



EVALUATION OF THE EARLY IMPACTS
OF THE BETTER COTTON INITIATIVE ON
SMALLHOLDER COTTON PRODUCERS
IN KURNOOL DISTRICT, INDIA

FINAL EVALUATION REPORT



Authors: R. Kumar, V. Nelson, A. Martin, L. Narayanan, B. Suresh Reddy, D. Badal, A. Latheef and S. Young





Table of Contents

Table of Contents	i	2.9.5 Stages of Research (2015-18)	20
List of Tables	iii	2.9.6 Innovative elements of the research	21
List of Figures	iv	2.9.7 Perspectives on limitations of the research	21
List of Photos	v	2.9.8 Reflections on the Methodology	22
List of Boxes	v		
Acronyms	vi	3. Context Analysis	25
Acknowledgements	vii	3.1 Global Cotton Markets	25
Citation	vii	3.2 Cotton production in India	26
Executive Summary	viii	3.2.1 Area, production and productivity of cotton in India	26
		3.2.2 Use of Pesticides in cotton	27
1. Introduction	1	3.3 The Study Context	28
1.1 Background to the Study	1	3.3.1 The Study area	28
1.2 Better Cotton Initiative	1	3.3.2 Value chain Context	29
		3.3.3 The Role of external factors in adoni cotton	32
2. Research Design	4	3.4 The Study Respondents - Farmer profile and characteristics	33
2.1 Objectives	4	3.4.1 Education	34
2.2 Research Questions	5	3.4.2 Religion and Caste	34
2.3 Overall approach - Theory Based Impact Evaluation (TBIE)	5	3.4.3 Landholding	35
2.3.1. The project theory of change	7	3.4.4 Household size	36
2.4 Evaluation Design and methodology	8	3.4.5 Livelihood strategy	36
2.5 RCT design	10	3.4.6 Gender and social relations	36
2.5.1 Selection of a design	10		
2.5.2 Cluster RCT with matched pair randomisation	12	4. Key Findings	38
2.6 Methods and tools	15	4.1 Implementation of Inputs & activities	38
2.7 Data analysis and Statistical methods used	15	4.1.1 Mobilizing learning groups & Producer Unit	39
2.8 Sampling Design	16	4.1.2 Facilitating Farmer field schools, demonstrations and trainings	40
2.9 Implementation of the field research	19	4.1.3 Developing internal Management systems	40
2.9.1 Household Questionnaire survey	19	4.2 Outputs	42
2.9.2 Focus Group Discussions	19	4.2.1 Learning groups Established	42
2.9.3 Household Case Studies /panel	20	4.2.2 Knowledge & application of better Cotton practices	44
2.9.4 Key Informant Interviews	20	4.2.3 Farmers' awareness & adoption of decent work principles	49



4.2.4	Catalysing partnerships and linkages	56	5.1.3	Outcomes - Economic	83
4.2.5	Enabling mechanisms for farmers	56	5.1.4	Outcomes - Environmental	84
4.2.6	Sensitization of ginners and spinners	58	5.1.5	Outcomes - Social Impact Pathway	84
4.3	Outcomes	58	5.1.6	Outcomes - Value Chain	85
4.3.1	Cost of production	58	5.1.7	Interconnections between the pathways	85
4.3.2	Yield	60	5.1.8	Impacts	86
4.3.3	Fibre quality	61	5.1.9	Ultimate Goal: Sustainable mainstream commodity	87
4.3.4	Improved service provision to the farmers	62	5.2	Analysis of Assumptions	87
4.3.5	reduced Pesticide use and increased bio-pesticide usage	64	5.2.1	Context-based assumptions	87
4.3.6	improved efficiency and balanced fertiliser use	67	5.2.2	Design and implementation assumptions	87
4.3.7	Working conditions for hired labour	68	5.2	Key Findings on the evaluation questions	90
4.3.8	Observance of Health and safety measures	68	5.3	Overall Conclusions	92
4.3.9	Functioning of producer unit	68	6. Recommendations	93	
4.3.10	Licensing & recognition of better cotton in the supply chain	68	6.1	For the Better Cotton Initiative	94
4.3.11	Chain of custody system established with identified gin	68	6.2	For Implementing Partners & National BCI team	96
4.3.12	Improved farmer and household access to markets	69	6.3	For the sectoral stakeholders	97
4.3.13	Collective procurement and sale	69	References	98	
4.4	Impacts	70	Annexes	99	
4.4.1	Cotton profitability	70	A.	Study TOR	99
4.4.2	Poverty Impact	72	B.	Observations on ISEAL common core indicators	100
4.4.3	Food security	76	C.	Better cotton composite index methodology	102
4.4.4	Improved soil health	77	D.	MPI and PPI methodology	105
4.4.5	Reduced incidence of child labour	78	E.	Adoption levels on key 'Better Cotton' practices	109
4.4.6	Reduced discrimination of women	78			
5. Discussion		79			
5.1	Key Findings on the theory of change	79			
5.1.1	Inputs and Activities	79			
5.1.2	Outputs: Participation, Awareness Raising and Adoption	81			



List of Tables

Table 1	BCI Result Indicators for small holders	2
Table 2.	Definition of a 'Treatment': A package designed as per the BCI Principles	11
Table 3.	Stratification Parameters and ranges applied	12
Table 4.	Randomly selected Intervention and Non-intervention clusters	14
Table 5.	Samples at baseline and final evaluation research*	15
Table 6.	Sample size determination	18
Table 7.	ICCC based on baseline data	18
Table 8.	Demographic /socio-economic situation in Adoni (as per 2012 government data)	29
Table 9.	Land profile changes from baseline (2015) to final evaluation (2018)	35
Table 10.	Assessing Implementation	38
Table 11.	Details of learning groups and membership in 2018	39
Table 12.	Farmers reporting on the Farmer Field Books (Focus Group Discussions)	41
Table 13.	Summary of Intervention Village FGD feedback on Learning Groups	43
Table 14.	Analysis of influence of soil, land and education factors in knowledge and adoption levels of treatment farmers	46
Table 15.	Comparative wage rate analysis based on FGDs with men and women farmers /agriculture workers	54
Table 16.	Difference in Final evaluation values and Baseline values of cost of production of various inputs	59
Table 17.	Analysis of influence of soil, land and education factors in cost of production of treatment farmers.	59
Table 18.	Analysis of influence of soil, land and education factors in cotton yields obtained by treatment farmers	60
Table 19.	Pesticide doses of Active Ingredient used by farmers	65
Table 20.	Trend in proportion of farmers reporting excess use of NPK	67
Table 21.	Trend in NPK (kg/ha) use in Adoni	67
Table 22.	Analysis of influence of soil, land and education factors on cotton profits of treatment farmers	70
Table 23.	Annual household income estimation (average for study respondents) from combined primary and secondary income sources	73
Table 24.	Effect sizes and Margin of Error for key outcome indicators	90



List of Figures

Figure 1. Description of Better Cotton Initiative	1
Figure 2. Better Cotton – level of changes in sustainable production and supply	4
Figure 3. Theory of Change of the BCI project	6
Figure 4. Evaluation Framework and Indicators	9
Figure 5. Adoni <i>Mandal</i> – google map – depicting heterogeneity by soil profile	10
Figure 6. Estimators of heterogeneity in Adoni <i>Mandal</i>	10
Figure 7. Stratification approach	13
Figure 8. Schema representing coverage of Focus group discussions in each round of research	19
Figure 9. World Cotton Production and share of India's production in metric tonne (2018/19)	25
Figure 10. Trends in Cotton Productivity in India	27
Figure 11. Intensity of cotton cultivation in Kurnool district (Adoni <i>Mandal</i> indicated by the arrow)	28
Figure 12. Key steps in the generic cotton value chain	29
Figure 13. Cotton value chain map in Adoni /Kurnool (2015)	30
Figure 14. Rainfall pattern of last five years in the study district	32
Figure 15. Education status of respondents (both male and female combined in respondent households)	34
Figure 16. Education status of women in the respondents' family	34
Figure 17. Farmer classification based on total land holding	35
Figure 18. Index values on Overall Knowledge of Better Cotton practices (Rainfed cotton)	45
Figure 19. Index values on overall adoption of Better Cotton practices	45
Figure 20. Cost of Production of cotton per hectare (for the season)	58
Figure 21. Cotton productivity – Lint cotton (kg/ha)	60
Figure 22. Trend in prevalence of use of main pesticide active ingredients in Adoni	65
Figure 23. Trend in gross revenues and gross margin (Rs. per ha)	70
Figure 24. Proportion of households in a profitability range	71
Figure 25. Distribution of MPI weighted scores among respondents from baseline to final evaluation	74
Figure 26. Poverty likelihoods trend	75
Figure 27. Poverty likelihoods trend, among different categories of farmers	75
Figure 28. Poverty rate by education levels	76
Figure 29. Poverty rate among cotton farmers in Adoni, national and international poverty lines	76
Figure 30. Evidence-based Rating Scale* used in assessing progression on the ToC	79
Figure 31. Summary of Findings on the Theory of Change of the BCI project (2015-18)	80
Figure 32. Scales of poverty in MPI	104



List of Photos

Photo 1.	Farmer interview	15
Photo 2.	Household Survey	19
Photo 3.	FGD with women group	19
Photo 4.	Household panel interview	20
Photo 5.	Key Informant Interview	20
Photo 6.	View of seed cotton in a ginning mill	31

List of Boxes

Box 1.	Heavy reliance upon agrochemical pesticides in cotton production, India	27
Box 2.	Summary of LG experiences (FGD data)	42
Box 3.	Better Cotton Composite Index (BCCI)	44
Box 4.	Intervention Village Focus Group Discussions Findings: Feedback on Learning Groups, Awareness and Adoption	46
Box 5.	A limited spread effect – qualitative data	47
Box 6.	Household Case Study Panel Findings on Adoption	48
Box 7.	Examples of practice changes reported by household case study panel farmers as a result of NGO training on BCI practices	48
Box 8.	Barriers to adoption (household case studies)	49
Box 9.	Focus Group Discussions (FGDs) and Health and Safety Issue Awareness and Practice Adoption	51
Box 10.	Focus Group Discussions, Household Case Studies and Provision of Drinking Water to Hired Labourers	51
Box 11.	Focus Group Discussions and Child Labour Findings	52
Box 12.	Household Case Studies and Child Labour	53
Box 13.	Trading relationships with <i>dalals</i> as reported by the study panel	57
Box 14.	Focus Group Discussion Findings on Yields	61
Box 15.	Household Case Study Findings on Yields	61
Box 16.	Agricultural Information, Financial Services and the BCI project	63
Box 17.	The opportunity and barriers to direct sales by farmers to ginners	69
Box 18.	Focus Group Discussions Findings on Cotton Profitability	71
Box 19.	Household Case Studies: Cotton Profitability Findings	72



Acronyms

BCCI	Better Cotton Composite Index	IPM	Integrated Pest Management
BCI	Better Cotton Initiative	IWM	Integrated Water Management
BCFTP	Better Cotton Fast Track Program	LG	Learning Group (also referred to as treatment group)
BL	Baseline round of early impact study	MDE	Minimum Detectable Effect
BPL	Below Poverty Line	MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
CESS	Centre for Economic and Social Studies, Hyderabad, India	NGO	Non-Governmental Organisation
COSA	Committee on Sustainability Assessment	NRI	Natural Resources Institute (University of Greenwich)
CoP	Cost of Production	ODK	Open Data Kit
CSO	Civil Society Organisation	PRDIS	Participatory Rural Development Initiatives Society – Implementing Partner
DCED	Donor Committee on Enterprise Development	PRI	Panchayati Raj Institution
EL	End line of early impact study – the Final Evaluation.	PU	Producer Unit
GIDR	Gujarat Institute of Development Research	RCT	Randomised Control Trial
ICCC	Intra Cluster Correlation Coefficient	SC/ST	Scheduled Caste / Scheduled Tribe
IDH	The sustainable trade initiative, Netherlands	TBIE	Theory Based Impact Evaluation
3iE	International Initiative for Impact Evaluation	ToC	Theory of Change
INM	Integrated Nutrient Management	VSS	Voluntary Sustainability Standard
IP	Implementing Partner (in the BCI project)	WHH	Women headed household





Acknowledgements

The authors are grateful for advice and assistance from many members of ISEAL team - Kristin Komives (Director – Impacts), Marta Maireles (Associate Manager, Impacts) and Vidya Rangan (Sr. Manager, Impacts) and Udit Khare (Associate Manager, Impacts). The research immensely benefitted with inputs, openness and flexibility from the BCI team - Kendra Park Pasztor (Monitoring and Evaluation Manager), Damien Sanfilippo (Director, Standards & Assurance), Rajeev Baruah (Country Manager, India), and Rebecca Aranha (Senior Implementation Coordinator). The research team also acknowledges contribution to the research design and baseline report from 3ie - Heather Lanthorn and Markus Olapade. The research team also collaborated with Daniele Giovannucci of COSA in this endeavour. We greatly acknowledge Daniele's contribution in formulating and harmonising indicators.

The research design and consequent research would not be possible without the receptivity, flexibility and encouragement of the implementing Partner – PRDIS – of the Better Cotton Growth and Innovation Fund (GIF) project. Professor SV Reddy and team from PRDIS have provided sound contributions and suggestions for conceptualising the theory of change and for developing the randomisation approach and research plan. PRDIS team also provided their regular inputs for validation of research findings.

The research team would like to express their gratitude to the 729 farmers (men and women - who participated in the household survey) along with more than 250 other farmers (who participated in focus group discussion and household panel case studies) and more than 100 key informants (who provided their perspective on the cotton value chain). Without their patience, time and perspectives, this study would not have been possible.

Citation

R. Kumar, V. Nelson, A. Martin, A. Latheef, B. Suresh Reddy, L. Narayanan, D. Badal, S. Young (2019) 'Evaluation of the early impacts of the Better Cotton Initiative on smallholder cotton producers in Kurnool district India: Final Evaluation Report'. Commissioned by ISEAL and the Ford Foundation, Natural Resources Institute, University of Greenwich report, Chatham: UK

Production coordinator: Gillian Summers, Natural Resources Institute, University of Greenwich

Art direction: Simon Pointer & Geoff Denney, GDA Creative Design





Executive Summary

This report presents the findings of a three-year study, funded by ISEAL, of the early impacts of the Better Cotton Initiative on smallholder cotton producers in Kurnool District, Andhra Pradesh, India. The project is being implemented by a non-governmental organisation (NGO). The study included a baseline assessment (July to September 2015), an interim monitoring (August to November 2017) and a final evaluation (August to November 2018).

The Better Cotton Standard System is a holistic approach to sustainable cotton production, covering all three pillars of sustainability: environmental, social and economic. BCI aims to transform cotton production globally by developing Better Cotton as a sustainable mainstream commodity.

The study methodology employed theory-based evaluation and a Randomized Control Trial approach, the latter being feasible due to the willingness of the Implementing Partner to rollout their programme using a randomization strategy developed by the evaluation team. A cluster-RCT approach was used with the attribution of impacts of the BCI intervention package analysed by pre and post comparisons between intervention and non-intervention groups. The level of BCI project exposure to the farmers was also assessed. Matched pair randomisation was used based on statistical data (village / cluster wise) from various sources. Observational approaches were employed following the lines of comparison of the experimental design to generate lessons on how and why change has occurred, with methods including a household survey, focus group discussions, household case study panel and key informant interviews. We analysed the data comparing treatment (Learning Group members) and control households, as well as distinguishing the spread effect among farmers who were not part of the Learning Groups but were residing in the intervention clusters. We have used an evidence-based rating scale, with change assessed at four levels to communicate the overall findings.

Context

Since 2015/16, India has been the world's biggest producer of cotton, currently producing approximately 23% of global cotton. Following the introduction of Bt technology in cotton in 2002, there was a significant increase in the area under cotton, volumes and productivity increased (where irrigation and high inputs also contributed). Pesticide use in cotton is high and increasing, presenting threats of pest resistance, new pests, insecticide resistance and disease.

The BCI project, subject of this study, is being implemented in Adoni *Mandal* (population - 250,000 in 46 villages) in Kurnool district, Andhra Pradesh since 2015. Livelihoods are highly

dependent on agriculture, and cotton is the main source of income for most households through production and on-farm hired labour, with migration providing an important safety net and / or alternative livelihood opportunities. Black soils are favourable for cotton production, but most farmers rely on rainfed agriculture. There is a strong informal labour market in the rural areas of Adoni, as well as incidence of urban outmigration.

Findings

Not all the activities anticipated in the project theory of change have been implemented. Therefore, there are elements of the theory of change where no change can be expected or where activities have only recently been initialized and so treatment effects may not be highly visible. Progress has been achieved in terms of some of the anticipated inputs/activities and outputs.

The project has facilitated the establishment of 98 Learning Groups, reaching 3,425 farmers. Women's participation is very low. The intensity of exposure (i.e. more farmers getting more treatment) to trainings and demonstrations has increased over time from a low level. Integrated Pest Management and Soil Health-related practices have been the focus of the project, with decent work initiated only in the third year. The Producer Unit has been established and has been licensed to sell Better Cotton in the 2015-16 and 2017-18 season. Women were 6% of the total membership at final evaluation stage (2018). An Internal Management System has been established, but it requires improvement, one of the challenges being the widespread illiteracy of farmers. The quality of training and demonstrations has been limited, with a lack of farmer level follow-up and continuous support from IP project extension staff, plus there are opportunities for more experiential learning to be facilitated. For example, facilitation of joint learning plot experimentation by farmers as part of a Farmer Field School (FFS) was not observed. Partnerships to address issues related to decent work have recently been formed. More intense support on the ground for cotton farmers is needed to achieve capacity and practice change. Value chain, markets and financial linkages have not been created to date.

As a result of the project inputs and activities, **knowledge levels on Better Cotton practices have significantly increased for treatment farmers.** Awareness levels have significantly increased for treatment farmers on a range of practices such as preparation of bio-pesticides, the use of neem oil, balanced use of fertilisers, inter-cropping, border crops, refugia crops, cleaning and grading of cotton etc. However, the spread of knowledge on 'Better Cotton' practices is largely limited to men, with limited participation of women in the Learning Groups or information sharing in the household.



Similarly, adoption levels have increased. Treatment (Learning Group members) farmer level adoption is significantly higher than for other groups of farmers. The BCCI¹ adoption score has improved from 0.46 to 0.71 for treatment farmers and from 0.53 to 0.62 for control farmers. A clear correlation is seen between treatment exposure and knowledge and adoption levels. However, the consistency of adoption by farmers appears to be variable, plus poor rains and indebtedness may have prevented some farmers from adopting. Entrenched beliefs about pesticides and yields are difficult to overturn, particularly in a context in which farmers' main source of extension advice is from private agrochemical input dealers and commission agents, with whom so many farmers are trapped in debt relationships and forced to sell to them, with little negotiating power. Some farmers report being unconvinced by what they have heard from Implementation Partner field facilitators. According to the questionnaire survey, **treatment farmers did experience a slightly lower increase in the costs of production compared with control groups, as well as slightly better yields** (not statistically significant) and slightly higher profits from cotton. The differences are not very large, which may affect the motivation of farmers to adopt and sustain the full set of Better Cotton practices and for others to also take up such practices. The qualitative research, conducted in a period of late/poor rains, captured more negative perceptions of cotton farmers in terms of yields and cotton profitability, as well as continued plans amongst most farmers to continue in cotton production. Despite all the challenges, cotton production over a sequence of several favourable seasons with good rainfall, can allow farmers to clear their debts and build up assets, although in recent times some farmers (from both treatment and control groups) have been forced not only to seek alternative employment, but to sell their lands outright. It is to be noted that a spread effect is also seen, with farmers who reside within the intervention clusters, but are not part of the Learning Groups. This effect is due to the spread of messages within the cluster through farmer to farmer interactions, and also due to IP teams' openness to provide support and guidance to all farmers, irrespective of membership in Learning Groups. In some cases (e.g. knowledge and adoption levels), the spread effect is also statistically significant when compared to the status with control group.

The BCI project prioritised Principle 1 of the BCI standard, i.e. minimising the harmful impacts of crop protection practices, and some significant results are being achieved in terms of the reduced proportion of treatment farmers using cocktail applications of pesticides. **The study results show a marked reduction in doses of all pesticides used (except Imidacloprid and Fipronil)**

by treatment farmers. Also, treatment farmers are reducing the doses of *monocrotophos*² significantly more than the control farmers. Such changes are known to have environmental benefits. Similar levels of reduction and appropriate use of chemical fertilisers is not observed.

Given that activities and inputs on decent work have only begun in earnest in the last year, it is unsurprising that there are few changes observed in relation to decent work. Awareness of child labour issues appears to have risen in the treatment areas, but it is not possible to validate changes in practices and the qualitative data is somewhat mixed. It is too early to know if the interventions on child labour have been effective or not, but there are issues of practicality and affordability for migrant workers in particular. There were limited changes observed with respect to other aspects of decent work, in terms of working conditions, wages for hired labourers, non-discrimination against women, and health and safety measures both for smallholder producers and hired workers.

In terms of farmer enabling mechanisms (market and finance linkages), the Farmer Producer Organisation or Farmer Producer Company is yet to be registered. **In terms of value chain sensitization, limited activities have been undertaken in terms of informing ginners, and the latter are highly numerous and fragmented.** Ginners have not received market signals from spinners, who in turn have not received market demand from international buyers. Ginners note the opportunity for direct sales by farmers, providing cost savings for both the ginner and farmers.

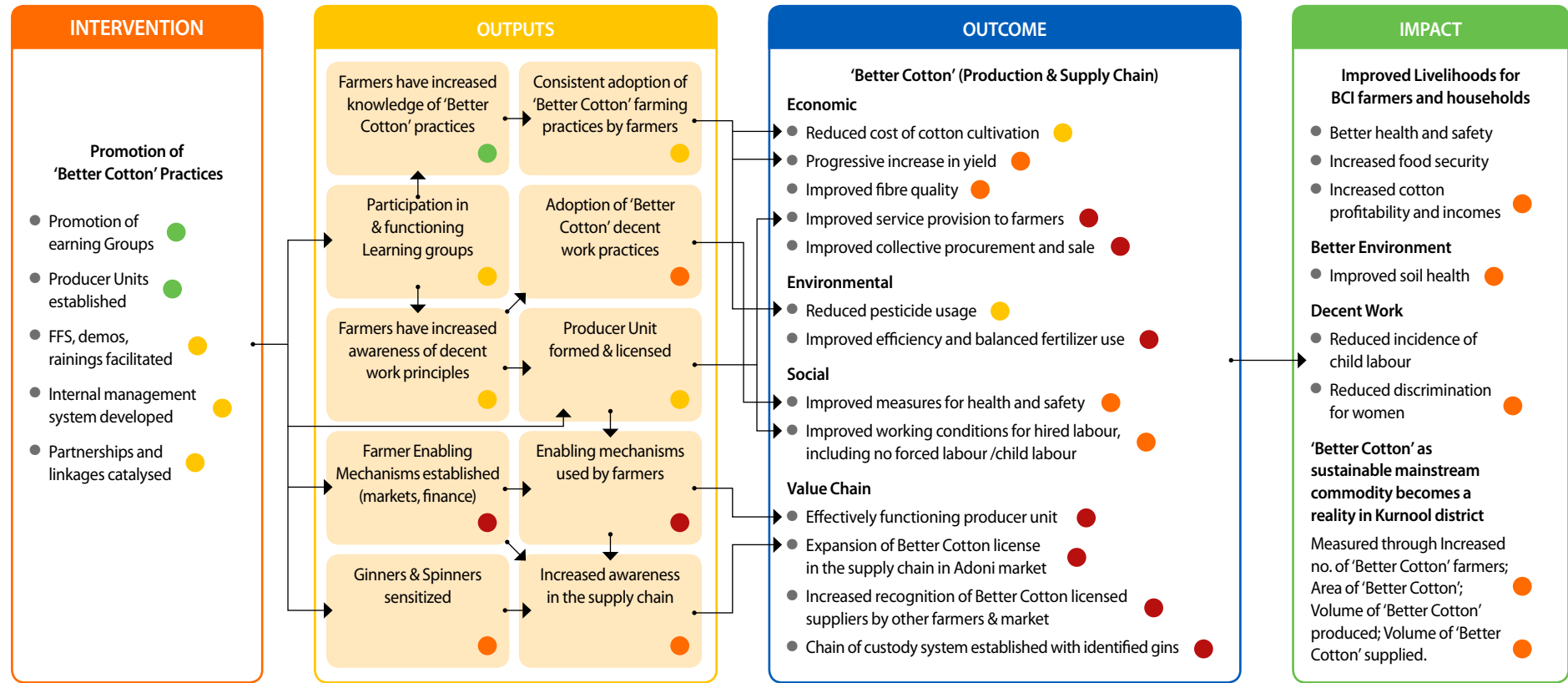
The Theory of Change anticipates all four impact pathways (economic, social, environmental, value chain) working together to achieve desired outcomes and impacts. There are some outcomes related to implemented interventions where changes are beginning to be seen, such as changes in awareness resulting from training on Integrated Pest Management. However, **in other areas of the theory of change it is too soon to expect change to have occurred, and/or non-implementation of parts of the theory of change, such as enabling mechanisms and value chain sensitization**, has undermined achievements in the areas which have been implemented, such as training and adoption of promoted practices. In general, there is no evidence that desired impacts have been achieved, but this should also be contextualized in terms of the partial implementation of the theory of change and a recognition of the time taken to change farming practices and build farmer organisations in contexts of high levels of poverty and illiteracy.

1. The research team developed an index called the Better Cotton Composite Index (BCCI) which tracks every member of the learning group, (as well as those who are not part of the learning group in the intervention set and those belonging to the 'control' set) in terms of their knowledge and application of BCI recommended practices. A score of '1' on the index means that the farmer (or a group of farmers) is following more than 80% of the recommended 'Better Cotton' practices. A score of '0' means that the farmer (or group of farmers) in question do not follow any of the relevant practices.

2. A pesticide acutely toxic to humans and birds, which is banned in the USA and Europe, but which is still available and approved for use in cotton in India.



Theory of Change: Summary of Evidence



- Significant change observed (Green dot)
- Limited change observed (Yellow dot)
- A small change observed (Orange dot)
- No /negligible change observed (Red dot)

Figure 3. Theory of Change of the BCI project



BCI does not have a clear definition of sector change. **Although the Implementing Partner has been successful in reaching 3,425 farmers, this is only a proportion of potential farmers in the Mandal, and to date not all farmers reached have changed their practices.** Beyond simple scaling in terms of the numbers of farmers participating and the area farmed using Better Cotton practices, sector level change can also be analysed in terms of whether systemic changes have been achieved, which can help to move a sector to a new state, for example, through multi-stakeholder dialogue, coordination and social learning processes can potentially contribute to policy and regulatory reforms and improved policy and regulatory implementation.

