	Potential of Hydrogen
SFAC	Small Farmer Agribusiness Consortium
SHG	Self-Help Group
SIS	Structured Interview Schedule
SO	Specific Objective
SUFALAM	Short name of the project (meaning “the orchard glows”)
VDC	Village Development Committee
WtRF	Where the Rain Falls
WHO	World Health Organization
Zn	Zinc

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Executive Summary

A. Context

Organic farming is a method of agricultural production that utilizes natural materials and biological processes to achieve production goals while protecting the well-being of the farmer and the consumer and environment. Less than one percent of global cotton production is through organic cultivation. India accounts for 51 percent of world's organic cotton production[1]. Though Maharashtra tops 10 cotton producing states of India in area, it comes last in productivity. Cotton is the most widely cultivated crop in the Vidarbha region of Maharashtra.

Area under **Bt cotton**[2] accounts for more than 95% of the cotton growing area in India. Besides the price of seed material being very high (it cannot be produced at farm level), Bt cotton requires high use of chemical fertilizers and pesticides, which not only escalates the cost of cultivation without matching returns, but also results in loss of soil fertility, pest resurgence, health and environmental hazards, particularly contamination of water sources and unsustainable water use.

In the drought prone district of Buldhana, 95 percent of (cotton) farmers, mostly small or marginal and holders, grow Bt cotton, mainly under unirrigated conditions, following unscientific agronomic practices. More than half of the farmers in Buldhana supplement their incomes by working as agricultural labour. Migration for four to five months (mostly during January to May months) in a year is common for economic opportunities. Women ownership and control over land is missing or not recognized, and violence against women is common, which the community attributes to alcohol consumption by men.

[1] Organic exchange/Textile exchange
[2] Bt cotton is a genetically modified organism (GMO) or genetically modified pest resistant plant cotton variety, which produces an insecticide to combat bollworm

B. The Project

CARE India's project on **"Environmentally Sound and Climate Resilient Cotton Production Practices (ESCRCPP)"**, supported by *Group Galeries Lafayette*, was implemented from 2018 to 2021 in 10 villages of Jalgaon Jamod block of Buldhana district in Vidarbha region of Maharashtra, aimed to promote environmentally sound, climate-resilient and inclusive cotton production. The location of the project was guided by the fact that Vidarbha accounts for half of the cotton area of Maharashtra, which has one third of cotton growing area in India and Buldhana district is the major cotton producing area in Vidarbha. The cotton based agricultural economy of the region faces challenges like water stress, climate variability and issues related to farming practices and technology. These result in low productivity, frequent crop failure, poor management of water resources, and high indebtedness of farmers.

The project had three purposes (sub-objectives or outcomes) and six expected results (outputs). The outcomes were: women small holders have the capacity to engage in environmentally sound and climate-resilient cotton production; strengthened collectives for building solidarity, promoting gender equity, and facilitating access of women smallholders from poor and vulnerable households to resilience building resources, services, and opportunities; and enabling environment in the form of supportive cotton value chain actors.

To implement the project, CARE India had designed an intervention package which comprised of the following:

i. Developing environmentally-sound and climate-resilient cotton production model plots for demonstration, on the lands of traditionally cotton growing women smallholders in 10 project villages.

ii. The demonstration package includes modules on good practices for cotton pre-production to post-production, as well as inputs like seeds, bio-fertilizers, farm equipment, post-harvest storage materials.

iii. Organizing a learning group of 15 women smallholders around each 0.5-acre demonstration plot with the aim to enhance knowledge, skills and practices of women smallholders and their cotton growing households for practicing environmentally sound and climate resilient cotton production. Two seasons of learning cycles are about to be completed.

iv. Setting up a risk fund of Rs.10,000/acre of demo plot to compensate for any loss of cotton-based incomes incurred by farmers as they switch to new ways of farming and the cotton production model takes time to stabilize, as demo-plot owners come from poor and marginalized households (now being used for COVID response activities).

v. Women's literacy and leadership interventions through Self Help Groups and Farmers' Groups. This is intended to enhance womens' confidence and self-esteem for pursuing environmentally sound and climate resilient agricultural production and access to resilience-building resources, services, and opportunities.

vi. Providing inputs, services, tools and technologies to women smallholders through utilizing the supportive ecosystem of men, government functionaries, and market actors. This will help the women participants to change over from the current set of input intensive and environmentally harmful cotton production practices.

vii. Zero-tolerance approach to child labour in cotton production in project villages.

viii. Making use of multi-stakeholder platforms to disseminate the learning and experiences of women smallholders, and push for environmentally sound and climate resilient cotton production in the district.

C. The 'Final Evaluation'

The purpose of this end line evaluation is to **analyse the changes brought about by project interventions.** The specific purpose of the evaluation included summarizing the **quantitative and qualitative results and outcomes** from CCACP activities and i**dentifying key lessons learnt and provide recommendations** that can both contribute to the sustainability of benefits of this project, and aid in the overall enhancement of the programming of CARE and its partners in India.

A mixed-method technique was used for collecting data on the relevant indicators listed in the logframe, applying the techniques of quantitative and qualitative research. Quantitative research consisted of a survey of 430 respondents (Direct beneficiaries: 111, Indirect beneficiaries: 319) spread across 10 villages using structured questionnaires. The sample was robust enough to yield valid and reliable inferences at the confidence level of 95 percent. The indicators used in both the baseline and endline surveys were the same, allowing for comparison of the baseline situation with the current situation. Qualitative data was collected through FGDs and IDIs to get qualitative feedback from the stakeholders. We also used secondary information related to the project. All quality assurance measures were applied to get valid and reliable results.

D. Key Findings

Characteristics of the sample respondents

This study is based on a sample of 430 Scheduled tribal (The Scheduled Tribes (STs) are officially designated groups of people in India suffering from extreme social, educational and economic backwardness on account of the primitive agricultural practices, lack of infrastructure facilities and geographical isolation) farmers, including 111 (26%) demo plot farmers. **Females** comprised 32 % of the sample (Females could not be interviewed as most of them were in their fields. The dominant **age group** was 36-45 years, followed by 46-60 years.

Agriculture, supplemented by wage labour, was identified as the **main source of livelihood,** supported by livestock rearing. Draft animals powered land tilling operations. The entire sample was small or marginal land holders with **average holding size** of 3.2 acres. Demo plot farmers had slightly larger holdings, conforming to the project's selection criteria.

Mobile phone ownership was 74 %, but less than 10 % of them used to phones to access agriculture related information.

Traders and agents were the source of **market information** for 70 % of the respondents. Brokers/agents acquire the produce at farm gate, relieving the farmer the bother of transporting the goods to the APMC or mill at Malkapur, though the price realized by the farmer is much lower.

Program Support & Feedback

Generally, there was high level of **awareness of project interventions**, though not necessarily its name **"Sufalam".** Regarding inputs and services from the project, very high percentage of respondents (90%) affirmed having received **technical support and training** from the project on summer ploughing, bio-dynamic composting, preparation & use of botanical extract and spraying organic pesticides. Around 89 percent stated learning about seed treatment and germination test as these were physically demonstrated to them in sample plots.

In terms of **physical and material support**, all demo farmers received resilient variety of seed and 90 % received organic pesticides and manure, water tanks, IPM kits, cotton picking bag and water tanks. All demo farmers participated in exposure visits.

Overall, around 58 % of the women respondents stated receiving training on **financial literacy and leadership skills** and the topics of the training stated by them included; decision making (68%), time management (64%) and problem-solving skills (49%). However, as per the FGD findings, influence of the training on leadership skills was largely seen on office bearers of the groups (President & Secretary) and they were the ones who had maximum knowledge about bank transactions and savings in the group.

Knowledge and Awareness

Awareness about **sustainable cotton production practices** among the farmers shot up from nil level at baseline to 52 % (demo farmers-100%) during endline. Nearly 29 % of demo farmers and 6% of Non-demo farmers were aware about contamination of soil and surface water due to excessive use of chemical fertilizers and pesticides (Baseline-7%).

Compared to 31 % at baseline, 74 % of farmers at end line were "moderately" **aware about general climate change effects**. Overall, 61 percent of respondents (90% demo and 51% non-demo) were aware about climate variability depleting water availability and reducing fiber quality. All demo farmers agreed that climate variability reduced cotton production, but about half the number of non-demo farmers did not see any such connection.

Adoption of practices

The **adoption rates** of all the different environmentally sound sustainable practices were much higher among the demo plot farmers. The practices that majority of demo plot farmers have adopted are use of botanical extract (91%), improved and resilient variety of cotton seeds (90%), bio-dynamic

composting (90%), use of organic fertilizers (86%) and summer ploughing (86%). It was learnt that all the demo plot farmers were making organic manures (through bio-dynamic composting) and botanically extracted pesticides and applying them in their demo plots.

During the discussions an interesting observation came into notice of the survey teams. **Demo plot farmers of the five villages in the first year are now using organic fertilizers and pesticides for Bt cotton as well as other crops.** However, demo farmers from the villages which were selected during the second year of implementation were making organic fertilizers and pesticides only for their organic cotton cultivation. But given the lesser cost involved in making these fertilizers/pesticides, they have plans to make it on a large scale from next year.

Soil testing was done for all the 111 demo farmers and 3 non-demo plot farmers also had given their soil for testing. Of the total 114 farmers who had given their soil for testing, a little over 50% said that they got soil testing report on time. It was learnt from CARE officials that soil testing report was handed over to all the demo farmers on time. Probably the respondents of the survey may not be aware about the timely receipt of the report because the report would have been handed over to the head of the household and therefore the survey respondent may not be aware of it (chances are that the person who received the soil testing report was not interviewed but some other person in the family was a part of the survey). Also, some respondents may have confused the soil testing report received from the agriculture department which usually takes a lot of time. Around 66 % of the respondents stated applying fertilizers on the basis of the soil testing report. None of the farmers during the baseline stated doing soil testing.

At aggregate level, nearly 77 %respondents (demo farmers -91%, non-demo farmers-72%) stated adopting at-least one water wastage reduction technique. The adoption percentage during the baseline was 19 %.

Overall, 56 percent respondents (demo farmers-75%, Non-demo farmers-50%) were following **precautionary measures while spraying**. As reported by farmers during the discussion, that they have now started using protective gear like masks, gloves, goggles, apron etc. while spraying. It was further elaborated by them that earlier they used to suffer from skin allergies while spraying. However, after they started using the safety kit, they have been spared of skin related problems.

Among the adoption of various **water wastage reduction techniques**, 40 % of demo plot farmers and 32 % of non-demo plot farmers stated using rain guns. Conservation of soil and water was done by 31 % respondents while 13 % had installed sprinklers in their fields. Drip irrigation was done by 4 % respondents to reduce the wastage of water. ***Few farmers have got drip and sprinklers installed at subsidized rates through government schemes.***

Outcome and Impact

Project impact is seen in increase in **soil fertility** as reported by 23 % of the respondents (47 percent demo plot farmers and 14 % non-demo farmers); reduction in use of chemical fertilizers (overall 64 %, 98% demo farmers and 51 % non-demo farmers). Fertilizer use has come down from the baseline level

of 2.6 quintals/per acre to 2.3 quintals/acre (2.2 quintal/acre and 2.4 quintals/acre for non-demo farmers). Reduction in chemical pesticides use was reported by 99 % of demo farmers (76 percent respondents overall).

All the above led to overall increase in agriculture productivity and income per unit area." High" and "very high" rating of productivity, which stood at 7 % respondents before the project intervention increased to around 22 % post intervention. Higher proportion of demo farmers (29%) than non-demo farmers (20%) stated increase in agricultural productivity after their involvement with the project. **As use of organic manures and pesticides reduced, the overall input cost of cotton cultivation decreased from Rs. 17307 per acre at baseline to Rs. 16793 at end line, realization of net profit increased to Rs. 14338 (Baseline- Rs. 11948) per acre i.e. an increase of 20% in the cotton based income.**

Most of the respondents were highly satisfied with organic cotton cultivation, compared to Bt cotton, in terms of lower input costs, better returns and reduction in pest attack. However, when it came to production, majority respondents said they were more satisfied with the yield of Bt cotton as compared to organic cotton. According the sample respondents the labour requirements for organic cotton was the same as for Bt cotton.

The proportion of respondents who believed that they possess good or excellent leadership skills for practicing environmentally sound climate resilient cotton production increased from nil at baseline to around 36 % at end line (moderate skills 39%). Majority of demo farmers (69%) stated good leadership skills after their involvement with the project as compared to non-demo farmers (25%).

Social and behavioural changes included increased awareness of child labour issues, enhanced awareness of schemes and access to government services, increased membership in farmer. It must be added that these collectives have so far not taken much collective action for bargain with marketing channels for better price realisation, or undertake value addition activities through sorting, grading or processing. These collectives require handholding support for a greater duration of time.

Trend towards change in role of women is apparent from the fact that around 14 % women stated that they can now take decision on their own in picking of cotton. However, decisions are taken jointly with spouses, as reported by 60 % of women respondents (ideal form of decision making). More than half of the sample respondents confirmed that the decision regarding land preparation and field management was taken by their spouses.

Women now have greater role in **financial decision making** (at baseline only 1 % women had complete involvement in financial decision-making processes at household level while another 38 % stated that they were involved in decision making to a moderate extent. At end line this increased to 19 % and 58 % respectively).

The proportion of respondents having **bank accounts** increased from 46 % at baseline to 99 % currently. About one third of the respondents had access to credit, commercial banks being the source for more than 94 % of those who had access.

While there was substantial increase from the bench mark level in the proportion of respondents accessing MGNREGA, PDS and rural housing, there was decline in those accessing other services like sanitation, drinking water and so on, probably because these pertain to one time infrastructure installations (e.g. toilets, pipelines for drinking water) or enrolments (pensions etc.). The baseline situation of only 5 percent of the respondents accessing insurance products continued at end line.

Women's involvement in **community level planning and decision making** has also improved after their involvement with the project (baseline 18 % women had no involvement which have gone down to 8 % currently. The proportion of women having some involvement has gone up from 44 % before has now gone up to 68 %). Before the project intervention, only 5 % of the demo as well as non-demo farmers could raise their concerns in public forums; more women can now raise their issues in public platforms (12 % non-demo plot farmers and 22 % demo farmers); more women now have access to credit (before the project, nearly 42 % of the respondents did not have any access to credit, now half of the sample respondents were able to access credit to a large extent).

Regarding **access to farm inputs** like improved cotton seed varieties, bio-fertilizers, bio-pesticides, micro irrigation, water harvesting structures, markets, entitlements etc., nearly half of the respondents did not have any access. Post project, all except 13 % have access. As compared to the non-demo plot farmers (5%), higher number of demo plot farmers (46%) indicated getting better access to farm inputs post project.

The **adaptive capacity index** analysis suggests that villages **Charban and Wayal have the highest ACI score** and got the first rank among all the villages, while **Islampur got the lowest ACI score** among all the villages. Though the variations are not high, yet one gets a sense of the adaptive capacity existent in all the project villages. The comprehensive ACI score for all the villages is 0.8, which can be considered reasonably good. This is most likely an improvement over the baseline situation, the ACI score for which could not be computed as village-wise data was not available. However, we can conclude that any improvement would have been a likely outcome of the project interventions and good work done by CARE team in the project location.

All the above indicates that the project has been able to successfully train and empower the farmers and there has been much improvement in their overall socio-economic conditions. No wonder that majority of the sample respondents stated satisfaction with the support and assistance provided by CARE (high satisfaction – 10%, 67% satisfied, 12% neutral but 11% not very satisfied). Those who indicated non satisfaction with the support provided by CARE were mainly due to more expectation from the project in terms of getting better quality inputs, help with marketing the produce and linkages with ginning units.

E.Conclusion

Overall, this short duration project has successfully demonstrated the potential of organic cotton to reduce excessive use of chemical inputs, encourage farmers to prepare organic manure and bio pesticides, adopt integrated pest management, thereby enhancing soil health, reducing cost of inputs

and enhancing farm income and not significantly lowering productivity. The fact that there was no need for using the contingency (risk) fund created for compensating farmers for any initial income loss on adoption of organic cotton cultivation itself is a testimony to the success of the initiative. The project was used to power the pandemic coping activities. By promoting farmers collectives, the project has laid the foundation for institutionalizing the process in the future. The social and behavioural outcomes, including the trend towards women empowerment, vouchsafe to the project achieving most of its development objectives. The increased child labour prevention awareness created is a very healthy outcome of the project.

F. Recommandations

It is recommended that the project be either extended for another phase or a follow-on project take its place to consolidate the gains and make the outcomes sustainable. This is based on the following reasons:

1. Organizing and negotiating the organic certification process and enabling farmers to get higher prices applicable to organic products.
2. Further research and setting up systems for production of organic cotton seed in the light of seed replacement norms.
3. Formalizing efficient organic bio pesticide and organic manure production systems.
4. Handholding support for farmer collectives to mature and operationalize their functions.
5. Carry forward the social mobilization and women empowerment activities including SHG strengthening and encouraging IG activities.

It is also recommended that evaluation findings and lessons be shared with the ultimate beneficiaries.

Section I

INTRODUCTION

1.1 Overview

1.1.1 Organic Farming

Organic agriculture emerged as a response to the rapid loss of biodiversity, and an enhanced understanding and awareness of long-term ecosystem and human health concerns. Negative implications of modern agricultural practices that are heavily dependent on monoculture and chemical inputs have been documented all over the world. Organic farming is a method of food and fiber production that utilizes natural materials and biological processes to achieve production goals while protecting the wellbeing of the farm ecosystem, its surroundings, the farmer and the consumer. The main features of the approach to organic agriculture are the following:

- The farm is considered as a whole living system;
- It strives to build and maintain healthy, living soil;
- It uses biological processes to sustain crop and livestock production;
- Biodiversity is maintained for ecological stability;
- Diversification of enterprises is adopted for economic stability;
- Utilize on-farm and renewable resources whenever practical;
- Strive for long-term sustainability - ecological, economic, social;
- Pests are controlled through preventive both biological and physical controls.

Organic farming' was the only way farming was done in the days before fossil fuels, plantation monoculture and agrochemicals. Agricultural pioneers such as Sir Albert Howard, Lady Eve Balfour, J.I. Rodale, and E.E. Pfeiffer first developed organic farming concepts in the early to mid-20th Century to address problems with declining soil productivity, seed quality, crop vigour, livestock and human

health. Howard, a British soil scientist, documented the vital role of soil organisms in decomposing plant and animal residues into humus, recycling nutrients and thereby maintaining soil fertility. J. I. Rodale launched the organic farming movement in the United States in the 1940s, and Rodale Institute continues to conduct long term farming systems research comparing productivity, sustainability, soil quality, and carbon sequestration for several organic and non-organic farming systems.

Since the 1970s when organic agriculture re-emerged as eco-agriculture, institutional strengthening and diversity became a part of the movement. Formation of IFOAM in 1972 indicated that the movement had come of age. It grew and made a place for itself in the overall world of agriculture, especially in the 1990s.

Organic farming has expanded enormously in those countries which had adopted large-scale chemical-based farming systems and were the first ones to realize their harmful side-effects. Many of the practices of organic agriculture were the only option for farmers before the advent of chemically synthesized fertilizers, pesticides, biocides, medicines, mechanization and fossil fuels that allow industrial agriculture to function. Without recourse to such technologies, farmers had no option but to work within biological and ecological systems. As such therefore, farming in the developing world (including India) are organic by default.

1.1.2 Organic cotton production across the world

Cotton is an important fiber and cash crop which plays a dominant role in the industrial and agricultural economy of India. Organic cotton makes up 0.7 % of total cotton production worldwide and involves more than 1,82,000 farmers. While 19 countries now boast of organic cotton production, 98 % is concentrated in seven countries: India, China, Kyrgyzstan, Turkey, Tajikistan, the United States and Tanzania. India, Tanzania, Turkey, Kyrgyzstan and China lead the way in transitioning land to organic. About 44 per cent of the growth in India's production is attributed to its increase in the proportion of certified land used to grow cotton, which increased from 45 % to 70 %.

Table:1 Details of trends in the production of organic cotton

(thousand metric tonnes)

Year	World	India	Contribution of India (%)
2007-08	141.56	73.70	51.2
2008-09	175.11	107.51	61.4
2009-10	241.70	195.76	81.0
2010-11	151.08	102.89	68.1
2011-12	138.13	103.00	74.6
2012-13	109.83	80.79	73.6
2013-14	117.03	86.85	74.2
2014-15	112.49	75.25	66.9
2015-16	107.89	60.18	55.8
2016-17	117.53	59.47	50.6

Source: Organic exchange/Textile exchange

India being the second largest producer of cotton in the world is also one of the preferred sourcing sites for various international textile brands and retailers. Gujarat, Maharashtra, Telangana, Andhra Pradesh, Karnataka, Madhya Pradesh, Haryana, Rajasthan, and Punjab are the major cotton growing states of India. Being a cash crop, cotton is known for its intensive cultivation. The increasing demand for cotton is placing enormous pressure on agricultural land. Aggressive production practices by farmers often leads to very high input use, with little regard to matching returns. The excessive input use not only escalates cost of cultivation, but also decreases profitability and results in pest resurgence, health and environmental hazards, loss of soil fertility and contamination of water sources. Cotton is a thirsty crop, requiring excessive use of ground and surface water, with extensive potential for water depletion. Another factor aggravating the heavy input use is widespread use of Bt cotton, which caused recurrence of pest attacks, worsened by unsustainable land and water use. The growing resistance to pests, such as the pink bollworm, and an alarming rise of secondary pests, suggests that there has been an increase of pesticide use. Under such situations, bringing cotton production in line with even minimally acceptable environmental standards is a challenging task.

1.1.3 State of cotton cultivation in India and Maharashtra

Cotton is one of the most important cash crops and accounts for around 25% of the total global fibre production. Cotton is also one of the most important commercial crops cultivated in India. In the raw material consumption basket of the Indian textile industry, the proportion of cotton is around 59%. It plays a major role in sustaining the livelihood of an estimated 5.8 million cotton farmers and 40- 50 million people engaged in related activities such as cotton processing and trade. India also has the distinction of having the largest area under cotton cultivation in the world i.e. about 126.07 lakh hectares. The details of Organic Cotton production in India in comparison to the world production are as follows

Table:2 Organic Cotton production in India in comparison to the world production

Description	India	Rest of the world
Organic farmers	1,92,060	28,418
Organic certified land (ha)	3,86,464	86,535
Organic cotton fibres (MT)	59,470	58,054
Organic in-conversion and (ha)	1,72,180	42,936
Share of global organic cotton production (%)	51%	49%

Source: *Organic Cotton Market Report, 2018*

In India, there are ten major cotton growing states which are divided into three zones, viz. north zone, central zone and south zone. North zone consists of Punjab, Haryana, and Rajasthan. Central zone includes Madhya Pradesh, Maharashtra and Gujarat. South zone comprises Andhra Pradesh, Telangana, Karnataka and Tamil Nadu. The total area and production of cotton across major states in India are as follows –

Table:3 Area and production of cotton across major states in India

State	Area (In Lakh hectare)		Production (In Lakh bales)		Yield (In Kgs /hectare)	
	2017-18	**2018-19(P)**	**2017-18**	**2018-19(P)**	**2017-18**	**2018-19(P)**
Punjab	2.91	2.68	11.76	11.50	687.01	729.48
Haryana	6.65	7.08	21.48	23.00	549.11	552.26
Rajasthan	5.84	6.29	23.26	25.00	677.09	675.68
Gujarat	26.24	26.59	103.84	87.00	672.74	556.22
Maharashtra	43.51	42.54	83.35	77.00	325.66	307.71
Madhya Pradesh	6.03	6.14	22.14	24.00	624.18	664.50
Telangana	18.97	18.27	54.44	47.00	487.87	437.33
Andhra Pradesh	6.46	6.21	21.26	15.00	559.47	410.63
Karnataka	5.47	6.88	17.32	15.00	538.28	370.64
Tamil Nadu	1.83	1.31	5.50	6.00	510.93	778.63
Odisha	1.45	1.58	3.65	4.50	427.93	484.18
Others	0.50	0.50	2.00	2.00	680.00	680.00
All-India	**125.86**	**126.07**	**370.00**	**337.00**	**499.76**	**454.43**

Source *- Cotton Advisory Board (CAB) P-Provisional as estimated by CAB on 18.6.2019*

Cotton is a long-duration crop, allowing for little scope of a post-cotton crop in most parts of MP and Maharashtra. Still, farmers in Maharashtra are adopting the of practice intercropping cotton along with some other compatible oilseed crop, as shown in Table 4.

Table:4 Cropping system of cotton in MP and Maharashtra

States	Cropping system	Intercropping
Maharashtra	Cotton (Monocrop), Cotton-Jowar (two- year rotation)	Cotton + green gram+ black gram/ Cotton + Soybean Cotton + Groundnut Mixed cropping with red gram

Source *- https://www.nfsm.gov.in/BriefNote/BN_Cotton.pdf*

Cotton is one of the most important and widely grown cash crops of Vidarbha. Nearly 13 lakh ha area of the region is under Cotton Cultivation (Data from PKV Akola, Maharashtra). However, the cotton-based agrarian economy of Vidarbha region faces several challenges such as unsustainable use of

resources (fertilizer, pesticide, water), climatic variability and farming practices. These lead to low productivity, frequent crop failure, poor management of water resources and high indebtedness among farmers.

1.1.4 From deshi to Bt cotton - major changes in cotton production systems in India in the last 2 decades

Cotton has been historically grown in India for more than four thousand years. Much of the cotton cultivated till the early 20th century was the indigenous deshi variety of cotton called *Gossypium arboretum*. Hybrid cotton varieties *Gossipium Hirsutum* was introduced in the 1990s. Hybrid varieties increased yield but was regularly devastated by local pests and needed more fertilizers and pesticides. It was in this context that Bt cotton was introduced in India in 2002. Area under Bt cotton spread rapidly over the next few years, and today covers more than 95% of the cotton growing area in India.

1.2 The 'CCACP or Sufalam' Project

1.2.1 About the project

CARE India with the financial support from Groupe-Galeries-Lafayette has been implementing a two years project titled **"Climate Change Adaptation and Cotton Production (CCACP)" or "Sufalam"** (January 2018 and until March 2021). The project initiative is coordinated and facilitated by CARE France for smooth programme implementation. The project has designed and implemented an organic intervention package to address the vulnerabilities of women smallholders in Vidarbha region of Maharashtra.

CARE India's innovative organic agricultural practices-based project on **"Environmentally Sound and Climate Resilient Cotton Production Practices (ESCRCPP)"** was implemented in 10 villages of Jalgaon Jamod block of Buldhana district in Vidarbha region of Maharashtra. Given the unique socio-economic and agricultural profile of the area, it is aimed at promoting environmentally sound, climate-resilient and inclusive cotton production.

Goal of the Project

Promote environmentally sound, climate-resilient and inclusive agriculture among cotton producers of Vidarbha region.

Specific Objective (SO)

SO1: To enhance the capacities (including knowledge and skills), capabilities and confidence of women smallholders to engage in environmentally sound and climate-resilient cotton production.

SO2: To strengthen inclusive, strong, and effective collectives for building solidarity, promoting gender equity, and facilitating access of women smallholders from poor and vulnerable households to resilience building resources, services, and opportunities.

SO3: To build an enabling environment of supportive cotton value chain

actors for adoption of sustainable cotton production practices by tribal women smallholders and their communities.

Expected results

- **ER1.1:** Tribal women smallholders adopt environmentally-sound and climate-resilient cotton production practices (ESCRCPP).
- **ER1.2:** Tribal women leaders carry forward environmentally sound and climate-resilient cotton production in households, communities, and the district.
- **ER2.1:** Strong collectives of tribal women smallholders capacitated to facilitate access of women from poor and vulnerable households to resilience-building resources, services and opportunities.
- **ER2.2:** Tribal women smallholders have increased access to inputs, services, and opportunities for practicing environmentally sound cotton production practices.
- **ER2.3:** Collectives of tribal women smallholders propagate and practice decent work in sustainable cotton production systems.
- **ER3.1:** Key cotton value chain actors facilitate tribal women smallholders' access to inputs, services, and opportunities for adoption of environmentally sustainable and socially responsible cotton production.

1.2.2 Contextual analysis of project area

The project design was based on the contextual analysis done in Buldhana district, where the project block is located, which revealed the following:

i. BT cotton is grown by 95 % farmers of Buldhana district.
ii. There is a preponderance of marginal and smallholder farmers, who work on one or two cotton crops in a year.
iii. The standard agronomic practices followed by farmers is not good.
iv. Irrigation coverage is low.
v. The district is prone to drought, hailstorm, heat waves and sudden outbreaks of pests and diseases.
vi. More than half of the farmers in Buldhana supplement their incomes by working as agricultural labour.
vii. Migration for four to five months (mostly during January to May months) in a year is common. The reasons for migration are lack of water for irrigation and the necessity to look for alternative livelihood opportunities.
viii. Women ownership and control over land is missing or not recognized, and violence against women is common, which the community attributes to alcohol consumption by men.

1.2.3 Design features of the project

Project design comprises an intervention package inclusive of the following:

ix. Developing environmentally-sound and climate-resilient cotton production model plots for demonstration, on the lands of traditionally cotton growing women smallholders in 10 project villages.

x. The demonstration package includes modules on good practices for cotton pre-production to postproduction, as well as inputs like seeds, bio-fertilizers, farm equipment, post-harvest storage materials.

xi. Organizing a learning group of 15 women smallholders around each 0.5-acre demonstration plot with the aim to enhance knowledge, skills and practices of women smallholders and their cotton growing households for practicing environmentally sound and climate resilient cotton production. Two seasons of learning cycles are about to be completed.

xii. Setting up a risk fund of Rs.10,000/acre of demo plot to compensate for any loss of cotton-based incomes incurred by farmers as they switch to new ways of farming and the cotton production model takes time to stabilize, as demo-plot owners come from poor and marginalized households (now being used for COVID response activities).

xiii. Reinforcing and propagating these learning as well as for the delivery of women's literacy and leadership interventions through Self Help Groups of women and Farmers' Groups. This is intended to enhance women's confidence, self-esteem and efficacy for pursuing environmentally sound and climate resilient agricultural production. These collectives were also strengthened to facilitate access of women smallholders from poor and vulnerable households to resilience-building resources, services, and opportunities.

xiv. Providing inputs, services, tools and technologies to women smallholders through utilizing the supportive ecosystem of men, government functionaries, and market actors. This will help the women participants to change over from the current set of input intensive and environmentally harmful cotton production practices.

xv. Zero-tolerance approach to child labour in cotton production in project villages.

xvi. Making use of multi-stakeholder platforms to disseminate the learning and experiences of women smallholders, and push for environmentally sound and climate resilient cotton production in the district.

1.3 Project Outputs

1.3.1 Village selection

Firstly, the project team identified the project villages where intervention was planned to be carried out. The main criterion for identification of villages was that the beneficiaries should come from tribal communities, on the basis of which 10 predominantly tribal villages of Jalgaon Jamod block were

selected for the intervention. The tribal communities in these villages were originally migrants from Madhya Pradesh.

1.3.2 Selection of women smallholder farmers/demo farmers

The 111 tribal women farmers who are termed as demo plot/model farmers were chosen from the 1511 households listed from the 10 identified villages. The selection of farmers was done on pre-defined criteria and those who agreed to undertake organic cotton cultivation on their 0.5 acres of land that was considered as demonstration plots to carry forward environmentally sound and climate resilient cotton production. The **following specific criteria were followed for the selection of model farmers-**

- Cotton should be cultivated as main product.
- The farmer should possess more than 5 acres of land and is willing to devote 0.5 acre for demonstration plot.
- Preference was given to female farmers.
- Interested to learn/ adopt innovative ESCRCPP.
- Willing to spend some additional amount required from his own resources.
- Willingness to adopt the ESCRCPP in timely manner.
- Preferably the land for demonstration should be road side plots.
- Willing to educate other farmers to visit their farm for the purpose of mass adoption of ESCRCPP.
- To be nominated preferably by farmer's group/ SHG.
- Ready to commit ZERO TOLERANCE to child labour through adoption of a resolution in the meeting of participant collectives.

Table:5 Details of project villages and demo plot farmers

Sl. No.	Name(s) of the villages	Total No. of Households	No. of demo plot farmers
1	Rajura Budhru	74	12
2	Charban	172	12
3	Umapur	345	13
4	Nimkhedi	215	12
5	Rajura khurdu	75	10
6	Bandapipal	93	12
7	Garpet	143	13
8	Hanwatkhed	135	12
9	Wayal	88	10
10	Islampur	171	05
	Total	**1511**	**111**

A detailed baseline study of the 111 lead farmers was conducted to understand the cost of cultivation, practices followed, inputs used etc. in order to compare the differences in status of the farmer at the end of the project period due to switching over from chemical cotton cultivation to organic cotton cultivation.

In the first year of implementation, 55 progressive women tribal farmers were given all input support and also on-site handholding from pre-sowing to post harvest period to set up demonstration plots. In addition to this, fourteen other cotton farmers near these plots were brought together in a learning group and were given technical inputs and linkage guidance to switch to environmentally sound and climate-resilient cotton cultivation. In the second year of implementation, the remaining 55 lead farmers were provided the same support.

1.3.3 Seed Selection

In order to support the lead farmers for cultivating organic cotton, CARE India established linkages with two prominent institutes, i.e. Punjabrao Krishi Vidyapeeth (PKV) Akola and Maharudra Agriculture Institute, Buldhana. During the first year of implementation, CARE India procured 160 Kgs of certified indigenous cotton variety seed (AKA – 07) from PKV, Akola and distributed among the 55 demo plot farmers. The seed procured was suitable for the local climatic conditions. During the second year, 20-25 kg of seed was procured from PKV while 111 packets, each packet having 400 grams of hybrid variety of seed was sourced from Maharudra Agriculture Institute, Buldhana.

1.3.4 Meetings and awareness creation activities

- Initial meetings were held by the CARE team and the sub grantee team in all the project villages to make the farmers aware about the benefits of organic cotton cultivation. While mobilizing the farmers for the meetings, it was ensured that old farmers who were used to cultivating desi varieties of cotton a few years ago, before the trend to cultivate Bt cotton would attend the meetings. This was done so that the old farmers would be able to influence the younger generation of farmers to start organic cotton cultivation.
- Village level awareness and learning meetings were also organised by inviting the external resource persons from various organisations like Pani Foundation, Better Cotton Initiatives (BCI), SARG Vikash samiti, Supa Biotech Pvt Ltd. and Dr. Punjab Rao Deshmukh Krishi Vidyapeeth. A total of 45 village meetings were conducted on environmentally sound, climate-resilient cotton production.
- Wall paintings on organic cotton cultivation were done in all the 10 project villages to create awareness among the farmers on organic cotton cultivation. During the Ganesh puja celebrations in the selected villages, the CARE team used a projector to showcase the practices and benefits of organic cotton cultivation.
- 47 different types of pictorial Information Education Communication (IEC) material on organic cotton cultivation, prepared by the project, were displayed in all the 10 project villages for awareness generation.

- To observe and understand the advantage of organic cotton cultivation, an exposure visit was organised to Patuda village of Sangrampur block for 12 lead farmers.

1.3.5 Collaboration and Partnership

The project team, in order to bring impetus to the project interventions, made collaboration and partnership with various technical and research agencies such as Krishi Vigyan Kendra (KVK), Better Cotton Initiatives (BCI), SARG Vikash samiti & Supa Biotech Pvt Ltd, Dr. Punjab Rao Deshmukh Krishi Vidyapeeth and Pani Foundation. The kind of collaboration and partnership established with these institutions are mentioned in Table 6.

Table:6 Collaboration and partnership with several institutes

Krishi Vigyan Kendra/ Farm Science Centre, Jalgaon Jamod	Involved in preparation of Package of Practices (PoP) for organic and climate resilient cotton cultivation practices, soil testing and analysis of soil quality and providing technical support on organic cotton cultivation.
Better Cotton Initiatives (BCI)	External resource persons from **BCI** were invited for organizing the initial learning meetings/awareness programs/workshops with the demo plot farmers.
SARG Vikash samiti & Supa Biotech Pvt Ltd	Involved in providing technical support for organic farming system including biodynamic compost preparation, seed treatment training, Integrated Nutrient Management and Integrated Pest Management etc.
Dr. Punjab Rao Deshmukh Krishi Vidyapeeth, Akola	Entrusted with the responsibility of provisioning organic cotton seeds and providing technical support for organic cotton cultivation.
Maharudra Agriculture Institute, Buldhana	Procured hybrid variety of cotton seed (111 packets, each packet having 400 gram of seed)
Pani Foundation	Rehabilitation of community water structures like farm ponds, check dams graded bunding are done under the technical guidance of **Pani Foundation.**

1.3.6 Inputs and services

1.3.6.1 Knowledge inputs (technical support)

The knowledge inputs were more in the form of package of practices (POPs) pertaining to do’s and don'ts across the cotton farming cycle. It was mandatory for the demo plot farmers to strictly adhere to these knowledge inputs on POPs in their demo plots, so that the yield outcomes can be objectively assessed.

- Technical guidance and support on cultivating environmentally sound climate resilient organic cotton was provided by Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola.

- **The Package of Practices (PoP)** on environmentally sound climate resilient organic cotton production was prepared by the Krishi Vigyan Kendra (KVK)/Farm Science Centre, Jalgaon Jamod and the beneficiary farmers were told to follow the package of practices recommended by them. Standard operating procedure for organic cotton cultivation and plot specific designs were prepared in both English and Marathi. The training manual was printed and circulated in the project villages for the ready reference of farmers.
- **Farmer's diaries** were prepared with the support of Farm Science Centre, Jalgaon Jamod. The 111 lead farmers who were switching over from chemical intensive cotton cultivation to organic cotton cultivation were given a farmer diary to record different activities undertaken for specific crop and monitor the expenses incurred for different activities to estimate cost benefit ratio of cultivation
- The project team with the support from KVK facilitated the soil testing of 111 demo plot farmers. The soil samples were analysed on different parameters like Nitrogen (N), Phosphorus (P), Potash (K), electrical conductivity (EC), Organic carbon (OC), Zink (Z), Sulphur (S), Boran (B), Iron (I), Copper (Cu), Manganese (Mn) and Calcium (C). The farmers were told about the deficiencies in their soil and solutions were offered to overcome the deficiencies.
- **A senior scientist** from KVK was hired as a technical expert who was entrusted with the responsibility for providing advice to demo farmers on plant protection, providing training on Integrated Nutrient Management and Integrated Pest Management, briefing on application of botanical extract, spraying of organic pesticides, weeding and culture management, organic manure management, training on fibre quality management, monitoring insect, pest & diseases issues, picking and safe storage of cotton, post-harvest measures to be followed, organising buyer and seller meet and briefing farmers on fibre quality management. A schedule of visit of the consultant was finalized and as per the plan, he was supposed to make three field visits in a month and provide on-site orientation to farmers. In total, the technical expert would make 15 days field visit in a period of five months.
- **Block Level Organic Cotton Committee (BLOCC)** members have been trained on collective procurement of inputs and collective marketing of organic cotton.

1.3.6.2 Material (Physical) Support

In addition to knowledge inputs, lead farmers have also received other physical and material support which include; AKA-07 organic cotton seed, Seed treatment input, Botanical extract (Organic Pesticides) and (S9+ UrJa+Divya), Organic Manures, Micro Nutrients, IPM Kit, Cotton Picking bag, Sprayer, Water tank (50 liters) and Farm display board. In addition to this, **10 electronic weighing scales** were also procured with project support and given to one of the SHGs in each village for promotion of fair-trade practices.

1.3.6.3 Extension and Support Services

Formation and revival of SHGs and farmers groups: In order to facilitate the access of women from poor and vulnerable households to resilience-building resources, services and opportunities, 53 Self-Help Groups (SHG) were established in 10 project villages with 539 members.

Table:7 Details of SHG groups operating in the project villages

Sl. No.	Name of the village	No. of Groups	No. of Members	Amount of savings	Internal Loan (INR)	Revolving Fund	Bank Loan
1	Bandapipal	4	44	32000	0	30000	0
2	Charban	8	82	123836	35000	30000	27000
3	Garpeth	3	30	71341	20500	45000	0
4	Hanwatkhed	7	70	150900	55000	105000	283000
5	Islampur	3	30	43000	24000	15000	50000
6	Nimkhedi	6	61	54500	10000	30000	0
7	Rajura Bk	8	80	82786	5000	30000	0
8	Rajura Kd	5	51	64390	23900	30000	0
9	Umapur	8	81	88361	16500	30000	165900
10	Wayal	1	10	10200		0	0
Total		**53**	**539**	**721314**	**189900**	**345000**	**525900**

Also, 5 Farmers Groups were formed in Charband, Garpet, Hanwatkhed, Bandapipal and Islampur villages with 10 members in each group. One farmer's group namely SUFALAM was registered under Agriculture Technology Management agency (ATMA), Agriculture Department (Govt. of Maharashtra) as an authorized farmer group of agriculture Department. This farmer group will take all Government agriculture schemes for the village level on priority basis for extension and agriculture development.

Table:8 Details of farmers groups formed under CCACP

Name of the Village	Name of the Farmers Group	Target	Members	Months Formation
Charban	Kishan farmers group	1	10	April, 19
Garpeth	SUFALAM Farmer Group	1	10	April, 19
Hanwatkhed	Shashwat Farmer Group	1	10	April, 19
Bandapipal	Veer Hanuman Farmer Group	1	10	April, 19
Islampur	Suvidha Farmers Group	1	10	April, 19
Total		**5**	**50**	

Capacity building of SHGs and farmers groups: Capacity building programs were developed for strengthening and developing the SHGs and farmer groups. Training modules were prepared for enhancing capacities of SHGs and Farmer's Groups. The areas for capacity building included basic

group processes, savings/credit product development, book keeping, best practices in SHG management, leadership, and inclusive social action, SHG quality assessment, etc. The training module of National Banks for Agriculture and Rural Development (NABARD) was followed by the project team for capacity building of SHGs. The training module of Small Farmers Agri Business Consortium (SFAC) was used for training of the farmers groups. Orientation programmes on Institution Building and village level awareness campaigns were organised for 46 SHGs and 5 Farmers groups.

A training module on the **Farm and Financial Literacy** was prepared in **"Marathi"** and rolled out among the SHG members for their capacity building for improving their financial decision-making capabilities within household decisions and improving negotiation and bargaining skills with cotton value chain actors and other financial actors. Altogether 118 tribal women smallholders attended Financial Literacy training sessions.

A training material cum module for leadership was developed. Collective approach through Self-Help Group platforms was followed to deliver this training. Different thematic areas under this training programme included skill building on communication and negotiation, problem solving and decision making, and time and stress management. The training module was prepared in "Marathi". Each of the SHGs operating in the project villages were provided a copy of the module for their reference.

Gender dialogue module in the context of project area was prepared with the involvement of the project team and translated in vernacular language "Marathi" for easy understanding of the project participants. 20 gender dialogue sessions were conducted during the period in 10 project villages.

Awareness sessions: Awareness generation on environmentally sustainable and climate resilient cotton production were organised in five villages with total number of 54 participants through guest interaction with Senior Agricultural Development Officer & Senior scientist Farm Science Centre, Jalgaon Jamod. Awareness generation on MNREGA schemes was organised by conducting interaction sessions by the Revenue Inspector, Jalgaon Jamod where 65 project participants of two villages attended the programme.

Awareness generation sessions for 143 persons including 63 men and 80 women were organized in 5 project villages viz. Wayad, Nimkhedi, Rajura Budru, Bandapipal and Charban on child labour issues. Discussions were held on the impact of child labour and its long-term repercussions.