To answer the evaluation questions, impacts are yet to be felt as a result of the BCI project, but this does not mean that with more time and a fuller implementation of the theory of change that such effects could not be achieved. **At outcome level, economic benefits are being achieved, although of limited magnitude so far. Social outcomes are very limited, but implementation has only recently got underway. On environmental variables, pesticide use has been reduced, but the optimised use of fertiliser has not improved.** The Producer Unit is not yet fully functional and will take time to develop and begin to offer services to members. There has been an expansion in the farmers participating in the project and who are now part of the Learning Groups and Producer Unit. However, market demand is not apparent and uptake in the value chain has not yet occurred for reasons covered above. Benefits and costs for value chain actors cannot be articulated by these stakeholders, due to the lack of market signals from buyers and/or sensitization by the project. However, ginners expressed their interest, if the Producer Unit were able to offer adequate supply, as they can avoid certain costs through direct purchase. Farmers can potentially benefit from direct sales, by avoiding the commission and interest rates of commission agents, to whom many are highly indebted, but this has not yet occurred.

Key Recommendations

1. **BCI should strengthen its approach to sector transformation in its theory of change, flowing into the design of specific projects.** The study demonstrates that the following are necessary to realize meaningful benefits for farmers to incentivize more consistent and widespread changes in their farming practices:
 - a. improvements in farmer access to services, such as improved access to finance, collective input sourcing and marketing are required to improve farmers' returns and

help them to escape indebtedness, improved access to climate services to strengthen climate resilience, and improved access to livelihood diversification opportunities in contexts of climate change.

- b. producer organizational development is critically important to build viable producer groups that can help deliver such services to farmers, to strengthen internal accountability to members and to increase their bargaining power in the value chain and capacity to engage in direct sales to ginners and to access finance etc;
- c. affirmative measures on gender equity from the outset, to avoid re-enforcing inequalities and to maximize women's participation in better cotton farming processes and outcomes.
- d. strengthening the business case via market demand measures and engaging value chain actors for enhanced coordination and sensitization, to increase demand for sustainable cotton, to build support for direct sales opportunities and fair contracts to realize higher benefits for producers.
- e. advocacy measures for more supportive national government policies and legislation in consumer and producer countries. Relevant policy issues include social protection, infrastructure, agricultural extension provision, climate information services, regulation of the private sector in agrochemicals, land governance, supportive taxation and procurement policies;
- f. develop partnerships and learning between development actors to facilitate delivery of services to farmers, enhancing farmer bargaining power, tackling gender equity and child labour issues to support learning, more effective joint responses and advocacy. At a local level, an area-based approach is proposed.
- g. Invest in monitoring, evaluation and learning systems that include tracking of systemic change: Build up the MEL system to support improvement and enhance BCI impact. This should include assessing transformative change both in area-based projects, but also at national scales and globally. This would begin with setting out the kinds of transformative change that is envisaged and identifying the specific contributions of BCI and those actions that others may need to undertake, which BCI can lobby for. Emergent change indicators should be identified to capture 'early' changes on systemic issues.



2. BCI projects should pilot the adoption of an area-based approach based upon a social learning approach and if successful, seek to roll this out. A key strength of BCI is in its relatively flexibility for local interpretation responding to local contexts. This study shows that many challenges are both context specific, but also require simultaneous actions by different stakeholder groups to achieve desired goals. Thus, learning, coordination and motivation are needed for success. We suggest piloting an 'area-based' approach, with the following features:
 - a. BCI should invest in bringing together key stakeholders in a geographic target area, ideally prior to project design, but also on a continual periodic basis, to enable joint analysis of problems and development of solutions. This should include projections of future scenarios for the geographic area, including the implications of a changing climate, plus biodiversity and land degradation trends.
 - b. A social learning approach involves structured facilitation of such learning processes between different kinds of stakeholders, building trust and new relationships, but, done well, can also challenge received wisdom to positive effect, and builds ownership and motivate action, including at policy levels. Overall, this has the potential to improve BCI project implementation.
 - c. A diversity of stakeholders should be supported to participate. All key stakeholders, including farmers, ginners, spinners, buyers from the outset to ensure that diverse perspective are engaged. Farmer representation should include women farmers and marginalized groups. Value chain, government and civil society actors should be involved. By engaging value chain actors, including buyers, there is the potential to support coordination and information sharing along the value chain, but ultimately commercial actors will respond to the strength of the business case in making decisions. Such an approach should involve local authorities and state governments to encourage favourable procurement and policy reforms, which have been shown in wider evidence to advance the effectiveness of sustainability standards by creating a more level playing field. Further, such an approach could help to identify and build area-based partnerships from the outset to address decent work, market and financial linkages.
 - d. The methods for facilitating learning should be tailored to context, designed by participants and reflect their needs: Learning should move beyond workshop-based events, to include field visits and creative approaches to surfacing diverse understandings and solutions, and should seek to unearth the root causes of unsustainable cotton production and systemic responses.
 - e. Initial engagement and on-going reflection for adaptive management: An area-based approach would involve facilitation of initial stakeholder problem analysis and solution identification in an area where BCI intends to intervene, leading to an initial project design. But it is not a one-off process, but it should continue with regular collection of monitoring data linked to regular stakeholder reflections upon the project theory of change to enable adaptive management. Contracts for project implementers should enable such flexibility.
3. **BCI should recognize the climatic challenges faced by farmers and support climate resilience interventions to strengthen farmer resilience, including for some, livelihood diversification away from cotton.** Analysis of climate projections should be a key part of an area-based approach in which stakeholders review climate projections and explore scenarios for the geographic area to understand the implications and options for sustainable cotton farming. BCI should support enhanced access to weather and seasonal forecast information by integrating this in the BCI theory of change (under service provision for farmers) and may require partnerships with meteorological agencies. Exploring livelihood diversification strategies as part of a farming system approach is also important, beyond the focus solely on cotton for all farmers.
4. **BCI should strengthen project design and implementation. The BCI project theory of change should flow from an area-based approach involving stakeholder participation and social learning.** Project designs should set out how all key components of the agreed theory of change will be delivered and by whom, accompanied by realistic assessments of stakeholder capacity and the time taken to achieve change in poor rural areas that are largely reliant on rainfed agriculture. BCI in each focal country should seek to undertake national level advocacy as well as supporting engagement of state or provincial level governmental bodies, and support value chain coordination. It should facilitate or provide



oversight of the area-based approach in specific target areas and support reflection and learning processes to improve implementation on an on-going basis. Adequate support and oversight should be provided for implementing partners to ensure they have access to key capacities and capabilities, including adequate resources.

5. **BCI should conduct a review of the most effective approaches to agricultural extension and ensure that area-based processes have access to such information to inform project design.** Given the centrality of agricultural extension to any BCI initiative, it is important to ensure that the most effective approaches are being employed. The approach in the current study did not include strong experiential learning as facilitated in farmer field schools and farmer networks, yet the latter may be more effective in achieving change in contexts where there are strong countervailing forces, in combination with changes in farmers' access to services and bargaining power, such as farmers trapped in debt relations with commission agents and heavily reliant on private input dealers for advice and inputs.
6. **BCI should support market demand-side measures for 'Better Cotton' and seek to demonstrate the business case.** Key avenues include engaging national and meso-scale government bodies in producing countries- an area-based approach would support coordination amongst such entities either to enforce better cotton standards in a jurisdiction and/or to support scaling via integration into public procurement policies. Changes may be required in policies and regulations, but also engaging buyers is a key strategy, combined with consumer, government and buyer awareness and market-building campaigns in consumer countries. Changing global market trends mean that a focus on Asia is likely to be important in terms of engaging consumers and buyers.





1. Introduction

1.1 Background to the Study

The ISEAL Alliance Secretariat works with its sustainability standard members on various projects aimed at strengthening their approach to M&E systems, learning more about the impacts of standard systems, and determining how to increase the effectiveness of standards. The 'Demonstrating and Improving Poverty Impacts' (DIPI) project, has this aim and is funded by the Ford Foundation. Through this project, ISEAL and six of its forestry and agriculture members (4C Association, Fairtrade International, Forest Stewardship Council, Rainforest Alliance, Union for Ethical Biotrade, UTZ Certified) are working together to evaluate the contribution that certification systems can make to poverty alleviation and pro-poor development and to drive improved livelihoods for those working primarily in agriculture and forestry, through improved impacts of certification. The Better Cotton Initiative (BCI) has joined the project in its second phase, where the focus is on measuring the contribution of certification to pro-poor development and testing impact evaluation methodologies.

ISEAL has commissioned a consortium led by the Natural Resources Institute of University of Greenwich, and including the Gujarat Institute of Development Research, the Centre for Economic and Social Studies, and Pragmatix Research and Advisory Services, to conduct a study of the early impact of pre-certification technical assistance and certification on previously uncertified smallholders. The research is focused on a Better Cotton Initiative (BCI) project, being implemented by a BCI partner (PRDIS) in Adoni *Mandal*, Andhra Pradesh, India. The project is funded by the Better Cotton Growth and Innovation Fund (GIF).

The baseline study was conducted in 2015, interim monitoring in 2017, and the final evaluation was conducted in 2018. This report presents the results of the final evaluation.

1.2 Better Cotton Initiative

The Better Cotton Standard System is a holistic approach to sustainable cotton production that covers all three pillars of sustainability: environmental, social and economic. At the time of starting this research, BCI did not have an explicitly expressed theory of change. The BCI system overall explains the intent of the cotton sustainability standards. Six components make up the Better Cotton Standard System:

- i. Principles and Criteria
- ii. Capacity Building

3. The standard was revised by BCI during the period of the study in 2018-19.

- iii. Assurance Programme
- iv. Chain of Custody
- v. Claims Framework
- vi. Results and Impact

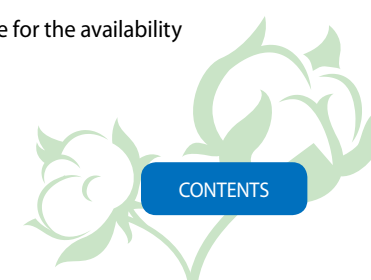
BCI states that Better Cotton exists to make global cotton production better for **the people** who produce it, for **the environment** it grows in, and better for **the sector's future**. Better Cotton is an agricultural management system defined by:



Figure 1: Description of Better Cotton Initiative

BCI aims to transform cotton production globally by developing Better Cotton as a sustainable mainstream commodity. Its ambition is to transform the cotton production sector. The Better Cotton Principles & Criteria provide a framework for cotton farmers and partners to make sustainability improvements. BCI aims to coordinate a sustainable financial model that channels funds from membership and public-private partnerships back into the supply of Better Cotton through farm-level capacity strengthening and verification. BCI's ambition is to transform the cotton production sector. The Better Cotton Principles & Criteria provide a framework for cotton farmers and partners to make sustainability improvements. The Better Cotton Principles and Criteria Version 1 lays out the global definition of Better Cotton, by upholding the following six principles³:

1. Better Cotton is produced by farmers who minimise the harmful impact of crop protection practices.
2. Better Cotton is produced by farmers who use water efficiently and care for the availability of water.





3. Better Cotton is produced by farmers who care for the health of the soil.
4. Better Cotton is produced by farmers who conserve natural habitats.
5. Better Cotton is produced by farmers who care for and preserve the quality of the fibre.
6. Better Cotton is produced by farmers who promote Decent Work.

How BCI works / Structure of BCI

In this particular case, BCI has funded a project, which is being implemented by an Implementing Partner (IP) called PRDIS. The latter has facilitated the creation of a Producer Unit (PU) of farmers. The PU is made up of about 100 Learning Groups (each having 35-40 farmers), which are formed within target villages.

BCI intends to achieve a number of sustainability outcomes in this project. The following have been identified as relevant for the context of this evaluation of this particular project:

- Enhanced financial profitability for farmers producing Better Cotton is demonstrated
- Children in Better Cotton communities exercise their right to education
- Working conditions are improved in Better Cotton farms
- Better Cotton is produced by farmers who minimise the harmful impact of crop protection practices
- Better Cotton is produced by farmers who use water efficiently and care for the availability of water
- Better Cotton is produced by farmers who care for the health of the soil and conserve natural habitats

BCI has a number of sustainability indicators to help them track progress towards their intended sustainability impacts. Some of those indicators, Results Indicators, are fully integrated into the Better Cotton Assurance Program to ensure that sustainability improvements are adequately measured everywhere Better Cotton is produced. Each season, Producer Units collect this data from a representative sample of participating farmers and report it to BCI.

Table 1. BCI Result Indicators for small holders

Results Indicators	Measurement	Smallholders
Pesticide Use	Kilograms/hectare/for each active ingredient	√
Fertiliser Use	Kilograms/hectare/for N, P, K	√
Water use for Irrigation	Cubic metres/hectare	√
Yield	Total cotton produced in kilograms of lint/total cotton production in hectares	√
Profitability	Gross margin/hectare	√
Elimination of Child Labour – A. Leveraging partnership with local specialist organisations	Existence of partnership(s) established by or on behalf of the Producer Unit with credible social organisations to address child labour, in particular to identify and reduce barriers to formal schooling.	√
Elimination of Child Labour – B – Improving understanding and awareness	Percentage of farmers who can accurately differentiate between acceptable forms of children’s work and hazardous child labour	√
Inclusion of women	Number of farmers and workers receiving BCI training who are women by training topic	√

Source: BCI

The key components of the BCI project interventions based on which the theory of change is devised are as follows:

- **Interventions designed and implemented around BCI Standards** (6 principles as listed in version October 2013)





- **Interventions following an Assurance Programme:** This included 3 levels of assessment - Self-assessment, 2nd party credibility checks - BCI or partners and 3rd party verification by independent verifiers. The system mandates following requirements as per the assurance programme:
 - Better Cotton performance scale = Minimum Requirements + Improvement Requirements
 - Minimum Requirements = Minimum Production Criteria (MPC) + Management Criteria + reporting on result indicators
 - Producer units need to comply with minimum requirements to earn the Better Cotton licence.
- **Interventions report on result indicators after every season's harvest:** The 8 result indicators (shown in Table 1) are around three dimensions:
 - Environment: pesticide, fertiliser, water,
 - Economic: yield, profitability
 - Social: Decent work – leveraging partnership with local specialist organisations, improving understanding and awareness, women's inclusion in BCI activities

As per Better Cotton Chain of Custody (CoC) Guidelines⁴ - Between the farm and the gin, BCI requires a product segregation CoC model. This means that farmers and ginners need to store, transport and process Better Cotton (seed cotton and lint cotton bales) separately from any conventional cotton. This ensures that all Better Cotton bales produced by participating gins are 100% Better Cotton and can be traced back to licensed BCI Farmers. After gin level, BCI requires a mass balance CoC model to be implemented. Mass balance is a volume-tracking system that allows Better Cotton to be substituted or mixed with conventional cotton. However, it ensures that the quantity of physical cotton sold with a Better Cotton claim cannot exceed the quantity of cotton purchased with a Better Cotton claim (accounting for relevant conversion rates). BCI measures the Gin Uptake Level (GUR), or the percentage of Better Cotton produced that is procured by ginners.

4. The Better Cotton Chain of Custody Guidelines were revised in early 2018 and v1.3 was released on 1 May 2018, to be effective by 1 August 2018. This revision focused on restructuring the document to remove duplicative and outdated requirements, provide key clarifications, and further clarify responsibilities for control of Better Cotton between farm and gin level. This version also included new mandatory timelines for entering data into the Better Cotton Platform (BCP, formerly the Better Cotton Tracer) and expanded mandatory use of the BCP in the future.



2. Research Design

The full research design can be found in the research design document. In this section we provide an overview update on the research design – research objectives /questions, theory of change, Randomised Control Trial (RCT) design, methods and tools, sampling design and on implementation of the field research.

2.1 Objectives

The overarching goal of the study is to examine the impact that becoming and being licensed under BCI's sustainability standard has on cotton farmers and their households. The four main primary objectives of the study are to:

- i. Measure the attributable impact on cotton farmers and their households;
- ii. Assess the potential benefits that the Producer Unit and Producer Company will bring to cotton farmers;
- iii. Improve understanding of the added value and specific contribution of being included in the BCI system;
- iv. Identify lessons from the programme and impact evaluation approach of voluntary sustainable standards.

Two further secondary objectives of the study are:

- To improve understanding of how market dynamics in Kurnool and the livelihood context in the area are likely to have affected observed outcomes;
- To assess the strength of the BCI system and its implementation model, suitability of project design, the Better Cotton sustainability and its effects on the cotton supply chain in Kurnool

There are also additional learning objectives for this study, namely:

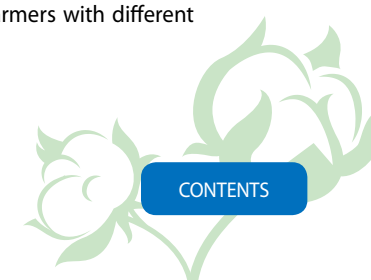
- Testing selected ISEAL common core indicators and reflecting on how well they work and how best to report on observed results;
- Facilitate discussion of the maintenance of counterfactuals in quasi-experimental and experimental research designs;
- Testing the use of qualitative approaches to answer research questions that cannot be examined solely through a quantitative approach;
- Insights on the production of informative research reports, with clear, transparent results and communicable stories and experiences, to help ensure the influence of the research both within the standard system organisations and beyond.

The research has observed /measured changes in sustainable production and supply of 'Better Cotton' at three levels – farm/ household, Producer Unit and cotton value chain levels as depicted in Figure 2.



Figure 2. Better Cotton – level of changes in sustainable production and supply

The study has examined how participation and outcomes differ across farmers with different poverty profiles and starting level of assets.





2.2 Research Questions

In line with above evaluation objectives, the study research questions are as follows:

- To what extent has the **process of becoming or being licensed under BCI sustainability standards had an impact** (positive or negative, expected or unexpected) upon smallholders (farmers and households) in Kurnool district? What are the economic (yield, productivity, incomes, food security) and social (child labour, farm workers, no discrimination in wages for women) impacts?
- To what extent do we see an **improvement in environmental variables** connected with cotton production (optimised use of fertiliser use, reduction in pesticide use, efficient water use, soil health, habitat /biodiversity)?
- To what extent can the **Producers Unit and Farmer Producer Company 'empower' cotton farmers** and households – both economically and socially?
- Can we see an **increase in Better Cotton availability and uptake** in the district /beyond? How can this be strengthened? What are the relative benefits and costs of meeting BCI standards and achieving licensing for intended beneficiaries and supply chain actors?

2.3 Overall approach - Theory Based Impact Evaluation (TBIE)

In order to be able to measure and attribute impact, but also to understand what has created impact and identify lessons, the study employs a theory-based evaluation approach. The theory of change lays out the anticipated chain of inputs, outputs, outcomes and impacts, and the causal linkages between them. By identifying this expected impact chain and the associated assumptions inherent within it, we can gather and use evidence to establish whether the theory of change holds true and where it does not, i.e. where there are weak linkages, as well as unexpected and unintended consequences of the intervention. The theory of change allows for consideration of the relative contribution of the intervention vis-à-vis other interventions.

Through the combination of theory of change, which allows us to understand how impact has or has not been achieved, together with a randomized control trial (RCT), the latter enabling a rigorous attribution of impact - we can assess the impact of the intervention – in this case the BCI project implemented by PRDIS.

A Randomized Control Trial (RCT) was found feasible primarily due to the willingness of the Implementing Partner to rollout their programme following a randomization strategy identified by the evaluation team. As BCI and Implementing Partner targets and resources are limited for Kurnool, in terms of outreach to farmers, randomisation is a fair approach to reach out to farmers and households (not unfair to other farmers not selected). The research team along with the Implementing Partner considered various options for randomization before finalizing the most suitable approach for the context of the BCI project.

A cluster-RCT approach is used with the attribution of impacts of the BCI intervention package analysed by comparison of pre- and post-situation of 'treated' farmers, and pre and post comparisons between intervention (treatment) and non-intervention (control /counterfactual) groups. The level of exposure of farmers to the project has also been assessed so that the analysis takes account of variations in implementation.

Qualitative research methods were employed (following the lines of comparison of the experimental design) to interrogate the theory of change – to assess what change has happened and why, through focus group discussions, household panel interviews and key informant interviews. Based on various interviews, the evaluation team conducted extensive context analysis to understand the context of implementation, unexpected outcomes, and the relative influence of different drivers of change.

The baseline study was conducted from July-September 2015 (recording data on cotton season in 2014-15), an interim monitoring was conducted in 2017 and the final evaluation (end line) was conducted in 2018 (recording data on the cotton season in 2017-18).



The envisaged theory of change of the BCI project is described in Figure 3.

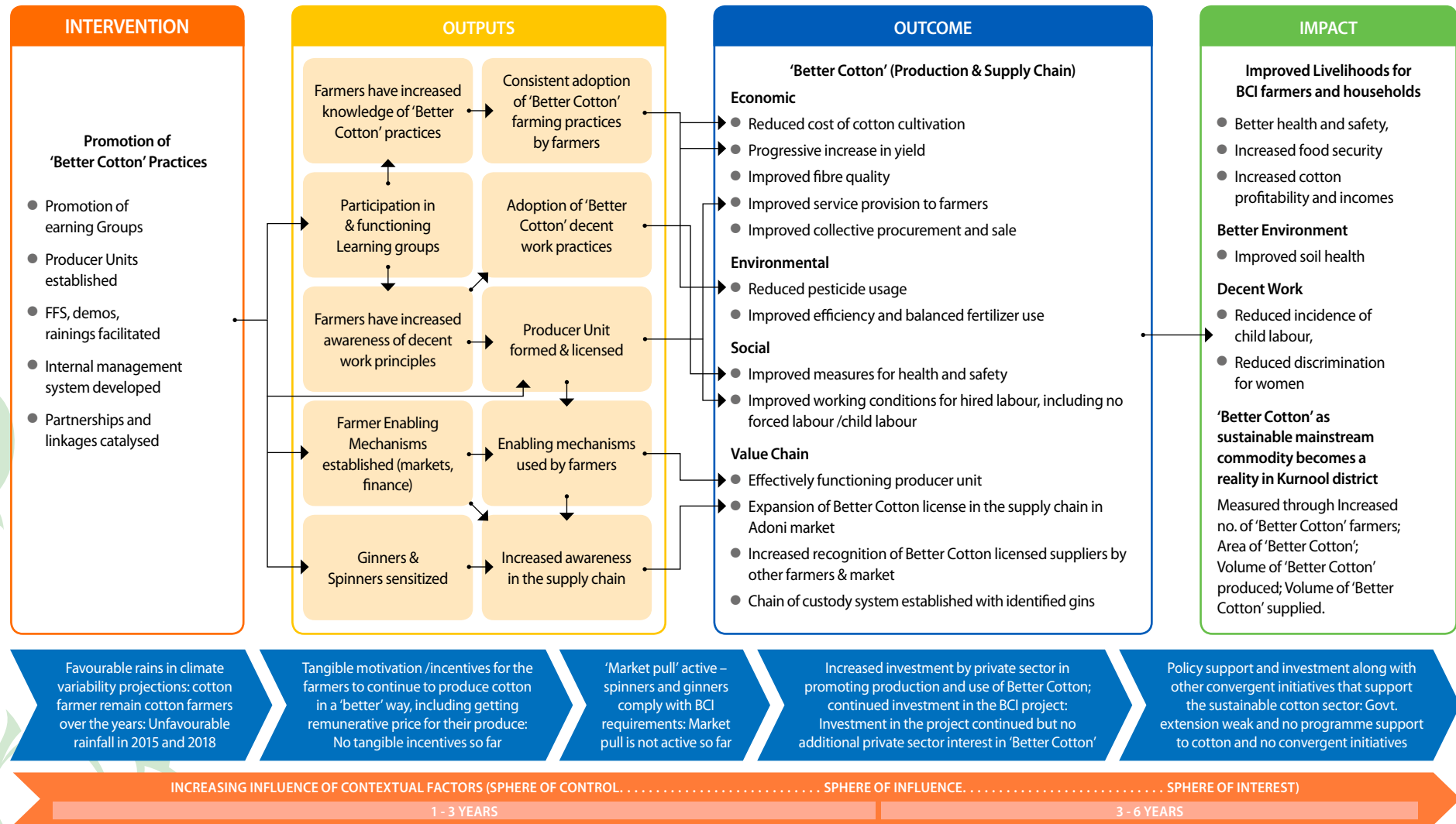


Figure 3. Theory of Change of the BCI project



2.3.1. The project theory of change

The theory of change reflects how BCI and PRDIS have envisaged the roll out of the project and how results will be achieved (in terms of what will lead to what) over a period of time. Clearly the theory of change starts with host of interventions by the BCI project for promoting knowledge and consistent adoption of Better Cotton practices. The route to promotion of Better Cotton practices is the formation of a Learning Group and later a Producer Unit and includes various agriculture extension approaches like Farmer Field Schools, demonstrations and exposure visits. With capacity building support, the farmers are motivated to adopt as they start seeing the benefits of being Better Cotton farmers. According to the PRDIS team, a reduction in the cost of production of cotton is the key outcome which will motivate increasing number of farmers to join the learning groups and to try and meet the BCI standards. Therefore, the incentives for the farmer lie in saving inputs costs. Inter-cropping (with red gram /pigeon pea, green gram and other crop combinations) can also provide additional returns (estimated⁵ at about Rs.10,000 to 15,000 per ha) to cotton farmers. With a portfolio of agronomic practices⁶ improving soil fertility and cotton fibre quality, the progressive realisation of increased yields and better returns from cotton farming is expected to be achieved.

The flow of economic benefits to the cotton farmers in Adoni is expected and intended to simultaneously lead to positive environmental outcomes and impacts. Farmers realise economic benefits when they reduce their use of inputs, such as pesticides and fertilisers, at the same time stabilising /progressively increasing yields through improved soil fertility management - which in the long run is expected to improve soil health. Alongside the economic and environmental benefits accruing, social benefits are also intended from the BCI intervention package. Practices promoted by BCI include those related to improving working conditions (e.g. ensuring workers have access to safe drinking water) and better health and safety (e.g. the safer use of pesticides, the non-use of pesticides banned / prohibited by BCI standard, the non-application of pesticides by children and pregnant women etc.). The BCI intervention package also intends to lead to reduced discrimination in wages for women along with prevention of forced labour on the cotton fields. These are expected to be achieved through a series of interventions related to awareness raising and extension among the BCI farmers in the Learning Group /Producer Unit.

The achievement of social standards is anticipated as enhancing the well-being of smallholder cotton farmers and hired labourers on their cotton farms.

The theory of change also envisaged how and when the impact pathways identified above may not occur. If the assumptions implicit within the theory of change do not hold true, then the result transitions (from inputs to outputs, from output to outcomes, and from outcomes to impacts) may not happen. For example, in the process of implementation, contextual realities on the ground (irregular rainfall, wild animals affecting crop, unethical business practices of input dealers promoting their products etc.) may mean that changes are not observed. Many other assumptions, if not true, may compromise the achievements on the ToC, e.g. ineffective implementation may mean that expected results are either not achieved or a lower magnitude of results is achieved. There could be unanticipated or unexpected results. In some instances, projects may achieve their outputs, but the expected outcomes do not occur, because the assumptions that are implicit within the theory of change are found to be false.

Each transition in the theory of change has an assumption associated with it that must hold true for observable outcomes and impacts to be found in practice (see Figure 3 on page 6). Moving along the theory of change the influence of contextual factors becomes more important – thus there are limits to the accountability of any development intervention. Each project has a sphere of control (inputs and outputs) and a sphere of influence (outcomes) and sphere of concern (impacts) which are distinguished in the analysis of evidence captured aligned with the ToC.

Favourable rainfall is a key assumption as cotton farmers wait for the signs of rains before sowing cotton seed. If the rains fail, some of the cotton farmers may choose some other crop instead, or leave the land fallow. For the theory of change to function effectively in practice, there is an inherent assumption that farmers will have tangible incentives of sufficient magnitude to continue to produce cotton in a 'better way', such as cost savings from reduced input use, maintained or improved productivity, and access to extension services. Similarly, ginners and spinners need a business case to follow chain of custody requirements and to engage in direct trade with farmer groups. If the brands demand a supply of Better Cotton through their vendors / supplier, then the 'market-pull' will start working throughout the supply chain, engaging ginners and spinners to participate in the BCI cotton value chain.

5. By PRDIS team

6. As recommended by BCI and developed over a period of time by the implementing partner. These practices have been well-proven to improve soil fertility status and cotton yields by the pre-BCI and BCI projects implemented by PRDIS. These practices include those which are also being promoted by the state government of Andhra Pradesh and state agriculture universities. This alignment ensures the scientific validity of the practices being beneficial in improving sustainability in cotton farming and also yields and incomes. The household research instrument was designed to capture the knowledge and application levels of these practices by the cotton farmers giving the baseline and final evaluation status which are used in making inferences regarding impact of the BCI project.



While designing the ToC, it was realized that achieving its intent may take more time than the three-year phase of the research, e.g. mainstreaming of BCI sourcing in Kurnool will take longer than the duration of this study. The early impact study was designed to identify and capture early signs of change in this direction.

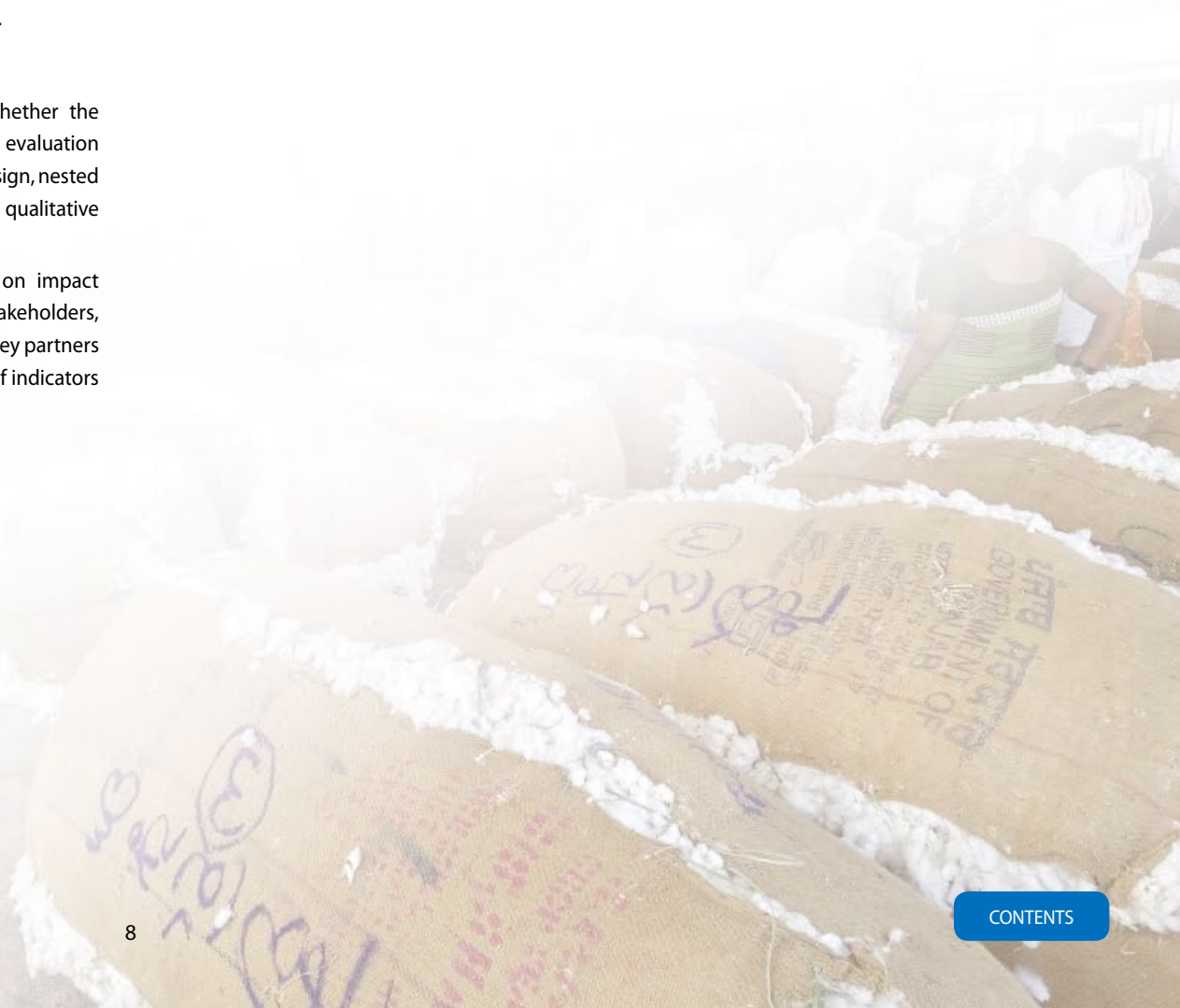
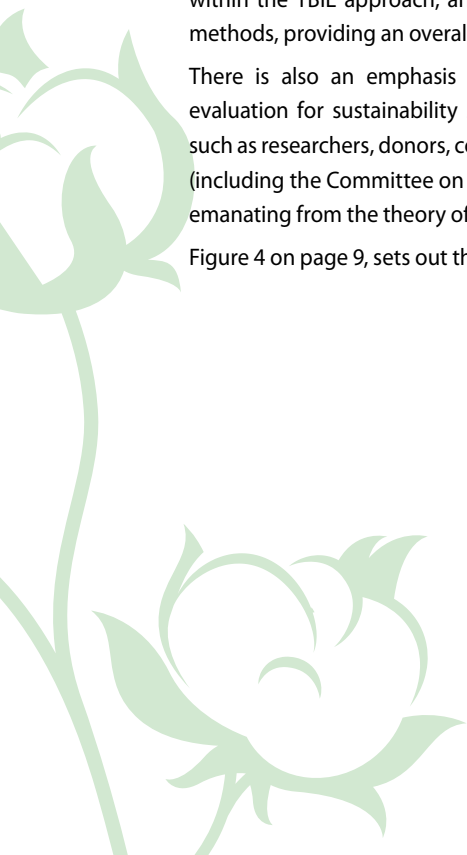
As the intervention package involves a number of different intervention areas and consequences, it is possible to identify impact pathways, while also recognizing the inter-relationships between them. We have included these analyses in each of the relevant sections of the report.

2.4 Evaluation Design and methodology

Theory based impact evaluation should enable understanding, not only of whether the intervention has or has not had an impact, but – and as importantly – how. The evaluation emphasizes rigour and the study design includes a Randomized Control Trial (RCT) design, nested within the TBIE approach, and associated also with a mixture of quantitative and qualitative methods, providing an overall highly credible approach to the impact evaluation.

There is also an emphasis on informing learning and knowledge generation on impact evaluation for sustainability standards and collaboration with other interested stakeholders, such as researchers, donors, companies etc. The research team, in consultation with key partners (including the Committee on Sustainable Agriculture - COSA), has developed a set of indicators emanating from the theory of change.

Figure 4 on page 9, sets out the selected indicators linked to the Theory of Change.





Evaluation Framework: Demonstrating and Improving Poverty Impact of Sustainability Standards

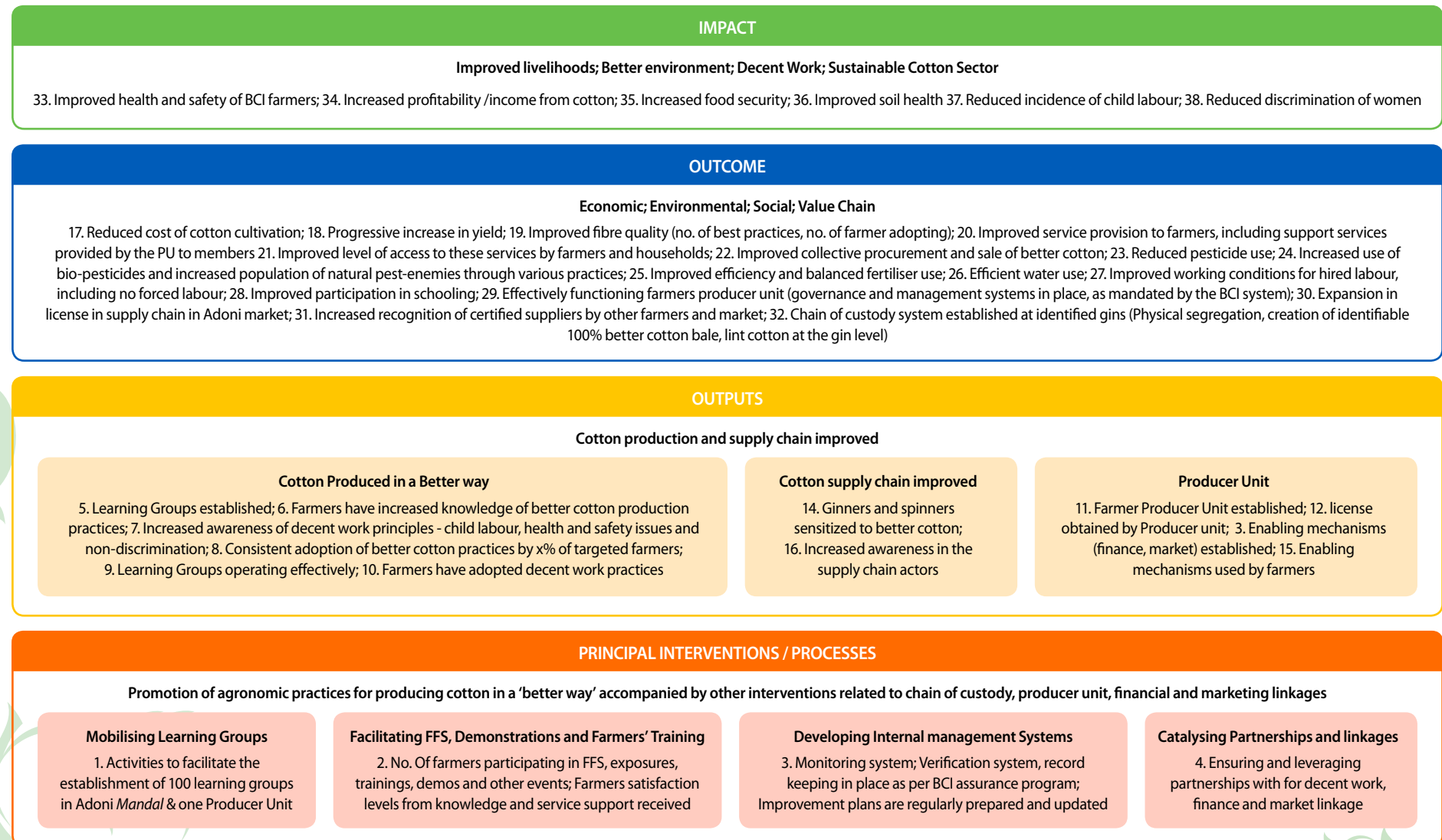


Figure 4. Evaluation Framework and Indicators



2.5 RCT design

2.5.1 Selection of a design

The success of any evaluation study is contingent on its ability to credibly identify the effects of the project, controlling for bias caused by the selective choice of project beneficiaries, or by correlation of treatment status with other omitted variables which may independently affect the outcome of interest. The BCI project's and Implementing Partner's (PRDIS) willingness to select 'beneficiary' farmers randomly from within Adoni *Mandal* has allowed the construction of 'intervention' and 'comparison' groups which provides the basis for a credible evaluation, based on a comparison of outcomes across the two groups, as explained above.

Various options for randomisation were considered and assessed. A homogeneous situation on the ground would have permitted a simple randomisation approach, but this was not the case (see google map depicted in Figure 5).

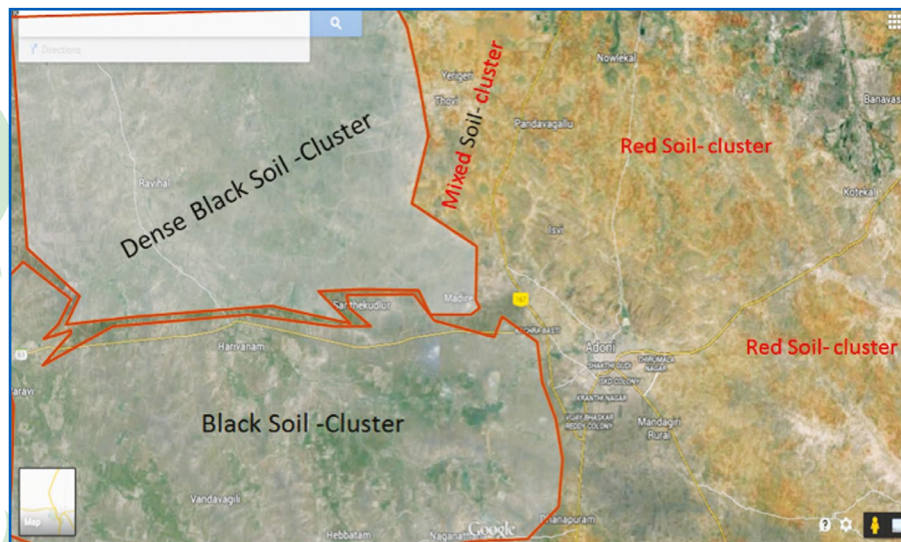


Figure 5. Adoni Mandal – google map – depicting heterogeneity by soil profile

A situation of diverse heterogeneity was found during the scoping study for designing the research which indicated that a cluster RCT approach could be more appropriate. Figure 6 demonstrates the initial estimates (drawn from government data) of heterogeneity in the *Mandal*:

- **Village - Household No.:** 16 to 853 (Avg. 366)
- **Landing size:** 1 to 5 a. (69% small holders <2 ha)
- **Population Profile:** 12 villages with tribal population (otherwise predominantly SC villages)
- **Village Area:** 50000 ha to 5627 ha; Average - 1205 ha)

- **Soil Profile:** vastly variable
- **Cotton Intensity:** vastly variable dependent upon soil profile
- **Irrigation:** irrigated area 2175 ha
 - 15% have assured (tube well); some also have access to canal irrigation
 - Variable across villages e.g. Virupapuram: 17 ha, Madire: 152 ha (111 canals)

Figure 6. Estimators of heterogeneity in Adoni Mandal

A pipeline randomisation approach was not found to be suitable at that time (2015) as there was some uncertainty regarding the continued flow of BCI investments into the area. The Implementing Partner (PRDIS) was expected to reach 10,000 farmers over the next five years, however the committed funding was for one year for 2,000 farmers. The subsequent year's resources were to be made available to the Implementing Partners based on assessment of work over the previous year. With an annual funding cycle, it was not possible to be certain of the next five years of progressive investment aimed at spreading 'Better Cotton' work in various parts of Adoni *Mandal*. Designing a pipeline randomisation approach was therefore not feasible at this stage.

Another option of multiple treatment arms was considered. The BCI system mandates implementation of an integrated package of services (see Table 2).





Table 2. Definition of a 'Treatment': A package designed as per the BCI Principles

<ul style="list-style-type: none"> ● BCI Principle-1: IPM - Reduction in pesticide use, Proper and safe use (registered, labelled, non-use of banned pesticides), inter- crop, border crop (both know-how and do-how)
<ul style="list-style-type: none"> ● BCI Principle-2: INM - Soil test based nutrient application, timely application, Composting, deep ploughing, crop rotation, repeated inter-cultivation, green manure, mulching (sun hemp and `diancha`), residue management, plant population, gap filling with other legumes, drought management, flood management
<ul style="list-style-type: none"> ● BCI Principle-3: IWM - Water conservation, water use efficiency measures
<ul style="list-style-type: none"> ● BCI Principle-4: Biodiversity - monitor land use /conversion as per national convention, flora and fauna (improvement criteria 4.1), community biodiversity committee (composite of learning groups)
<ul style="list-style-type: none"> ● BCI Principle-5: Fibre Quality - Clean harvest and storage solutions
<ul style="list-style-type: none"> ● BCI Principle-6: Decent Work - Hazardous work, alleviating discrimination

Other actions:

<ul style="list-style-type: none"> ● Chain of custody: Segregation at farmer field and at gins levels
<ul style="list-style-type: none"> ● Learning group, Producer unit: lead farmer development, FFS and other extension approaches, collective marketing, financial linkages, licensing process

The discussion with PRDIS clearly indicated that it is not possible to undertake a few selected interventions from this integrated package as the outcomes of BCI approach are crucially dependent on implementing multiple interventions with a group of farmers. Also, it was clear from the scoping visit that implementing a few interventions within one area (constituting one treatment arm) and a few other interventions in a second area (constituting a second treatment arm) and then the integrated package in a third area (third treatment arm) was eminently impractical from the BCI point of view. Therefore, it was realised that taking

different treatment arms was not appropriate given the integrated package being applied uniformly as per the BCI mandate.

Matched pair randomisation was considered and found to be suitable as we could gather observable or statistical data (village-wise) from various sources (though it was very difficult to do so given that the state of Andhra Pradesh was being divided that time and the available datasets were in a reconciliation process for the new state). At this point, we realized that the broader design needs to be a cluster⁷ RCT, within which a matched pair randomisation approach would improve the precision of selection of non-intervention clusters, closely matched in characteristics to the intervention clusters. Matching was done based on available data from secondary sources. A cluster RCT design is an appropriate design given the specific heterogeneity within a broadly homogeneous *Mandal*. We performed post hoc tests, such as Tukey HSD, after the baseline study and found differences among treatment and control groups to be low indicating effectiveness of matching. This provided us confidence in generating approximately unbiased estimates of the effects of treatment in the final evaluation research.

The cluster RCT is expected to reduce or eliminate the influence of confounding variables as cluster-based randomisation ensures that the randomly assigned clusters represent all typical situations available in the *Mandal*. The cluster RCT design can address the control of the spread effect to a certain extent as the clusters are spread out across the *Mandal* since they are selected based on stratification using bio-physical and socio-economic parameters and not on the basis of geographical proximity. Despite this spread of project locations creating logistical challenges for the Implementing Partner, the PRDIS team expressed their willingness to go for this design in order to maintain the rigour of the site selection.

It is important to mention here that a village is a cluster and the unit of random assignment, as methodologically it was not possible to randomly assign farmers /households to the intervention within a village, given the saturation approach. The saturation approach entails targeting all farmers for the programme, wherein a few joins voluntarily in the first year and then progressively more become part of the project-promoted Learning Groups /Producer Unit in the second and third year. The unit of intervention by the BCI project is the Learning Group (member households within the Learning Group). The unit of assessment and analysis for this study is the household, Learning Group and clusters.

7. A cluster is the technical term used for describing the RCT method. The cluster in the case of the study is the 'village' which is the unit of randomisation.





2.5.2 Cluster RCT with matched pair randomisation

The Implementing Partner wanted to prioritise black or mixed soil areas in the first phase of project implementation⁸ (first 3 years) and hence this bio-physical measure (dense black, medium black, mixed soil) was used as a filter to create the universe for random selection of the clusters /villages. The sampling universe of 21 clusters (so obtained after applying the filter) was divided into the 10 best matched pairs (using existing bio-physical and socio-economic parameters) and then from each pair, a treatment and control cluster was randomly assigned. The following steps were used in implementing randomisation using cluster RCT design with matched pair randomisation:

Step - 1: Eligible clusters /sampling universe identified:

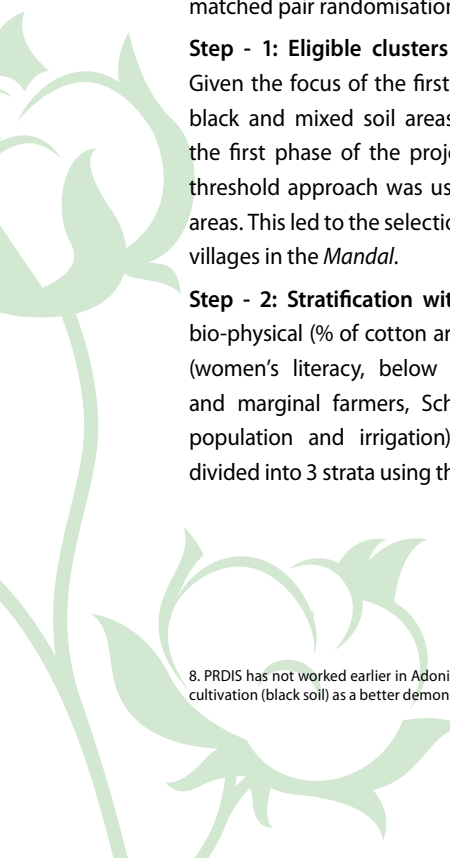
Given the focus of the first phase of the BCI project on the black and mixed soil areas (avoiding the red soil areas in the first phase of the project) within the *Mandal*, a raised threshold approach was used to filter black and mixed soil areas. This led to the selection of 21 clusters from 46 clusters /villages in the *Mandal*.

Step - 2: Stratification within the eligible clusters: Using bio-physical (% of cotton area /farmers) and socio-economic (women’s literacy, below poverty line households, small and marginal farmers, Scheduled Caste /Scheduled Tribe population and irrigation) parameters, 21 clusters were divided into 3 strata using the following criteria:

Table 3. Stratification Parameters and ranges applied

Three Cluster Criteria for sampling purpose	Stratum 1 < Best characteristic strata >	Stratum 2 < Medium characteristic strata >	Stratum 3 < Lower characteristic strata >
Bio-physical measures			
Total Land under cotton (ha) (2012)	60% >	< 30% -60%	< 20% -30%
% of Cotton farmers of the total farmers of the village	60% >	< 30% -60%	< 0%-30%
Socio-economic measures			
% of Literacy of Female (% of total female -Population)	30% >	< 10% -30%	< 0%-10%
% of Cotton farmers of the total farmers of the village	60% >	< 30% -60%	< 0%-30%
% BPL HHs of the village	10% >	< 5% -10%	<0%-5%
% SC Population	30% >	< 10% -30%	< 0% - 10%
Numbers of Small and marginal farmers (<2 ha)	< 40.01% and Above	< Between 20% -40%>	< Less than 20% >
% of farmers using assured irrigation for cotton	5% >	< 3% -5%	Up to 3%

8. PRDIS has not worked earlier in Adoni *mandal*. The BCI project will face the additional challenge of not much governmental or NGO intervention in agriculture or cotton sectors. This as per PRDIS necessitates interventions in areas which are recommended for cotton cultivation (black soil) as a better demonstration effect can be created in these areas within the *mandal*, consequent to which more mixed soil and red soil areas can be added to the project in subsequent years.



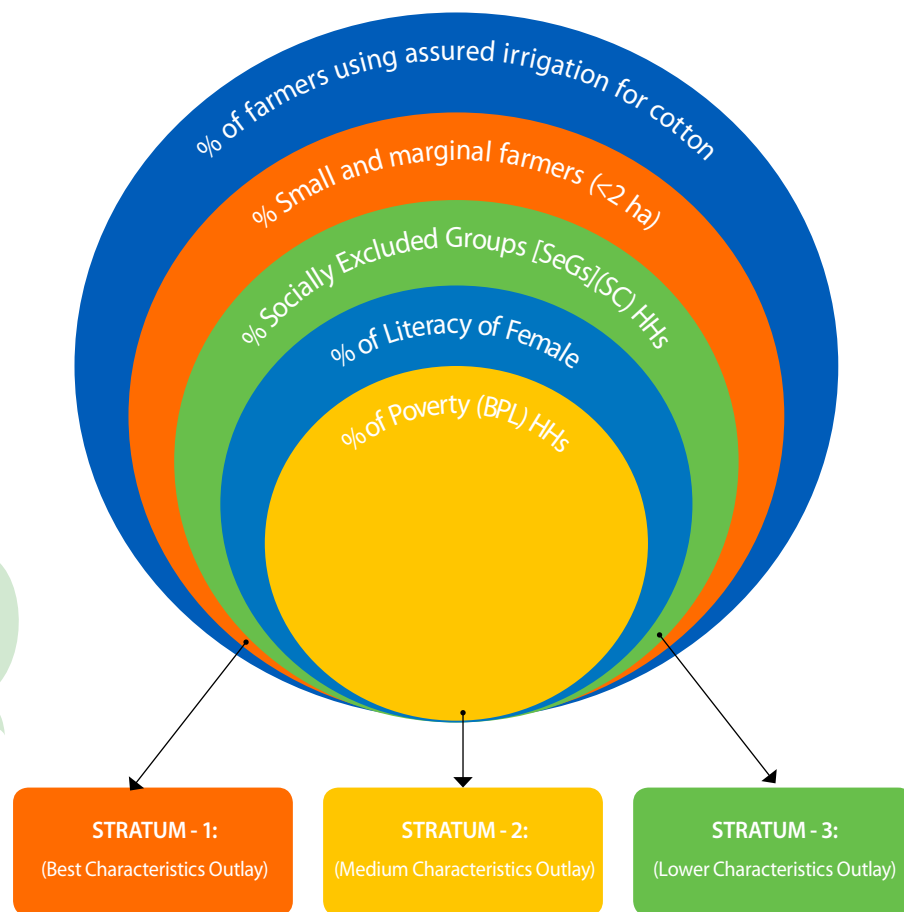


Figure 7. Stratification approach

Step - 3: Matched pair of clusters: Step-2 led to assignment of six clusters in stratum 1, four in stratum 2 and eleven in stratum 3. By using STATA 12, best matched pairing was carried out among the clusters within a stratum and thereby three pairs were formed in stratum 1, two in stratum 2, and 5 in stratum 3.

Step - 4: Random selection of pair of clusters: The Implementing Partner wanted to cover 2000 to 3500 farmers within the following three years. This level of coverage is mandated by BCI for formation of one producer unit. Given the expected level of outreach, it was decided by the Implementing Partner to focus the implementation on five clusters to begin with (2015-18). This would provide adequate coverage even considering that only about 70 percent of cotton farmers voluntarily join the BCI project (within a selected cluster) and stay with it over three years. With this approach, three pairs of clusters were randomly selected from stratum 1, one was randomly selected from stratum-2 and one was randomly selected from stratum-3. The decision regarding unequal allocation of implementation clusters across stratum was taken jointly with the Implementing Partner. This was considered justified from an implementation point of view as Adoni was a completely new area for PRDIS and for BCI to begin the implementation of sustainability standards. The Implementing Partner wanted to focus on relatively more clusters which represent the best characteristics for cotton cultivation and where small holder farmer households were relatively large in number. Given that BCI intends to continue to invest in the *Mandal* in later years, this programme strategy would allow better upscaling and expansion of programme area post 2018. These random assignment rules were agreed by the Implementing Partner.