Mapping of relevant stakeholders: The project team did the mapping of block and district level cotton value chain stakeholders. This initiative was undertaken so as to organize interface meetings of cotton value chain stakeholders with SHGs and producer groups. The project has prepared a directory of 57 key cotton value chain actors. This comprise of 8 Non-Governmental Organisations, 9 Agriculture Extension Centers, 5 financial institutions, 12 input suppliers and 23 Cotton Processing Units. Among the above Organisations effective linkages have been established with 3 NGOs i.e. Sarg Vikas Samity, Supa Biotech and Cotton Connect, 3 Agriculture extension centers i.e. Krishi Vigyan Kendra, Jalgaon Jamod, Punjabrao Deshmukh Agriculture University, Akola and Agriculture Department, Jalgaon Jamod, 4 Agri-input Suppliers i.e. Shree Sai Krishi Kendra, Jain Krishi Kendra, Shriram Krishi Kendra and Prajwal Agri Centre, 5 Cotton Processing Units i.e. Veerchand Narsi Cotton Private Limited, Mallkapur,

Shree Kotex Ginning and spinning Mill, Jalgaon Jamod, Shree Balaji Ginning and Spinning Mill, Buldhana, Tirupati Ginning and Agro Industries, Buldhana and Bharat Agro Industries, Buldhana for accessing input for cotton cultivation and sale of cotton produced by the farmers.

Krishi Vigyan Kendra, Jalgaon Jamod has undertaken organic cotton cultivation in Bandapipal and Charban villages which are happens to be part of CCACP project villages.

Measures taken towards soil & water conservation: The project team with the consent of community members worked on soil water conservation measures. This was done to increase soil moisture and checking soil erosion with slight alleviation of water table. Project has created awareness among the community for construction/rehabilitation of Pond and check dams (either earthen or masonry). Community water structures rehabilitated in Bandapipal, Charban, Wayal & Umapur villages with community participation and contribution.

Celebration of children's day: Children's day was celebrated in Charban & Neemkhedi villages on 14th November 2018 with participation of 120 children along with the 81 community members who have spread the message of ending child labour. The key messages spread on the occasion was that "stopping child labour will lead to the holistic development of children". All the 46 SHGs and Five Farmers groups were oriented in groups meetings not to engage their children as child labourers.

1.3.6.4 Trainings on practicing environmentally sound climate resilient cotton production

A total of 220 farmers days training was conducted with 4 sessions of training around each demonstration plot. **A pictorial flip book on organic cotton cultivation, prepared with the support of KVK, Jalgaon Jamod, was distributed to all the 1511 project participants.**

The details of the trainings/activities are summarized below:

Summer Ploughing: In all the project villages, farmers were advised to do summer ploughing to control deep-rooted weeds and to destroy pest larvae or cocoons. They were told to do two summer ploughings prior to advent of monsoon at an interval of 15-20 days and the third ploughing with harrow or cultivator to pulverize the soil and prepare field beds for sowing/transplanting soon after the first monsoon rain.

Training on soil sample collection and testing: A training programme for 40 participants was conducted on soil sample collection and testing of which 33 "SUFALAM beneficiaries' were present. Farmers were advised against the excessive use of chemical fertilizers, pesticides and water in the fields. The use of sustainable and organic manure to improve the soil and crop health was stressed upon. Farmers were briefed on the excessive use of chemical fertilisers and pesticides in the fields and hazardous effects of chemical farming. The technique and process of soil sample collection and testing process were described during the training. Besides this, soil sample collection process was demonstrated in field.

Seed treatment and germination test: The training programme was conducted with technical support and guidance of SARG, Akola. Discussions were held on the importance of seed treatment i.e. how it

encourages better seed germination and secures the roots from soil borne fungal diseases. The exact quantity of S9 culture to be used for one kg of seed was also explained. Farmers were shown the demonstration of seed treatment with S9 culture.

Integrated Nutrient & Pest Management: The Training programmes on "Integrated Nutrient & Pest Management" in organic cotton cultivation was organized between 6th & 14th August 2020 in ten project villages. There were 101 farmer participants (76 male & 25 female) in the training programme.

Biodynamic composting: Trainings were conducted in five project villages of Jalgaon Jamod on preparation of biodynamic organic composting techniques. The process of making biodynamic organic compost, its management and use were discussed in detail. A participatory practical demonstration on biodynamic composting methodology was made in the field in village Charban. Biodynamic Compost making material was collected and all the steps involved in Biodynamic compost making process were demonstrated. The technical support to prepare the biodynamic compost was imparted by SARG Vikas Samiti and KVK, "Farm Science Centre" Jalgaon Jamod.

Safe and scientific use of pesticides: A one-day training programme on the appropriate use of pesticides in cotton cultivation for 20 spray applicants and 12 demo plot farmers from the project villages was organised in collaboration with Krishi Vigyan Kendra (KVK), Jalgaon Jamod. Discussions were held on the health risks associated with spraying pesticides and the precautionary measures to be taken to avoid it. Using safety kits while spraying was emphasised. Around 38 participants were taken to KVK, Jalgaon-Jamod demonstration farm wherein the resource person demonstrated the safe and scientific spraying techniques of pesticides.

Training on fiber quality maintenance: To ensure that the tribal women farmers get the best market price of cotton fiber, two days training programme on the maintenance of fiber quality of the cotton was organised in the Charban village. A total number of 79 people (19 women and 60 men) participated in the training programme. Resource persons from Farm Science Centre, Jalgaon Jamod and Better Cotton Initiative facilitated the training programme. Discussions were conducted on the agronomic management and environmental influences that change the growth of the fibre, maximizing fibre quality, maintaining fiber quality during and after harvest.

Training report on "Preparation & Use of Botanical Extract: Training on "Preparation & Use of Botanical Extract" in cotton Production under Climate change adaptation of women smallholders and cotton producers" was organized by Mahatma Phule Samaj Seva Mandal (MPSSM) project implementing agency with technical support of CARE India. The training programme were organised at villages Charban, Garpeth, Rajoura (BK), Bandapipal and Hanwatkhed.

Training on cotton picking: The Project team conducted hands on training on safe and scientific cotton-picking methods for 111 lead farmers (safety measures for cotton picking). It was advised to start picking after the cotton is fully matured i.e. when the bolls begin to open. Pickings may be done at different phases at an interval of 20-25 days of each picking. In case of seed collection, early cotton picking is advisable as it gives slightly better-quality seed as the cotton picked from lately formed bolls (last pickings) is not good to preserve for seed.

Training on organic cotton storage: The lead farmers were trained on safe storage of cotton to prevent any contamination from dust or chemicals, especially fertilizers and pesticides and inflammables. Pesticides should not be used for pest control of harvested cotton and precaution should be taken to avoid any contamination of foreign particles i.e. clothes, hair etc., as it can affect the quality of the yarn. The storage place needs to be clean and dry. Damp conditions can lead to the growth of fungus, with significant loss of cotton quality. When organic harvest is stored in the same facilities with conventional cotton (e.g. in ginneries), care must be taken to clearly separate the organic and in-organic produce to avoid any mixing. The dry cotton should be stored in airtight cotton storage bags to prevent attraction of moisture which can reduce the quality.

1.3.7 Provision of risk fund

Since the demo-plot owners come from poor and marginalized households and given the criticality of cotton production as a source of livelihoods for farmers in the project area, and the deeply entrenched unsustainable methods of cotton cultivation, it was important to de-risk the lead farmers who take the initiative, and thus, the risk to shift to ESCRCP under the project. Hence, CARE India set up a risk fund equivalent to INR 10,000/acre to cover any income losses arising due to the switch to ESCRCP in designated plots of lead farmers. The ultimate idea behind creating a provision of Risk fund was to pave the way for these farmers to try out these new initiatives and be assured of the return. According to the Sufalam project budget, a total amount of Rs. 7,50,000/- (Euro 9375) was provisioned to cover any income loss arising due to the switch to environmentally-sound cotton production in designated plots of lead farmers over a period of two years (2018-2019 and 2020-2021) for 50 acres of land (first year 25 acres with 50 lead farmers and second year 50 acres with 100 lead farmers).

For the purpose, CARE India hired a specialised consultancy organisation (CMSR Consultants Pvt. Ltd.) to carefully design and prepare the protocol (criteria) for disbursement of risk funds to lead farmers to cover any income losses arising due to the switch to ESCRCP in designated plots. Disbursement of such funds was to be on the basis of the difference between pre-demonstration year income and the actual income realised from demonstration plot in a cotton season. A **'Post Assessment Matrices and Methods'** to assess the loss of lead farmers was also developed by CMSR.

However, during the course of the project, it was decided to reallocate the risk fund proposed under the CCACP project for Covid-19 response with due permission from the donor to revive the wellbeing and livelihood of the project beneficiaries to cope with the challenges and disruption posed by COVID 19. Also, farmers reported that there was no loss of income due to the switch to ESCRCP in the designated plots. The reason was also because of good rains last year resulting in increased productivity. Hence, reprogramming of the existing line item under risk fund has been made for protection and support to the most vulnerable communities under COVID-19 response activities as mentioned below:

1. Awareness of School Children and teachers

Ten awareness sessions were conducted (one awareness session per village in 10 project villages) for the school children's and teachers on the precautionary measures to prevent the potential spread of COVID-19. A total number of 1000 of students and 12 teachers from 10 project villages were covered under the programme. Information Education and communication (IEC) material on symptoms, methods of prevention and treatment of COVID-19 were printed in vernacular language "Marathi" and distributed to all the school going children and other 2000 persons belonging to the 10 project villages and 5 nearby villages.

IEC material on Covid-19 distributed to school children

2. Awareness of Anganwadi workers, Asha/ANM and SHG members

Considering the important role played by women (frontline healthcare workers, caregivers at home and mobilisers in Self-Help Groups and communities), the project has conducted 10 village level awareness session for Anganwadi[3]/ ASHA[4] workers and SHG members. A guidebook of titled **"COVID-19 Facilitator Guide"** of Ministry of Health and Family Welfare, Govt. of India was referred for conducting the awareness programme. The sessions were facilitated by the project staff and trained frontline healthcare workers. During the awareness sessions, special attention was given on understanding COVID-19, prevention (safe practices), community surveillance, managing stigma and discrimination etc.

3. Sanitization of Villages and Village wells

As per the technical brief of World Health Organization (WHO) published on 3rd March 2020, the provision of safe drinking water, sanitization and hygiene condition is essential to protecting human health during all infectious disease outbreaks including the COVID-19 outbreak. It is the universal medical evidence that a neglect to ensure purity of the water supply of the villages is responsible for many of the diseases suffered by villagers. As part of extra measure, the project-initiated disinfection efforts using sodium hypochlorite (HSCH) for outdoor areas and village wells in its operational area. Appropriate measures were followed while carrying out cleaning and disinfection work like using of protective dress, hand gloves and mask. The activity was supported through the involvement of the

[3] ***Anganwadi workers*** *come under the ICDS scheme. They help in providing basic education for under 6 children and enrolling women to undertake antenatal care. They are also responsible for immunization of children and pregnant women*

[4] *An accredited social health activist (**ASHA**) is a community health worker instituted by the government of India's Ministry of Health and Family Welfare (MoHFW) as a part of the National Rural Health Mission (NRHM).*

public health department. Altogether 10 villages including 22 hamlets and 15 village wells were sanitized.

4. Supply of Personal Protective Equipment (PPE)

PPE material i.e. masks, and soap were given to all school-going children and elderly people in the 10 project villages as an preventive measure to coronavirus. Considering that "Prevention is the best cure", the project has taken necessary precautions to protect children and elderly person from infection given through special focus on wearing of mask when they step out of the house and maintain social distancing. The use of hand sanitizer or medicated soaps for hand washing inside house and bath taking as soon as one enters the house were recommended and promoted. In addition to this, "Dos and Don'ts" **for prevention of corona virus** were explained to the children. The project assigned and trained a Self-Help Group (SHG) named "ARAADHYA" of Umapur village on manufacturing masks. Said SHG received financial support to procure fabric and machineries. A total number of 3000 masks were prepared by the SHG and distributed among elderly and children along with soaps. The details of distribution of masks and soaps are given on table – 5.

5. Supply of dry ration

The lockdown disproportionately hurt marginalized communities due to the loss of livelihood and lack of food, health and other basic needs. CARE India, as part of interim measure, provided immediate relief of dry ration (i.e. 30 kilograms of rice, 10 kilograms of wheat flour, 5 kilograms of dal, 1 kilogram salt, 2 kilograms of sugar, 1 liter of refined edible oil, 500 grams of tea powder and 200 grams of spices i.e. turmeric, chilly cumin etc.) to vulnerable families (wage laborers, returnee migrants, physically handicapped, women-headed households, widows/single women) to survive through this difficult phase. The support will also help them to start focusing on income generation once the lockdown is withdrawn. In order to select the most deserving beneficiaries, the village Development Committee (VDC) representatives listed out 170 beneficiaries from among the 10 project villages based on the above-mentioned categories. The entire relief operation was carried out with the permission of local administration following COVID-19 guidelines issued by national government. The details of distribution of dry ration to beneficiaries in 10 project villages is given on the below table.

6. Supply of vegetable seeds

As a matter of fact, most of the marginalised people had difficulty in accessing food and basic health care facilities during the pandemic time. The prices of vegetable soared as high as 40% of the regular price. Buying these items was extremely difficult for people due to prolonged lockdown and as they were stranded without any income. CARE India with the active involvement of Self-Help Groups provided the vegetable seeds to all the 1511 households of 10 villages for maintaining household nutrition during monsoon season. The different varieties of seeds distributed to each household includes; spinach, papaya, chilly, beans, brinjal, okra etc. Promotion of kitchen gardens directly contributed to household availability, accessibility and utilization of supplementary food. It also served as nutrition supplement meeting the daily vegetable need of the households.

Section II:

Final Evaluation – Approach and Methodology

CARE project entitled "**Climate change adaptation of women smallholders and cotton producers from Vidarbha region, Maharashtra State, India (CCACP)**" or "**Sufalam**" was implemented since January 2018 and it is likely to get over in March 2021. At this juncture CARE India wishes to get the final evaluation of the project done to assess the outcome and impact level changes may have occurred due to the project intervention.

2.1 Purpose of the evaluation

The purpose of the endline evaluation was to **gather evidence on the** quantitative and qualitative results and outcomes of this project to understand key learnings. The focus of the evaluation was also on the elements that worked very well and contributed to the sustainability of the project. The specific purpose of the evaluation included-

- Summarize the **quantitative and qualitative results and outcomes** from CCACP activities, including an exhaustive assessment of the qualitative results of each and every aspects of the project's logical framework indicators.
- **Identify key lessons learnt and provide recommendations** that can both contribute to the sustainability of benefits of this project, and aid in the overall enhancement of the programming of CARE and its partners in India.

The findings of this assessment will be shared among key stakeholders as a part of knowledge sharing.

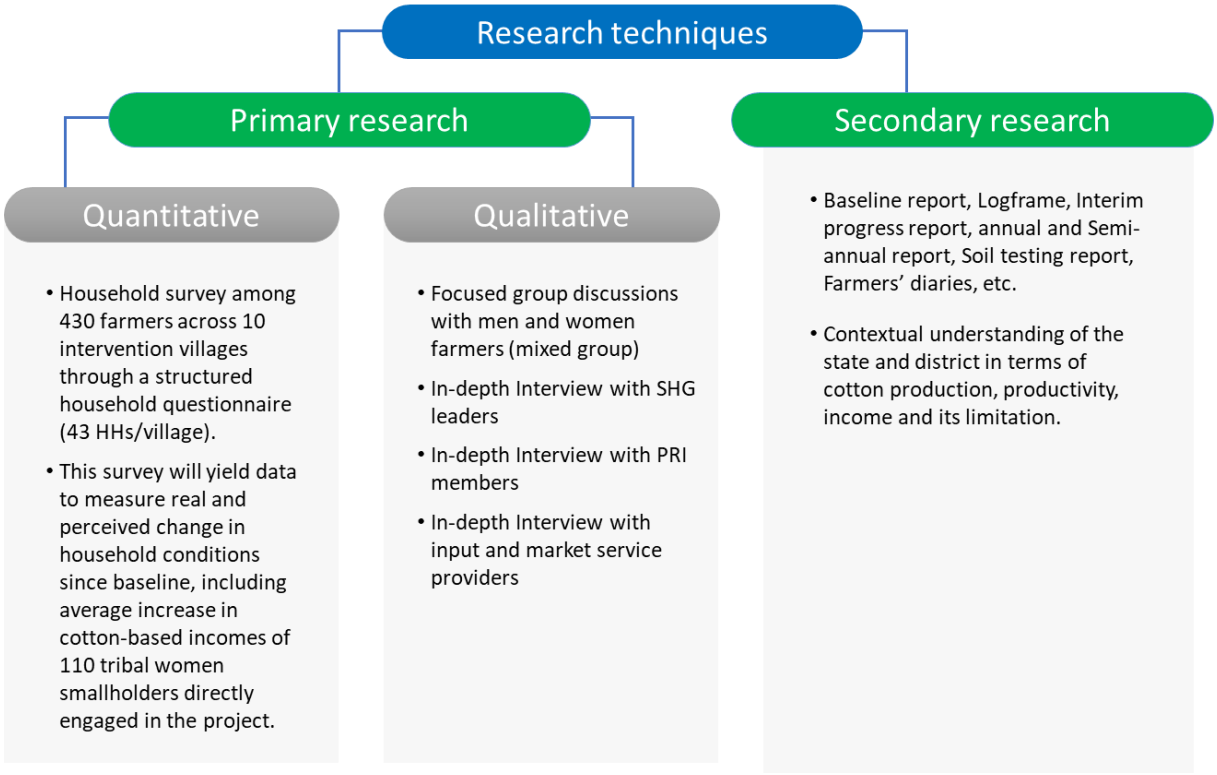
2.2 Methodology

2.2.1 Study design

The key objective of the study was to estimate changes against baseline values for outcome impact indicators. Comparing the data at two time periods, i.e. baseline and end line, the changes in the socio-economic condition of the ultimate project participant was to be assessed, attributing the changes to the interventions under the project.

Given this fact, a mixed-method technique was found to be ideal for collecting data on the relevant indicators listed in the logframe. Therefore, the study design encompassed a mix of primary and secondary research techniques to gather data and information as outlined in the below diagram -

Fig:1 Research techniques adopted for the study



The FGD and IDIs were conducted to elaborate, triangulate and validate key narratives of change emerging from household/community level surveys.

2.2.2 Sampling design

Quantitative

The survey was conducted among a total 430 smallholder farmers, comprising both men and women respondents. From each intervention village, 43 households were to be covered using systematic random sampling procedure. However, it was learnt that in one village, the number of total

households in the village is lesser than the sample number required for the survey, hence survey team could not complete the required number of samples from this village. The shortfall was compensated from other villages.

The sample size has been estimated by using below mentioned key assumptions and sample size formula:

$$n = \frac{\left[Z_{1-\alpha}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right]^2}{(P_2-P_1)^2} \quad \text{X Deff}$$

Where:

n = the sample size

p1= considered 50%

p2 = expected level, assuming a 10% change, upwards

Z1-α= Constant set according to the confidence level, for 95%, this value is 1.96

Z1-β = Constant set according to the power of study, for 80%, this value is 0.84

D= design effect (considered 1 as intervention has been planned in only 10 villages)

Based on the above assumptions and accounting for 10% of non-response rate, the sample size came out to be **(430 rounded off to 430).**

Qualitative

- **In-depth interview (IDI) with SHG leaders:** From each village, interview with 2 SHG leaders from 2 different SHGs were conducted, making a total of 20 interviews across 10 villages.
- **In-depth interview (IDI) with GP representative:** One GP representative (preferably woman) was interviewed from each village, thus, making a total of 10 interviews across the 10 sample villages.
- Four (4) **In-depth interview**s were also conducted with inputs and marketing service providers.
- Focus group discussion: 5 mixed FGDs, involving all categories of people in the village were conducted to understand their general perception as whole about the project.

Following table summarizes the overall sample size achieved-

Table:9 Sample Size

Sl. No	Respondent's category	Number	Type of Interview
1	Men and women smallholder farmers (43 interviews in each village)	430	Structured Interview Schedule (SIS)
2	Men and women smallholder farmers	05	Focus Group Discussion (FGD)
3	SHG leaders (Interview with 2 SHG leaders from 2 different SHGs in a village)	20	In-depth Interview (IDI)

Sl. No	Respondent's category	Number	Type of Interview
4	GP Representative (one from each village)	10	In-depth Interview (IDI)
5	Inputs and marketing service providers	4	In-depth Interview (IDI)

2.3 Execution of the assignment

Based on the meticulous review of the change indicators mentioned in the logframe, firstly a draft questionnaire, interview and discussion guides were prepared. While preparing the questionnaire and guides, tools used during the baseline were also referred so as a comparison could be drawn between baseline and endline values. The draft questionnaire and interview guides were shared with the client and their feedback was duly incorporated while finalizing the tools. The final questionnaire and guides used in the field were bi-lingual (English & Marathi). Adequate number of enumerators and supervisors were deployed in field to carry out the data collection. All the team members were well oriented before their deployment in field. The orientation/training focused on familiarising the team with the objectives of the study and acquainting them with every question of the survey schedule and how to fill it up. The classroom sessions of the training were followed by the mock calls and de-briefing sessions. The entire training session was performed under the presence of CARE project team officials. All the field team members were hired locally and were well conversant with the local language and had the required experience in conducting the similar nature of field studies. Data collection and field movement plans were prepared before initiating the field work. Entire survey was conducted under the close supervision of an experienced field manager. The FGDs and in-depth interviews with input and marketing service providers were conducted directly by the core staff of CMSR while an experienced moderator was engaged to carry out the in-depth interviews with SHG leaders and GP representatives.

2.4 Quality assurance

The training which preceded the actual survey oriented the field team towards the objective and quality standards of the study. Due precautions were taken to ensure data quality in field. The field supervisors and field manager accompanied the enumerators in field. They were also responsible to keep track of the progress of field work and ensure data quality by verifying randomly the interviews conducted by their team members. The CMSR field manager managed and monitored the entire field survey. Additionally, at central level, a team member from CMSR Consultants was entrusted to oversee the entire data collection, data management, back checks, etc. The system analyst in the central office applied logical checks during data processing and production of output tables.

2.5 Report structure

The report has been organized into seven sections. **Section I** gives an overview and background of the project and also outlines the key areas of project interventions and process followed. **Section II** discusses the detailed methodology and approach adopted for completing the assignment. **Section III** provides a detailed description of the demographic features of the survey respondents (farmers). It also analyses the data and information related to land, livestock, access to mobile phones and market information.

Section IV captures the detailed information on output, outcomes and impact of the project. The section specifically attempts to assess whether there has been any change in the knowledge, skills, capabilities and confidence of the farmers, particularly demo farmers to engage in cultivating environmentally sound climate resilient cotton due to project intervention. It also discusses about the adoption practices and tracks the reduction in the usage of chemical fertilizers and pesticides and change in yield and household income. The section also presents the overall improvement in the adaptive capacity of the farmers as compared to baseline situation.