Step - 5: Random assignment of treatment and control cluster within a matched pair: As a result of step-4, we obtained random selection of three pairs of clusters in stratum-1, one pair in stratum-2 and one pair in stratum-3. Within each of these 5 pairs of clusters, one cluster was assigned randomly to intervention (treatment) and the remaining one was assigned to non-intervention (control). Therefore, in this way, the BCI project in Adoni got the randomly selected five intervention clusters and we obtained five intervention and five non-intervention clusters for the early impact study.



**Table 4. Randomly selected Intervention and Non-intervention clusters**

Sr No	Stratum	Best - Paired Clusters	
		Cluster / Village Names*	
1	Stratum 1	Balladur	Naganathana Halli
2	Stratum 1	Dhanapuram	Madire
3	Stratum 1	Chinna Harivanam	G.Hosalli
4	Stratum 2	Pedda Thumbalam	Chinna Gonehal
5	Stratum 2	Virupapuram	Billekallu
6	Stratum 3	Pedda Harivanam	Ganekal
7	Stratum 3	Hanavalu	Kadithota
8	Stratum 3	Kuppagal	V.Kondapuram
9	Stratum 3	Pandavagallu	Santhekudlur
10	Stratum 3	Yadavalle	Jalibenchi
11	Stratum 3	Salakalakonda	-

Green coloured – Intervention cluster; Yellow coloured – Non-intervention cluster

Step - 6: Random selection of designated number of households within a village –

We used stratified random sampling for selecting the respondent farmer /households from among those who had joined the BCI project in the first year and from the subset of farmers

who had not yet become part of the BCI project and might join it in subsequent years. The stratification was done using land holding criteria, women headed households and caste. We applied the same stratification in non-intervention clusters, the only difference being that the non-intervention clusters had no Learning Group and therefore all the cotton farmers within the non-intervention cluster were listed and then stratification criteria applied to them, after which the study sample was randomly selected. The stratification is generally understood as improving precision of the sample and therefore statistical power of the study.

In the intervention clusters, we used the database of LG farmers and added to this database the list of farmers who had not yet become part of the Learning Group (but might do so subsequently). We then applied a *population proportion to size* (PPS) sample selection procedure to select the approximate number of already LG and not so far LG (called non-LG or spread group) farmers. We had to carry out this procedure as the BCI project was following a 'saturation' approach, meaning that all farmers within a village were targeted to 'voluntarily' join the Learning Groups (in other words, the treatment cohort). We drew a sample from those who were already part of LGs and from those who could potentially become part of LGs subsequently. At the baseline round (2015), this sample taken from both LG and non-LG participants was treated as the 'Treatment' group as no intervention had begun at that time. At the final evaluation stage (2018), it became known that some of the non-LG samples had become part of learning groups, while some had not. This means that at final evaluation we have three distinct groups:

- **LG:** those who have received various direct intervention as per the package described above. This is a pure treatment group.
- **Non-LG /Spread Group:** those are part of the treatment cluster but have not become part of LG yet and therefore are not receiving any direct interventions. As this group is residing close to the LG participants, a high likelihood of a 'spread effect' is there on this group of farmers. This means this group can neither be treated as a 'treatment' nor as a 'control' group. Therefore, this group of farmers are considered as a 'Spread Group'.
- **Control:** This is the counterfactual. Here the farmers are part of non-intervention clusters, where by design, BCI project has not made any intervention.



Table 5. Samples at baseline and final evaluation research*

Group	Baseline (2015)	Final evaluation (2018)
Control Farmers	367 (12)	352 (11)
LG Farmers (Treatment Group)	216 (8)	223 (5)
Spread Group Farmers	146 (2)	120 (2)
Grand Total	729 (22)	695 (18)

*figures in bracket denote number of first respondents who are female

The study design, having an additional spread group, offers advantages. The saturation approach of the BCI project meant that we were expected to measure how the spread of LG membership happens over a period of time, when farmers voluntarily join LGs, learning from their fellow farmers. We have tracked this process, even though we now know that very few additions to LGs happened over three years as the BCI project changed its strategy and expanded horizontally instead i.e. to other clusters within the Adoni *Mandal*. As a result of having this additional comparative group (spread group), we have measured the spread effect within the treatment cluster. This could provide some evidence to the BCI, in terms of alternative implementation approaches - area based saturation approach versus working only with licensed entities.

2.6 Methods and tools

The research was conducted at household level as well as with farmer groups (Learning groups in the intervention area and a non-specific group of farmers in non-intervention area). Three rounds of research were done over 2015-18 - baseline (2015) and final evaluation (2018), with a subset sample based interim monitoring (2017). The following tools were used in the research:

- **Household survey** – 694 matched households in baseline and final evaluation
- **Focus Group discussions** – 24 FGDs in baseline and final evaluation, with men, women, hired labour, Learning Group (LG) LG-mixed, LG exclusive etc. (12 FGDs in interim monitoring)

- **15 household case study panel** among the treatment group, covered in three rounds
- **More than 100 key informant interviews**, across three rounds of research
- **Review of PRDIS data, BCI data**



As part of KIIs, we interviewed supply chain actors (e.g. ginners, traders, commission agent etc.) and other stakeholders (e.g. the Implementing Partner, BCI team in India, Government of India local agriculture department etc.).

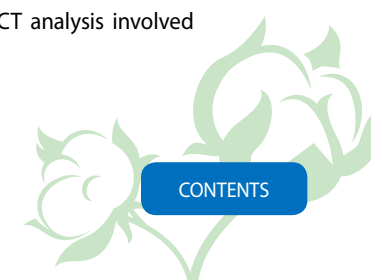
Photo 1: Farmer interview

2.7 Data analysis and Statistical methods used

The analytical framework is aligned with the theory of change – evidence is gathered and analysed against the theory of change to assess the extent of and causes of impact, including exploration of other potential pathways to observed outcomes through the qualitative enquiry. The experimental design is nested within the overall study approach allowing for rigorous assessment of what impact the BCI intervention package has had (by controlling for other variables) and thus an attribution of impact.

The key lines of comparison are – before and after the BCI project (2015 and 2018) and between treatment and control groups of farmers ('with and without' scenario). We have also conducted multi-group comparisons (using Tukey multiple comparison of means in 'R') to see variances across these groups and to distinguish results for the non-LG group for analysing the spread effect.

The analytical approach for assessing the impact through comparison between control and treated series is to use a **Generalised Linear Mixed Effect model**. The study uses standard multivariate regression to better understand the causal relations. The RCT analysis involved





constructing a multiple regression model, both based on and also analysing behaviour of explanatory variables. The strategy we adopted was to use a mixed effect model (Douglas Bates, Martin Maechler, Ben Bolker, Steve Walker (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1-48) with village as a random effect and BCI participation, land under cotton, irrigation, education and soil type as fixed effects. For statistical inference, allowance was made for the intra cluster (village) correlation using the Design Effect. Standard errors were adjusted in the same way. Statistical methodologies are adopted to ensure robust inference and standard errors for the model parameters, allowing for the constraints imposed on the study design by practical considerations relating to the intervention. These include:

- clustering effects from the limited number of clusters
- difference in difference calculations, to separate any longer-term linear trends (secular changes) which affect both control and intervention groups, from the causal effect of the treatment.

By interim monitoring, it had become clear that saturation approach in intervention villages was not adhered to by the Implementing Partner. Therefore, by the time of final evaluation, we have groups of respondents in intervention villages who have not yet become part of Learning Groups /treatment and therefore would need to be considered as 'Spread' group of farmers. We adjusted the analysis methods to cope, and used:

- Mixed effect models with a random component to allow for repeated (baseline/ final evaluation) measures from the same respondent
- Linear Anova models analysing **differences** in response variables between baseline and final evaluation, for each respondent. This method was more likely to produce statistically significant findings.

In addition to analysing statistical significance (p-values), we also conducted examination of effect sizes. Effect size quantifies the size of the difference between two groups, and may therefore be said to be a true measure of the significance of the difference⁹. We have analysed effect sizes, together with an estimate of its likely 'margin for error'¹⁰. These are presented for key outcomes (cost of production, cotton yield and cotton profits).

The study measures heterogeneous effects i.e. subgroup analysis for different clusters and for different types of farmers. The sampling framework has been derived to ensure statistical power

(0.8) for undertaking sub-group analysis. The study analyses the findings on various independent variables viz. education, land size, poverty profile, caste etc. Overall the study is able to capture the level of achievement on the outcomes of interest and the explanatory variables and other factors responsible.

All analyses used R (R Core team 2018):

2.8 Sampling Design

We recognise that a 10-cluster design will result in a reduction of power for the statistical tests, but our sample sizes within clusters compensate for this as far as is possible, and we are confident that our analysis is not subject to type 1 errors¹¹. Clustering reduces the effective sample sizes and so allowance for this has been made in the data analysis. To develop the sampling design, the following have been our guiding principles:

- **Sampling Method:** Difference in means of two equal size groups
- **Samples estimates:** Effect size: 0.4 (moderate); Power: 0.8; significance level: 0.05 (95%)

Further explanation of sample determinants is given below:

Effect size: We have used the PRDIS experience of implementing the BCI project in Mahbubnagar for calculating the minimum detectable effect. We have also referenced the classic Cohen categories (Cohen, J. 1988) which have the 0.3 to 0.5 range as "moderate". The key point is that the effect size is measured in standard deviation units. Thus, the absolute level of percentage changes in gross margin per ha, productivity and production costs which the study will reliably detect are estimated based on experiential data from Mahbubnagar district, which is located nearby to the study district. Increasing sample sizes to improve effect size runs the risk of wastefully detecting statistically significant but economically insignificant changes.

Power: We have taken the 0.8 as the power to detect statistically and economically significant results. The study with this level of power does not affect the validity of any statistically significant findings - all it means is that some marginal differences between control and intervention populations will fail to reach statistical significance. These small differences (e.g. less than 5 percent reduction in cost of production) will not be of clear economic importance to the farmers and to the BCI system.

9. Source: <https://www.leeds.ac.uk/educol/documents/00002182.htm>

10. The margin of error is the range of values below and above the sample statistic in a confidence interval

11. In statistical hypothesis testing, a type I error is the incorrect rejection of a true null hypothesis (a "false positive"), while a type II error is the failure to reject a false null hypothesis (a "false negative"). More simply stated, a type I error is detecting an effect that is not present, while a type II error is failing to detect an effect that is present.



Data from Mahbubnagar district clearly shows that even the most conservative estimate of the level of reduction in cost of production, is expected to be greater than 10 percent. If there is only marginal improvement in the outcomes of interest, these will not be sufficient economic rationale for the farmers to become BCI farmers.

Intra Cluster Co-ordination Coefficient: ICCC measures the proportion of the overall variance in the outcome which is explained by within group variance. When the intra-cluster correlation is 0, individuals within cluster are no more similar than individuals in different clusters. When the intra-cluster correlation is 1, everyone within a cluster acts the same, and so we effectively will have number of observations equal to the number of clusters. We wanted to use the PRDIS Mahbubnagar data for calculating the ICCC for the purpose of this study. However, the data was not organised by clusters /villages. Therefore, we used the ICCC of 0.037 based on 3ie cited research in the power calculation manual (Eric W Djimeu et al, 2015).

Sample distribution: Optimum allocation method (Neyman): the larger the variance for strata 1, the larger the sample size required.

Estimating treatment effect: Both the pre and post situation among the treated group and treatment-control differences will be able to explain the outcomes /impacts. Analysing differences between treatment and control group between baseline and final evaluation guards the study against type-1 (claiming an impact which is not due to 'treatment') or type 2 (missing an impact which is due to 'treatment') errors.

The sampling design is based on the key outcomes of interest, which are:

Environment: Cotton as sustainable mainstream commodity

- Improvement in environment variables – pesticides, fertiliser and water use

Economic: Farmer's income and livelihoods:

- Reduction in cost of cultivation
- Improved productivity
- Improved profitability (gross margin per ha)

Social: Improved working conditions /health and safety

Not all three dimensions of outcomes were used for the determination of sample size. This is due to the fact that experiential data on each of the above in similar conditions was not available. The experiential data obtained from PRDIS relating to pre-BCI projects in Mahbubnagar was more reliably available for two key outcomes of interest:

- Improved productivity – yield which is a direct measure
- Reduced cost of production – which is a derived measure

Utilising both a direct measure and a derived measure provides a good indication of the most appropriate sample sizes. Since our study uses a cluster RCT approach, we have adjusted the effective sample size using the following formulae:

Effective sample size = N/design effect

Design effect = 1 + (number in a cluster / (number of clusters-1) * ICCC)

ICCC = 0.037

Among the two sample sizes for two different outcomes of interest as calculated in Table 6, we have considered the outcome of interest (cost of production) which suggests take-up of higher samples. This will ensure enough statistical power for both direct and derived measures. Given the above, the study sample for both the treatment and control groups was **472**. To this, we applied 35% attrition rate (observations lost to follow ups or other reasons for farmers dropping out from the study before or during the final evaluation stage). The higher samples taken in this way were intended to improve the sub-group samples and consequently the sub-group analysis. The overall sample size for the study therefore was **640** i.e. 320 for the treatment group and 320 for the control group. To improve the power of sub-group analysis, we further increased the sample to **729 households** in the baseline research. In the final evaluation, we could track down **694 households** of the 729-households covered in the baseline. Therefore, we observed that 35 households were lost in the follow up, or from attrition as mentioned earlier. As a result, we now have baseline and final evaluation data for 694 households.



Table 6. Sample size determination

Sample size with no clusters								Effective sample size with Clusters					
Outcome of interest	Mean	SD	Impact	Effect size	Coefficient of variability	N for power = 0.9	N for power = 0.8	effective sample size allowing for 10 clusters 0.9 0.8		No. of clusters - 10	Corrected N power 0.9	Corrected N power 0.8	
Yield	1925	348	142	0.41	0.18	126	94	88	72	ICCC: 0.037	180	123	
Cost of production	33497	20625	6523	0.32	0.62	206	154	119	100		355	236	

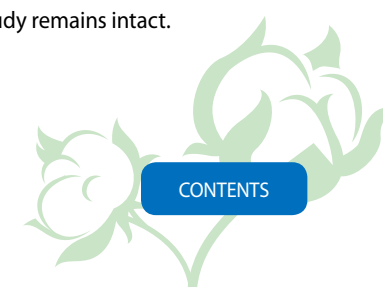
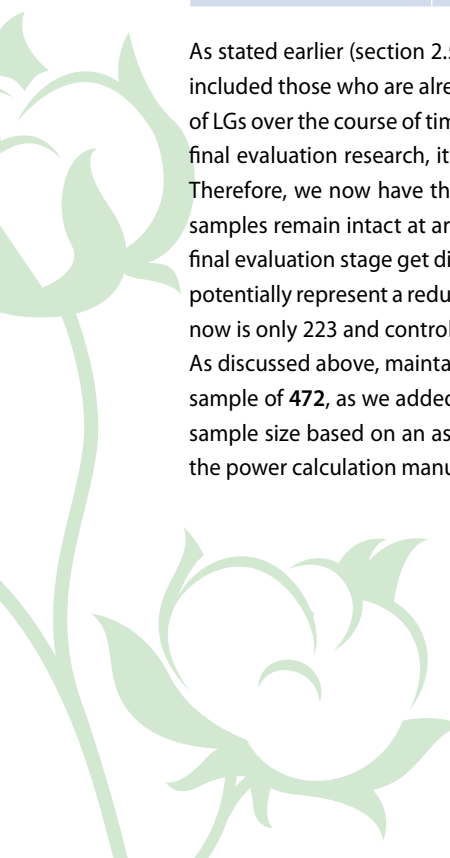
As stated earlier (section 2.5.1), the baseline research was done with a treatment group, which included those who are already part of LGs and also those who were expected to become part of LGs over the course of time as the BCI project was following a ‘saturation’ approach. After the final evaluation research, it was known that not all non-LG farmers have become LG farmers. Therefore, we now have three groups – LG (treatment), non-LG (spread) and control. Control samples remain intact at around 350 across baseline to final evaluation. Treatment samples at final evaluation stage get divided into pure treatment (223) and spread (120) groups. This could potentially represent a reduction in the statistical power of the study. The pure treatment group now is only 223 and control is 352. This means that study has covered an actual sample of **575**. As discussed above, maintaining the power (0.8) of the study would have required a minimum sample of **472**, as we added 35% attrition rate in the baseline. Furthermore, we calculated the sample size based on an assumed ICCC of 0.037, which was derived from 3ie cited research in the power calculation manual (Eric W Djimeu et al, 2015).

Baseline data analysis gives us actual values of ICCC as follows:

Table 7. ICCC based on baseline data

Output measure	Intra-cluster correlation coefficient (ICCC)
Yield -rainfed (kg/ha)	0.036
Production efficiency (Rs./kg)	0.027
Cost of production (Rs. per ha)	0.027
Profit (Rs./ha)	0.034
Average	0.031

If we use ICCC as 0.031, then the sample size at 0.8 power comes out to be **445**, which when divided into two equal groups provide us a sample of **222** for treatment. The study has covered a sample of **223** for the treatment group and therefore the power of the study remains intact.





2.9 Implementation of the field research

2.9.1 Household Questionnaire survey

A household survey was conducted with 729 households at baseline and 695 households at final evaluation research. The survey was done with tablets using Open Data Kit (ODK) platform.



Photo 2: Household Survey

The enumerators were trained in interviewing techniques, particularly in asking farmers and estimating costs and were provided with the necessary benchmarks on level of usage and range of prices for various inputs (labour, seeds, fertiliser, pesticides). The overall costs were computed by the tablet and validated with the farmers. The family labour costs were estimated only for land preparation and sowing (based on farmers response in the household survey). The

hired labour costs could partially be estimated (given the limited recall and no record keeping at the farmer level on the hired labour). The same computation methodology was followed during the baseline and final evaluation to provide a comparative picture.

The study team employed two key poverty indices to measure the change in incomes, over a period of time. The UNDP's Multidimensional Poverty Index was used as a measure of poverty. This index measures deprivations in three dimensions: education, health and living standards. We used the methodology from the technical paper (UNDP, 2014). The Poverty Probability Index (erstwhile called the Progress Out of Poverty Index) is a tool developed by the Grameen foundation. It consists of 10 indicators that can be easily assessed for each household. It results in a score between 0 and 100. This score is converted to a poverty likelihood value by using a lookup table. These tables are provided for different poverty lines. In this baseline study we have used the international \$1.90/day 2005 PPP poverty line. The methodology of use of MPI and PPI is described in Annex-E.

In the final evaluation, the study team could track 694 households out of 729 interviewed in the baseline, so, the attrition rate in the research was small (<5%).

2.9.2 Focus Group Discussions

Focus group discussions (FGDs) were held across the study sites with intervention and non-intervention farmers in order to explore in more depth the difference that becoming and being licensed to BCI cotton makes. The focus groups covered a variety of information related to village



Photo 3: FGD with women group

level social and physical infrastructure, factors affecting cotton production and productivity, the role of BCI's Implementing Partner in promoting standards and fostering learning among farmers, productivity and related farmers livelihoods.

A total of 24 FGDs were conducted in the baseline study, 12 FGDs in the interim monitoring and 25 FGDs in the final evaluation.

Figure 8 sets out the focus group discussions planned and held during the baseline study.

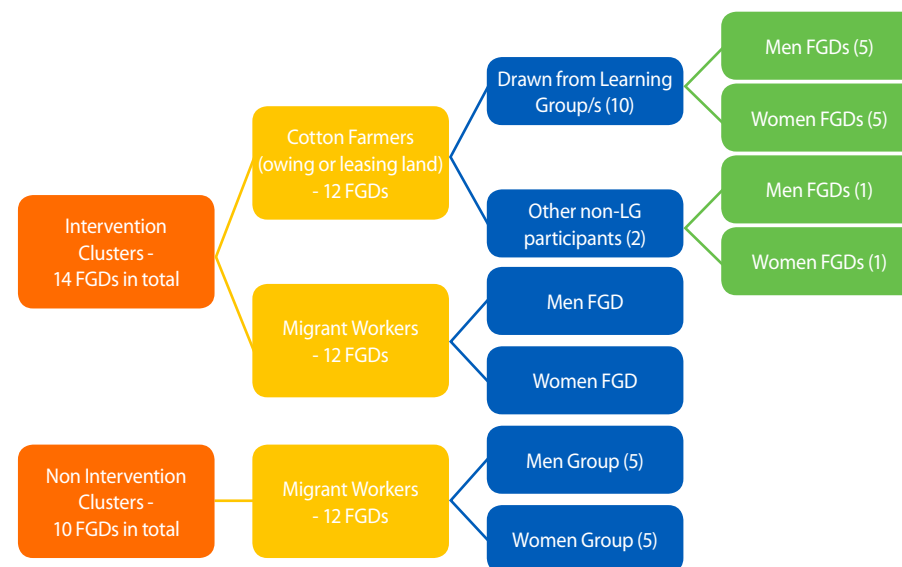


Figure 8. Schema representing coverage of Focus group discussions in each round of research



The FGDs in each round of research, were conducted following the schema as shown above, e.g. the same procedures were followed for inviting different types of respondents (LG members, non-LG members, control farmers, migrant /hired labour, men and women etc.) for discussions. We made attempts to invite the same respondents to the FGDs in each round. However, this was found to be practically challenging. Overall, the FGD respondent selection process was same across the survey rounds, but respondents themselves were not necessarily the same as many other members joined the conversations, based on their availability when the research team was in the villages.

2.9.3 Household Case Studies /panel

The study used a blind panel, which consisted of 15 households selected without the Implementing Partner knowing the identities of the panel. This reduces the risk of bias /undue attention or influence accorded to the panel members. The panel have been tracked over baseline (2015), interim monitoring (2017) and final evaluation research (2018). The panel was selected from the five intervention villages. These households were selected purposively, based upon anticipated heterogeneities, including male and female headed households. The panel households in each intervention village (three households selected) were selected based on the following segmentation:

- Women headed households – five WHH
- Households belonging to small and marginal¹² land holding – five households
- Households belonging to medium and large¹³ land holding – five households



Photo 4: Household panel interview

In each of the above three categories, three members were selected from those who are already part of the learning group, while two members were selected from among those who are not yet part of the learning group. Overall the panel consisted of nine households who were part of the learning groups and six households who were not yet part of the learning groups (but might subsequently become LG members).

12. Small and marginal farmers, in the study context, are defined as those having less than 2 hectares of land.

13. Medium farmers are defined as those holding 2 to 5 ha of land, while large farmers are defined as those having more than 5 hectares.

Efforts were made to understand intra-household dynamics as well as changes in the household between the baseline and final evaluation. In the final evaluation, the study team could track 12 out of 15 household panel members as three had left the villages for temporary migration or shifted to urban areas and sold their lands.

2.9.4 Key Informant Interviews

Key informant interviews (100+ interviews) were conducted to further understand the Kurnool cotton value chains, and to understand how becoming and being licensed to Better Cotton alters value chain relationships. They also sought to identify the enabling and constraining factors which influence the willingness of ginners and spinners to register to be a part of the BCI system. The following KIIs were conducted:

1. Agriculture Extension Officer of Department of agriculture in Adoni
2. Commission Agent at cotton market yard
3. Ginning & Pressing Factories
4. Inputs dealers at village and *Mandal* level
5. District level agriculture department officials
6. Village level leaders, including sarpanch



Photo 5: Key Informant Interview

2.9.5 Stages of Research (2015-18)

The research was conducted in three stages: baseline (2015), interim monitoring (2017) and final evaluation (2018). While baseline and final evaluation research were full-fledged studies covering the full sample, the Interim monitoring was a subset study carried out with a limited goal to understand interim status /progression of the BCI-supported project on its theory of change, including analysing assumptions and emerging contextual risks. Interim monitoring captured progress against the baseline, tracked real-time implementation of the theory of change, capturing what is working and what is not and documented contextual challenges faced by the BCI project. The interim monitoring also analysed project implementation from a gender perspective. While this report primarily presents comparative analysis of two full-rounds of research (baseline vs. final evaluation), interim monitoring insights have also been used to inform the overall assessment.

As reported above, we followed the same households in the survey.



2.9.6 Innovative elements of the research

Assessing the impact of sustainability standards using randomised control trials (nested within theory-based impact evaluation) in the cotton sector is quite innovative with respect to voluntary sustainability standards impact evaluation. Although this is not the first theory-based evaluation and possibly not the first experimental design that is underway with respect to VSS, quasi-experimental designs being more commonplace, there are limited situations in which an experimental design is feasible, and it is unlikely to have been combined with TBIE, offering fertile ground for lesson learning for ISEAL and other audiences.

The research design of Cluster RCT with matched pair randomisation within different strata (selected based on bio-physical and socio-economic parameters) is an innovative approach to constructing a counterfactual.

The study design also includes a representative household panel (based on anticipated heterogeneity) to be tracked over four years. The panel was not made known to the BCI project, reducing the chances of biased attention.

The research employed a methodology for tracking the programmatic exposure of the cotton farmers to various BCI project activities (treatments). This was to help the researchers in validating the contribution of the project, alongside other explanatory variables, including a qualitative enquiry analysing the theory of change, unpacking other potential routes to observed outcomes and exploring unintended and unexpected effects. The research charts out the progression of each individual member over a period of time in terms of their knowledge and application of BCI recommended practices. It also tracks the outcome variables (cost of production, yield, profitability, pesticide use etc.). The correlation between practices and outcomes are analysed. The research team developed an index called the Better Cotton Composite Index (BCCI) which tracks every member of the Learning Group (also those who are not part learning group in the intervention set and those belonging to 'control' set) in terms of their knowledge and application of BCI recommended practices. This is a simple and potentially replicable analytical tool.

The mixed method design makes the research stronger in collection, validation and analysis of evidence along the theory of change. The experience from the research indicates that qualitative and quantitative evidence are for the most part, complementary and reinforce each other.

2.9.7 Perspectives on limitations of the research

The BCI interventions are not a single 'treatment' but consist of a 'package' of treatments offered to farmers who come forward voluntarily to understand and apply practices which they were not doing earlier. The application of a package of practices leads to some changes at farm, farmers and household level. The research experience shows that RCT (nested within TBIE) is able to identify 'what works' in a general sense and 'for whom'. We are able to delineate the cause and effect of the combination of practices being adopted by the farmers, but the ability of the research to pin-point the specific practice leading to specific outcomes (e.g. crop rotation or inter-cropping or mulching or any specific pest control technique leading to better yield and /or profit realisation) is limited¹⁴ given the nature of the interventions in the BCI project and their inter-connectedness.

The BCI project theory of change was developed based upon a distinction between the BCI global system and the specific intervention – the PRDIS project – being implemented in India. At the time of the baseline study there was also no global BCI Theory of Change to adapt. As such we included all of the elements noted in the PRDIS project proposal and developed a theory of change for this particular intervention, in consultation with BCI. The temporal element in the PRDIS project proposal is evident in the ToC – some aspects are not expected to be achieved within the initial stages of the project and will only be fully realised over a longer time horizon, beyond the end of this study. This timescale is captured and represented in the theory of change. The study is titled 'early impacts', but the theory of change approach entailed a tracing of changes along the TOC and identified some early changes at outcome levels. BCI did not anticipate the achievement of impacts within the 3-year study period: This presents a limitation for the study and indicates the importance of follow-up evaluation at a future point in time, and also should be considered in reporting the findings.

The BCI system mandates work on social, economic, environmental and value chain dimensions of sustainability in production and trade. However, the project implemented is mainly resourced for working on production principles, which are mostly related to the environmental and economic dimensions. The social dimension is considered very challenging by the Implementing Partner, requiring structural and norms changes which they consider as being a 'long-haul' for a BCI project focussed on cotton production related practices. However, this is not always the case

14. Linking one practice to one outcome would be challenging in any case given how interconnected and interdependent various practices are in sustainable agriculture



in all contexts where BCI is adopted and implemented and may reflect the capacities and biases of the IP as well as the lack of priority given to this aspect by BCI in agreeing the project proposal with the IP. Similarly, value chain interventions (post-harvest, storage, financial linkages, market access, ginners' sensitisation, chain of custody system etc.) have not been expected from the Implementing Partner, i.e. it was not part of the project proposal, but it is not clear why this was the case. However, the BCI India Supply Chain team indicated during the research validation workshop that they are working on these issues. Both social and value chain aspects of the intervention require specific expertise and partnerships which may not necessarily be residing in the Implementing Partner of the BCI project. The BCI India programme is now encouraging IPs to form partnerships and leverage other organisations to support them where they lack expertise. This has occurred in this case, but only recently (in the last year).

While the RCT design allows for a relatively strong attribution of impact *in this specific case*, it is not possible to generalize the findings across the BCI system. However, it provides a more powerful insight, particularly with respect to the economic and environmental impact pathways, (and possibly the other impact pathways if the research was carried on for a longer period of time), and more so than quasi-experimental designs, as the attribution of impact is more robust.

The research is able to provide the status-check and throw light on the lessons to be learnt from experience of implementing BCI system at a particular site. The lessons from this research have global implications and relevance. Lessons from this research can feed into global and specific country level programming, but it is important to highlight here that many experiences and evidence cited in the report may not be relevant to all country contexts, where BCI operates.

2.9.8 Reflections on the Methodology

Theory-Based Impact Evaluation in VSS context: The use of theory-based evaluation is now fairly well established with respect to impact evaluation of voluntary sustainability standards. While not being new, there are aspects of the approach we have adopted that present interesting lessons and there is still scope for methodological innovation. When the research started in 2015, BCI did not yet have a theory of change. The research team facilitated the articulation of a BCI project level theory of change, in consultation with the BCI and IP team. This process was useful in developing a shared understanding between stakeholders as to the pathways to impact and it aligns stakeholders to result-based thinking.

The theory of change can be used at baseline stage to identify *potential* weak links in the causal pathway, which may be useful to stakeholders. At each stage of the research, the use of theory of change has helped to focus understanding not only on whether a standard has an impact, but also how and why, and what the barriers may be. This indicates that the theory of change is useful not only for evaluation purposes, but also at design stage and if linked to on-going monitoring with good feedback loops it can support adaptive management by VSS.

Randomized control trial Design Pre-Conditions: The randomized control trial (RCT) design enables a rigorous attribution of impact. This study demonstrates that a RCT design is a viable option in VSS contexts, but only in cases where one standard is being promoted or adopted (i.e. in contexts of multi-certification or multiple development interventions it is not feasible). Applying RCT methodology combined with TBIE can improve assessment quality and validity. However, an RCT methodology also requires sophisticated skills, as well as being resource intensive. A third pre-condition for an RCT design is the willingness of the implementation agencies and private sector partners to cooperate by adhering to an agreed implementation design. By complementing the randomized control trial with TBIE, the study team has shown that a rigorous attribution of impact is possible as is shown *in this particular case*.

Systematic analysis of assumptions: Careful interrogation of the assumptions at each stage of the theory of change has generated many of the lessons and insights from this study and helped to show how and why change has or has not occurred. Early analysis of such assumptions at the baseline stage is also feasible and the baseline study (Kumar et al 2015) already began to highlight priority 'at risk' assumptions. This could be done on an on-going, more in-depth basis, to inform adaptive management potentially and to guide monitoring priorities.

Aligning timescales and targets with study terms of reference: When developing a theory of change it is important to explore from the outset, the 'contribution claim' of the standard organisation, especially where uptake by producers is supported through a specific project. It is also important to consider the anticipated timescale over which change will happen. This should guide the terms of reference for an evaluative study aligned with the expected implementation and process of change on the ground. In this case, the evaluation of the 'early impacts' of BCI within a three-year period was a somewhat problematic, since the envisaged impacts were not anticipated to occur within this time frame. It would have been more appropriate for the focus of the 'final evaluation' in 2018, to be on outputs and early outcomes, with a Final Evaluation planned in 2020.



Constructing a counterfactual: The research design of Cluster RCT with matched pair randomisation within different strata (selected based on bio-physical and socio-economic parameters) is an innovative approach to constructing a counterfactual. On applying the Linear Mixed-Effects Models, it is known that there is very little sign of any significant interaction between the potential predictors (land under cotton, use of irrigation, education, and soil type) and control/treatment group for the poverty, knowledge and adoption (of BCI recommended practices) indicators, confirming that the randomization process has worked well, and that the groups are not significantly biased with respect to these predictors.

Blind Household Panel: The study design included a representative household panel (based on anticipated heterogeneity) tracked over three rounds of research. The panel was not known to the BCI project, thereby reducing the chances of biased attention. Since the panel itself was selected randomly (based on defined criteria), not all members of the panel were part of the Learning Group in the beginning. The panel methodology has also provided useful insights on the following:

- How many panel members became part of the BCI process and how they entered the process?
- In-depth feedback of the panel members on their own and their household's participation in the project, changes in capacity and practices and barriers to these, and the benefits to lives and livelihoods derived from it, as well as any potential costs or unexpected outcomes.
- Insights into the household gender dynamics which shape participation in the project.
- The contextual factors and challenges shaping household decision making, such as the pressure of indebtedness and of finding resources for weddings, leading to the poorest having to sell their lands.

Interim monitoring: The research also involved an interim monitoring round in between baseline and end line research rounds. The purpose of interim monitoring study was to find out the status /progression of the BCI project on the theory of change, including analysing assumptions and contextual risks. Interim performance monitoring provided the IP an opportunity to review and reflect on their performance. It also contributed to the research by improving BCCI methodology, by providing contextual and other insights. Thus, interim monitoring can enhance the quality of research and project implementation in several ways.

Capturing Farmers Exposure to the intervention: The research employs a methodology for tracking the programmatic exposure of the cotton farmers to various BCI project activities (treatments). This has helped the researchers in validating the contribution of the project, alongside other explanatory variables, including a qualitative enquiry analysing the theory of change, unpacking other potential routes to observed outcomes and exploring unintended and unexpected impacts.

Better Cotton Composite Index: The BCI license is awarded to the Producer Unit (based on a three-tier assessment of sample members). The research charts the progression of each individual member over a period of time in terms of their knowledge and adoption of BCI recommended practices. It also tracks the outcome variables (cost of production, yield, profitability, pesticide use etc.). The correlation between practices and outcomes are analysed. The research team developed an index called Better Cotton Composite Index (BCCI) which tracks randomly selected members of the Learning Group (and also farmers belonging to the 'control' set) in terms of their knowledge and adoption of 'Better Cotton'. This is a simple and potentially replicable analytical tool, which can potentially be integrated within the analysis of the Farmer Field Books data, to provide accurate, reliable and cross-seasonal comparison of progress achieved in terms of knowledge and adoption of sustainable cotton practices by cotton farmers. However, consideration is also needed of the extent to which farmers are fully or partially adopting technologies, or innovating through qualitative enquiry.

Evaluative scale: Visualizing the findings on the theory of change using an evaluative scale is a useful way of making researchers' evaluative judgements clear and also helps in communicating the findings in a relatively simple manner, despite the complexity of the theory of change and of the study itself. Future studies could develop more defined evaluative scales for enhanced transparency in evaluative judgement. Ideally this would link to exploration of targets, goals and contribution claims by researchers, voluntary sustainability standards, and Implementing Partners.

Mixed methods approach: The research has employed 'mixed method' approach in terms of data collection tools and also for data analysis and reporting. This has worked well in answering the research questions and analysing the implementation of the ToC. Some issues required specific methods, e.g. the research on social sustainability issues (such as child labour, gender discrimination, hired labour rights, health and safety of migrant workers etc.), Learning



Group and Lead Farmer mobilisation and strengthening processes were more appropriately investigated through qualitative methods, while research on costs of production, profitability and income related issues was more accurately assessed through quantitative methods. To enhance the quality of the study, data collected using one particular method was combined with related data on the same issue collected through another method. The research team drew upon quantitative data to answer questions on the extent to which a change had occurred as a result of the BCI intervention, while the qualitative material shed light on how and why change may or may not have occurred. For example, the quantitative data demonstrates the extent to which cotton yields have or have not changed, and the qualitative data highlighted farmers' views on the factors affecting yields in their context. Triangulation also occurred between the different types of data collected.

There was an instance when mixed methods captured contradictory findings. At the final evaluation (2018), the perceptions of farmers on their yields, costs of production and profits over the study period were fairly negative, and this is thought to be because they were experiencing the failure of the rains at the time of questioning in 2018. However, the detailed and specific quantitative data collected from household surveys at different points over the study period

found that, for example, cotton yields have actually improved slightly rather than declining. In such cases of divergence in data collected through different methods, we have reported both, and indicated the research team's understanding of the likely cause.

Hired labour research: Focus group discussions with hired labourers were also valuable and have not been so widely conducted in sustainability standards impact assessment previously. Hearing their perspectives is valuable, rather than relying upon self-reported data from cotton landowners who hire them.

Measuring child labour incidence: These require attention. Ideally, ethnographic observation would be included in future studies to enable research teams to understand whether labour practices are changing on the ground. Quite often awareness campaigns can inform farmers and casual workers as to what to say to researchers, but that does not mean that they are able or willing to make changes on the ground. Specific work is needed to extend the theory of change relating to child labour and to research what kinds of incentives and what magnitude of incentives can change behaviour.





3. Context Analysis

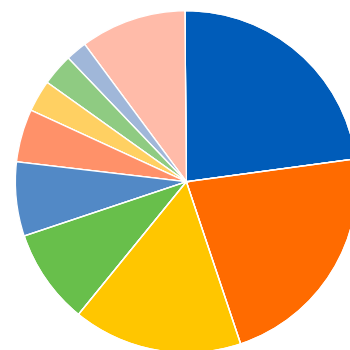
The contextual analysis section explores global cotton markets, Indian cotton production, the Kurnool study site context, and the sustainability standards landscape in India. The contextual analysis also presents the dynamic (as captured from baseline to final evaluation research) profile of farmers in the Adoni *Mandal*, with whom the BCI project is working.

3.1 Global Cotton Markets

Cotton is one of the most important and widely produced agricultural and industrial crops in the world. Cotton is grown in more than 100 countries, on about 2.5% of the world’s arable land, making it one of the most significant crops in terms of land use after food grains and soybeans. Cotton is also a heavily traded agricultural commodity, with over 150 countries involved in exporting or importing cotton. More than 100 million family units are engaged directly in cotton production. When family labour, hired farm labour and workers in ancillary services such as transportation, ginning, baling and storage are considered, total involvement in the cotton sector reaches an estimated 350 million people. It provides employment to additional millions in allied industries such as agricultural inputs, machinery and equipment, cotton-seed crushing and textile manufacturing. Cotton cultivation contributes to food security and improved life expectancy in rural areas of developing countries in Africa, Asia and Latin America. Cotton played an important role in industrial development starting in the eighteenth century and continues to play an important role today in the developing world as a major source of revenue¹⁵.

India is, since 2015/16, the World’s biggest producer of cotton¹⁶. Over many years, India continues to produce around 23% of the global cotton (with 36% of global area under cotton).

2018/19: 26.3 Million tons



6.0

MILLION

India is since 2015/16, the world's biggest producer of cotton

- India 23%
- China 22%
- US 16%
- Fr. Africa 5%
- Rest of the World 10%
- Pakistan 7%
- Brazil 9%
- Turkey 3%
- Uzbek 3%
- Australia 2%

Figure 9. World Cotton Production and share of India’s production in metric tonne (2018/19)
Source: International Cotton Advisory Committee

China is second at 22% with USA at third place at 16% of the world cotton. India has surpassed China in 2015 to become the largest producer of cotton in the world. This has happened due to decreases in the area under production and in yield (due to less favourable weather) in China which is also a response to Chinese government’s policy of reducing price support in recent years.

15. Source: <http://www.cottonguide.org/cotton-guide/the-world-cotton-market/overview/#sthash.U2y42qoD.dpuf>
16. Source: https://www.wto.org/english/tratop_e/agric_e/item_3_icac_cotton_yields_29_november.pdf





Cotton is grown in about 70 countries across the world and planted in an area of 31.8 million hectares (2017-18)¹⁷. India commands the highest share globally (36%) in terms of area under cultivation (11.3 million). China has 10% share of the area under cotton (3.2 million ha) and the USA has 14% share of the area under cotton (4.5 million ha).

India has more than double the area under cotton production (12.6 million ha in 2014-15) than China (5.1 million ha in 2013-14) yet produces almost same level of cotton as China due to the largely rainfed nature of cotton and lower productivity. As per ICAC data (2017-18), China's productivity is 1558 kg/ha while India's is 541 kg/ha USA's productivity is 999 while it is 717 kg/ha in Pakistan. Australia (1737) and Brazil (1561) have the highest cotton productivity in the World.

Despite being the major producer of cotton, China is a net importer of cotton. China consumes 30% of total cotton produced in the world. Its import constitutes 17% of total cotton imported by various countries. India is a net exporter and has a share of 13% of total exports, behind USA which is the largest exporter of cotton (36% market share) in the world. As per ICAC report, the widening gap between production and consumption (~3.2 million ton) in China could give a further boost to cotton imports in the country.

3.2 Cotton production in India

Cotton originated from India. 'Four hundred fifty years before Christ, Herodotus testified that India had wild trees that bore fleeces as their fruit, of these the Indians made their clothes' (Dantwala 1947: 1). Two important processes that altered the course of India's development, namely the industrial revolution and the consolidation of the political power by the British in India, have been closely associated with cotton.

3.2.1 Area, production and productivity of cotton in India

India is the only country in the world growing all the four cultivated species of cotton, *G.hirsutum*, *G.arboreum*, *G.herbaceum* and *G.barbadense*, which are cultivated on a commercial scale besides hybrids. The majority of the area is covered by the hybrids. Cotton is grown in the nine major states in three different zones. Punjab, Haryana and Rajasthan in north zone; Maharashtra, Gujarat and Madhya Pradesh in central zone and Andhra Pradesh, Karnataka and Tamil Nadu in the south zone are the major cotton growing states. The central zone accounts for about 60% of

all cotton, and where only 16% is irrigated. Cotton is also grown in other parts of the country and about four million farmers grow the crop in 13 states. India is unique among the major cotton growing countries because of the broad range of agro-climatic and soil conditions which permit cultivation of all varieties and staple lengths of cotton (Samuel, 2013).

Presently in India, *G.arboreum* and *G.hirsutum* are the principal species that are being cultivated). Traditional (desi) varieties and in particular, *G.arboreum*, are known for their drought tolerance and resistance to bollworms and sucking pests. On the other hand, American cottons usually have long and extra-long staple and better spinning potential (higher counts) than traditional (desi) cottons. They were introduced into India by the colonial administrators to meet the demands of English textile manufacturers anxious to secure an alternative and cheaper source than the United States (Guha, 2007).

Cotton is vulnerable to a large number of insects/pests and natural enemies and most of these occur at different stages of crop growth. A few of them are: (1) Wilt where the leaves turn brown and drop off; (2) Root-and complete wilting of the plant; (3) Anthracnose—reddish brown depression spots on leaves and bolls; (4) Bacterial blight at all stages which causes secondary infection; (5) *Alternaria* which causes leaf spots and affects the plant at all stages; (6) *Areolate* or grey mildew, and (7) *Carcospora* or leafspot – both occur at maturity stage where the leaves become yellowish and finally fall. Further, American bollworm, pink bollworm, spotted bollworm, tobacco caterpillar, jassids and spider mite are active throughout the year on the cotton plant.

More than 60 million people in India are associated with cotton farming, processing, ginning and working in the textile industry, etc. In view of the direct and indirect employment opportunities and livelihoods dependent on cotton-processing, the GOI has set up a number of agencies for the promotion and development of cotton, viz., Ministry of Agriculture, Directorate of Cotton Development, Central Institute for Cotton Research, and the ones at the state level, Department of Agriculture and state Agricultural Universities. Until the late 1990s, the public sector played a critical role in the provision of a very fundamental input in agriculture viz., seeds. Particularly in the case of cotton, public sector institutions in India take the credit for introducing the world's first hybrid variety in 1970 known as H4.

17. Source: <http://www.citiindia.com/wp-content/uploads/2018/02/Cotton-Data.pdf>



India - Cotton Yield Trend (kg/ha)

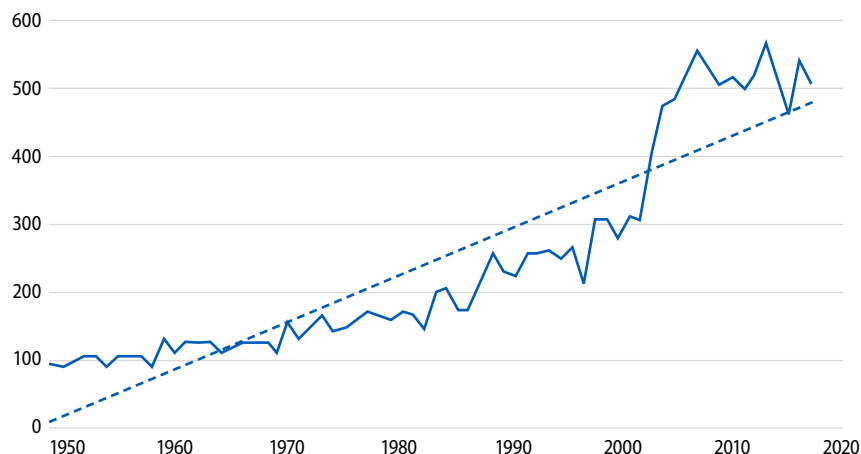


Figure 10. Trends in Cotton Productivity in India

Source: Compiled from CICR, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India

The introduction of hybrid varieties in cotton while increasing the yield, also resulted in increased use of inputs such as irrigation, synthetic fertilisers and pesticides. Imbalances in the use of inputs resulted in the appearance of different kinds of insects, encouraging even more use of insecticides in cotton. Heavy attack of pests is one of the reasons for the fluctuations observed in the production and yield of cotton. Till the early 2000s, cotton was infamously known as a crop that used the largest share of insecticides compared to other crops. The long-term trends in productivity of cotton shown in Figure 10, clearly bring out the substantial increase in productivity of cotton following the introduction of genetically modified cotton (*Bacillus thuringiensis*) in 2002–03, while the increase in the cotton area was only marginal.

Bt cotton was introduced into India in three cotton hybrids of Mahyco (a well-known seed company) in the year 2002, in the central and southern zones in India. The percentage of hybrids which was 24% of the cotton seed sales in 1996–97 increased to 95% of the total cotton seeds in 2009–10 (Pray and Nagarajan 2010).

18. There has been a significant increase in production and productivity of cotton in all the nine major cotton growing states, and a marginal decline in cotton area in Haryana and Rajasthan after the introduction of Bt cotton. Among the major states, Maharashtra continued to occupy the largest share in area during both the periods (36.5% and 35.6% respectively), while Gujarat has emerged as the largest producer in the post-Bt scenario with a relative share of 33% in the national cotton output, followed by Maharashtra (26.3%) and Andhra Pradesh (17%). Gujarat also significantly improved its status as number one in terms of cotton productivity (659 kg/ha) after introduction of Bt. Gujarat, with an average productivity of 317 kg/ha, was ranked fourth in the pre-Bt scenario and the state has out-performed the other leading producers, viz., Andhra Pradesh and Madhya Pradesh as well as Tamil Nadu, which had the highest productivity (600 kg/ha) in the pre-Bt scenario.

19. Available at www.cibrc.nic.in, accessed on 25 March 2013.

Following the introduction of Bt technology in cotton, India's cotton area increased from 7.63 million ha during 2003–04 to 11.1 million ha during 2010–11. Cotton production more than doubled from 137 lakh bales to 335 lakh bales, and productivity increased from 321 kg/ha to 518 kg/ha during the same period. If expressed in annual terms, the post-introduction of Bt cotton period witnessed an annual increase in cotton area by 3.71%, a 14.6% increase in production and an 8.3% rise in productivity¹⁸.

3.2.2 Use of Pesticides in cotton

India is the largest producer of agrochemicals after the US and China (Dave 2012: 37) and has about 30% of the total cultivated area under pesticide cover. The agrochemical market is highly fragmented. A number of pesticides formulations have become generic and about 600 generic companies are operating in this field in India. Hence, the same chemical would be sold by different trade names by different manufacturers. Patented new molecules are held mainly by the multinationals. The pesticide industry consists of both organised and unorganised manufacturers.

The use of insecticides is regulated under the Insecticides Act 1968 which regulates the import, manufacture, sale, transportation, distribution and use of the pesticides with a view to prevent 'risks to human beings or animals and for matters connected therewith'. The Insecticides Rules 1971 govern registration, license to manufacture, labelling of the product etc. As of November 2012, 241 insecticides have been registered for use in India and 32 products have been banned from manufacture, import and use in India¹⁹.

Box 1. Heavy reliance upon agrochemical pesticides in cotton production, India

While insecticide use declined in some areas of the world in the early part of the century following the introduction of GM cotton varieties, it is on the rise again as farmers struggle to control secondary pests like aphids, Thrips and whitefly. Resistance in Bt cotton is much harder to manage in a developing economy where cotton is grown by large numbers of small farmers, and where problems are compounded by fake or illegal seed, re-use of GM seeds and input supply. It must also be noted that around 75% of cotton insecticide use is reported to be in just 5 countries (Brazil, India, China, USA, Pakistan), while cotton is still the fourth largest market for agricultural chemicals overall. In a recent article, Dr Kranthi, Head



of ICACs technical section and previously director of the Indian Central Institute for Cotton Research (CICR) notes that these five countries are also seeing pest problems 'brewing up'. The problems are boll weevil, cotton bollworm, pink bollworm, whitefly and leaf curl virus. He warns of a potential serious threat to cotton, not just from pest resistance but also from new pests, herbicide resistance, and disease.

In small scale cotton production systems, it is very common for farmers to use the cheapest of available insecticides for pest control. Many of the cheaper insecticides either belong to WHO Class 1 (extremely or highly hazardous) or are linked to carcinogenicity. India still permits the use of *monocrotophos*, a pesticide blamed for the death of 23 children in Bihar in 2013 after they ate contaminated free school lunches.

Source: An excerpt from a report²⁰ by Pesticide Action Network, UK, depicting the pesticide use situation in India (revised June 2018)

3.3 The Study Context

3.3.1 The Study area

The site chosen for the study is Adoni Mandal (subdivision) in Kurnool district of Andhra Pradesh, India. Andhra Pradesh state (undivided, prior to state division in 2014-15) ranked third in terms of Indian cotton production. Currently (2017-18), Andhra Pradesh has dropped down to sixth in terms of Indian cotton production. Kurnool district has a strong agricultural background, with about 70% of the working population of the district either directly or indirectly engaged in agriculture or related activities and roughly 10% of the cultivated land used for cotton production. The agricultural season commences with the onset of the southwest monsoon, normally during the second week of June bringing a total normal rainfall of 670 mm. The climate is mainly tropical, with temperatures from 31°C to 45°C in summer and 21°C to 29°C in winter.

The BCI project is being implemented in Adoni Mandal, which has a total population of 250,000 (36,026 households as per 2012 revenue data of the government of Andhra Pradesh), living in 46 villages. The population mainly depends on agriculture for their livelihoods. Cotton is the main source of income for more than half (18,232 households) of Adoni households.

20. Source: http://www.pan-uk.org/cottons_chemical_addiction_updated/

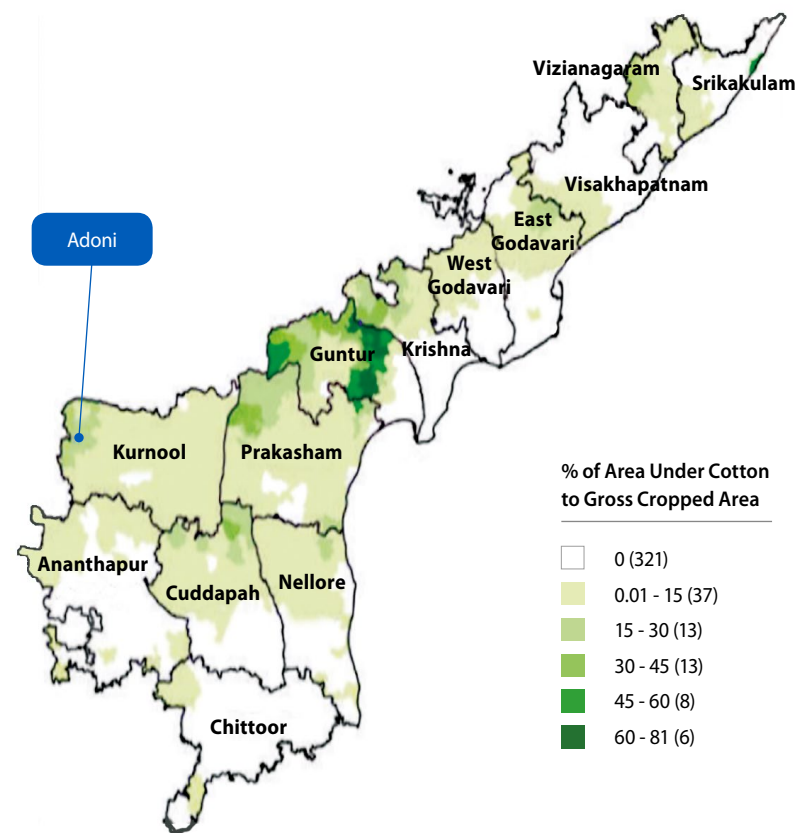


Figure 11. Intensity of cotton cultivation in Kurnool district (Adoni Mandal indicated by the blue arrow)





A snapshot picture of Adoni is presented in Table 8, based on secondary information collected from local government office by the research team:

Table 8: Demographic /socio-economic situation in Adoni (as per 2012 government data)

Parameter	Status	Description
Number of Households	36,026 households in 41 villages	Minimum no. of household in a village: 18 in V. kondapuram Maximum no. of household in a village: 3809 in Pedda thumbalam Average no. of households - 948 No. of HHs in treatment villages - 5788 No. of HHs in control villages - 4158
Cotton growing HHs	18,232 HHs in 41 villages	Average no. of cotton growers in a village: 479 Total cotton growers in treatment villages: 4250 Total cotton growers in control villages: 2025
Soil profile	Variable	Mostly Black soil – 21 villages, Mostly Red soil - 12 villages, Mostly Mixed soil - 9 villages
Female Literacy	43% average (~60% male literacy rate)	Lowest literacy rate 15% in Kuppagal and highest 83% in Arekal Average literacy 36% in treatment and 32% in control villages
Irrigation	Average 2% households have access to assured irrigation	12 villages have access to a canal 4% area under irrigation (2094 Ha irrigated of total 47625 ha)
Small and marginal households	Overall 39% having less than 2 ha	

3.3.2 Value chain Context

The general cotton value chain usually follows the steps presented in Figure 12:

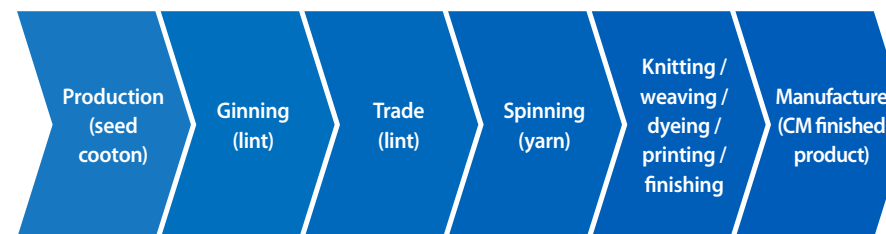


Figure 12. Key steps in the generic cotton value chain

In the context of Adoni /Kurnool, the value chain structure is presented in Figure 12. There are three main nodes in the value chain – cotton production, ginning and pressing, spinning and textile. Cotton production, ginning and pressing happens in Adoni /Kurnool while the spinning happens in Tamil Nadu and other states where the bales of cotton are transported via diverse set of traders. There are no spinning mills in Kurnool (there used to be few spinning mills, but they were closed due to labour issues).