Lessons Learnt and Recommendations are discussed in the last **Section (V)** of the report. **Executive Summary** is placed at the beginning of the report.

2.6 Summing up

A mixed-method technique was used for collecting data on the relevant indicators listed in the logframe, employing the techniques of quantitative and qualitative research. Quantitative research consisted of a panel survey of 430 participant farm households using structured questionnaire. The sample was robust enough to yield valid and reliable inferences at the confidence level of 95 percent. These households were also surveyed during the base line survey. The indicators used in both the baseline and endline surveys were the same, allowing for comparison of the baseline situation with the current situation. Qualitative data was collected through FGDs and IDIs to get qualitative feedback from the stakeholders. We also used secondary information related to the project. All quality assurance measures expected from a scientific study were employed to get valid and reliable results.

Section III:

Sample Respondents Features

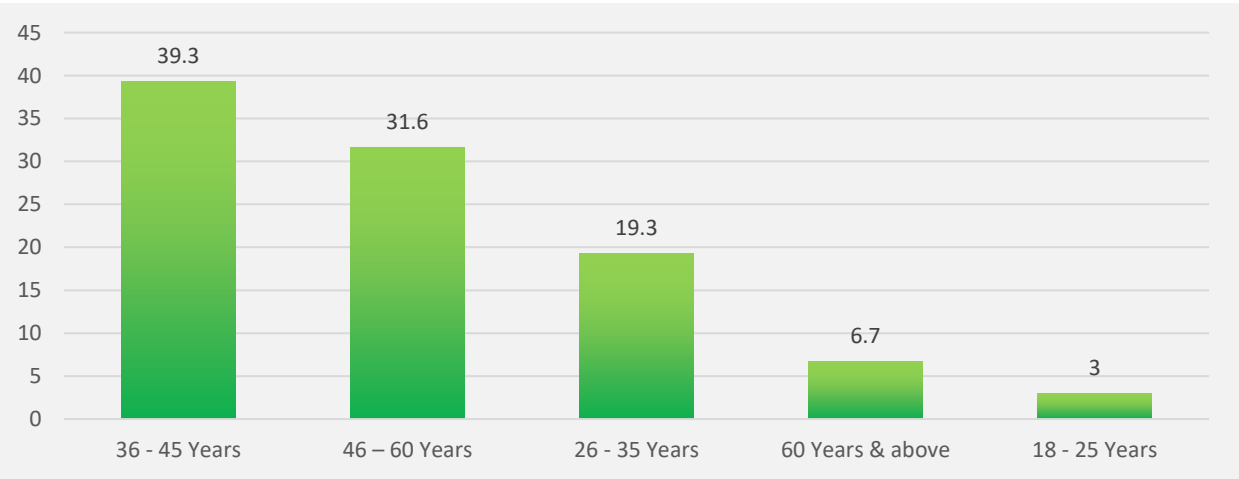
This section discusses about the features of the sample respondents i.e. demographic (age, educational qualifications, caste, poverty category, occupation, etc.), their land holding status and annual income of the sample households.

3.1 Demographics

A total of 430 respondents were interviewed as a part of the study of whom 111 (26%) were demo plot farmers and remaining 319 were Non-demo farmers. Of the total sample, 68 percent were males while the remaining 32 percent were females.

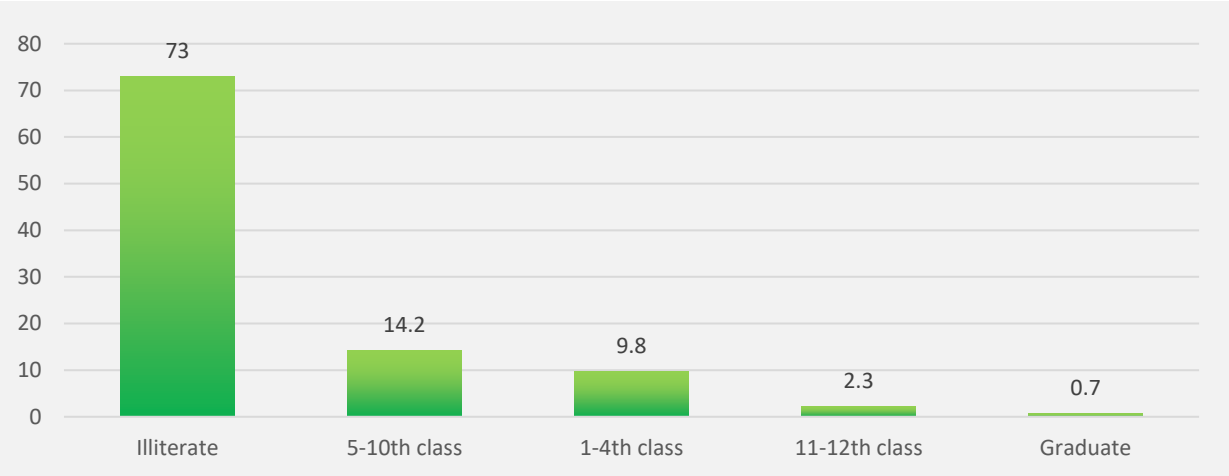
The age group of 36-45 years formed 39.3 % of the sample, the age group of 46 – 60 years accounted for 31.6 % and the younger age group of 26 – 35 years formed the third most predominant group in the sample. Respondents aged above 60 years were nearly 7 % in the sample while only 3 % were in the 18 – 25 years age cohort.

Fig:2 % distribution of respondents by age-group



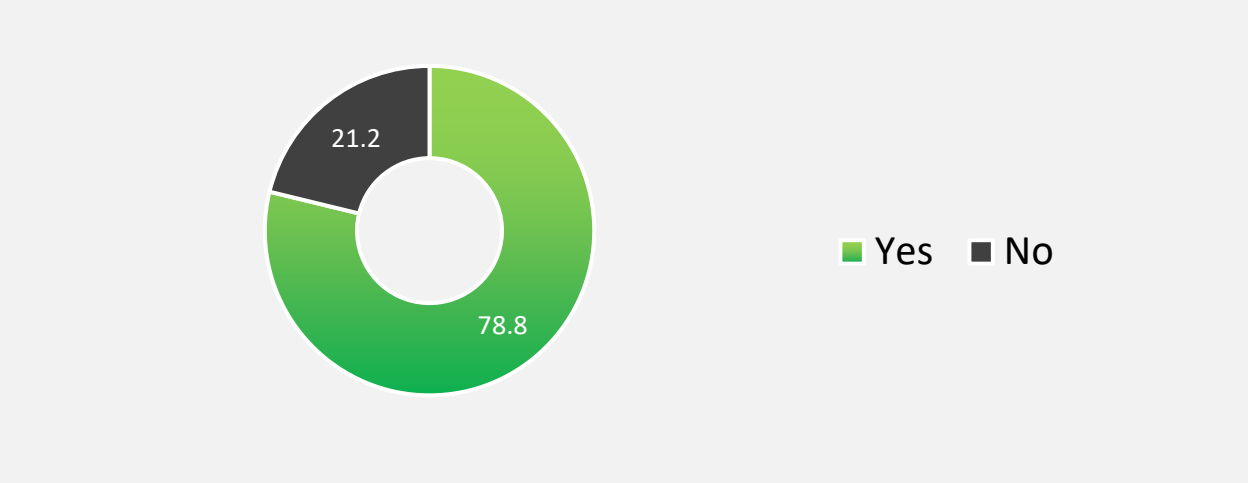
Nearly three fourth of the sample (73%) was illiterate, 14 % had studied from 5th to 10th grade and 10 % had attended school from 1st to 4th grade. Negligible percentage of respondents (2%) had studied till 12th grade and above.

Fig:3 % distribution of respondents by educational status



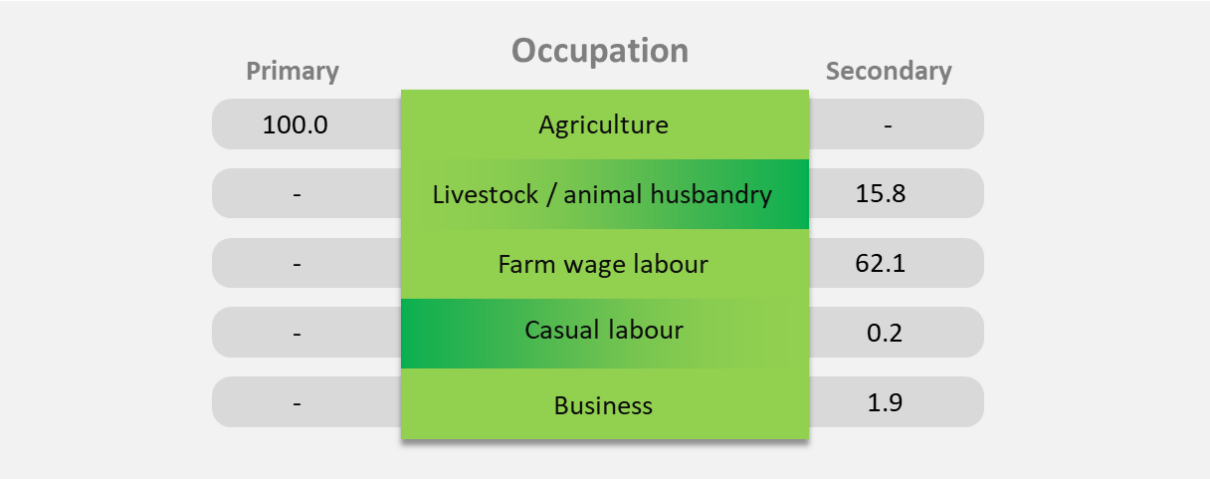
All the households interviewed in the sample belonged to Scheduled Tribes. BPL families constituted for nearly 67 % in the sample (Baseline -70%). In terms of electricity connection, more than two-thirds of the households (79%) had electricity supply at their homes (baseline - 67%).

Fig:4 % distribution of households by electricity connection



The primary occupation of all the sample households is agriculture. In terms of secondary source of income, 62 % respondents worked as farm wage labour. Another 16 % stated their secondary income source as animal husbandry/raising livestock.

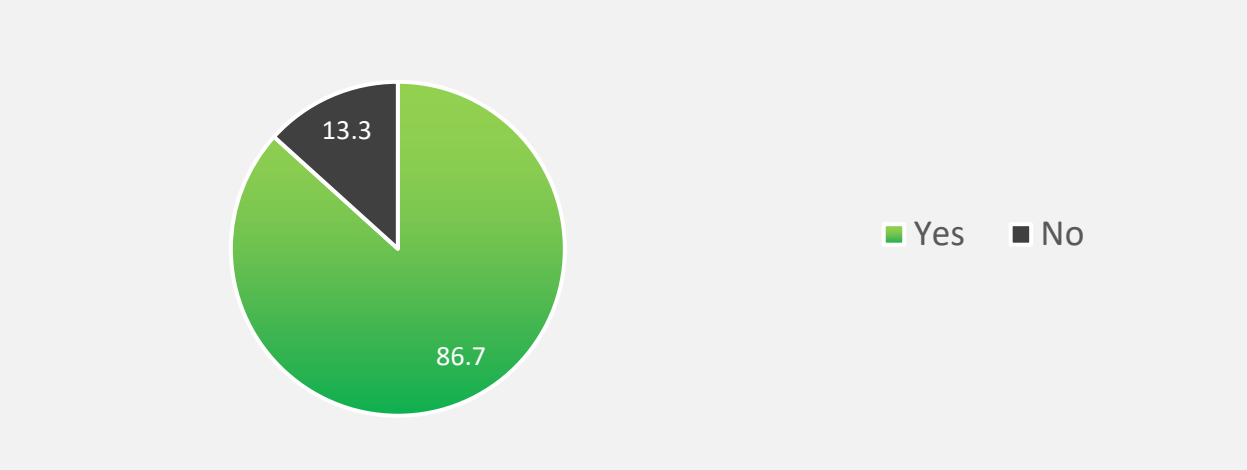
Fig:5 % distribution of respondents by their source of primary and secondary occupation



3.2 Livestock

More than 85 % of the sample households owned oxen, bullocks and buffaloes. Two thirds of the sample respondents (75%) used draft animals for ploughing and other land preparation activities.

Fig:6 % distribution of respondents stating owning of oxen, bullocks and buffaloes



3.3 Land

Land holding size

On an average, the total operational land was 3.5 acres, of which 2.2 acres was irrigated land and 1.3 acres was rainfed. Average operational land was found to be higher among the demo plot farmers (4.2 acres) than the non-demo farmers (3.2). In terms of owning land, demo plot farmers had 4.1 acres of average land size as compared to 2.8 acres of own land possessed by non-demo plot farmers. The higher land holding size of demo farmers was mainly due to the fact that CARE had purposely selected those farmers who had larger land holdings so that they spare 0.5 acres land for cultivation of organic

cotton. Leasing in and leasing out was not a common practice among the sample. Of the total 430 respondents, 7 respondents had taken land on lease while just one respondent had reportedly leased out his land.

Table:10 % distribution of respondents by average land size (in acres)

Land Category	Respondent's Category	Irrigated	Rainfed	Barren	Total
Total operational	Demo farmers	3.2	1.0	0.0	4.2
	Non-demo farmers	1.8	1.4	0.0	3.2
	Overall	**2.2**	**1.3**	**0.0**	**3.5**
Own land	Demo farmers	3.2	0.9	0.0	4.1
	Non-demo farmers	1.6	1.2	0.0	2.8
	Overall	**2.0**	**1.1**	**0.0**	**3.2**
Leased – in	Demo farmers	0.1	0.1	0.0	0.2
	Non-demo farmers	0.2	0.2	0.0	0.4
	Overall	**0.1**	**0.2**	**0.0**	**0.3**
Leased – out	Demo farmers	0.0	0.0	0.0	0.0
	Non-demo farmers	0.0	0.0	0.0	0.0
	Overall	**0.0**	**0.0**	**0.0**	**0.0**

Type of land used for cotton cultivation

A large proportion of Demo farmers (61.3%) raised cotton on irrigated land compared to non-demo farmers (54.9 %). Overall, 56.5 % of the respondents cultivated cotton on irrigated land while 37.7 % depended on rainfall for their cotton cultivation and around 5.8 % irrigated a part of their cotton crop.

Table:11 % distribution of respondents by type of land used for cultivating cotton (n=430)

Respondent's category	Type of land used for cultivating cotton		
	Irrigated	**Rainfed**	**Both**
Demo farmers	61.3	28.8	9.9
Non-demo Farmers	54.9	40.8	4.4
Overall	**56.5**	**37.7**	**5.8**

3.4 Access to mobile phones

Of the 430 farmers who took part in the survey, 320 (74%) owned mobile phones. When the farmers who owned phones were asked if they used their phone to seek information related to crops, only 31 farmers (10%) stated in the affirmative. Majority of the respondents (58%) used their phones to get information about inputs, pests and pesticides and market rates of crops. Only 19 % pointed out seeking weather related information.

Table:12 % distribution of respondents by access to mobile phones and type of information seek on their phones

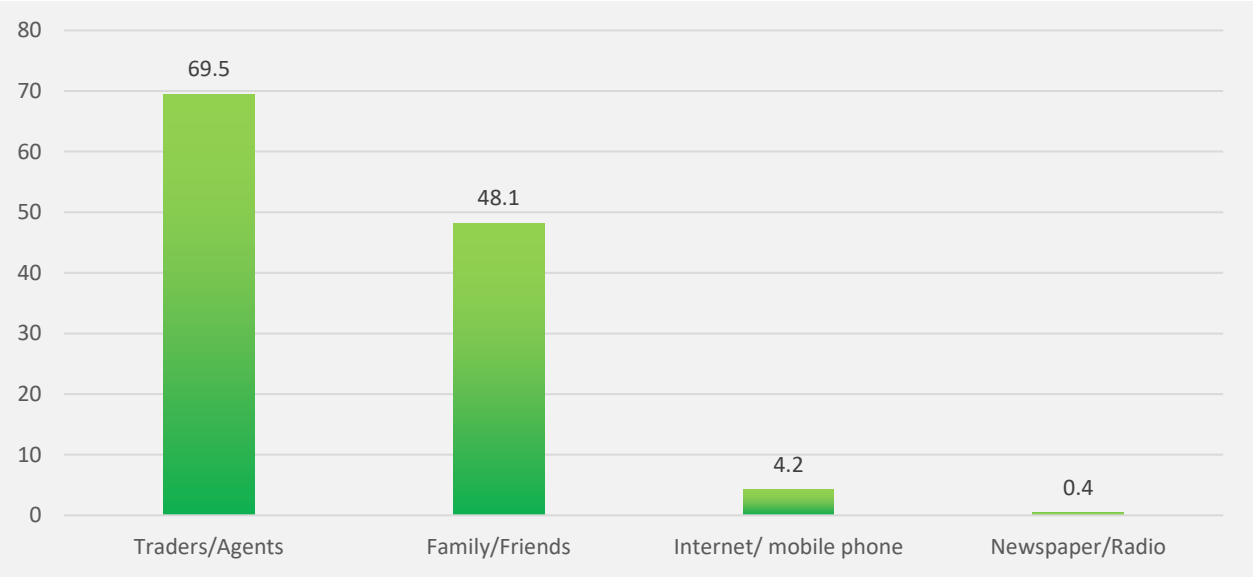
% of respondents stating access to mobile phones	74.4
% of respondents stating usage of phone to get information related to crops	9.7
Kind of agri. related information seek on phones	
Inputs (seeds and fertilizers) and their prices	58.1
Pests and pesticides	58.1
Market rates	58.1
Weather	19.6

3.5 Market Information

Source of your market information

Most respondents (70%) pointed out that they sourced market information from traders and agents. Family/friends were the source of market information for 48 % farmers while 18 farmers (4%) also stated sourcing market information through internet/mobile phones.

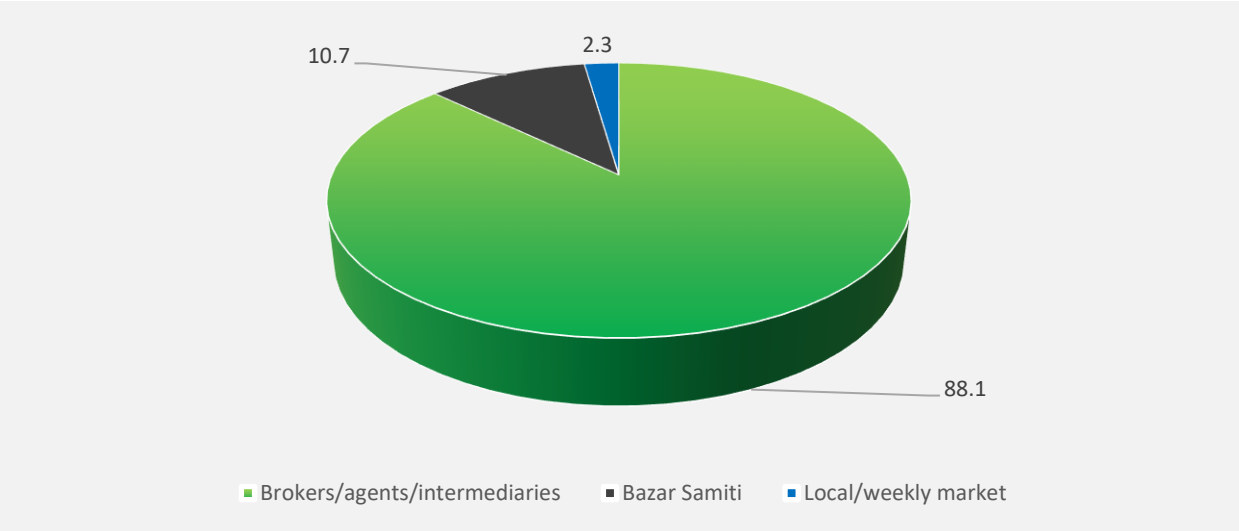
Fig:7 % distribution of respondents by source of market information



Sale of produce

The popular practice followed in the sample villages was selling their produce to the brokers/traders who come to the village to collect the produce. ***This was ascertained during the focus groups also as most participants confirmed selling their produce to the traders as it saves them the time and efforts. There is a ginning mill in Malkapur. However, the produce has to be transported in bullock carts or tractors/trollies and farmers also need to wait in the queue in order to sell their produce to traders. Hence, they preferred to sell to traders.*** Few farmers also sell their harvest to bazaar samitis (11%) and local markets (2%).

Fig:8 % distribution of respondents by sale of produce

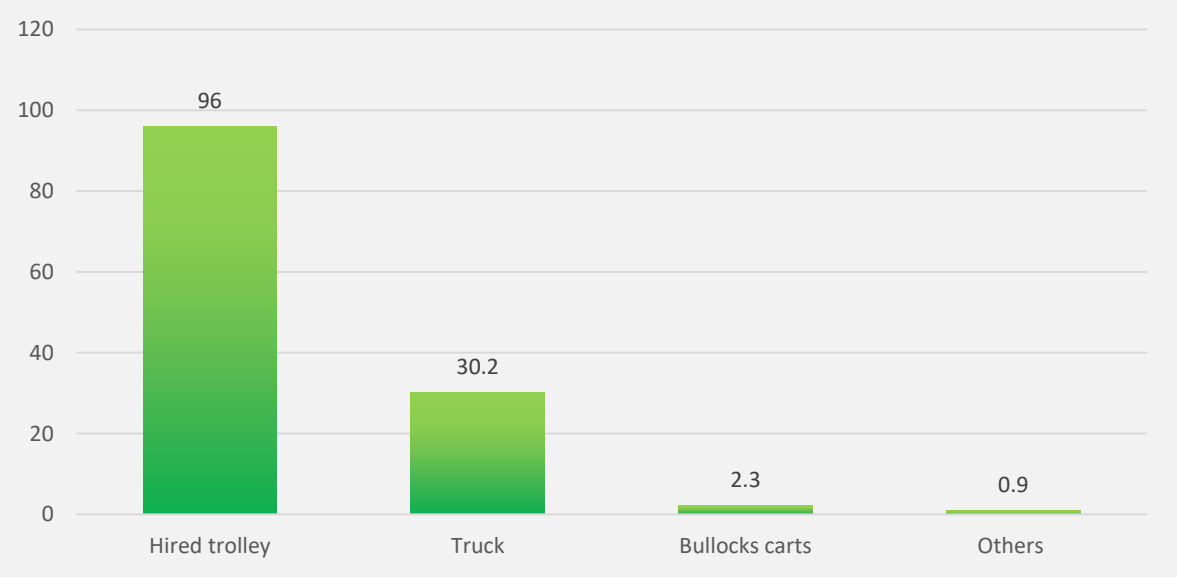


Distance of the nearest market and mode of transport

For majority of the respondents (72%), the nearest market was at a distance of more than 10 kms from their village, followed by distance between 7-10 km (26%) and 3-6 km (2%).