Cotton value chain in Adoni

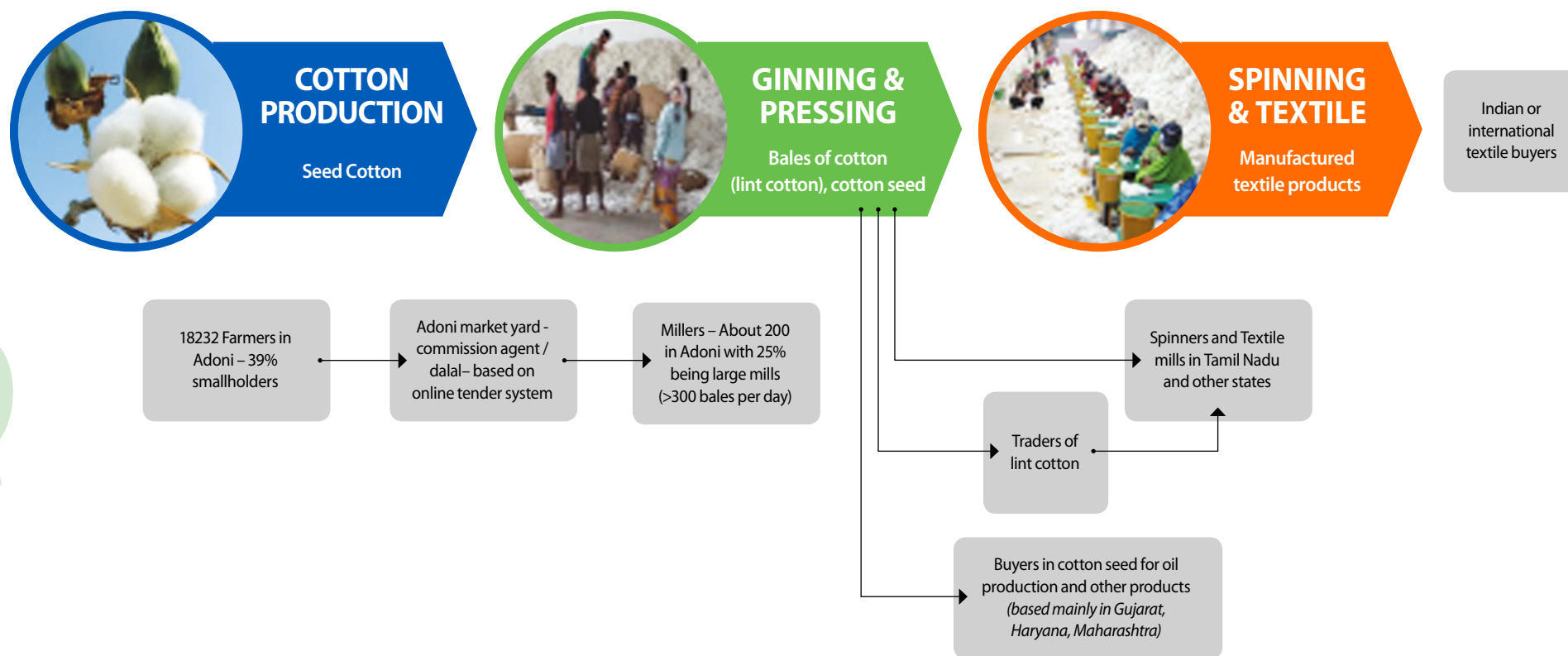


Figure 13. Cotton value chain map in Adoni /Kurnool (2015)





Adoni offers very favourable conditions (Black soil) for cotton production, with more than 18,000 farmers deriving their main livelihood through cotton farming. As per secondary information (according to the Government of Andhra Pradesh Census and Agriculture data), about 39% of cotton farmers in Adoni are smallholders (having < 2ha land under cotton). The cotton yield depends on the seeds that farmers use. 'Ajith' is a good choice of seed which experiences less pest attack (KI interview, FGDs). 'Jadu' brand is also highly preferred by farmers (KI interview, FGD). The shift to Bt cotton has been comprehensive since 2002. All of the farmers interviewed in the FGDs during the baseline survey (2015) reported that both expenditures and yields were lower earlier (about 10-15 years previously) when they were using conventional seeds. With Bt cotton, there was consistent reporting that both the yields and expenditures were higher. Other livelihood strategy opportunities (wage labour, industrial jobs etc.) are relatively limited within Adoni.

Indebtedness is prevalent, with many farmers taking loans with the commission agents (also known as *mandi* agent or *dalals*; *the latter being the term used henceforth*) in Adoni town. At the baseline survey (2015), a large proportion of farmers (estimated to be more than 95%) were selling their cotton to *Dalal* or commission agents from whom they had already borrowed money as a loan for cotton cultivation purposes. *Dalal* work as financiers to farmers without any documents or security. They finance Rs.10000 to 35000 per hectare (~US\$ 150 to 500) to each farmer as input costs with a recovery period of 5-6 months. However sometimes recovery takes two years (e.g. when rains affect the crop and farmers are unable to pay on time). Delays in repayments lead to indebtedness as these intermediaries charge a high interest rate of 24% (at Rs.2/100/Month). The intermediaries also take 2% commission on the sale value of the cotton while selling to the ginner/buyer. At the baseline survey (2015), less than 5% farmers were selling direct to ginner (KI, FGD). Farmers are very rarely able to negotiate cotton prices with *dalals*. Each morning and evening, the cotton rate is fixed through the online tender system²¹. All licensed tenders are able to bid and quote for the rate; whoever quotes highest will get the allotment of the day for a particular auction lot. The *dalal* will calculate the rate to be offered to the farmers based on online tender rate minus loading and unloading costs and minus 2% commission. The payment to the farmers is given after 8 days. However, this calculation is not necessarily clear and transparent to farmers – something that could potentially be addressed through direct sales and digital distributed ledgers for fairer contracts and value chain relations.

After declaration of the bidding, the ginner will weigh the seed cotton and prepare a chart. The cross-verification weight will be checked at ginning level only if discrepancy or scope for doubt occurs. In this arrangement, the online tender system provides some transparency in price setting, however the chances of farmer exploitation on prices remain, due to lack of awareness and negotiating skills /position of the farmers with the intermediaries. Additionally, most farmers are not in position to select the commission agent or traders to whom they sell cotton as they are indebted to them. It takes some time to build up a trading relationship between the farmer and the *dalal*, and so it is not easy for farmers to change between them.



Photo 6: View of seed cotton in a ginning mill

Adoni town has become an important trading centre in Andhra Pradesh, because the region is a large producer of cotton and because of the presence of a large ginning and pressing factory. There is also substantial trading of groundnut oil in Adoni town. It has a big market situated in the centre. The town is also well connected with surface transport facilities. Adoni ginner send the ginned /pressed cotton to spinners in South Indian states, especially Tamil Nadu, and a few are also sending ginned/pressed cotton to spinners in Maharashtra.

Ginner demarcate the quality of cotton through dryness, staple length and colour. Moisture free, white, good staple length cotton attracts a good price (KII). Ginner says that electronic scales are largely used to weigh the cotton. According to ginner in the key informant interviews, sometimes farmers moisten their cotton to increase the weight. Low trash, long staple and dryness of cotton mainly determine the quality.

There is a high degree of competition among ginner in Adoni. Ginner generally have volume-based contracts with spinners and so their focus is on ensuring contractual compliance. Ginner are frequently hard pressed to secure a supply of seed cotton and therefore they are willing to engage farmer /farmers collective directly. They are willing to offer price incentives based on assured supply and fibre quality to farmers and farmers collectives.

21. An online tender system operates under the aegis of eNAM – electronic National Agriculture Market, which is a pan-India electronic trading platform for agriculture commodities. eNAM runs integrated Agriculture Produce Marketing Committees (APMCs) across the country, to support better price discovery through transparent auction processes based on quality of produce along with timely online payment.



The founder of a ginning mill, which has been established for almost ten years and has a capacity of 300 bales per day (each bale being 150 to 180 kg in weight) provided information on current sales and prices obtained: The ginning mill sells the bales in Khandi (1 Khandi = 359 kgs). The Khandi of the highest quality currently fetches Rs.: 32000 – 34000. Medium Quality Khandi fetch Rs.: 28000 – 30000 while the lowest quality is worth Rs.: 10000 – 15000. Cotton seeds are sold at Rs.: 2000 – 2500/quintals. Cotton seeds are sold to buyers in Maharashtra, Gujarat and Haryana for the production of oils and other products.

3.3.3 The Role of external factors in adoni cotton

Many external factors affect cotton and the BCI project progression on the ToC. These contextual factors affect the cotton crop significantly but are outside the sphere of control of the BCI project. One of the main contextual factors which pose limitations on the progression of the BCI project theory of change, are climatic factors such as unpredictability of the rainfall. Untimely, late or no rainfall badly affect cotton sowing and subsequently cotton yields. A research paper²² by DW Pravin et al (2005) analysed 4 years of data to indicate that yield declines by 10.10 kg of lint per centimetre of accumulative rainfall. After adjustments for possible negative bias, the researchers concluded that minus 5.82 kg of lint per day (3.4% per week) is a satisfactory estimate of the daily decline in yield given average weather. Clearly rainfall variability can positively or negatively influence cotton yields significantly. It was, therefore, our main concern to understand how study results in different survey rounds (baseline and final evaluation) are affected due to the rainfall factor. We analyse rainfall pattern over three years, specifically comparing rainfall for the 2014-15 season (for which the baseline data was collected in 2015) and for 2017-18 season (for which the EL data was collected in 2018). We obtained rainfall data from Indian Meteorological Department for the study district²³ (specific Adoni division data was not available). The Figure shows the rainfall pattern over last five years.

The points to analyse here are the deficient rainfall patterns in baseline and final evaluation years during the cotton growing season (May to September). As stated earlier, baseline data collection was done for 2014-15 cotton season and final evaluation data collection was done for 2017-18 cotton season. For both years, the rainfall was deficient in May, when cotton sowing starts, relatively more deficient in 2017, than in 2014. However, rainfall picked up in June for both years, more so for 2017. In July, it was normal rainfall in 2014, but deficient rainfall in 2017,

while in August it was above-normal rainfall in both years. Overall, it shows that neither of these years were ‘good’ years for cotton, as deficient rainfall was recorded in crucial cotton growing months. The year 2016 could be termed as ‘good’ year for cotton as rainfall was above-normal or near normal during cotton growing months (Farmers in FGDs during interim monitoring also acknowledged that 2016 was a good year for them). However, observing differential rainfall patterns across baseline and final evaluation years, it is possible to consider both 2014 and 2017 as ‘similar’ but ‘below average’ rainfall years, though 2017 (final evaluation year) could be termed as a slightly better year than 2014 (baseline year). This establishes reasonable comparability of baseline and final evaluation data and we think no adjustment factor needs to be applied, given the ‘similarity’ of rainfall pattern across these years.

Kurnool District Rainfall Pattern measured in terms of % Depreciation against the Historical Normal Rainfall (mm)

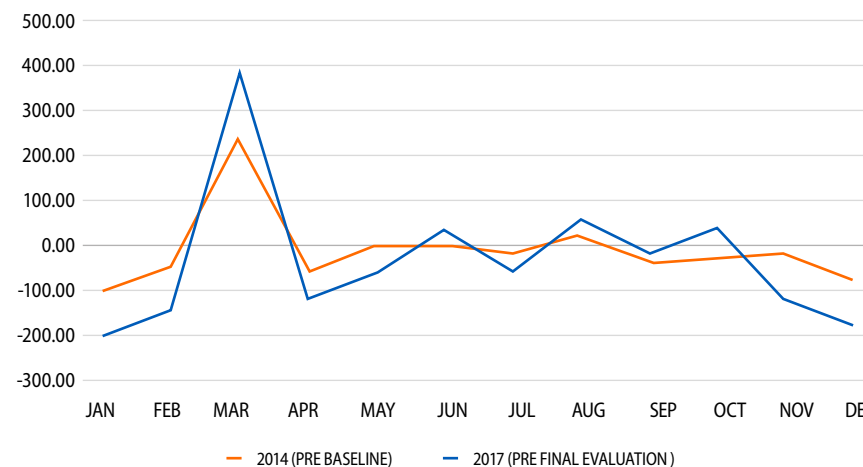


Figure 14. Rainfall pattern of last five years in the study district

22. Source: <https://www.cotton.org/journal/2005-09/3/upload/jcs09-115.pdf>

23. Source: [http://hydro.imd.gov.in/hydrometweb/\(S\(zkksq24apmmzx55ynx10p55\)\)/DistrictRaifall.aspx](http://hydro.imd.gov.in/hydrometweb/(S(zkksq24apmmzx55ynx10p55))/DistrictRaifall.aspx)





However, 2018 (when the final evaluation research was being conducted) was a considerably 'bad' year. When this final evaluation research was going on in 2018, farmers were very pessimistic about cotton yields and incomes in that season. Prolonged dry spell initially and then excessive rainfall in 2018 had badly affected cotton sowing, pests and household economic situation. Indian newspaper reports²⁴ suggested that India's cotton production in 2018/19 is likely to fall 4.7 percent from the previous season to 34.8 million bales, as scant rainfall and an attack of pink bollworms were expected to squeeze crop yields.

Apart from climatic factors, interactions with farmers (from baseline to final evaluation, including during interim monitoring) continued to indicate the following constraining factors to growing cotton in Adoni:

- **Limits on access to land and irrigation:** Farmers consistently noted in many FGDs their small area of land and lack of access to irrigation, though access to irrigation has improved for some farmers as final evaluation data indicate.
- **Lack of access to finance and reliance on commission agents:** Only a very few farmers can access bank loans. Many farmers have defaulted on a bank loan so can no longer access formal credit. Most farmers rely upon the commission agents, who provide them with loans for input and help them out in emergencies, but also charge very high rates of interest (upwards of 2% per month), which increases their indebtedness.
- **Pests and wild animals, especially deer:** While pink boll worm is a key pest, other pests, such as whitefly and thrips, have also emerged during last few years. Being resource constrained, farmers have great 'fear' of pests which can damage their crop extensively, which explains their cautious approach and repeated application of pesticide sprays. In addition, farmers have reported huge losses during early plant growth because of deer consuming the young plant shoots. Repeated petitions, complaints to the government regarding this issue has not triggered any response. On the other hand, farmers complained that if a deer gets killed, the farmers are harassed for harming the wildlife.
- **High cost of inputs:** Fertilisers, and especially pesticides are costly for smallholder farmers. Farmers mostly have to borrow from the commission agents to obtain agrochemicals. The investment can also be lost in a poor year, when there is a lack of rain, increasing

indebtedness. Also, Adoni has large number of pesticide dealers within the village as well as in the town. India has a regulatory framework for the manufacture, import, registration, sale, transport, distribution and use of pesticides. The Indian Insecticides Act 1968 is expected to be replaced by a proposed Pesticide Management Bill 2017 with more focus to protect farmers and promote the safe use of pesticides. The dealers are expected to comply with these regulations, however while the regulation is in place, its compliance is poorly monitored /enforced. The Agriculture department or local authorities in Adoni are unable to prevent unethical business practices, with the result that dealers are easily able to push their products to mostly illiterate farmers. Many farmers also have long-standing trading relationships with these dealers as they provide them loans in times of their need. In return, farmers are obliged to buy from them, often on credit, which can also lead farmers to indebtedness and at the same time inappropriate pesticide application.

3.4 The Study Respondents - Farmer profile and characteristics

Most households are relying on cotton production for their income. Cotton production plays an important role in enabling Adoni farmers to build up their assets and/or to pay off debts. Although some other crops (chilli, groundnut) are grown, this depends on land and irrigation access. There is a strong informal labour market within Adoni – farmers hire labourers from their own village or from neighbouring villages to meet their cotton production needs. In some areas there is outmigration during the off season to find work in other towns and cities outside of Kurnool.

The baseline study covered 729 households almost equally among treatment (361) and control (368). The final evaluation research was able to locate 695 of the 729 households (34 were lost to follow-ups due to migration; ~5% attrition rate). 97% of the respondents in the household survey are male headed households in both baseline and final evaluation research. The average age of head of household at baseline survey (2015) was 42 years, while the average age of the first respondent at final evaluation survey (2018) was 45 years. Median age of the first respondent in the baseline survey was 40 years, while it was 43 years at final evaluation survey. This perfect 3-year difference is expected as the same panel households were approached 3 years later for survey in the final evaluation research.

24. Source: <https://in.reuters.com/article/india-cotton-output-idINKNCN1MI0C7>



3.4.1 Education

Not much change in education levels can be expected from baseline to final evaluation, given only 3-years' time lapse. The educational levels continue to be very low in Adoni. Close to 50% of household members (both males and females) in treatment and control groups are illiterate. Levels of educational attainment are not significantly different between control, LG (treatment) and non-LG households. Among women, around 54% of control and 53% of LG (treatment group) are illiterate. Women, in particular, have more limited opportunities for formal education. Many of those interviewed in the FGDs and household case studies were found to be illiterate, and the literacy level of women is lower than for men.

Education status: Proportion of Respondents (both male and female)

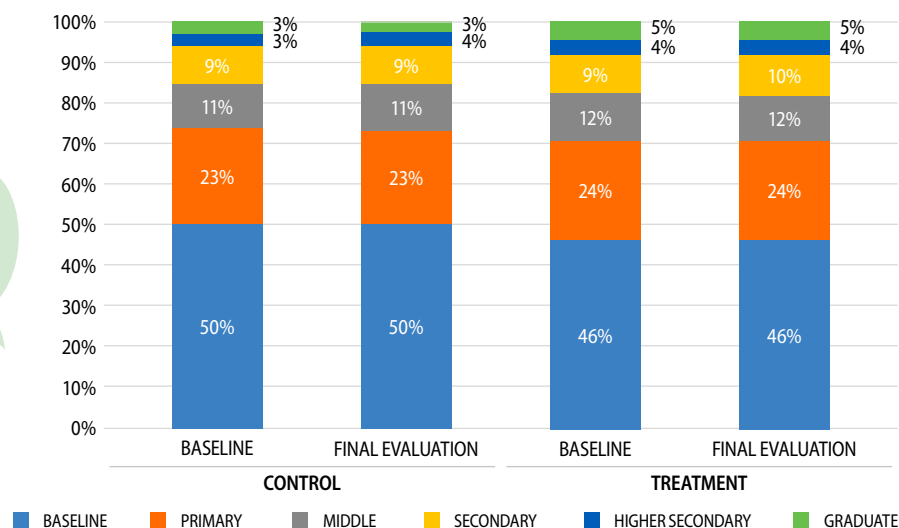


Figure 15. Education status of respondents (both male and female combined in respondent households)

Women's education status: Proportion of Respondents

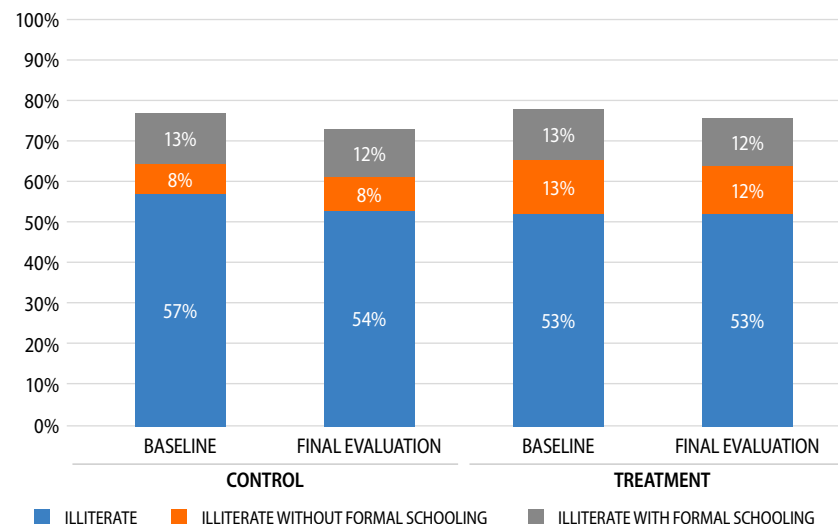
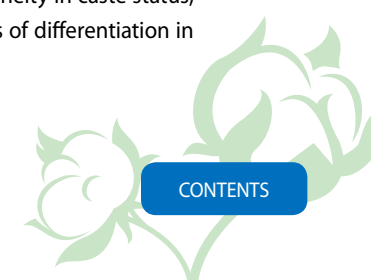


Figure 16. Education status of women in the respondents' family

3.4.2 Religion and Caste

The population of Adoni is mix of three religions – Hinduism, Islam and Christianity - 84% Hindus, 13% Muslims and 3% Christians. This is same in both treatment and control areas. The same status is reflected in both baseline and final evaluation surveys.

Caste in India is a system of social stratification which has some influences on the poverty and wealth status of different caste groups. However, in Adoni, we have witnessed a considerably homogenous situation. Other Backward Caste (OBC) is the main social class in Adoni. Close to 90% of farmers (in both treatment and control groups) are OBCs. Another 6% households in the treatment and 9% households in the control group belong to scheduled castes. Scheduled tribes are less than 1% in both treatment and control groups. Given the homogeneity in caste status, any analysis of household participation in the BCI project and any analysis of differentiation in impacts by caste would not be very meaningful.





3.4.3 Landholding

Close to half (47%) of the treatment group of farmers in Adoni have small and marginal land holdings (<2 ha) under cotton. The same proportion of the control group of farmers have small and marginal land holdings under cotton. Close to one third of farmers are medium farmers (2 to 5 ha) and around one-fifth farmers are large farmers (>5 ha). On the basis of total land holding, the graph below shows the farmer categorization:

Land size based categorisation: Proportion of Households

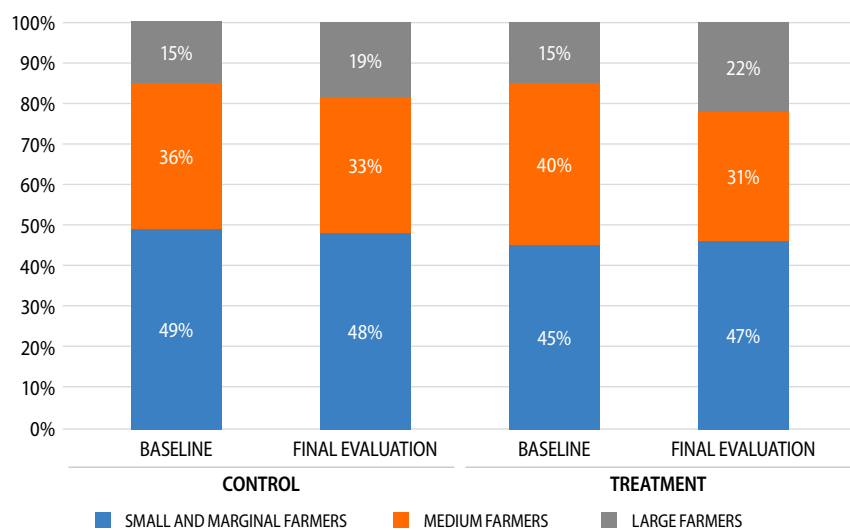


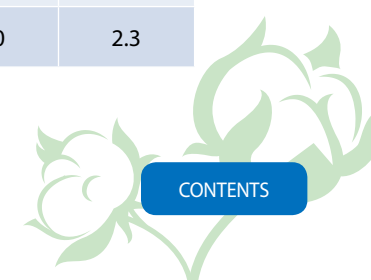
Figure 17. Farmer classification based on total land holding

The ratio of land under cotton to total land utilized for treatment farmers in the baseline was 0.81 while it was 0.77 for control farmers. The ratio remains almost same in the final evaluation. However, there are many variations observed over the last three years. Total land area under cotton has come down by 35% for the control group and 22% for the treatment (LG) group. In 2018 (when final evaluation research was done), more land was leased-out, than leased-in. This shows that farmers optimism with cotton has reduced over the years due to uncertainties associated

with rainfall. This does not mean that farmers are shifting to other crops, instead they are tending to lease out land and migrate in search of alternative livelihoods such as wage labour in nearby towns and cities. It is to be noted that the per cent reduction in land under cotton is significantly lower for treatment (LG) in comparison to control group. It indicates that the optimism level (with cotton) has reduced at a lower rate for treatment farmers in comparison to control farmers. The land under cotton in rainfed conditions has slightly increased for treatment farmers, while it has decreased for control farmers. This has happened due to higher rate of land leased out by control farmers than by the treatment farmers. Another point to note is that even though cotton is mostly a rainfed crop in Adoni, access to supplementary irrigation is available and has in fact increased (from baseline to final evaluation) for both control group farmers (from 15 to 21% having some source of irrigation, either canal or borewell) and treatment farmers (from 9 to 22%).