Majority respondents (96%) used hired trolleys to transport their agricultural produce to the market. Another 30 % also stated using trucks to transport their produce to markets.

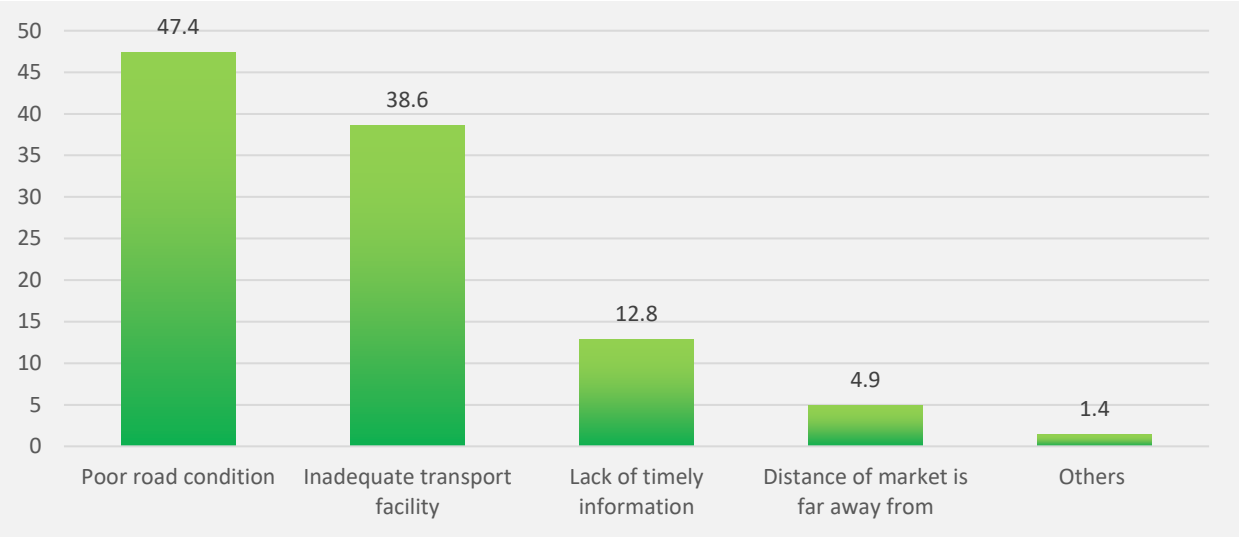
Fig:9 % distribution of respondents by type of transport use to take agriculture produce to the market



Challenges in accessing the market

The major challenges in accessing the market as stated by the respondents were poor road condition (47%) followed by inadequate transport facilities (39%) and lack of timely information (13%). Distance of market from the village did not seem to be a challenge for the farmers.

Fig:10 % distribution of respondents stating challenges in accessing market



Change in marketing practice

Collective bargaining: At aggregate level, more than 86 % farmers stated doing collective bargaining with the traders while marketing their produce. Before the project intervention, only about 61 % were doing the same.

Collective transport: Overall 73 % farmers stated using collective transport for taking their harvest to the market before the project. However, 91 % respondents were making use of collective transport post project. Higher number of demo plot farmers (95%) used collective transport as compared to non-demo plot farmers (89%) post project.

Collective information sharing: Around 83 % farmers stated sharing information with their peers about farming before the project started which increased to 91 % post project. Pre project only 81 % demo plot farmers stated sharing information with other farmers. However, post project, around 95 % were sharing and discussing farm related information. Hence, it can be safely said that the project has helped farmers to open up with one another and discuss and share their experiences and knowledge about farming practices.

Table:13 % distribution of respondents by different methods used for marketing of their produce

Methods for marketing	Respondent's category	Before	Now
Collective bargaining	Demo farmers	63.1	89.2
	Non-demo farmers	59.9	85.6
	Overall	**60.7**	**86.5**
Collective transport	Demo farmers	75.7	94.6
	Non-demo farmers	71.5	89.3
	Overall	**72.6**	**90.7**
Collective information sharing	Demo farmers	81.1	94.6
	Non-demo farmers	84.0	89.7
	Overall	**83.3**	**90.9**

3.6 Summing Up

This study is based on a sample of 430 Scheduled Tribe farmers, including 111 (26%) demo plot farmers. Females comprised 32%. The dominant age group was 36-45 years, followed by 46-30 years. Illiteracy at 73% was very high. Agriculture, supplemented by wage labour, was the main source of livelihood, supported by livestock rearing. Draft animals powered land tilling operations.

The entire sample was small or marginal land holders with average holding size of 3.2 acres. Demo plot farmers had slightly larger holdings, conforming to the project's selection criteria.

Mobile phone ownership was 74%, but less than 10% of them used their phones to access agriculture related information.

Traders and agents were the source of market information for 70% of the respondents. Brokers/agents acquire the produce at farm gate, relieving the farmer the bother of transporting the goods to the APMC or mill at Malkapur, though the price realized by the farmer is much lower.

SECTION IV:

MAJOR FINDINGS

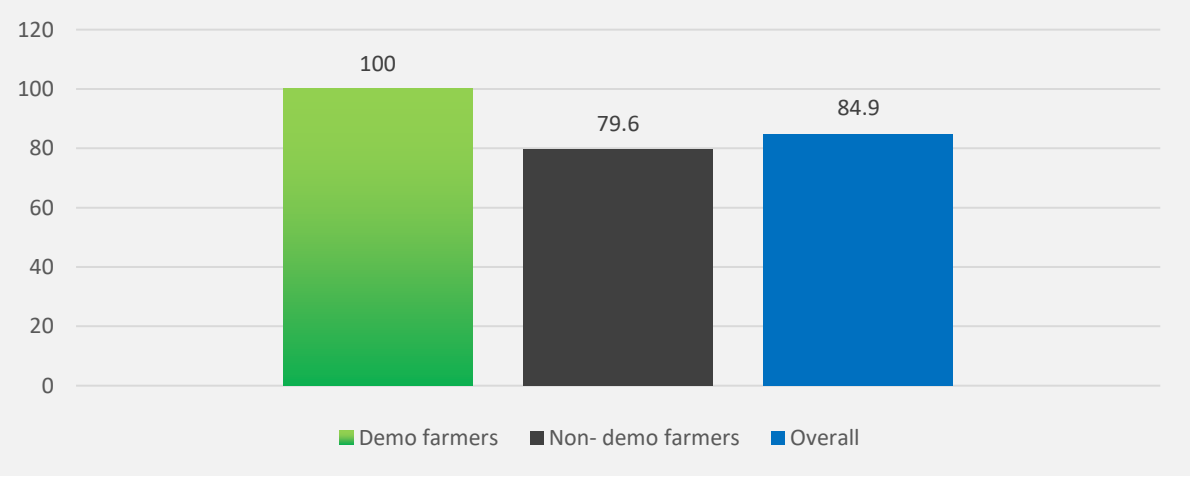
This section focuses on understanding and assessing the overall program feedback on the benefits and impact of the program on the target beneficiaries. It attempts to assess whether there has been any change in the knowledge, skills, capabilities and confidence of the farmers, particularly demo farmers to engage in cultivating environmentally sound climate resilient cotton due to project intervention. It also discusses about the adoption practices and tracks the reduction in the usage of chemical fertilizers and pesticides and change in yield and household income.

4.1 Program Feedback

4.1.1 Awareness about 'Sufalam' project

Awareness about the "Sufalam" project was quite high among the respondents (85%). Around 80 % of the non-demo farmers also had knowledge about the project implemented by CARE. Focus groups confirmed that most participants knew about the activities undertaken by CARE under the project although they were not aware of the name "Sufalam".

Fig:11 % distribution of respondents stating awareness about "Sufalam" project (n=430)



4.1.2 Technical support

Respondents were asked to recall the kind of technical support, services and training received by them under the program in the last two years. More than 90 % farmers stated receiving support and training in summer ploughing, bio-dynamic composting, preparation & use of botanical extract and spraying organic pesticides. Around 89 % stated learning about seed treatment and germination test as these were physically demonstrated to them in sample plots. The table below depicts the percentage of respondents who stated receiving technical support /services/training from the Sufalam project in the last two years for cultivation of environmentally sound climate resilient organic cotton.

Table:14 Percent of demo farmers confirming receipt of technical support for climate resilient organic cotton

Item	% of 'yes' (n=111)
Plant protection	54.1
Summer Ploughing	91.0
Soil sample collection and testing	84.7
Seed treatment and germination test	89.2
Biodynamic composting	95.5
Preparation & Use of Botanical Extract	96.4
Integrated Nutrient Management	75.7
Integrated Pest Management	86.5
Application of botanical extract	95.5
Spraying of organic pesticides	93.7
Weeding and inter culture management	19.8
Organic manure management	70.3
Fiber quality management	75.7
Picking and safe storage of cotton	65.8
Post-harvest measures/management	35.1

*"Not only men, but women have also learnt to identify the different insects/pests attacking cotton. They have also learnt about the nature of damage caused by different insects/pests and the control measures to be taken to prevent them. They have learnt that if the leaves turn yellow, it is due to nitrogen deficiency and if the leaves are small in size, it is due to zinc deficiency". – **Dr. Umale, Scientist, KVK***

4.1.3 Physical and material support

When asked about the kind of physical and material support received by them under the program in the last two years, all the demo farmers stated receiving organic cotton seeds from CARE. Other

material support included seed treatment input, Botanical extract, Organic Manures, IPM Kit, Cotton Picking bag and water tank (more than 90 % of the demo farmers). Sprayers were given to only five demo farmers and all of them confirmed receiving the same.

Table:15 Percent of demo farmers receiving physical and material support under the programs

Physical and material support	% of 'yes' (n=111)
Organic cotton seed	100.0
Seed treatment input (S9 culture)	92.8
Botanical extract (Organic Pesticides) and (S9+ UrJa+Divya)	91.0
Organic Manures	89.2
Micro Nutrients	91.9
IPM Kit	94.6
Cotton Picking bag	89.2
Sprayer	3.6
Water tank	91.0
Farm display board	92.8
Electronic weighing scales	6.3

During the FGDs, participants stated receiving water tanks for making pesticides, organic cotton seeds, training on bio-composting, method of making organic fertilizers and pesticides, weighing scale, uniform for cotton picking, yellow sticky traps, pheromone traps, knowledge about clean picking, training on gender, equality, weighing scale etc. It was heartening to note that farmers were interested to continue with composting and making organic pesticides and fertilizers and use it for all their crops in place of chemical pesticides and fertilizers.

4.1.4 Training on financial literacy and leadership skills

As a part of the Sufalam project, training on financial literacy and leadership skills was imparted to the women members of the SHGs to improve their negotiation and bargaining skills. Overall, around 58 % of the women respondents stated receiving training on financial literacy and leadership skills. When asked about the topics in which they received training, maximum women farmers (68%) said sessions were organized on decision making followed by 64 % stating time management and problem-solving skills (49%). Another 28 % each stated being trained on stress management and training on improving their negotiation skills with traders.

Table:16 % distribution of women respondents by receiving training on financial literacy and leadership skills (n=139)

Training on financial literacy and leadership skills	58.3
Topics of training	
Decision making	67.9
Negotiation/bargaining skills with value chain actors	28.4
Problem solving skill	49.4
Time management	64.2
Stress management	28.4

The FGD findings revealed that influence of the training on leadership skills was largely seen on office bearers of the groups (President & Secretary) and they were the ones who had maximum knowledge about bank transactions and savings in the group. More emphasis could be given to make the members of the groups financially literate and to develop their leadership skills. This aspect of the intervention could have been given greater stress and emphasis.

> *"the CARE team taught us alphabets and motivated us to read"* – *Sairibai Dhansingh Umaria (Secretary of Supa Kripa SHG)*

4.1.5 Exposure visits

All the demo-plot farmers were aware of the exposure visits organized by CARE. However only 17 % of the non-demo plot farmers were aware of the same. Of the 111 demo farmers, 104 had gone on exposure visits organized by CARE. ***FGD participants said that they were taken on exposure visits to the cotton processing, ginning and spinning units at Malkapur and Buldhana.***

4.2 Knowledge and Awareness

4.2.1 Awareness about environmentally sound sustainable practices

Overall, 52 % sample respondents stated awareness on sustainable practices like crop management, water management, pest management, soil management etc. Cent percent of the demo-plot farmers were aware of these sustainable practices. However only 36 % non-demo plot farmers stated awareness about the same. **During the baseline, none of the sample farmers were aware about practicing environmentally sound and sustainable crop cultivation.**

Table:17 % distribution of respondents stating awareness about environmentally sound sustainable practices

Respondent's Category	Yes	No
Demo farmers	100.0	0.0
Non- demo farmers	35.7	64.3
Overall	**52.3**	**47.7**

4.2.2 Awareness about consequences of use of pesticides and fertilizers on surface water

At the aggregate level, nearly 12 % (baseline-7%) respondents were aware of the consequences of excessive usage of pesticides and fertilizers on not only the soil but the surface water as well. Higher number of demo plot farmers (29%) were aware as compared to non-demo farmers (6%). ***The greater awareness of the demo plot farmers on the negative impact of chemicals on soil and water could be attributed to the training imparted by the Senior Scientist from KVK on how the indiscriminate use of chemical fertilizers and insecticides/pesticides causes decrease in plant immunity and reduced soil health. This fact was reiterated during the FGDs wherein most participants stated awareness about how the soil fertility was deteriorating due to excessive use of chemical fertilizers and pesticides.***

4.2.3 Awareness and understanding of climate change

Respondents were asked to rate their awareness about climate change and its impact before and after the project. They had to give a rating from 0 to 5 wherein 0 signifies no awareness at all, 5 denotes complete awareness and 3 moderate awareness.

At the aggregate level, before the intervention, only 31 % farmers had knowledge and understanding of climate change (rating of 3 and above). However, after the intervention 74 % stated the same indicating that the project was successful in bringing about an increase in their understanding about climate change and its impact. The data reveals that the awareness regarding climate change after the intervention was much higher (rating of 4 and 5) among the demo plot farmers (35%) as compared to the non-demo plot farmers (17%).

Table:18 % distribution of respondents by awareness and understanding of climate change

Rating	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (None)	2.7	0.0	8.8	4.1	7.2	3.0
1	22.5	7.2	15.7	7.8	17.4	7.7
2	43.2	17.1	44.8	12.5	44.4	13.7
3 (Moderate)	23.4	40.5	27.9	58.3	26.7	53.7
4	8.1	21.6	2.8	16.0	4.2	17.4
5 (excellent)	0.0	13.5	0.0	1.3	0.0	4.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

4.2.4 Knowledge and awareness about effects of climate change on cotton cultivation

Around 43 % of the non-demo plot farmers did not see any impact of climate change on the cotton production. Interestingly all the demo plot farmers believed that climate change negatively impacts the cotton production. This implies that the project team was able to make the demo farmers aware about the important role that climate plays in agriculture. Among the respondents who believed that climate change impacts cotton cultivation, 61 % respondents (90% of Demo plot farmers and 51% of Non-demo farmers) pointed out that there has been a decrease in yield. For 45 % and 35 % of demo farmers a climate change resulted in decrease in water availability and poor fiber quality respectively. The corresponding figures for non-demo farmers was very less i.e. 3 and 7 % respectively. ***According to the President of the SHG "Jai Durga" "Last year, there were huge losses in cotton crop due to heavy rains. Heavy rainfall is not good for cotton crop because the leaves turn yellow resulting in low yield".***

Table:19 % distribution of respondents stating effects of climate change on cotton production (n=430)

Respondent's Category	No effect	Decreased Fabric quality	Decrease in Yield	Less water availability
Demo farmers	0.0	35.1	90.1	45.0
Non- demo farmers	42.6	3.4	50.8	6.9
Overall	**31.6**	**11.6**	**60.9**	**16.7**

4.2.5 Knowledge of using sustainable and new/improved water management practices

Respondents were asked to rate their knowledge and application of using sustainable and improved water management practices before and after the project. They had to give a rating from 0 to 5 wherein 0 signifies no knowledge about sustainable and improved water management practices, 5 denotes good knowledge. The data indicates that at the aggregate level, before the intervention, around 55 % respondents had no knowledge or very little knowledge (rating of 0 and 1) of water management practices which reduced to 42 % after their association with the project. As compared to non-demo farmers (14%), higher number of demo plot farmers (41%) stated that they gained very good knowledge (rating of 4 and 5) about using sustainable and new/improved water management practices after their involvement with the project.

Table:20 Change in knowledge and application of sustainable and new/improved water management practices before and after the project (n=430)

Rating	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (None)	4.5	4.5	19.7	15.0	15.8	12.3
1	34.2	21.6	41.4	33.2	39.5	30.2
2	27.9	12.6	22.9	22.3	24.2	19.8
3 (Moderate)	7.2	19.8	9.1	15.0	8.6	16.3
4	26.1	35.1	6.9	13.5	11.9	19.1
5 (excellent)	0.0	6.3	0.0	0.9	0.0	2.3

4.2.6 Change in knowledge on handling post-harvest best practices in cotton

Only 10 % demo plot farmers stated having good knowledge of post-harvest best practices (rating of 4 and 5) before the project intervention while after their involvement with the project, 23 % felt that there has been a significant increase in their knowledge of post-harvest best practices. In comparison, knowledge of the non-demo farmers both before and after the project intervention was much lesser i.e., only 4 and 7 percent respectively.

Table:21 Change in knowledge on handling post-harvest best practices in cotton before and after the project (n=430)

Item	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (None)	4.5	2.7	20.1	19.1	16.0	14.9
1	31.5	15.3	32.6	27.9	32.3	24.7
2	38.7	27.9	32.9	27.3	34.4	27.4
3 (Moderate)	15.3	30.6	10.0	18.8	11.4	21.9
4	9.9	22.5	4.4	6.9	5.8	10.9
5 (excellent)	0.0	0.9	0.0	0.0	0.0	0.2

4.3 Adoption of Practices

4.3.1 Adoption of environmentally sound sustainable practices

Orientation and technical support/training was provided and various methods/techniques were taught to the farmers for cultivation of environmentally sound climate resilient cotton as a part of the project. Of the different methods taught to them, the respondents were queried on which of these they had started adopting in their farming in the last two years.

It is quite evident from the table below that as compared to non-demo farmers, the adoption rates of all the different environmentally sound sustainable practices were much higher among the demo plot farmers. The practices that majority of demo plot farmers have adopted are use of botanical extract

(91%), improved and resilient variety of cotton seeds (90%), bio-dynamic composting (90%), use of organic fertilizers (86%) and summer ploughing (86%).

Table:22 % distribution of respondents by adoption of environmentally sound sustainable practices in the last 2 years (n=430)

Practice	Demo farmers	Non- demo farmers	Overall
Improved and resilient variety of cotton seeds	90.1	17.9	36.5
Use of organic fertilizers	85.6	22.9	39.1
IPM	74.8	18.2	32.8
Crop rotation	55.0	50.2	51.4
Drip irrigation	4.5	0.6	1.6
Seed treatment	65.8	0.9	17.7
Germination test	30.6	3.8	10.7
Use of botanical extract	91.0	20.4	38.6
Safe and scientific use of pesticides	64.9	15.7	28.4
Summer ploughing	85.6	50.2	59.3
Bio-dynamic composting	90.1	28.2	44.2
Cotton field cleaning	40.5	20.7	25.8
Safe use of spray applicants	70.3	25.7	37.2

The adoption of sustainable and environmentally sound practices was also ascertained from the participants **during the FGDs.** It was learnt that all the demo plot farmers were making organic manures (through bio-dynamic composting) and botanically extracted pesticides and applying them in their demo plots. During the discussions an interesting observation came into notice of the survey teams. Demo plot farmers of the five villages in the first year are now using organic fertilizers and pesticides for Bt cotton as well as other crops. However, demo farmers from the villages which were selected during the second year of implementation were making organic fertilizers and pesticides only for their organic cotton cultivation. But given the lesser cost involved in making these fertilizers/pesticides, they have plans to make it on a large scale from next year.

Almost all the **FGD participants** stated that they have started making botanical extract using cow urine, leaves of neem, custard apple, papaya, guava and pomegranate. Participants said they will continue making the extract as it is cost effective and all the ingredients are available locally. The participants said that they would use the extract not only for cotton but for other crops as well.

4.3.2 Soil testing

Soil testing was done for all the 111 demo farmers and 3 non-demo plot farmers had given their soil for testing. Of the total 114 farmers who had given their soil for testing, a little over 50 % of them said that they got soil testing report on time. Around 66 % of the respondents stated applying fertilizers on the basis of the soil testing report. **During the baseline, none of the farmers stated doing soil testing, hence soil testing-based crop cultivation was not a practice.**

-Soil testing report-

Soil testing was done for all the 111 demo plot farmers during both the years (2019 & 2020) with the facilitation support from CARE India. In the year 2018, soil testing was not done as there was a delay in the project launch and by then the crop season had got over. The soil testing was done with the purpose of providing the information necessary to set nutrient application targets, which are used to calculate manure and fertilizer application rates. Test results from regular field sampling (particularly from benchmark sites) allow monitoring and detection of changes in soil parameters (e.g., PH, EC, OC, Nitrogen, phosphorous (P), potassium (K), copper, magnesium (Mg) iron (Fe) and zinc (Zn)) with time. **The soil testing results were analyzed on the above parameters for both the years and the key findings of the soil testing are summarized below-**

Potential of Hydrogen (PH): Most soils have pH values between 3.5 to 10. Soils are classified according to their pH value:

- 6.5 to 7.5—neutral
- over 7.5—alkaline
- less than 6.5—acidic, and soils with pH less than 5.5 are considered strongly acidic.

The soil testing results indicated that all the sample villages (except for Garpet and Islampur) have neutral soil type as PH values in these villages ranges from 7.09 to 7.5. Garpet and Islampur villages were found with slightly exceeded PH values of 7.78 and 7.55 respectively (alkaline soil). There was no difference in the ph values of soil tested during 2019 and 2020. The change in PH takes a quite long time. This neutral type of soil is completely suitable for the typology of crop grown, namely, cotton, pulses, maize, jowar, sorghum, groundnut and wheat.

Electrical Conductivity (EC): Soil electrical conductivity (EC) is a measure of the quantity of salts in soil (salinity of soil). It is an important indicator of soil health. It affects crop yields, crop suitability, plant nutrient availability, and activity of soil microorganisms which influence key soil processes including the emission of greenhouse gases such as nitrogen oxides, methane, and carbon dioxide. Excess salts hinder plant growth by affecting the soil-water balance. The good range of EC is 0.3 to 0.5 (dS/m). The soil testing results revealed that in all the project villages (except Rajura Kh.) there have been quite accurate EC in the soil of demo plot farmers (0.3 to 0.48). Only in Rajura Khurd village, the average EC was 0.84. No difference in average EC was observed in the soil samples collected during 2019 and 2020.

Organic Carbon (OC): Soil organic carbon is a measurable component of soil organic matter. Organic matter makes up just 2–10% of most soil's mass and has an important role in the physical, chemical and biological function of agricultural soils. Organic matter contributes to nutrient retention and turnover, soil structure, moisture retention and availability, degradation of pollutants, carbon sequestration and soil resilience. The organic carbon content is ideal when the OC value is 1 unit. The data shows that in the intervention villages, the carbon content has increased due to the use of organic manure. On the other hand, in the 5 project non-intervention villages for phase 2, there were no changes in OC. From this it is quite clear that when organic manure (bio dynamic composting, neem cake, mulching of pulses stubble and botanical extract) is used, the organic carbon content increases resulting in increased micro nutrients in soil.

Nitrogen (N): Soil nitrogen supply is a laboratory test that reflects the release of mineral nitrogen from organic matter by soil microorganisms. The higher the value of soil nitrogen supply, the more likely it is that the microorganisms in a soil will convert more organic nitrogen into mineral nitrogen for plant uptake. Low

nitrogen level is 240kg/ha, medium is 240-480/kg/ha and high is 480kg/ha. Although the quantity of nitrogen in the project villages are still quite low in the range 181 to 257 kg/ha, an increase of approximately 15Kg/ha to 20Kg/ha has been noticed in the year 2020-21 as compared to 2019-20. To increase the nitrogen content further, cultivation of leguminous crop, crop rotation, use of organic manure and green manure etc could be followed.

Phosphorus (P): The quantity of phosphorus is moderate in all CCACP project villages. The amount of phosphorus which marks as low is less than 11 Kg/ha, medium is 11 – 22 Kg/ha and high is more than 22 Kg/ha. In the year 2020-21, the amount of phosphorus increased by approximately 2.5 kg/ha in the 5 intensive project villages as compared to 2019-2020 while in other 5 villages the quantity was constant. The amount of phosphorus in Islampur is very high (67.28) because it falls on a hilly area and therefore the biomass is high.

Potash (K): Potassium (K) is an essential nutrient for plant growth. Potassium helps regulate the opening and closing of the stomata, which regulates the exchange of water vapor, oxygen and carbon dioxide. Deficiency of potassium causes stunted plant growth and reduction in yield. The amount of Potash in the soil increased in the year 2020-21, by approximately 15 kg/ha in the 5 intensive project villages as compared to 2019-2020 while in other 5 villages the potash content in the soil remained the same.

Copper (CU): Copper is required for many enzymatic activities in plants and for chlorophyll and seed production. Deficiency of copper can lead to increased susceptibility to diseases like ergot, which can cause significant yield loss in small grains. Ideally, for healthy and productive soil, the concentration of copper should be 2-50 mg/kg. The quantity of copper in the soil in intensive project villages is quite low (1.62 – 1.98). Soils naturally contain copper in some form or other, ranging anywhere from 2 to 3 parts per million (ppm). In order to increase the quantity of copper in the soil, use of organic manure, cow dung, green manure and mulching should be encouraged.

Iron (I): Iron is the fourth most abundant element found in soil. Iron, in small amounts, is essential for healthy plant growth and is a micronutrient. It is important for the development and function of chlorophyll and a range of enzymes and proteins. It also plays a role in respiration, nitrogen fixation, energy transfer and metabolism. In the five intensive project villages, there has been a slight increase in the amount of iron where as in other five non-intensive project villages the iron contain in the soil is constant.

Zink (Zn): Zinc is considered as a trace element in soil. Zn plays an important role in auxin formation and in other enzyme systems. Zinc deficiency is seen in all ten project villages. However, there has been an approximate increase of 0.25 parts per million (ppm) in the five intensive project villages. In order to increase the zinc content, crop rotation, use of organic manure, cow dung, green manure and mulching should be encouraged.

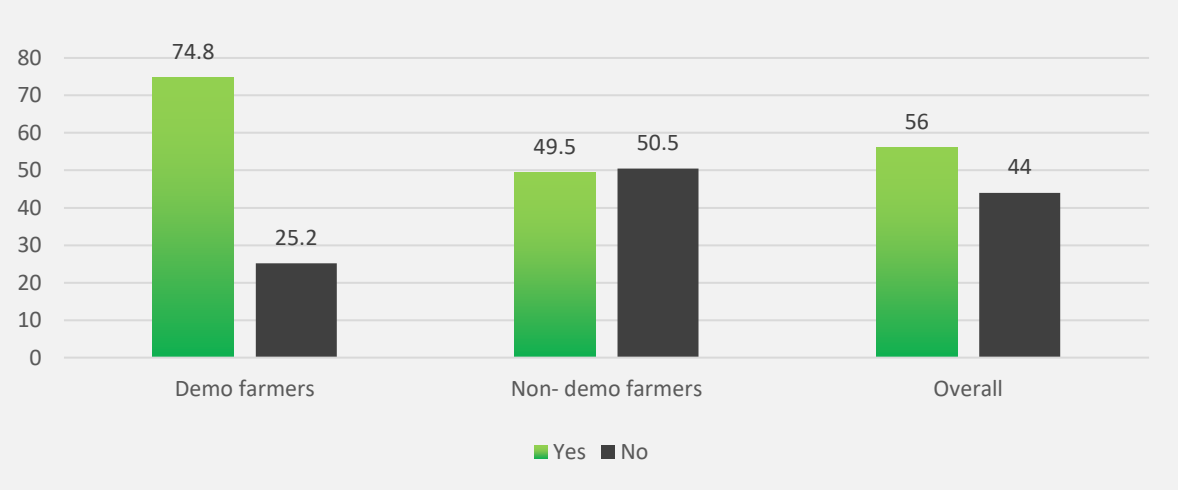
Magnesium (Mg): Magnesium is an essential element which is required throughout the whole growth period of a plant. Magnesium fulfils several functions within the plant; it is a central component of chlorophyll which is supporting the function to absorb sunlight during photosynthesis. The ideal magnesium content in the soil should be between 3.5 and 6.0. However, in all the project villages, the magnesium content is extremely high (9.8 – 17.8) which is due to excessive use of chemical fertilizers and pesticides. It could also be because the villages are in a hilly area and the rock minerals contain high magnesium.

Source: CARE document

4.3.3 Precautionary measures while spraying

Overall, 56 percent respondents stated following precautionary measures while spraying. Demo farmers outnumbered (75%) non-demo farmers (50%) in taking precautions while spraying. ***According to the FGD participants, training and demonstration was conducted by CARE on safe and scientific spraying techniques. Farmers have now started using protective gear like masks, gloves, goggles, apron etc. while spraying. During the FGD, farmers said that earlier they suffered from skin allergies while spraying. However, after they started using the safety kit, they have been spared of skin related problems.***

Fig:12 % distribution of respondents by follow precautionary measures while spraying (n=430)



4.3.4 Adoption of water wastage reduction techniques

At aggregate level, nearly 77 % respondents (demo farmers -91%, non-demo farmers-72%) stated adoption of at-least one water wastage reduction technique. The adoption percentage during the baseline was 18.67%.

Among the various techniques that they have adopted, 40 % demo plot farmers and 32 % non-demo plot farmers stated using rain guns. Conservation of soil and water was done by 31 % respondents while 13 % had installed sprinklers in their fields. Drip irrigation was done by 4 % respondents to reduce the wastage of water. ***During the FGD, few farmers said that they availed the government scheme and got drip and sprinklers installed at subsidized rates.***

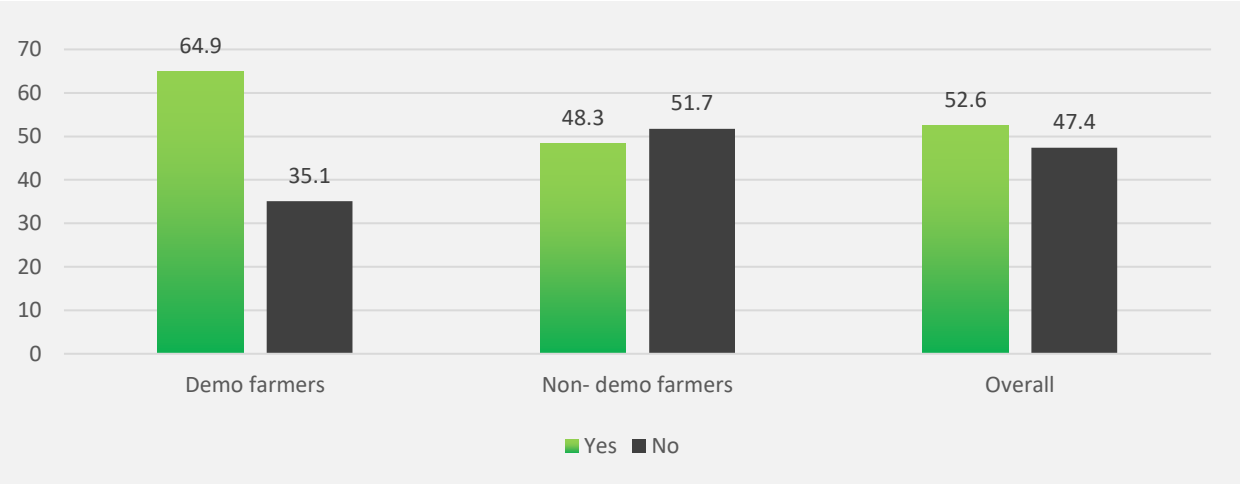
Table:23 % distribution of respondents using at-least one water wastage reduction techniques (n=430)

Respondent's Category	Sprinkler	Drip	Rain gun	Soil water conservation	Spacing	No Technique used
Demo farmers	21.6	4.5	39.6	33.3	1.8	10.8
Non- demo farmers	10.3	4.1	32.3	30.4	0.0	27.6
Overall	**13.3**	**4.2**	**34.2**	**31.2**	**0.5**	**23.3**

4.3.5 Adoption of post-harvest best practices

Overall, 53 % respondents have adopted at least one new post-harvest best practice in the last two years. Higher number of demo plot farmers (65%) than non-demo plot farmers (48%) had adopted post-harvest best practices.

Fig:13 % distribution of respondents adopting of at-least one new post-harvest best practice production in the last 2 years (n=430)



New Harvest Practices

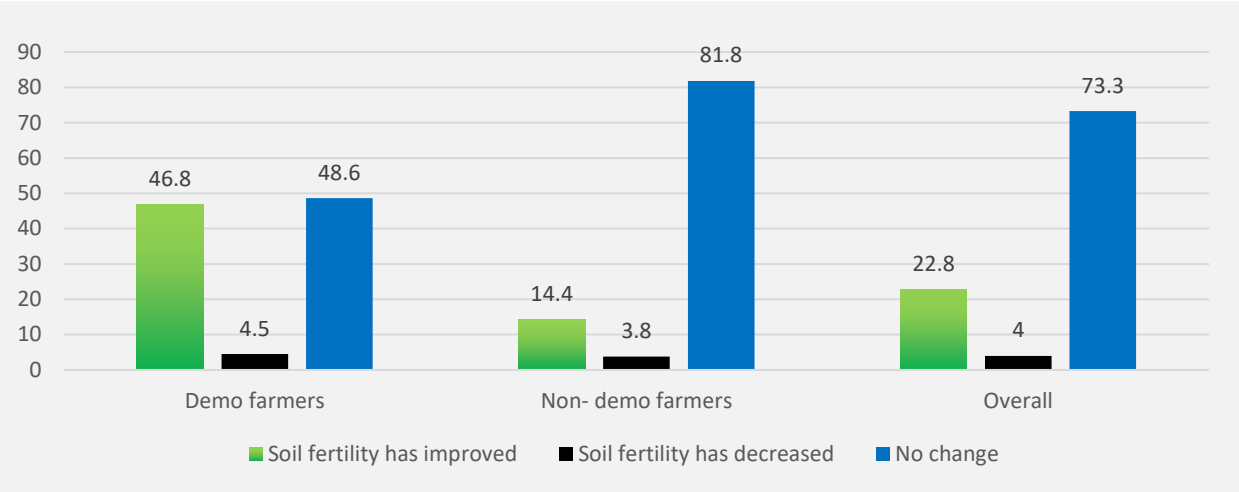
Participants stated that they were instructed by the CARE team to store the harvested cotton in air tight bags to avoid moisture and that they have started following the practice. In addition to this, participants said that they have gained knowledge about clean cotton picking like the cotton bolls should be picked from the upper branches first and then move to the lower ones. Also, that picking should be done only in the morning and evening and not in the afternoon. Few of them were also able to narrate the reason for the same - during morning and evening due to moisture levels, the dry leaves does not stick to the cotton bolls.

4.4 Tracking Benefits and Impact

4.4.1 Change in soil fertility

About 23 % of the respondents felt that the fertility of their soil has increased in the last two years while 73 % did not find any change. 17 farmers (4%) out of a total of 430 also said that the soil fertility has decreased. While 47 % demo plot farmers pointed out that the soil fertility has improved in the last two years, only 14 % non-demo farmers stated the same. This could be due to the fact that the demo plot farmers have started using organic manure and pesticides prepared at home.

Fig:14 % distribution of respondents stating change in the soil fertility in the last two years (n=430)



> *"After we received training on making organic fertilizers/pesticides, we have reduced the dosage of using chemical fertilizers even in the case of Bt cotton thereby improving the soil fertility". – **FGD Participants, Hanwattkhed***

4.4.2 Rating of soil quality

Overall, only 26 % respondents rated the quality of soil as good and very good before the project intervention and none of them rated their soil quality as "excellent". However, after their involvement with the project, 50 % rated their overall soil quality as good, very good or excellent. As compared to non-demo plot farmers (38%), higher number of demo plot farmers (72%) gave a rating of 4, 5 and 6 to their soil quality after their involvement with the Sufalam project. ***During the FGDs and the household interviews, it was quite evident that farmers have realized that excessive use of chemical fertilizers and pesticides will harm soil health. They have understood the fact that in order to improve the soil fertility, organic farming is the way forward.***

Table:24 Rating on overall soil quality before and after the project

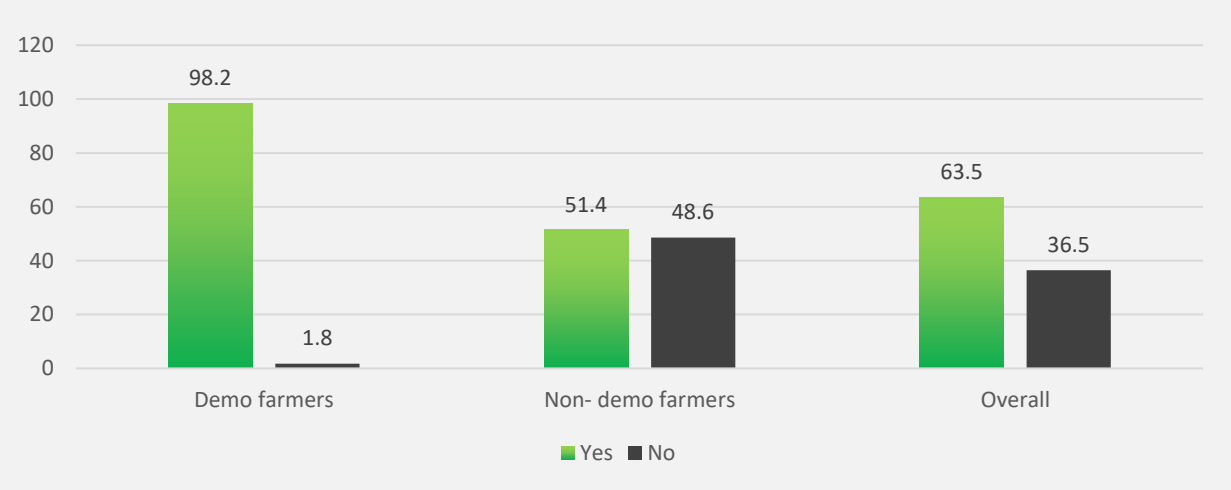
Item	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (very poor)	0.9	0.0	7.5	3.4	5.8	2.6
1 (Poor)	22.5	0.0	34.2	31.3	31.2	23.3
2 (Average)	38.7	19.8	36.4	27.0	37.0	25.1
3 (Good)	25.2	40.5	16.9	25.7	19.1	29.5
4 (Very Good)	12.6	31.5	5.0	12.5	7.0	17.4
5 (Excellent)	0.0	8.1	0.0	0.0	0.0	2.1

4.4.3 Reduction in usage of chemical fertilizer

One of the expected results of the project intervention was for demo farmers to reduce the usage of chemical fertilizers and pesticides.

Overall, 64 % of the sample respondents said that there has been a reduction in the use of chemical fertilizers in the last two years. Reducing the use of chemical fertilizers was much higher in the case of demo plot farmers (98%) as compared to non-demo plot farmers (51%).

Fig:15 % distribution of respondents stating reduction in the usage of chemical fertilizers in cotton cultivation in the last two years (n=430)



Overall, it was seen that prior to the project intervention, farmers were using on an average 2.6 quintals of chemical fertilizers per acre for cotton cultivation which has come down to 2.3 quintals/acre post project, thereby reducing the quantity by nearly 30 kg (0.3 quintal). This reduction in chemical fertilizer usage was much higher in the case of demo plot farmers (before-2.6 quintal/acre, now- 2.2 quintal/acre) than non-demo plot farmers (before- 2.5 quintals/acre, now – 2.4 quintals/acre). The percentage reduction of chemical fertilizers in the case of demo plot farmers was to the tune of 15%.

Table:25 % distribution of respondents stating average quantity of chemical fertilizer usage before and after intervention

Respondent's Category	Average usage of chemical fertilizers (quintal	
	Before	Now
Demo farmers	2.6	2.2
Non- demo farmers	2.5	2.4
Overall	**2.6**	**2.3**

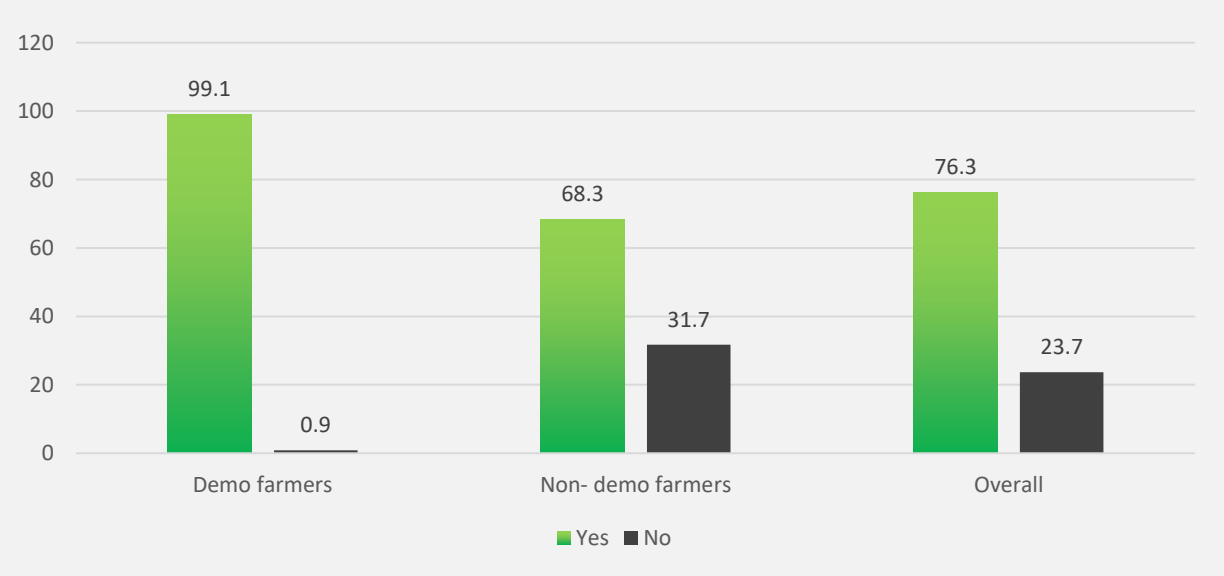
The baseline data conducted by CARE before the start of the project shows more or less the same usage pattern of chemical fertilizers. As per the data, at the time of the start of the project, demo farmers used to apply 2.5 quintals of chemical fertilizers (Urea-1.5 quintals and Phosphorus & Potash – 1.0 quintal) in cotton.