Table 9. Land profile changes from baseline (2015) to final evaluation (2018)

Land related parameters	Control		Treatment	
	Baseline	Final Evaluation	Baseline	Final Evaluation
Total land under cotton (ha)	1076	703	688	536
Average land under cotton (ha)	2.9	2.0	3.2	2.4
Total rainfed land (ha)	769	661	490	504
Average rainfed land (ha)	2.3	2.1	2.4	2.4
Rainfed farmers (No.)	332	316	201	209
Total irrigated land (ha)	57	41	44	33
Irrigation farmers (No.)	35	36	15	14
Average irrigated land (ha)	1.6	1.1	3.0	2.3





3.4.4 Household size

The household roster shows 3618 household members in the baseline (729 HHs), and 3562 members in the final evaluation (695 HHs). This means the average household size in Adoni is about five members. The sex ratio in the household sample at baseline is 789 females to every 1000 males which compares poorly with the sex ratios of all India (914), Andhra Pradesh (978) and Kurnool district (984) sex ratios as per 2011 census. However, in the final evaluation research, we found the sex ratio improving marginally to 797.

3.4.5 Livelihood strategy

The main sources of income for Adoni households are agriculture and wage labour (locally and in distant places). Close to 80% of farmers /households have reported cotton to be their main source of income, both in baseline and final evaluation surveys. This proportion is almost the same for treatment and control groups of farmers. Agricultural wage labour (~9%), other agriculture crops (4%), casual labour (~3%), private service (~2%), domestic household worker (1%), petty business (~0.5%) are some of the other reported primary sources of income for households in Adoni. This is consistently same for treatment and control groups of farmers.

In agriculture, a large majority of farmers are reportedly relying upon cotton production. Cotton is an important source of income for farming households (confirmed by both the household survey and FGD data) either from production on their own lands or as hired labour on others' farms. Thus, cotton plays a key role in household economic well-being and in enabling Adoni households to build up assets or to pay off debts. Other crops grown include *ajwain* (carom seeds), groundnut, chilli, jowar (sorghum), paddy, kora and millets. Farmers growing other crops such as paddy, chilli, and groundnut tend to have some access to irrigation.

The Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) scheme also provides opportunities for a few to supplement incomes. In one village the water reservoir has been deepened through the MNREGA programme.

Some households reported that, except for elderly members of the family, they may all migrate, during the non-cotton season, including the children, to places such as Bangalore (masonry

work), Guntur (hired labour in chilli cultivation, construction), Tirupathi (wage labour) and Mumbai (for drying and catching fish). Migration was more prevalent in some villages than others (qualitative enquiry).

Only a few farmers reported having livestock in their house (in the baseline as well as final evaluation), and this also means that few have access to farm yard manure for cotton cultivation.

In one of the FGDs (at baseline) farmers said that in the past they had grown sunflowers and groundnut, and now farmed cotton, but their future choices would depend upon future rains and also the cost of seeds. Currently, the seed costs of ground nuts are high, but they may reduce in the future and farmers might choose to grow ground nuts again or to move to other crops such as bishops weed, fox tail millet, pearl millet, sorghum, onion, castor and chilli. In this particular focus group, their cotton yields had declined as compared with the previous year, which has led them to consider alternatives. They did not envisage any major investments by government in infrastructure in the area in the next few years, which might influence their decision-making. In other FGDs, however, farmers mostly said they would continue to grow cotton for the foreseeable future as this was where they could make better returns in good years.

3.4.6 Gender and social relations

Gender relations are highly inequitable. Gender is intersected by caste and wealth distinctions in Adoni. In a patriarchal society, women have limited voice and influence in household decision-making. No significant change is reported in gender relations (from baseline to final evaluation). In the qualitative work some female farmers reported that their husbands consult them on household expenses, but on farming decisions, it is the men that make all of the decisions. In some men's FGDs, the men reported that they make all the decisions and have control of household income. Men decide, for example, on the varieties to be sown and on the appropriate price at which to sell cotton. In other cases, participants highlighted a process of consultation within the household on income-related decisions. In female-headed households, women do make these farming decisions, including with respect to the sale of cotton, but also consult with other neighbouring farmers on cotton marketing. Generally, women have much lesser access to formal education and to land. The situation was found to be the same during the final evaluation.



In terms of the gender division of labour, in general both men and women are involved in cultivation, but women have more work to do. Men are generally responsible for land preparation, pesticide spraying and load carrying. Women are involved in almost every sphere of cotton farming, carrying out land preparation, preparing pesticide containers, sowing, gap filling, weeding, applying fertilisers, harvesting and clearing the field after harvest. Women tend to have much greater work burdens in labour in cotton production and also have domestic and reproductive responsibilities.

These gender inequalities stem from gender norms that ascribe certain roles to women and men, and which fail to recognize women's rights (e.g. to land, to participation in decision-making). In several focus group discussions and household interviews it was clear that women tend not to have a strong voice in their household decision making. Frequently, the view was expressed that women are more appropriate for farm labour, for example, yet this belief is an example of an internally socialized norm, rather than having a basis in physical abilities.

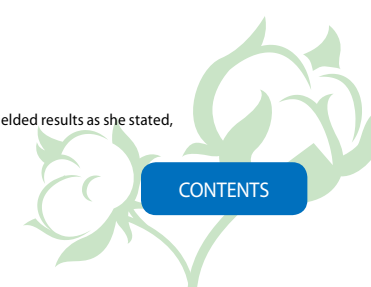
“Interactions with the farmers suggested that females have more patience and are fit for farm operation than men who are impatient. A farmer gave his own example wherein he had also put in his part of labour in planting the chilli plants, which affected his back badly, because he was not used to the job and the bending posture. That apart he said, women handle the tender plants better and they are faster (household case study participant during Baseline study).”

Fraser (2009) identifies three aspects of gender justice - recognition, redistribution and representation. It would appear that on all three aspects, women have limited gender justice in Adoni Mandal. They are not fully recognized as full members of the household and society – e.g. as having rights to land and resources. They have lesser access to resources, including land, labour and credit, except through their husbands. Female heads of household do have greater control of household affairs, but more research is needed with respect to their relative power and influence. Overall, women's access to education appears to be more limited than that of their male counterparts. Their mobility is similarly more restricted. Women tend not to travel to Adoni town to engage in cotton marketing, for example. The BCI project is seeking to engage women

in the Learning Groups, and there are a small number of examples of women participants and lead farmers (FGDs, HH panel). The number of women in LGs has very slightly improved from baseline (4%) to around 5% at final evaluation, but remains extremely low. In many FGDs during interim monitoring and during final evaluation, many women reported that while they are aware of the trainings being conducted by the BCI project, they have not attended any training so far. The participants (Santhekudlur FGD with women, interim monitoring) stated – “we are not aware of any Learning Group though we did hear that a few men are attending some meetings. We are not having any idea about PRDIS project”. It was also evident that the men, even if they attend any such meetings, do not share the details or the outcome of the meeting with the women, i.e. information is not being cascaded within the household either, and it is not clear if that would be feasible for some types of extension that rely upon experiential methods.

In some cases, women did not know who the lead farmer was, or what was their role. It was revealed in the FGDs that lead farmers did not have any interaction with the women and there are very few female lead farmers. In one case, a woman is a lead farmer²⁵, demonstrating that women can play this role if given the opportunity, but also that the IP needs to take stronger action from the outset in this regard. The project activities are not targeting women farmers specifically. The BCI project partner stated that they follow the principle of allowing the decision maker in farming families to decide on the eligibility for membership in a LG. At baseline stage (2015), the land ownership document was stated to be the decisive criteria for inviting members to the learning group. As most land records are in the name of the men, women are made ineligible to be member of the learning group except in women-headed households where women can be expected to have the land record in their name. The IP believes that although women share in household decisions, the major farming decisions are taken by men and hence the LGs members are mostly men. Unfortunately, this demonstrates the lack of capacity of the IP with respect to gender equality and women's empowerment and suggests also a lack of attention to this issue by BCI as well. Not addressing such issues from the outset not only fails to tackle inequalities, it risks reinforcing them.

25. She also facilitated many Watershed projects, vermi-compost Units, Bio-Pesticide, Check dams through IKP projects which benefited many village farmers. Rs. 6 Lakhs were received per group under this project for various mentioned works. Her efforts have yielded results as she stated, “Last year *Monocrotophos* was used whereas this year as per PRDIS suggestion we have stopped using this...”





4. Key Findings

In this section, we analyse all the evidence collected over three rounds of research - baseline, interim monitoring and final evaluation on the BCI project theory of change (see section 2.3). The study assessed the impact of the intervention using Theory-Based Evaluation and an experimental design, plus mixed methods. We assess the evidence on each causal step (e.g. changes in awareness and behaviour of farmers) and interrogate the assumptions between one step and the next to generate lessons. The analysis also includes the comparison between treatment (LG members) and control households.

4.1 Implementation of Inputs & activities

As discussed in section 2.5.1, the BCI project ‘treatment package’ comprises the following elements:

- Promoting ‘Better Cotton’ production practices through BCI production principles 1-6
- Sensitising stakeholders and market players about ‘Better Cotton’ and ensuring chain of custody especially segregation at farmer field and at gins levels
- Mobilising and strengthening LGs and PU, which include range of activities listed in section 2.5.1

The ‘treatment package’ is delivered through four sets of activities:

1. Mobilising learning groups and forming a producer unit
2. Conducting farmer field schools, demonstrations and trainings
3. Establishing and using an internal management system
4. Catalysing partnerships and linkages

Achieving strong progress on these activities is essential for triggering a process of change as envisaged in the ToC. In this section, we look at what are the achievements and gaps in doing each of these activities, except partnerships and linkages which are dealt with in the ‘Output’ section (4.2).

The extent to which the BCI approach has been implemented, recognizing the flexibility that is inherent in the BCI system, but also the key requirements of BCI is a key part of theory of change evaluation. Further, this experimental research is designed to measure the impact of a ‘treatment package’, provided to a voluntarily participating farmer (part of LGs). The

impact of this treatment package is crucially dependent upon its effective delivery. If there are significant dilutions in the delivery of the treatment package, then treatment effects are expected to be diluted²⁶.

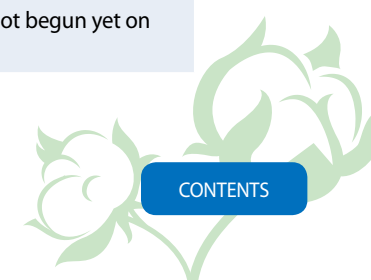
The BCI system works on the basis that core indicators are complied with each year, but the degree to which a particular PU works on a particular topic (beyond minimum compliance) varies year on year, depending upon the ‘focus areas’ chosen for each season in the PU’s annual Continuous Improvement Plan. Which means that improvement in performance / adoption rates on different topics can vary season to season. While it is understood that not all elements of the packages will be delivered in a particular year, it can be expected that over three years of the programme, most elements of the treatment package will be delivered at some point, sequentially or simultaneously.

A theory of change and experimental research design expects that most elements of the package will be delivered for the impact to be achieved. The theory-based approach allows for an exploration of the extent to which there has been good implementation or not.

Table 10: Assessing Implementation

Assessment of Implementation on the 'treatment package'	Adherence level	Remarks
Principles (P1 to P6)	●	Large focus /priority of implementation placed on P 1 and P3; less focus /priority on P5 and P6
Supply chain - ginners sensitised, chain of custody etc.	●	Supply chain mobilisation - low level implementation efforts so far
Learning groups, producer unit and BCI implementation approach	●	LGs mobilised; PU formed; however variable quality of implementation; non-standard processes used
Internal management systems, assurance systems	●	IMS implemented; standard of implementation can be improved
Market and financial linkages	●	Implementation has not begun yet on these fronts

26. Source: <http://www.incredibleyears.com/wp-content/uploads/fidelity-importance.pdf>





Testing implementation - scale used:

High level of adherence to the specific aspect of the treatment package and appropriate delivery of that aspect of the treatment package	●
Medium level of adherence and appropriate delivery	●
Low or no adherence and appropriate delivery	●

We have analysed implementation by unpacking the theory of change and gathering appropriate evidence to understand where implementation diverges from the theoretical plans at the outset of the project in this case. This is important as it shows why certain outcomes might not have been achieved or why unexpected impacts occur etc. The above analysis provides a summary view, below we consider the different inputs in more detail in terms of how far they have been implemented and how effectively. The BCI Standard and Assurance Model are the starting point for the intervention, however, while this provides the generic model and indicators, all regional implementation takes place with some degree of flexibility. BCI is not prescriptive on which practices must be promoted / adopted: IPs choose their focus areas each season (beyond core indicator compliance) and determine which practices/approaches suit their particular contexts best. This flexibility is desirable in that it allows tailoring to contextual challenges and situations, but also potentially responds more to the capacity or biases of the IP or even the regional BCI team. Further, there is the potential, as has occurred here, of differing expectations amongst the different parties – the IP, the BCI India team and the BCI global team. Continuous improvement planning is a key part of the BCI programme: all PUs must have a clear plan outlining how they plan to tackle the issues that require a longer time-horizon for higher adoption / change to be seen at field level, according to BCI. However, in this instance, no clear plan appeared to have been articulated by the IP or BCI India as to how decent work issues would be addressed until year 3, and even so it is not clear how effective the proposed strategies are likely to be.

Issues of gender equality need to be tackled as part of agricultural extension, not as a later issue to be addressed. There is ample work in international development to guide IPs on gender-sensitive agricultural extension for example. Further, it is not clear how far things such as ‘approaches to extension’ are defined and by whom. The study does not indicate that best

practice in agricultural extension was being followed, but this is not so much a question of implementation (as the flexibility is provided for by the BCI system), but more a function of the capacity of the IP and the quality of the oversight provided by BCI in general in shaping the Continuous Improvement plan and in providing capacity support to the IP.

4.1.1 Mobilizing learning groups & Producer Unit

The BCI project has mobilized 75 LGs across 5 intervention clusters. The details of these LGs are as given in Table 11.

Table 11. Details of learning groups and membership in 2018

Intervention Village	No. of Learning Groups	No. of men	No. of women	Total members
Virupapuram	20	688	33	721
Madire	23	800	28	828
Chinna Harivanam	10	353	13	366
Santhekudlur	12	402	26	428
Balladur	10	265	48	313
Total	75	2508	148	2656

Source: The BCI project data

This is an increase compared with the number at baseline (2015), as at that time 56 LGs were formed with 2055 members. Women’s participation in LGs has also improved between the baseline (79) and final evaluation (148), but remains very low overall as a proportion of the total participants. Women constituted 4% of the total membership at baseline stage; now they represent 6% of the total membership at final evaluation stage.

At the initial meetings during formation stage, the BCI principles were explained to the LG members. Most groups (56) were created in the first year of the project²⁷. An additional, 9 groups

27. BCI Project implementation and baseline study began at the same time. LG formation and baseline research were running simultaneously.



were formed in 2016 and 10 groups were formed in 2018. In 2016, the project was expanded to three other villages (Salakalakoda, Parvatapuram and Dibbanakal) with 28 LGs established as part of the project in these areas. Overall the BCI project now has 98 LGs with 3425 members, which is near the target number for the formation of a Producer Unit (PU). All farmers in the BCI system are now considered as part of the PU.

In most cases, household heads²⁸ were invited by the IP to be the Learning Group Member (FGDs), as major decision-makers and holders of land title. In the first year, not all those who had been listed as members were aware of the Learning Group. In the baseline survey, only 44% knew that they were part of the LG and the project, but most were aware of the LG by the final evaluation (FGDs). However, not all women were aware of whether their husbands were participating in the LG: 38% of women in the final evaluation reported that they were not aware of the LG. Similar observations were made in some of the Focus Group Discussions.

The BCI project has followed a non-standardised process of mobilizing LGs. Commonly, but with many variations, the project team visited the villages, interacted with Gram Panchayat leaders who then organized a farmers' meeting. In that meeting, the NGO team explained the objectives of the project. The project identified a farmer with knowledge and communication skills to motivate others. This lead farmer, then provided the names of fellow farmers in the village and formed a LG. In some cases, the list of farmers as members in the LG was prepared with local leaders.

"The PRDIS field supervisor contacted me and explained about the upcoming program. He motivated me and asked me to find 20 members to nominate - those who do cotton farming, with good skill. He also asked me to include women in this list. Now we have 20 Learning groups in the village and every group has 1 or 2 female farmers" (FGD participants at baseline study stage).

4.1.2 Facilitating Farmer field schools, demonstrations and trainings

The BCI project has carried out many training sessions, and demonstrations to promote knowledge and adoption of more sustainable practices as outlined by BCI. The study tracked the participation of farmers in these activities, through baseline and final evaluation household surveys. 59% of LG (treatment) farmers reported participation in the Learning Group activities

in the final evaluation survey. 26% of non-LG farmers also reported participation in the LG activities, which is indicative of spread effect within the treatment clusters. Control farmers did not receive any training or field demonstrations from the project. About 70% of LG and 27% of non-LG farmers in intervention villages reported observing and attending meetings at the practical demonstration which were held. Similarly, nearly 70% of LG farmers have reported participating in various training sessions related to BCI production principles. Baseline values on practical field demonstrations and various trainings are minuscule (~1 to 2% farmers) which is understandable as the project had just begun. It is to be noted that in most of these events, participation is reported by men. Women's participation rate is extremely low as women LG members participated in only 3% of all activities organised by the project.

Some practical demonstrations of specific technologies were reported, such as how to make bio-sprays, but this did not extend to learning plot experiments in the fields which might enable farmers to see with their own eyes if new practices work in practice. The LG lead farmers reported (in FGDs) that although the idea had been for the lead farmers' own fields to act as demonstration plots, this had not in fact occurred due to the poor rains. In one case, an FGD group reported seeing a video that the NGO had showed them, but it lacked the audio. Some farmers also suggested that exchange visits would enable them to learn more from other farmers (FGDs). This all indicates the potential to improve the quality of the approach to extension being used by the IP.

4.1.3 Developing internal Management systems

The BCI project promoted the use of Farmer Field Books (FFB) for keeping a record of various inputs and practices applied by the farmers every year in their cotton crop production. FFBs are potentially very useful for providing real-time data on the farm inputs used and practices applied, which can be compared over different cotton seasons. FFBs were distributed by the IP. However, the qualitative data indicates that the high levels of illiteracy amongst the farmers makes it difficult for them to fill in the FFBs. In the household case studies, the interviewees reported limited success in completing the FFBs. Only two interviewees in the panel at final evaluation reported that they were able and willing to fill in the FFBs. Several said that they struggled due to illiteracy to document their practices. One farmer had asked his literate grown-up children to

28. The person who is listed as the 'farmer' (i.e. the key decision-maker on the farm according to BCI's definition) becomes a part of the LG. This is generally the household head but not in all cases.



fill in the FFB for him, but they had not been willing. The BCI field facilitators are responsible for supporting the farmers in maintaining FFBs.

Overall, farmers reported different levels of performance in maintaining FFBs in the FGDs as well. Of the 11 Learning Group FGDs at final evaluation (see Table 12 below):

- 3 FGDs reported that all their members are completing the FFBs in full and have continued to do so since the group was formed.
- 3 FGDs reported only partial success: In 2 cases, group records are kept, but not at individual farmer level. In the other case, the members said that they began filling in the FFB, but they have lost interest recently due to crop failure this season
- 2 FGD groups said that they have not been successful: In one case, the group has not completed the FFBs, because of challenges of illiteracy. In the other case, they were not aware of the FFBs at all (women’s FGD).
- 3 FGD LGs did not comment on whether they complete the FFBs.

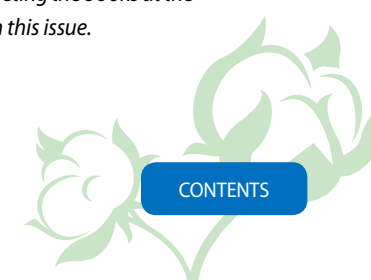
There is also a significant gender dimension to the issues relating to Farmer Field Books. Women are not completing the Farmer Field Books due to lower levels of literacy and their very low participation in the project. In one FGD, for example, they reported that they, as women, do not complete them, were not aware of them and did not know if their husbands maintain them. In another, they reported that the men in their families complete the FFBs.

29. Members of more than one Learning Group

Table 12. Farmers reporting on the Farmer Field Books (Focus Group Discussions)

FGD	Farmer Field Books	Assessment
Virupapuram LG,	Farmers in the FGD are writing in the farmer field book: pesticides used, labour used, ploughing expenses, fertilisers used and weeding costs. Farmers who lease land from others already note their costs of cultivation.	√√
Chinna Harivanam LG FGD	The farmers in this LG maintained the farmer field book seriously in the initial years but were not maintaining them properly during the year 2017 and 2018. The main reason being the disinterest in record keeping due to very poor crop growth.	√
LG Mixed FGD ²⁹ (Female), Virupapuram	Farmer field book is maintained by the men in the family of these women participants in the FGD.	√√
FGD with Learning Group (male) Santhekudlur	About record keeping they said, they have kept the receipts of the expenditures, but not maintained any written records as they are illiterates and cannot maintain.	×
Madire (men) Learning Group, Intervention Village	Individual farmers do not have any kind of records/book keeping habits. Members have group books like membership details, training attended, input details especially pesticide usage and dosage details of the members.	√
Santhekudlur, Mixed LG, Intervention, Men’s FGD	Yes, all the 10 groups have maintained attendance book and member details and how many acres they are cultivating of cotton and which are seeds they are using and fertiliser and pesticide details with dosage (LG Training record).	√√
Madire, Men’s FGD, LG, Intervention	Individual farmers do not have any kind of record books, but the group have maintained a LG Training Record (a separate requirement for PUs as part of the BCI standard) where they record the group members’ names, trainings in which they have participated, and pesticides used and dosage details.	√ (group approach)
Madire, Women’s FGD, LG Intervention	None of them are aware about FFBs and do not know if their husbands’ have a habit of keeping such accounts.	×

Indicative Scale: A majority of the farmers are completing the books in a sustained manner - √√; Majority of farmers completing the books at the start but have not continued - √; Not completing as have literacy challenges - ×. N.B. 3 of the 11 LG FGDs do not report on this issue.





The IMS data and external assessment in the BCI compliance reports (3rd party verification) reports in 2017 have suggested that many improvements to the internal data management system are needed to ensure regular, timely and accurate data flow from farm to PU level.

Overall, the IMS is established, but has weaknesses which need to be addressed at all levels (farmer, LG and PU levels).

4.2 Outputs

4.2.1 Learning groups Established

In terms of group size, structure and rules, each Learning Group generally consists of 30 to 40 members (FGDs). There are two groups with less than 20 members and 15 groups with 21 to 30 members. The remainder have between 31-40 members. There is no formal structure, other than the selection of a lead farmer. No financial contributions are required of members (HH case studies; FGDs).

The gendered nature of participation is marked. Female participation is extremely low or non-existent. The key decision-maker was judged by the IP to be the head of household, which is linked to land title. BCI defines the farmer as the decision-maker on the farm. The IP interpreted this to mean land-owning farmers who are heads of household. This not only excludes landless farmers, but also often excludes women who are much less likely to hold land title. There were two exceptions found in the household case studies, where widows and female-heads of household were actively participating in the LG. In the other household case studies, one female head of household was not sure if her sons were participating or not and in most of the others, the women of the household were not participating. In the FGDs, the women's groups interviewed were generally not able to articulate anticipated changes in knowledge and practices or to report on any changes in household knowledge and practices, which was a direct result of their limited participation in the LGs. The FGD data also demonstrates that information is not being shared at the intra-household level for example from husbands to their wives. By engaging only with male household members, this means there is a risk that the project is reinforcing gender inequalities.

In terms of farmer awareness of the LG, overall, the qualitative data from the household case studies and FGDs indicate that the majority of the farmers' listed as LG members have gained awareness of the presence of the project organisations and the visits of their staff. Farmer

participation in meetings has increased from a low level at the start. Many farmers have attended meetings at least once. Some farmers also report attending regular meetings. In 2015, during the baseline, most farmers did not know whether a Learning Group existed in their village, but by 2018, the household case study and FGD farmers interviewed were aware of their group and able to report the name of the lead farmer of their group. 8 of the 12 household case study interviewees reported that they participate in the LG, regularly attending meetings. 3 household case study interviewees reported non-participation. 1 household did not comment. [The other 3 households interviewed at baseline had moved out of the village].

Box 2. Summary of LG experiences (FGD data)

Virupapuram Learning Group, Intervention Village FGD - The group was formed 4 years ago and has 25 members. Household heads normally participate in the group. Landless are not invited to join. Lead farmers are selected according to their experience and education, because other farmers are more likely to listen to them. The group functions well – meetings are held once per month where farmers are informed about inputs for farming.

Chinna Harivanam Learning Group, Intervention Village, FGD – The group was formed 4 years ago and has 25 members. Household heads are chosen as the key member. There is harmony in the group and other LG members listen to them. Meetings are held once per month. Lead farmers are chosen based upon the education and experience, because they have the necessary information and skills to share with other farmers in the group.

Madire, Men's Learning Group, Intervention Village: The NGO visited, interacted with GP and Gram Panchayat people and called a farmers' meeting. The NGO explained the importance and objectives behind this group and potential benefits. A lead farmer was nominated, and they provided the names of fellow farmers for the group. There are nearly 30 such groups are there in this village. Each group has 30-35 members. Each LG has 1 or 2 female farmers. Some members are not active. No formal structure or financial contribution. The meet every two weeks. They identified a farmer with motivating skill, energetic and good in communication as a "lead farmer" in the village. This lead farmer provided names of fellow farmers in the village and formed a group called "Learning Group (LG). Some border crops seeds gave by PRDIS to protect cotton plant and said by joining PRDIS program we all get benefits like this.



Santhekudlur, Men's Multiple Learning Group, Intervention Village FGD: The NGO called a meeting at village panchayat level 3 years ago, inviting those interested to form an LG. 25-30 people per group. Membership is male. They meet once per month. There are 2 lead farmers in the group and 10 lead farmers in the village overall. Their main role is organizing the farmers. They have not received separate training.

Madire, Men's Learning Group, Intervention Village FGD – 1 or 2 lead farmers per group. 2 lead farmers in the group – role is to organize farmers in the village and discuss cotton farming with members.

On the regularity of meetings, participants in 3 LG FGDs said that they meet once per month, and 1 FGD reported that they meet every two weeks. Commenting on the functionality of the LG, in several instances, participants in FGDs said that the internal relations in the LG were harmonious, with all members actively participating, suggesting that this is an important criterion for LG functionality. In one case participants complained that a few of their peers were not actively participating in the group. An overall summary of FGD feedback on Learning Group experiences is presented in Table 13 below.

Table 13: Summary of Intervention Village FGD feedback on Learning Group

FGD	Participation	Functionality – Internal relations	Functionality – Meeting regularity	Selecting lead farmers
Virupapuram LG,	Household heads participate (25 members). Landless not invited.	Harmonious	Once per month	Based on education/ experience and because others will listen. 1 lead farmer in the group.
Chinna Harivanam LG FGD	Household heads (25 members)	Harmonious	Once per month	Based on education/ experience – information and skills to share.
Madire (men) Learning Group, Intervention Village	NGO held meeting. Each group has 30-35 members. Each LG has 1 or 2 female farmers.	Some members are not active	Every 2 weeks	Farmer chosen with motivation and communication skills.
Santhekudlur, Mixed LG, Intervention, Men's FGD	NGO called a meeting 3 years ago. 25-30 people per group. Membership is male.	Not stated	Once per month	2 lead farmers in the group.
Madire, Men's FGD, LG, Intervention	-	Not stated	Not stated	2 lead farmers in the group – role is to organize farmers in the village and discuss cotton farming with members.