> *"From the time we got training from CARE on making organic fertilizers/pesticides, we have been making it at home and have reduced the dosage chemical fertilizers on our field even for Bt cotton. Earlier we were applying 3 quintals of fertilizers which we have now reduced to 2 quintals. One quintal of chemical fertilizers was applied in 3 doses earlier. Currently we are only applying 2 doses of chemical fertilizers and organic fertilizers are applied as the third dose". – **FGD Participants***

4.4.4 Reduction in chemical pesticides

At the aggregate level, 76 % respondents pointed out that they have reduced using chemical pesticides in the last two years. Of the 111 demo plot farmers, 110 farmers (99%) said that there has been a reduction in the use of chemical pesticides in their cotton cultivation. **Earlier farmers were spraying chemical pesticides 5 to 6 times which has presently reduced to 4 sprays (percentage reduction by around 30%). Reason for the same is because the chemical use efficiency has increased due to the use of organic pesticides like botanical extract, neem seed extract and yellow sticky traps. It was also learnt that farmers have learnt the judicial use of pesticides. *According to the FGD participants, all the ingredients for making the organic pesticides was easily available in the village and the process of making it was quite easy. They also pointed out that their cultivation costs have decreased by using homemade organic pesticides.***

Fig:16 % distribution of respondents stating reduction in the use of chemical pesticides in cotton in the last two years (n=430)



4.4.5 Change in overall agriculture productivity

Farmers were asked to rate their agricultural productivity on a scale of 0 to 5 wherein 0 denotes very low and 5 very high. A rating of 4 and 5 (high and very high) was given by 7 % respondents before the

project intervention while around 22 percent gave the same rating post intervention. Higher number of demo farmers (29%) than non-demo farmers (20%) stated increase in agricultural productivity after their involvement with the project. This very clearly indicates that the project was able to successfully train the farmers on improved agricultural practices and techniques which resulted in better productivity.

Table:26 % distribution of respondents by rating of overall agricultural productivity before and after the project

Rating	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (Very low)	8.1	8.1	13.8	13.8	12.3	12.3
1	15.3	6.3	9.7	7.5	11.2	7.2
2	39.6	17.1	43.3	21.3	42.3	20.2
3	27.0	39.6	27.0	37.3	27.0	37.9
4	9.0	24.3	6.3	20.1	7.0	21.2
5 (Very high)	0.9	4.5	0.0	0.0	0.2	1.2

4.4.6 Change in income

The use of organic manures and pesticides has reduced the overall input cost of cotton cultivation from Rs. 17307/- per acre at baseline to Rs. 16793/- during the end line. As a result of reduction in input cost, realization of net profit has also increased to Rs. 14338/- acre (Baseline- Rs. 11948/-).

Table:27 Input & output cost and net profit from cotton cultivation (Baseline v/s End line)

	Input cost	Output cost	Net profit
Baseline	17307	29256	11948
End line	16794	31132	14338

The input cost was much lower in case of organic cotton cultivation (Rs. 11200/acre) against Rs. 17027/-acre for BT cotton. Again, this net profit was reported much higher in case of organic cotton cultivation (Rs. 16654/acre) against Rs. 14241/acre net profit realized from Bt cultivation.

Table:28 Area cultivated, input & output cost and net profit (Bt cotton v/s organic cotton)

Cotton	Area cultivated (in acre)			Average input cost/acre (INR)	Average output cost/acre (INR)	Net profit/acre (INR)
	Total	Ave.	Range			
BT cotton	1377	3.2	0.5 – 19	17027	31269	14241
Organic Cotton	58	0.52	0.5 – 1	11200	27854	16654
Overall	**1434**	**3.34**	**0.5 – 19**	**16793**	**31132**	**14338**

According to a FGD participant, ***"Pehle udhari se khad lekar aate the aur phasal ugane ke baad paise udhari chukane mein hee chala jata. Jab se khad banana lage, kharcha kum ho gaya aur bachat kar paa rahe hai"*** (Earlier we used to purchase fertilizers on credit and once the crop is harvested, all the money would go into repaying the loan. From the time we started making our own organic fertilizers, our expenses have decreased and we are able to save money).

4.4.7 Overall satisfaction with cotton production

An attempt was made to find out the overall satisfaction of farmers with cultivating Bt cotton compared to organic cotton on various aspects of farming. Most of the respondents were highly satisfied with organic cotton cultivation than Bt cotton in terms of input costs, better returns and reduction in pest attack. However, when it came to production, majority respondents said they were satisfied with the yield of Bt cotton as compared to organic cotton. According the sample respondents they were equally satisfied with the labour requirements of both organic cotton and Bt cotton.

Table:29 % distribution of respondents stating their overall level of satisfaction with organic and Bt cotton

Item	Bt cotton			Organic cotton		
	Highly satisfactory	Satisfactory	Not satisfactory	Highly satisfactory	Satisfactory	Not satisfactory
Less input costs	41.4	54.1	4.5	45.9	47.7	6.3
Better production	19.8	75.7	4.5	37.8	51.4	10.8
Better returns	27.9	53.2	18.9	37.8	46.8	15.3
Reduced pest attack	27.9	40.5	31.5	35.1	34.2	30.6
Reduced labor requirements	33.3	37.8	28.	33.3	36.0	30.6
Better market price	29.7	37.8	32.4	32.4	29.7	28.8

4.4.8 Change in leadership skills on environmentally sound climate resilient, cotton production practices

Respondents were asked to rate their leadership skills on cotton production practices before and after their involvement with the project on a scale of 0 to 5 where 0 denotes no leadership skills and 6 denotes excellent leadership skills. At the aggregate level, none of the respondents stated having good or excellent leadership skills before the project intervention (only 5% stated moderate skills). However, after their involvement with the project around 36 percent respondents felt that they have developed good/excellent leadership skills (moderate skills -39%) on cultivating environmentally sound climate resilient cotton. The data indicates that majority of demo farmers (69%) stated good leadership skills after their involvement with the project as compared to non-demo farmers (25%).

Table:30 % distribution of respondents by leadership skills on environmentally sound, cotton production practices (n=430)

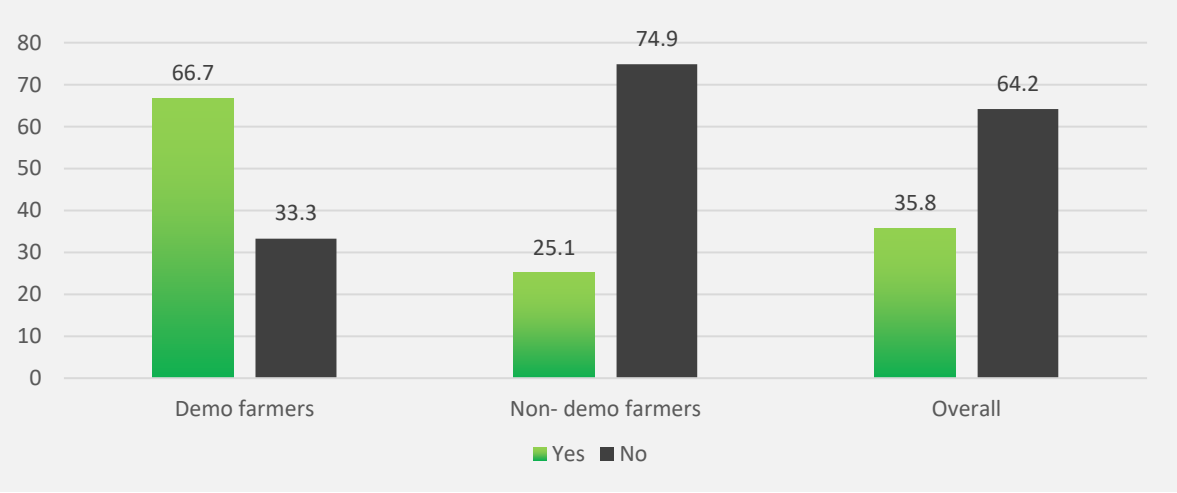
Rating	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (None)	12.6	0.0	29.5	0.0	25.1	0.0
1	51.4	0.0	45.5	11.6	47.0	8.6
2	28.8	2.7	20.7	20.1	22.8	15.6
3 (Moderate)	7.2	27.9	4.4	43.6	5.1	39.5
4	0.0	40.5	0.0	19.7	0.0	25.1
5 (excellent)	0.0	28.8	0.0	5.0	0.0	11.2

4.4.9 Child labour

Awareness on child labour issues

At the aggregate level, 36 % respondents acknowledged that they were given awareness on child labour issues. More number of demo farmers (67%) stated attending the awareness sessions against child labour as compared to the non-demo farmers (25%).

Fig:17 % distribution of respondents stating awareness given to them on child labour issues (n=430)



Reduction in child labour

The baseline data revealed that nearly 86 % families take their children (below 16 years) to support in different stages of cotton cultivation. However, the endline survey revealed that the involvement of child in cotton cultivation is almost negligible.

"All children in the village attend school and none of them work in the fields. We also ensure that our friends and neighbours do not engage children in the field and counsel them on the adverse effects of engaging children as labourers." ***– FGD Participants***

However, the FGD participants from Rajura BK cited that ***"since the classes are running online these days and all the time children are available at home, we do take their support in field occasionally".***

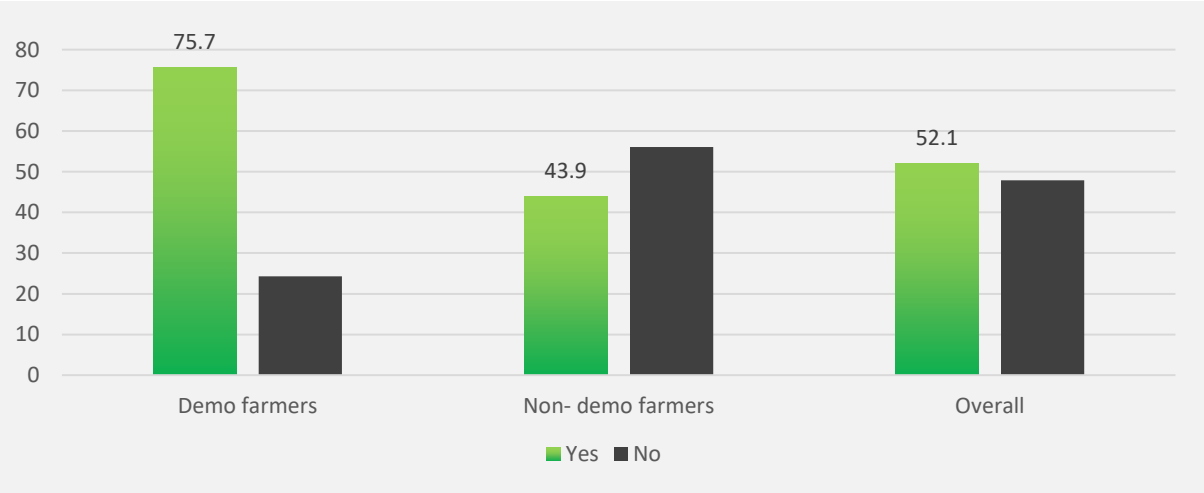
Respondents were also asked if they have taken any action against child labour as part of the collectives/SHG groups, and a little over 2.7 % of the respondents stated taking action to stop child labour.

4.4.10 Government schemes

Awareness about government schemes

Overall, according to 52 % of the sample respondents, they were given information on various government schemes. As compared to non-demo farmers (44%) higher number of demo plot farmers (76%) said that they were made aware of the government schemes through the Sufalam project. ***Awareness was quite high among the FGD participants on schemes like MGNREGA and PMAY. Participants pointed out that many villagers have been benefitted from PMAY and several houses have been constructed under the scheme. They also reported getting drip and sprinklers installed in their fields at subsidized rates. Several farmers in the village are also working under the MGNREGA scheme.***

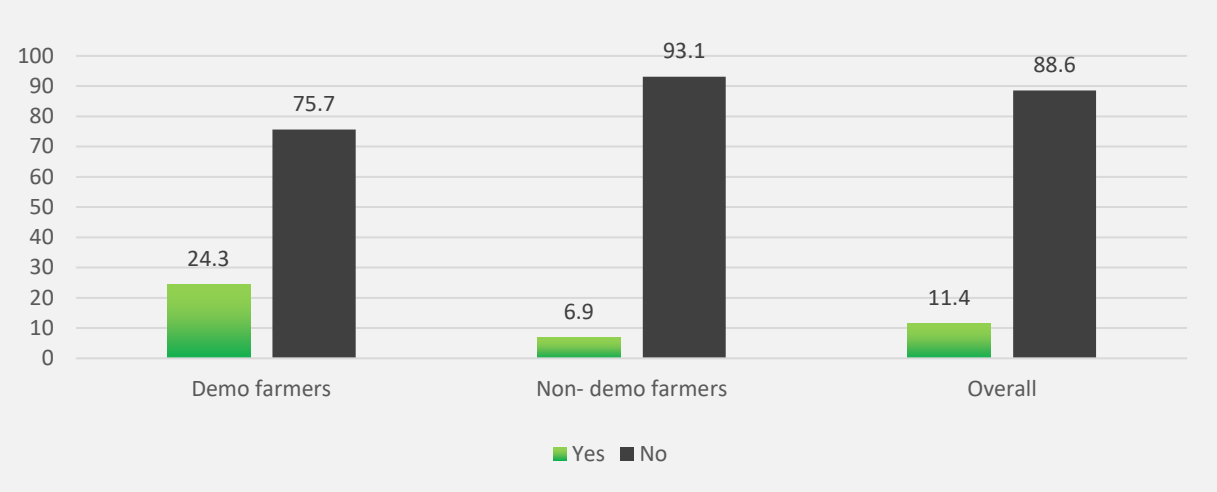
Fig:18 % distribution of respondents stating awareness given to them on various government schemes (n=430)



Awareness about government schemes supporting environmentally sustainable and climate resilient agriculture

Overall, 11 % sample respondents were aware of government schemes/programs that support environmentally sustainable and climate resilient agriculture. Awareness among demo farmers was as high as 24 % as compared to Non-demo farmers (7%). The baseline figures revealed that none of the respondents had knowledge about any such government schemes that support environmentally sustainable and climate resilient agriculture.

Fig:19 % distribution of respondents stating awareness about government schemes/programs supporting environmentally sustainable and climate resilient agriculture (n=430)



Assistance/support from government /other organizations

The data revealed that around 30 % of the respondents had received support from the government in the last two years. More demo plot farmers (33%) than non-demo plot farmers stated receiving assistance from the government. According to the 29 % respondents, they also received support from other organizations apart from the government in the last two years.

Table:31 % distribution of respondents by receiving assistance/support from the government and other organizations in the last 2 years

Respondent's Category	% of respondents who received support from government in the last 2 years	% of respondents who received support from other organizations in the last 2 years
Demo farmers	33.3	100.0
Non- demo farmers	27.9	4.4
Overall	**29.3**	**29.1**

Access to various government schemes

One of the components of the program intervention was to educate the farmers about various government schemes and increase their access to them. The effect of the intervention was somewhat visible in the responses of the farmers when the survey team enquired about their access to government schemes in the last one or two years. The government schemes that the respondents benefitted the most was PDS (91%), MGNREGA (70%) and PMAY (32%). The corresponding figures during the baseline were 31 %, 56 % and 22 % respectively.

Table:32 Access to government schemes (Baseline v/s Endline)

Schemes	Endline	Baseline
Old age pension	1.6	8.22
Widow pension	0.5	1.11
Maternity Benefit	0.5	7.56
Rural Housing (PMAY)	31.6	22.22
Household/Community Toilets	13.5	26.67
Drinking Water	0.0	36.0
Sewage/Drainage	1.4	0.22
Improving Irrigation	0.0	3.11
PDS	91.2	30.67
MGNREGA	70.0	55.56
Skill Development	0.0	0.0

It was learnt that although nearly 70 % respondents possessed MGNREGA cards, only around 13 % of the job card holders stated working under the scheme. On an average, respondents stated getting 32 days of work under MGNREGA (Maximum: 100 days, Minimum: 4 days).

Table:33 % distribution of respondents by access to MGNREGA schemes

% of respondents possessed MGNREGA cards	70%
% of respondents stating doing work possessed MGNREGA cards	13.6
Duration of work/employment	
Mean	32.2
Minimum	4
Maximum	100

While there was substantial increase from the bench mark level in the proportion of respondents accessing MGNREGA, PDS and rural housing, there was decline in those accessing other services like sanitation, drinking water and so on, probably because these pertain to one time infrastructure installations (e.g. toilets, pipelines for drinking water) or enrolments (pensions etc.).

Access to various agriculture related schemes

It may be noted that around 44 percent of the farmers reported having no access to agriculture related government schemes. Among the respondents who had availed government schemes, they were related to seeds and fertilizers (40%), finance (9%), technology (4%) and infrastructure (2%).

Table:34 % distribution of respondents by availing agriculture related government schemes

Respondent's Category	Infrastructure	seeds and fertilizers	Finance	Technology	Do not avail any government schemes
Demo farmers	2.7	33.3	13.5	5.4	45.0
Non-demo farmers	2.2	42.6	8.2	3.4	43.6
Overall	**2.3**	**40.2**	**9.5**	**4.0**	**44.0**

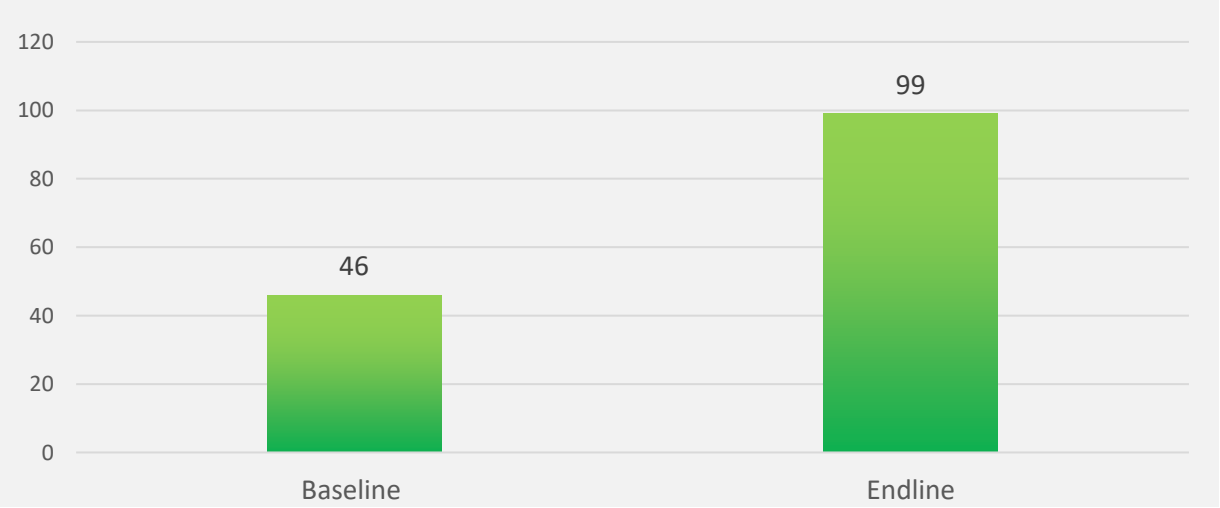
4.4.11 Insurance schemes

The survey data revealed that only 5 % sample farmers had availed the crop insurance. The baseline data also indicates the same value (5%) which means that insurance schemes are yet to become popular among the farmers.

4.4.12 Bank Account

Of the 430 respondents who participated in the survey, 427 (99%) had bank accounts. During the baseline, only around 46 % farmers had bank accounts. This increase could be attributed to the SHGs and Farmers groups constituted under the CCACP and the members of the SHG being educated on financial literacy and bank transactions. Maximum farmers (96%) had opened bank accounts with nationalized banks while 3 % had accounts with Cooperative banks.

Fig:20 % distribution of respondents having access to bank account and type of bank



4.4.13 Loan

Only 51.6 % of the sample respondents (women-97.1%, men-29.6%) stated availing loan in the last two years. All the respondents who took loan stated taking it for farming. The average amount of loan availed by the farmers was to the tune of Rs 43,414. (Maximum: Rs 2 lakh, Minimum: Rs 1000). Maximum respondents (60%) availed loan from Commercial banks and about 39 % farmers borrowed money from SHGs indicating that SHGs have started the activity of inter lending within the group.

Table:35 % distribution of respondents by availing loan in the last two years

% of respondents who had availed loan in the last two years	51.6 (women-97.1, men-29.6)
Amount of loan	
Mean	43,414
Minimum	1000
Maximum	200000
Purpose of loan	
Crop	95.0
Livestock	5.0
Source of loan	
Commercial Bank	60.2
Money Lender	0.0
Co-op Bank	0.9
SHG	38.9

4.4.14 Collectives Platforms

Membership/holding position in collectives

Slightly more than 60 % of the respondents who participated in the survey were not members of any groups. Around 30 % of the respondents were members of Self-help groups and 6 % stated being a part of the farmers groups. 3 respondents stated that they were members of the Gram Sabha. Slightly more than 90 percent of women respondents were members of Self-help groups.

Table:36 % distribution of respondents by membership/holding position in collective/s (n=430)

Collectives	% of respondents stating member of		
	Men	Women	Overall
Gram Sabha Sarpanch	0.0	0.0	0.0
Gram Sabha Panch	1.0	0.0	0.7
Village Development Committee	0.0	0.0	0.0
Water User Association / Water Resource Management Committee	0.0	0.0	0.0
Joint Forest Management Committee	0.0	0.0	0.0
Self-help group (SHG)	0.7	90.6	29.8
Farmers group	8.2	0.0	5.6
Block level organic cotton committee	0.0	0.0	0.0
Others	2.4	0.0	1.6
None	87.6	9.4	62.3

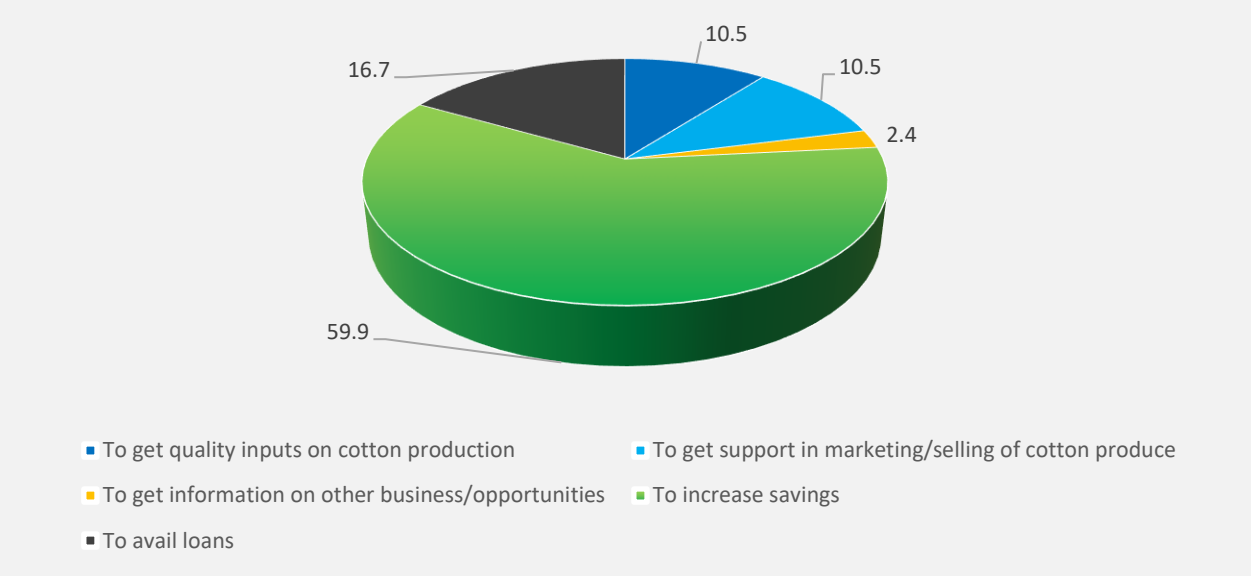
The respondents who were members of different groups or held positions in different committees (162) were asked if they were members before their association with the Sufalam project or after.

Around 92 percent said that they became members of different groups or held positions in committees after their involvement with the project.

Reasons for becoming a member of the group/collectives

More than half of the sample respondents who were members of different groups stated that they became members in order to enhance their savings while around 17 % joined the groups so as to avail loans. About 11 % each stated that they took membership to get quality inputs on cotton production and to get support in marketing of cotton produce.

Fig:21 % distribution of respondents stating reasons for becoming a member of the group



Actions by collectives

An attempt was made to find out if the sample respondents on their own or as a part of collective had taken any initiative for increasing farm wages, negotiating on farm working hours, negotiate with buyers regarding prices and convince farmers not to use children in farming. Maximum respondents (82%) pointed out that they had not taken any initiative or negotiated with anyone on the above-mentioned aspects. Overall, 8 % farmers (Demo farmers: 16%, Non demo farmers: 5%) stated having negotiated to increase farm wages. Likewise, 7 % respondents (Demo farmers: 14%, Non demo farmers: 4%) had negotiated with buyers for getting appropriate price for their produce. Less than 5 % farmers stated negotiating on farm working hours with employers as well as trying to convince farmers not to involve children in their farms.

Table:37 % distribution of respondents stating various actions by them/their collectives

Actions	Demo farmers	Non-demo farmers	Overall
Negotiate for farm wages	16.2	5.6	8.4
Negotiate for working hours with farm owners	6.3	1.9	3.0
Negotiate with buyers for appropriate prices of cotton produce	13.5	4.1	6.5
Convince cotton farmers not to send/take their children for labour work	9.0	3.4	4.9
None	62.2	88.7	81.9

4.4.15 Decision making

Decision on different aspects of cotton cultivation

An attempt was made to find out from the women respondents about their role in decision making with regard to different aspects of cotton cultivation. Around 14 % women stated that they could take decision on their own in picking of cotton. However less than 10 percent women stated being the decision makers on other farming related aspects. Interestingly in the case of most aspects of cotton cultivation, more than 60 % respondents said that the decision was taken jointly by them and their husbands. More than half of the sample respondents pointed out that the decision regarding land preparation and field management was taken by their spouses.

Table:38 % distribution of women respondents by decision making into different aspects of cotton cultivation (n=430)

Aspects	Self	Spouse	Jointly
Seed variety to purchase	1.4	28.1	70.5
Land preparation	3.6	51.8	44.6
Planting	8.6	18.7	72.7
Field management	4.3	55.4	40.3
Use of fertilizers and pesticides	0.7	33.8	65.5
Picking	13.7	30.2	56.1
Machine harvesting	0.7	36.7	62.6
Ginning	5.0	17.3	77.7
Selling/marketing	1.4	37.4	61.2

Involvement in financial decision-making processes

An attempt was made to assess the change in the involvement of the women respondents if any with regard to financial decision-making processes both at the household and farm level before and after the project intervention.

Interestingly, at the aggregate level, before their involvement with the project, only 1 percent women respondents stated their complete involvement in financial decision-making processes at household

level while another 38 % stated that they were involved in decision making, but to a moderate extent. The corresponding figure after the respondents' involvement with the project increased to 19 % and 58 % respectively. In the sample, 23 % women respondents were those who cited no involvement in financial decision making before their involvement with the project which have reduced to 7 % post their involvement.

Table:39 % distribution of women respondents by their involvement in financial decision-making processes ((n=430)

Involvement status	Before	After
Very involved	1.4	18.7
Moderately involved	38.1	51.8
Only involved occasionally	37.4	20.1
Not involved at all	23.0	9.4

During the in-depth interview with the SHG leader in Umapur which is a first-year intervention village, it was learnt that the group members have taken a loan of Rs 1,10,000 from SBI for goat rearing and farming. Each member in the group is able to successfully repay an amount of Rs 650/month. This kind of development signifies the empowerment of women and their becoming self-reliant on financial issues and bank transactions.

Involvement in community level planning and decision-making

Women's involvement in community level planning and decision making has also improved considerably after their involvement with the project. Earlier 18 % women respondents were not involved at all in any kind of community level planning or decision making which has gone down to 8 %. Likewise, as compared to only 44 % women involvement (before), now 68 % women are involved in community-level planning and decision making.

Table:40 % distribution of women respondents by their involvement in community level planning and decision-making (n=430)

Involvement status	Before	After
Very involved	10.8	22.3
Moderately involved	33.1	46.0
Only involved occasionally	38.1	23.7
Not involved at all	18.0	7.9

Raising concern in public forum

Respondents were asked to give a rating about their concerns being addressed in public forums before and after their association with the project. The rating was to be done on a scale of 0 to 5 wherein 0 denotes not confident at all and 5 very confident that their concerns would be addressed. The data reveals that before the project intervention, only 5 percent of the demo as well as non-demo farmers believed that their concerns would be addressed at public forums. After the intervention, while only

12 % non-demo plot farmers felt confident that their concerns would be addressed, 22 % demo farmers felt the same. This indicates that to a certain extent, the project is able to increase the confidence of the farmers.

Table:41 % distribution of respondents by their level of confidence on raising issues in public forums (n=430)

Rating	Demo farmers		Non-demo farmers		Overall	
	Before	After	Before	After	Before	After
0 (Not confident at all)	2.7	0.0	0.6	0.0	1.2	0.0
1	31.5	1.8	17.2	8.8	20.9	7.0
2 (Moderate)	41.4	37.8	54.2	21.6	50.9	25.8
3	19.8	36.9	22.9	57.4	22.1	52.1
4	4.5	21.6	5.0	12.2	4.9	14.7
5 (Very confident)	0.0	1.8	0.0	0.0	0.0	0.5

4.4.16 Change in 'access to savings and credit'

As a matter of the fact, in-spite of women's immense contribution to farming and other household chores, their access to savings and credit remains limited. The CARE India's CCACP project gave an opportunity to the women of the targeted villages to come together and form collective groups/ SHGs. The purpose was to promote the savings habit among them and thereby increase their access to savings and credits. This particular question was asked to know if there has been any change in the women's access to credit and savings as a result of becoming members of saving groups/collectives.

The survey findings indicates that before the project, nearly 42 % of the respondents said that women did not have any access to credit. Interestingly none of the respondents stated the same post project. Likewise, prior to the project, only 2 % pointed out that women had access to credit to a very large extent. Post project, half of the sample respondents believed that they were able to access credit to a large extent. This was ascertained during the FGDs also wherein several women members of SHGs had taken loan from banks for farming and allied activities.

Table:42 % distribution of women respondents stating their access to savings and credit before and after the project

Rating	Before	After
No access	41.7	0.0
Access to only some extent	56.1	50.4
Access to large extent	2.2	49.6

4.4.17 Change in 'access to inputs/assets'

Respondents were asked about their access to farm inputs like improved cotton seed varieties, bio-fertilizers, bio-pesticides, micro irrigation, water harvesting structures, markets, entitlements etc. before and after the project. The data indicates that overall, nearly half of the respondents stated that they did not have any access to inputs pre project. Post project, only 13 % said the same. None of the

respondents had access to inputs to a large extent before the project while after their involvement with the project, around 16 % stated getting access to inputs to a large extent. As compared to the non-demo plot farmers (5%), higher number of demo plot farmers (46%) indicated getting better access to farm inputs post project. This indicates that the project has been able to successfully train and empower the farmers and there has been much improvement in their access to farm inputs.

Table:43 % distribution of respondents stating their access to inputs/assets (improved variety of cotton seeds, biofertilizers, biopesticides, micro irrigation and water harvesting structures, markets, entitlements, etc.)

Rating	Demo farmers		Non- demo farmers		Overall	
	Before	After	Before	After	Before	After
No access	40.5	3.6	48.9	16.3	46.7	13.0
Access to only some extent	59.5	50.4	51.1	78.4	53.3	71.2
Access to large extent	0.0	46.0	0.0	5.3	0.0	15.8

4.4.18 Adaptive Capacity Index

An Adaptive Capacity Index (ACI) score was attempted using the data available from the endline survey. The ACI score used the following determinants for arriving at the score –

1. Asset base
2. Knowledge and information
3. Institutions and entitlements
4. Flexible and forward-thinking decision-making and governance
5. Innovation

Within each determinant, the indicators used are captured in the following table. This was done keeping to the scope of the projects and available data that could be used for consolidation of the score. Thus, a total of five determinants and twelve indicators intrinsic to those determinants were used for scoring.

Table:44 Adaptive capacity index determinants and indicators

Determinants	Indicators
Asset base	1. Adivasi women has access to a bank account 2. Adivasi woman takes a loan from Bank / FI / SHG for meeting her HH needs
Knowledge and information	1. Adivasi woman receives environmentally sound, climate -resilient cotton production practices 2. Adivasi woman is aware of at least three sustainable cotton production practices 3. Proportion of Adivasi women members of collectives able to recall at least one Government schemes related to cotton production

Determinants	Indicators
	4. Awareness about consequences of use of pesticides and fertilizers on surface water
Institutions and entitlements	1. Adivasi women is an active member of functional collectives in the village 2. Adivasi woman is associated with at least one new institution during project period
Flexible and forward-thinking decision-making and governance	1. Adivasi woman adopts at least one water conservation and management practice 2. Adivasi woman has contingency saving
Innovation	1. Adivasi households taking high-density drought -resistant cotton variety 2. Adivasi woman adopts at least one water wastage reduction techniques in on-farm and off-farm practices

The unit of assessment for the endline study were 10 villages where the implementation work had been carried out. Data pertaining to the determinants and indicators from these 10 villages were used for the analysis. A few other indicators were also discussed, but eventually dropped due to inadequacy of data or its relevance. For analysis, we have given equal weightage for each indicator and the direction of the influence for every indicator is positive (plus). The following table provides the normalized and average score for each determinant and indicators –

Table:45 Adaptive capacity index matrix

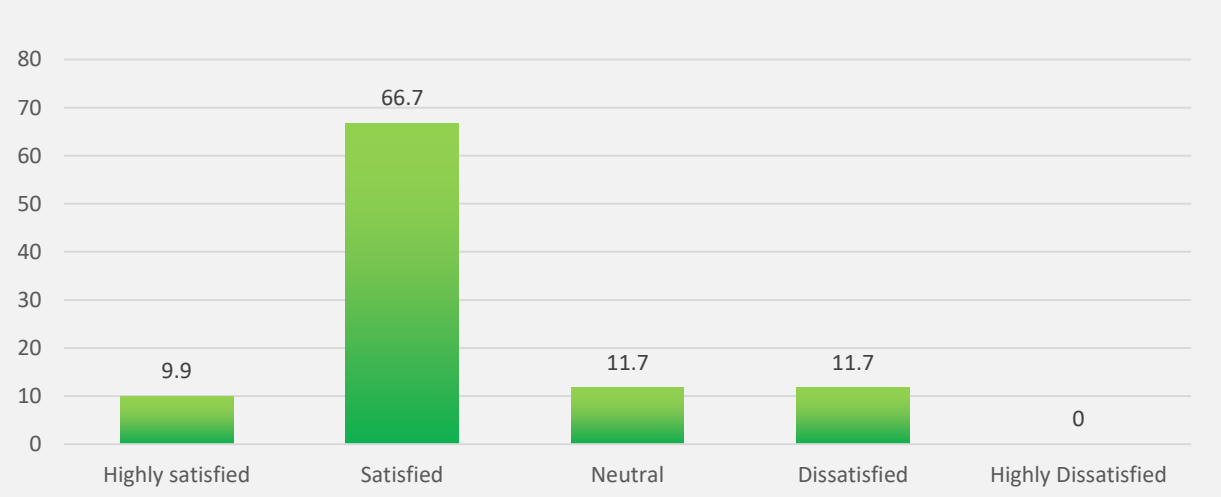
Village	Asset base	Knowledge and information	Institutions and entitlements	Flexible and forward thinking decision making and governance	Innovation	Total score (rank)
Bandapipal	0.94	0.63	0.85	0.71	0.83	0.79 (4)
Charban	1.00	0.52	1.00	1.00	0.91	0.88 (1)
Garpet	0.93	0.85	0.88	0.75	0.79	0.84 (2)
Hanwatkhed	1.00	0.64	0.92	0.68	0.80	0.81 (3)
Islampur	1.00	0.43	0.73	0.79	0.48	0.69 (8)
Nimkhedi	1.00	0.50	0.93	0.46	0.86	0.75 (7)
Rajura Budhru	1.00	0.56	0.85	0.91	0.86	0.84 (2)
Rajura Khurdu	0.99	0.53	1.00	0.74	0.61	0.78 (5)
Umapur	1.00	0.63	0.78	0.67	0.74	0.76 (6)
Wayal	1.00	0.63	0.95	0.87	0.96	0.88 (1)

From the analysis, we see that villages Charban and Wayal have the highest ACI score and got the first rank among all the villages, while Islampur got the lowest ACI score among all the villages. Though the variations are not high, yet one gets a sense of the adaptive capacity existent in all the project villages. The comprehensive ACI score for all the villages is 0.8, which can consider to be reasonably good. This is most likely an improvement over the baseline situation, the ACI score for which could not be computed as village-wise data was not available. However, we can conclude that any improvement would have been a likely outcome of the project interventions and good work done by CARE team in the project location.

4.4.19 Satisfaction with CARE's support

Majority of the sample respondents stated satisfaction with the support and assistance provided by CARE. Around 10 % reported high satisfaction. Around 11 % respondents also pointed out that they were dissatisfied with the support provided by CARE.

Fig:22 % distribution of respondents stating their level of satisfaction with the support provided by CARE India



4.4.20 Summing Up

Very high percentage of respondents affirmed having received technical support and training from the project on summer ploughing, biodynamic composting, preparation of organic pesticides, seed treatment and germination test. Awareness about sustainable cotton production practices shot up from nil level at baseline to 52 % (demo farmers-100%) during endline. Compared to 31 % at baseline, 74 % of farmers at end line were "moderately" aware about general climate change effects. Overall, 61 percent of respondents (90% demo and 51% non-demo) were aware about climate variability, depleting water availability and reduced fiber quality.

Project impact is seen in increase in soil fertility (47 % demo plot farmers and 14 % non-demo farmers); reduction is use of chemical fertilizers (overall 64 percent, 98% demo farmers and 51% non-demo farmers); Fertilizer use has come down from the baseline level of 2.6 quintals per acre to 2.3 quintals/acre (2.2 quintal/acre for demo farmers and 2.4 quintals/acre for non-demo farmers); Reduction in chemical pesticides (76 % respondents overall, 99% of demo farmers). **All the above led**

to overall agriculture productivity and increase in income per unit area." Use of organic manures and pesticides reduced the overall input cost of cotton cultivation from Rs. 17307/- per acre at baseline to Rs. 16793/- at end line, realization of net profit has increased to Rs. 14338/- acre (Baseline- Rs. 11948/-) per acre. The **Social and behavioural changes** included increased awareness of child labour issues, enhanced awareness of government schemes and access to government services, increased membership in farmer collectives (which have only begun to take action on issues of concern).

The proportion of respondents having bank accounts increased from 46 % at baseline to 99 % currently. About one third of the respondents had access to credit, commercial banks being the source for more than 94 % of those who had access. Regarding access to farm inputs like improved cotton seed varieties, bio-fertilizers, bio-pesticides, micro irrigation, water harvesting structures, markets, entitlements etc., nearly half of the respondents did not have any access. Post project, all except 13 % have access. As compared to the non-demo plot farmers (5%), higher number of demo plot farmers (46%) indicated getting better access to farm inputs post project.

Women's involvement in community level planning and decision making has also improved after their involvement with the project (baseline 18 % women had no involvement which have gone down to 8 % currently. The proportion of women having some involvement has gone up from 44 % before to 68 %). Before the project intervention, only 5 % of the demo as well as non-demo farmers could raise their concerns in public forums; more women can now raise their issues in public platforms (12 % non-demo plot farmers and 22 % demo farmers); more women now have access to credit (before the project, nearly 42 % of the respondents did not have any access to credit, now half of the sample respondents were able to access credit to a large extent).

All the above indicates that the project has been able to successfully train and empower the farmers and there has been much improvement in their overall socio-economic conditions.

Section V:

Lessons Learnt and Recommendations

5.1 Taking the project to its logical conclusion

The greatest learning from the project is that organic cotton farming is an effective, efficient and sustainable option for the farming community and once proven its merit, farmers are eager to adopt it. However, the project period was too short to organize and educate the farmers to adopt it in a sustainable manner. The danger is that once project support is withdrawn, the farmers might go back to their old practices in the absence of the required nurturing support. If the support systems can be mobilized, we recommend that this project be further extended for a period of at least three more year or a follow-on project undertaken in the same locality, incorporating the lessons.

5.2 Need for organic certification and non- conventional marketing linkages

Farmers are eenthusiastic about cultivating organic cotton, and have acquired moderate skills on the practices associated with it, namely, use of bio-dynamically composted manure and bio pesticides. However, in the absence of organic certification, they continue to get prices for their organic product on par with Bt cotton. Getting organic certification is a time consuming and cumbersome process, beyond the reach of these resource poor farmers. Some arrangements should be in position to get organic certification for the participating farmers. There is a need to bring farmers in contact with alternative marketing channels like pharmaceutical companies selling surgical cotton. Such companies would be willing to pay the organic cotton growing farmers the incremental price. Scope of organic cotton in medical industry could be researched. Sustainability of the intervention depends much on the access of farmers with such marketing channels that assure them enhanced and competitive price. Organic cotton has specific buyers who are not present in the vicinity of project location. Hence, there is a need for creation of market opportunities in the local area for sale of organic cotton with better price realisation.

5.3 Availability of organic seeds

It is not easy to get organic, climate resilient seeds as these are not locally available. Therefore, for farmers to cultivate organic cotton, arrangements should be made for making these seeds available to them. Tie-ups with Punjabrao Krishi Vidyapeeth or CICR Nagpur could be done to make available climate resilient, organic cotton seeds to farmers.

5.4 Awareness on right dosage of organic inputs

Farmers have learnt to make organic fertilizers and pesticides and are also using it on their cotton crops. However, they do not understand that as compared to chemical inputs, the dosage of organic inputs should be more because the nutrient quantity in chemical fertilizers/pesticides is much higher. Therefore, less quantity of chemical fertilizers would suffice. However, in case of organic fertilizers/pesticides, as the nutrient quantity is less, the dosage that is used should be much higher. Also, there is a need to maintain a continuity when using organic inputs. Farmers need to be educated and trained on these aspects so that they can get the maximum utility/potential of the organic fertilizers/pesticides.

5.5 Organic input production unit

Organic inputs like climate resilient seeds, fertilizers and pesticides are not as easily available as chemical fertilizers and pesticides. Officials of KVKs and NIPHM, Hyderabad could be roped in to train farmers and to provide the culture. Once the farmers are trained, they could be encouraged to set up an organic input production unit in their villages. Another option to procure organic seeds would be to link the farmers with CICR Nagpur as they release new climate resilient varieties of cotton.

5.6 Sensitising farmers about long term benefits of organic farming

An issue with cultivating organic cotton is that the yield/productivity is not high during the first year. The productivity starts increasing after 2-3 years because using organic inputs increases the soil fertility at a slow pace. The farmers are disappointed on seeing the low yield during the first 2-3 years and stop cultivating organic cotton as they do not understand the long-term benefits. Therefore, training and awareness programs should be conducted from time to time to change the mindset of the farmers.

5.7 Financial literacy for women

Although training on financial literacy and leadership skills was imparted to the women members of the SHGs, it was observed that influence of the training was largely on office bearers of the groups (President & Secretary) and they were the ones who had maximum knowledge about bank transactions and savings in the group. More emphasis could be given to make the other members financially literate and to develop their leadership skills. This aspect could be given greater emphasis in the future.

5.8 Awareness about government programmes

Awareness regarding government schemes/programs that support environmentally sustainable and climate resilient agriculture was quite low among the farmers. Officials of the agriculture department, NGOs etc could be approached to educate the farmers on different government schemes so that they can avail the benefits.

5.9 Membership in collectives/committees

Apart from SHGs, women farmers do not have any membership with different collectives. Neither do they hold any positions in the Gram Panchayat or any committees existing in the village. Women could be encouraged to be a part of collectives/committees. The farmer collectives take time to mature and initiate the activities to fulfil their mandate. This is why the collectives were not able to play a major proactive role so far. They need more hand holding support.

5.10 Encourage decision making

Although women play an important role in farming, as far as their decision making on different aspects of cotton cultivation is concerned, it was very low. Women and men could be given some gender sensitisation workshops/training to empower them and to assert a dominant role at both the household as well as the farm level.

5.11 Follow-ups and training

Regular follow-ups of the training imparted to the farmers is very important because they tend to forget the lessons taught to them. Therefore, it would be a good idea to increase the frequency of training and follow-up sessions could be conducted.

5.12 Collaborations/tie-ups with ginning and spinning units

Collaborations/tie-ups with ginning and spinning units could be established with the farmers cultivating organic cotton. If there is a demand for organic cotton and if farmers are able to get the remunerative prices, farmers would be more than willing to cultivate organic cotton.

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