The criteria for the selection of lead farmers was reported by FGD participants to be education and skills, including communication skills and motivation, because, with these attributes, other farmers are more likely to listen to them. The lead farmers were able to explain their role (lead farmer FGD), i.e. arranging meetings with villagers, organising demonstrations, receiving information from NGO staff and sharing knowledge with other learning group members. The lead farmers in one village (Virupapuram) said that their capacity had been enhanced by the NGO: they had learnt through the NGO field staff about the proper use of pesticides, such as how to spray them, suggesting that as a result of their efforts to share this information with other farmers, there were fewer instances of ‘cocktail spraying’. They also learnt about certain inputs, such as use of refugia /non-Bt varieties, and the importance of border crops and intercrops. Further, the lead farmers reported learning from the IP about the role of beneficial insects for cotton cultivation and the need to avoid indiscriminate spraying. The lead farmers said that they are promoting amongst farmers the uptake of red gram and bajra (pearl millet) as intercrops and the incorporation of cotton stubble into the soil to enhance its quality. They also share recommendations on appropriate fertiliser use based on soil testing results and explain to farmers which pesticides should not be used according to their symbols. They explain to farmers how to maintain records on the costs of cultivation and in some cases have trained the older children of illiterate farmers on how to keep records. Further, lead farmers have a role in trying to solve any problems that arise in cotton cultivation and in asking the NGO for assistance where necessary.

However, the lead farmers in one village also reported that it is not necessarily the case that other farmers will follow their advice. For example, in one village, Santhekudlur, lead farmers reported that while some farmers listen to them, others do not. In one of the two lead farmer FGDs, the participants said that not all of them had been able to implement the practices they were supposed to, because of the poor rains over the last few years.

4.2.2 Knowledge & application of better Cotton practices

Cotton cultivation in Adoni dates back more than 20 years³⁰ Most of the villagers, in both intervention and non-intervention villages, have been growing cotton for many years. Since 2002, there has been a major shift to Bt cotton production. Previously, traditional varieties such as Laxmi and Panduranga varieties were cultivated. Nowadays, only Bt cotton varieties are being cultivated. Ajith, Jadu, Kaveri, Jhony, Bhakthi, Tulasi, Sriram, Police, and Janu were all

mentioned as the common brands of Bt seeds used by farmers in the villages (FGDs, household case studies). During interim monitoring and final evaluation, farmers reported the use of bollgard2 (Bt 2) varieties.

BCI recommends various practices under six principles³¹. Through a process of consultation with the IP at the study baseline in 2015, the research team prioritized 39 Better Cotton practices (37 for rainfed plots) to be tracked by the study over the study period, out of a total of 70+ practices. Under the BCI system, the IP selects the most relevant sustainable cotton practices to be targeted in their particular context. This allows for flexibility and tailoring to local circumstances. Out of these 39 practices, 17 practices (15 for rainfed plots) are recommended by the BCI under the BCI Minimum Production Criteria (MPC).

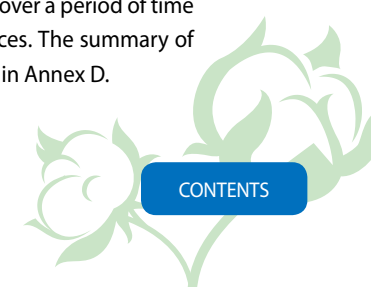
Box 3. Better Cotton Composite Index (BCCI)

The Better Cotton Composite Index is constructed in a way that an index score of 1 can be achieved when all the farmers practice at least eighty% of the BCI recommended practices. The purpose of developing this index is to understand the overall /cumulative status of a farmer or for all the farmers in the project area on ‘Better Cotton’ practices. The index values can capture progression /trend in knowledge and application of ‘Better Cotton’ practices. The practice level knowledge and adoption are anticipated to improve over a period of time, and the index score would capture this improvement. Based on suggestions from the IP, and with the agreement of the BCI India team, some additional ‘Better Cotton’ practices were included in the index during interim monitoring and final evaluation research. To account for this, suitable adjustments were made to the baseline index values, to maintain comparability.

The research team constructed an index called the Better Cotton Composite Index (BCCI) to understand the cumulative status of the current level of knowledge and application on overall and MPC practices. The BCCI score provides an assessment of levels of knowledge and application of BCI recommended practices by the treatment and control farmers correlated with exposure to project knowledge-building and support activities. Changes in BCCI scores over a period of time provide an indication of the trajectory of change on ‘Better Cotton’ practices. The summary of the methodology is provided in the Box above, with more details provided in Annex D.

30. Historically, Adoni had considerable production of rice and rice mills during British rule. It was a major trading hub of grain and gold, along with cloth and textile production.

31. See at <https://bettercotton.org/about-better-cotton/better-cotton-standard-system/production-principles-and-criteria/>





The results of the final evaluation (household survey) demonstrate **strong evidence of increased knowledge on 'Better Cotton' production among rainfed cotton producers**. Awareness levels have seen a significant increase on a range of practices such as bio pesticides, neem oil, balanced use of fertilisers, inter crop, border crop, refugia crop, cleaning and grading of cotton etc. The improvement in awareness is statistically significant for LG farmers. A spread effect is also seen in treatment areas with Non-LG farmers (index score improving from 0.49 to 0.73), again with statistically significant results. A few lead farmers reported that they usually share information with non-LG farmers (Lead farmer FGDs) although this is not done in any systematic manner.

Better Cotton Composdex (Rainfed): Overall Knowledge

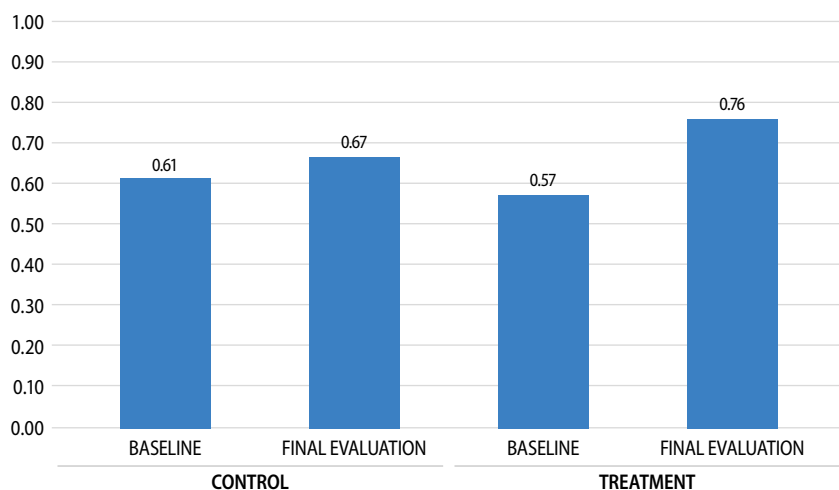


Figure 18. Index values on Overall Knowledge of Better Cotton practices (Rainfed cotton)

With regard to the Minimum Production Criteria (MPCs), the index scores have also improved from baseline to final evaluation, in a statistically significant manner for the treatment farmers.

The BCCI also shows that levels of adoption of the promoted practices have increased. Treatment (LG) farmers' adoption scores are significantly higher than the control groups of farmers.

Better Cotton Composdex (Rainfed): Overall Adoption

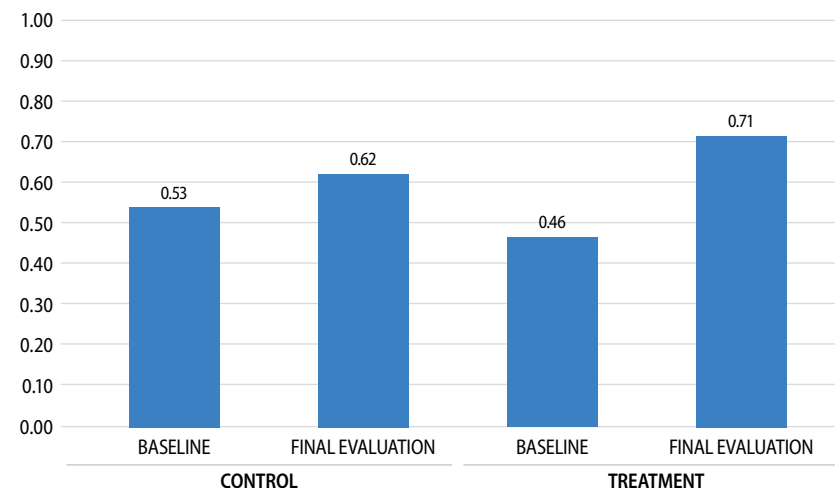


Figure 19. Index values on overall adoption of Better Cotton practices

The change in knowledge and adoption levels cannot be so rigorously established for irrigated cotton plots as they were very low in number (35 control, 15 LG and 7 non-LG irrigated cotton plots). Given the low numbers of irrigated plots, any change in index values between baseline and final evaluation is showing as non-significant.

The extent to which soil profile, land size and education levels play in role in influencing farmers' knowledge and adoption of 'Better Cotton' practices by treatment farmers was analysed through 2-way ANOVAs for LG: factor interaction. Table 14 below has p-values for the LG: factor interactions. The green highlights, $p < 0.05$. Yellow highlights $p < 0.1$ and > 0.05 . This reveals that land size and education levels do play a role to some extent in influencing knowledge and adoption of sustainable production practices. Medium-sized land holding³² farmers have relatively lower levels of knowledge and adoption, compared with small and large farmers. Educated farmers (either primary- or secondary-educated) have comparatively better levels of knowledge and adoption than non-educated farmers.

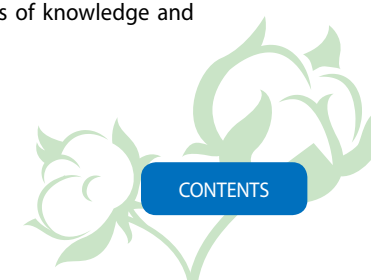




Table 14. Analysis of influence of soil, land and education factors in knowledge and adoption levels of treatment farmers

Outcome of interest	Mean (final evaluation treatment)	SE (final evaluation treatment)	Significant interaction by (p-values)		
			Land category	Soil	Education
Rainfed_BCCI_ Knowledge_Overall	0.76	0.015	0.06*	0.85	0.09*
Rainfed_BCCI_ Adoption_Overall	0.72	0.013	0.03*	0.92	0.23*
Rainfed_BCCI_ Knowledge_MPC	0.75	0.013	0.14	0.63	0.03
Rainfed_BCCI_ Adoption_MPC	0.72	0.012	0.05*	0.87	0.07*
Irrigated_BCCI_ Knowledge_Overall	0.71	0.052	0.60		0.14
Irrigated_BCCI_ Adoption_Overall	0.72	0.054	0.95		0.24
Irrigated_BCCI_ Knowledge_MPC	0.61	0.052	0.91		0.07*
Irri_BCCI_Adoption_ MPC	0.64	0.055	0.95		0.09*

Significance codes: 0 '***' 0.001 '**' 0.01 '*' >0.05 & < 0.1

Analysing factor interactions for knowledge and adoption levels indicate that both are influenced by size of landholding and education. However, the influence on adoption is weaker than the influence on the level of knowledge. This indicates that any change in farmers' adoption behaviour would demand much more convincing evidence of the efficacy of interventions, and would likely require more practical training on how to implement as well as changes in the enabling context.

32. Small and marginal farmer < 2 hectares; Medium farmer: 2 to 5 ha; Large farmers: >5 ha

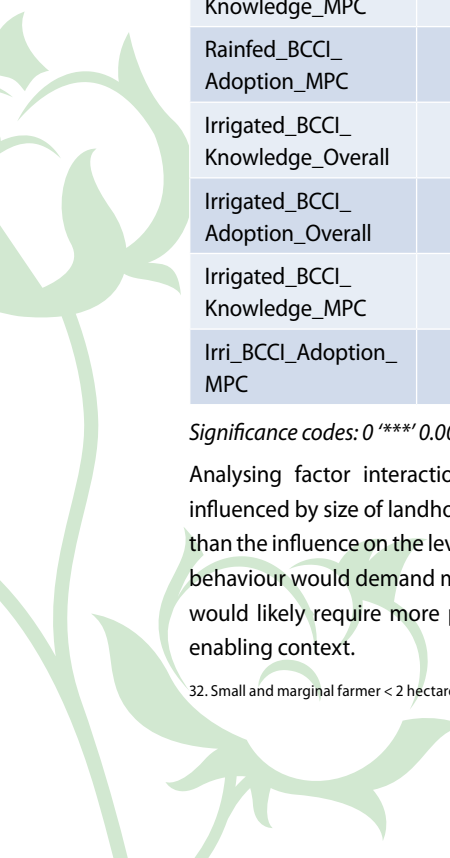
Interestingly, a clear correlation is seen between treatment exposure and knowledge and adoption levels. Those who are exposed to treatment at a higher level (indicated by higher % participation rate in the BCI project) have a significantly better index score e.g. the application index score of those with a high participation rate is 0.75 as compared to 0.59 for those with a low participation rate. The application index score of those with a medium participation rate is 0.64. The same pattern is seen in knowledge index scores. **This indicates that intensity of exposure is a predictor of higher knowledge and adoption among treated farmers.**

Box 4: Intervention Village Focus Group Discussions Findings: Feedback on Learning Groups, Awareness and Adoption

Overall, on feedback and enhanced knowledge of the promoted practices, the findings were as follows:

- In 3 of the FGD groups which included LG members, participants gave positive feedback on the training and report enhanced knowledge on promoted practices. (✓✓)
- In 6 of the intervention village FGDs, some farmers gave positive feedback and report enhanced knowledge on promoted practices (✓)
- In 2 of the intervention villages, there was insufficient or no comment.
- Amongst lead farmers, the findings were that for the 2 FGDs, both groups report gaining knowledge (✓✓) and adoption of many of the practices themselves (✓✓), with efforts made to share with other farmers. However, there were a few cases where the lead farmers interviewed had not yet adopted practices. A couple of farmers noted the poor rains of the last few years which has affected their capacity to adopt some of the practices.

The types of practices most commonly reported as being adopted by the farmers in the Learning Groups fall under Principle 1 and Principle 3. Under Principle 1 the main practices reported were the use of border crops and refugia seeds, an appropriate number of sprays and types of pesticide, safer pesticide application practices, knowledge of beneficial insects, and preparation of bio-pesticides. Under Principle 3, the main practices reported included intercropping and use of appropriate quantities of fertiliser. Very little was reported on Principle 2 or Principle 5. This is compared to the situation at baseline, in 2015, when most farmers reported using *monocrotophos* pesticide and indiscriminate usage of fertilisers, arguing that these practices are necessary to obtain good yields.





The FGD evidence presents a similar picture to the household survey data, although it is slightly less positive than the latter, and reveals the variability and complexity associated with the adoption behaviour of farmers. In the intervention village FGDs, positive feedback was given by all farmers interviewed on the Learning Groups and on the training which they had received, where this was discussed. For example, one participant said the following (with which the wider FGD group concurred): 'We are happy that somebody is there to help, assist and encourage us to do something in agriculture. Due to this there is a reduction in input cost also' (Madire Village, Men's FGD). Farmer awareness of the practices has increased for those participating in the Learning Groups. A majority of the FGD farmers reported that they had gained some knowledge of the promoted practices. The qualitative data demonstrates that many male farmers are able to explain the newly learned practices, but this is not the case for most of the women farmers interviewed. Many of the FGD farmers interviewed in the intervention village had implemented some of the practices, such as avoiding cocktail spraying, but not all of the practices. The adopted practices are largely those falling under Principle 1 and Principle 3. However, there were a few cases where less progress had been made: for example, some farmers were not yet convinced of what the NGO or lead farmer had told them and were still guided by the input dealers who sell them the agrochemicals, continuing with excessive use of pesticides and cocktail spraying. While the benefits of bio sprays were mentioned by some participating farmers, not all have adopted this practice. Some of the lead farmers have adopted many promoted practices and sought to share them with other farmers, but poor rains have undermined the capacity of some to adopt certain practices, such as intercropping, and to use their own fields as demonstration plots.

In comparison, in the non-intervention village, such interventions have not been introduced. From the 6 FGDs conducted in the non-intervention villages, it is clear that the farmers are still over-spraying and using *monocrotophos*. They do not have awareness of bio-pesticides and bio-fertilisers, do not intercrop and continue to burn the cotton residues in the fields rather than incorporating them into the soil. The FGDs also show that larger numbers of farmers in control areas continue to buy and use the inputs directed by the private sector input dealers compared with farmers in treatment areas, although the influence of the input dealers is still felt in the treatment areas as they have significant influence.

Participants in the two women's FGDs did not report enhanced knowledge or adoption. This is unsurprising, because women are generally not effectively invited to participate in the Learning

Groups due to the assumption that the head of household should participate (which is generally men) plus a lack of proactive measures to actively engage women. Further, and information is not being shared at an intra-household level. Women have internalized the notion that farming decisions are the responsibility of men: In one FGD (Balladur) said that 'farm practices are to be managed and decided by men. We will do what they ask us to do in the field'. 'Some men in the village do share with their wives, but our households are different'.

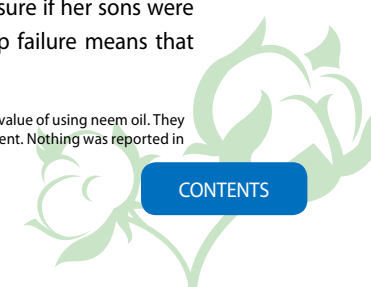
The FGD qualitative data suggest a limited spread effect has occurred to date, i.e. enhanced knowledge and adoption in intervention villages amongst farmers not participating in the LG³³.

Box 5: A limited spread effect – qualitative data

Amongst the non-LG farmers in the intervention village interviewed, in 1 of the 3 FGDs the farmers were aware of the NGO and knew the extension worker by name and reported enhanced knowledge on how promoted practices can reduce costs, and on the value of using neem oil. They reported using refugia seeds and intercropping, but they continue to spray 5 to 6 times including using *monocrotophos*. Only a small number in the FGD knew that red and yellow triangles on the packet denote dangerous chemicals for humans and the environment. Nothing was reported in the other 2 FGDs out of the 3 non-LG groups interviewed in the intervention village.

The findings are highly gendered: during the women's FGD groups, participants indicated that they have limited access to the training and limited information (i.e. information is not being shared at an intra-household level due to prevailing gender norms which largely exclude women from farm-related decision-making. Gender shapes women's access to the learning groups and hence to practice adoption. Of the two household case study women (widows, female-heads of household) participating in the LGs, both reported uptake of the promoted practices. They also said that they have managed to reduce their expenditures as a result of reduced agrochemical input use, although as per most of the male interviewees, they could not estimate by how much. Both also stated that other farmers in their group had benefitted from participation. However, another widow reported that she had not participated and was not even sure if her sons were participating in the LG. She said that in any case for her household 'crop failure means that implementing new practices would be impossible'.

33. Amongst the non-LG farmers in the intervention village interviewed, in 1 of the 3 FGDs the farmers were aware of the NGO and knew the extension worker by name and reported enhanced knowledge on how promoted practices can reduce costs, and on the value of using neem oil. They reported using refugia seeds and intercropping, but they continue to spray 5 to 6 times including using *monocrotophos*. Only a small number in the FGD knew that red and yellow triangles on the packet denote dangerous chemicals for humans and the environment. Nothing was reported in the other 2 FGDs out of the 3 non-LG groups interviewed in the intervention village.





In terms of changes to agronomic practices resulting from the promotion of BCI practices and increased awareness, the responses in the household case studies were somewhat mixed. Some farmers reported uptake of some practices, especially PP1 and PP3 practices (less so on PP2 and PP5). However, the findings are less positive than the household survey and also compared with the FGDs, potentially reflecting the real-life complexity at the ground level in terms of farmer decision-making and the challenges posed by poor rains, high levels of indebtedness and pressure from input dealers to buy and excessively and inappropriately-use agrochemicals. See box 6 below.

Box 6 Household Case Study Panel Findings on Adoption

In the panel, only 4 households out of 15 cases reported adoption of multiple promoted practices, and 2 households reported adoption of a small number of practices. Overall, 15 household case studies were conducted in the panel survey, but by 2018, 3 of the household cases had moved out of the village so they could not be interviewed. It is important to note that mostly they have moved in search of work, being unable to continue in farming, which suggests that they would not have had the means to adopt the promoted practices had they remained in cotton farming.

Of the remaining 12 household case studies who could be interviewed:

- 4 households reported that they participate in the Learning Group and have adopted multiple practices as a result (although not all the promoted practices).
 - 2 households are participating in the Learning Group and have adopted a small number of practices.
 - 5 cases reported that either they do not participate in the Learning Group or do participate, but they have not implemented any of the practices.
- 1 did not respond regarding participation in the LG and resultant adoption of practices.

Where farmers reported agronomic changes, these included modifications to spraying practices to enhance safety (e.g. spraying in the morning, wearing more protective clothing).

A few farmers mentioned that they intercrop. In one case, the farmer mentions being given border crop seeds by the Implementing Partner. A small number of farmers mentioned that they have increased their use of organic fertilisers and neem oil. As in the FGD data, the practices that have been adopted by farmers are primarily PP1 and PP3 practices. See box 7 for illustrative examples.

Box 7. Examples of practice changes reported by household case study panel farmers as a result of NGO training on BCI practices

One farmer attends an LG meeting regularly (e.g. once per month minimum). The group has 20 members. They have been shown a video from a demonstration plot, although the audio failed. The training covered the use of appropriate quantities of fertilisers and pesticides, not using *monocrotophos* and using protective measures while spraying pesticides and only spraying in the morning and washing hands with soap after spraying and not to chew tobacco or smoke. He is following these techniques: spraying in the morning helps him from a health perspective. His expenditures have reduced to the extent of about Rs.6000 (~US \$85). But he has still sprayed multiple times. He could not clearly report on the required time gap between the two sprays or the kind of chemicals that he had used. The group leader has provided him with a record sheet, and he has begun recording input use. Other farmers have reduced their expenditures as well, but he is not sure by how much. As he is illiterate the information written on the walls is not understandable.

Another farmer reported reducing agrochemical usage, saving approximately Rs.20,000 (~US \$280) on his expenditure in last cotton season, plus the growing of refuge seeds which has reduced pests on farm.

Another farmer has learnt how to pick the cotton from the plant itself rather than letting it fall on the ground and learned how to dress properly when spraying pesticides. He has begun to use biopesticides such as neem oil. However, he could not adopt all the practices promoted by the NGO: 'We were asked not to use costly fertilisers and pesticides but did the same; We were asked to reduce the human labour, but we could not'.



Barriers to adoption were explored in detail in the household case study interviews. These include crop failure, unchanged farmer mindsets on the importance of agrochemicals in achieving good yields, and the lack of rain. See box 8 below.

Box 8: Barriers to adoption (household case studies)

- **Crop failure** was noted by one farmer as the reason for their household not being able to implement the promoted practices.
- **Farmers not convinced:** Another farmer said they were unconvinced that their yields would be unaffected. This farmer had already received government training on low input farming five years before and he decided not to participate in the LG, because he is too busy with other tasks and fears not using enough agrochemicals will affect his yields, so he uses whatever he gets from the shopkeeper. Further, he does not do intercropping as there are only two of them in the household, but their relatively better off status may also be a reason that they do not invest in food production in the cotton field.
- **Lack of rain:** The NGO had distributed 100 grams of tuar dal to each farmer in the intervention village free of cost and most of the farmers had used these seeds, but a couple of the panel farmers reported that these intercrops have dried up due to the lack of rain.

4.2.3 Farmers' awareness & adoption of decent work principles

The BCI project has organised several training activities focussed on decent work principles with land owners and hired labourers. The types of activities undertaken include trainings (use of PPE, awareness training on various decent work issues), awareness campaign (wall paintings, meetings), partnership building (e.g. with MV foundation for child labour), and the formation of child labour monitoring committees. The BCI project in the first three years focussed more on PP1 than on PP6. The main activities for addressing decent work issues have been trainings and partnerships, both of which have been implemented with low intensity so far.

The evidence collected by the research team indicates a few instances of improved knowledge (of land owners and hired labourers) on decent work issues such as potable drinking water,

health and safety of farm workers, non-discrimination of women, child labour etc., but not on a consistent basis by any means. This is unsurprising given the later implementation of activities focused upon decent work by the IP:

1. **Awareness of Health and Safety Risks in Cotton Farming:** at baseline, farmer and hired labourer awareness of the health and safety risks in cotton farming were found to be limited. In many cases, respondents said that cotton farming was not hazardous. Although many could report cases of hospitalisation from exposure to pesticides by those spraying, few could articulate the longer-term potential health risks of pesticide exposure, indicating gaps in their knowledge. By final evaluation overall awareness levels had improved on some aspects such as drinking water provision and child labour, but have stayed largely the same on other aspects such as health and safety, wages, and gender pay gap.
2. **Adoption of decent work practices:** The household survey data indicates an improvement in decent work: **The Household survey indicates that the index values have improved from 0.46 to 0.58 for decent work (Principle 6) while they have improved from 0.46 to 0.78 for IPM (Principle 1).** Clearly, the improvement is lower for adoption of decent work issues compared to IPM issues or improvement in adoption behaviour on other Principles.
3. **Informal Work:** no change is observed in informal working arrangements for hiring farm workers and a very limited change is noticed in working conditions. In a few instances there is better drinking water provision especially for migrant workers. A few instances of improved practices related to health and safety after pesticide application were reported in the qualitative interviews. However, no change is noticed on additional health and safety benefits for the hired labour. Still, only rudimentary PPEs are in use. Challenges are greater for migrant workers who are migrating with families, due to health and security risks to women and children. A gender pay gap is also widely reported.
4. **Child labour:** mixed reports were received from interviewees on whether there are changes in the child labour situation. Awareness levels have clearly improved on child labour, more so in treatment areas due to the campaign run by the BCI project - but it is feasible that interviewees know better what to say, rather than being convinced to act in practice. However, we do not have the evidence to draw firm conclusions on actual incidence of child



labour as it was not feasible to observe actual practices, which would require a different methodology and type of study. The women (in the FGDs) observed that child labour is not prevalent within the village, i.e. within households resident in the village, and it was also stated that the hired labourers from other villages do not bring their children along with them now (at final evaluation). However, they attributed this positive change to the increased campaigning by the government. They were also not aware of the large messages written on the wall of the school by the BCI project (which says children should be in school and adults should be at work). In an intervention village, it was reported that during the holidays, children do work in the fields so as to meet their petty expenses such as costs of books and pencils, but this is allowed under the BCI standard³⁴. Children were reported as participating in farm work such as weeding and cotton picking. In other FGDs, it was reported that child labour amongst migrant labourers is common due to the migration of the entire family for a specific time period. During these times school drop outs are also common. Labour shortages at the time of harvesting the cotton were reported to be a major challenge in this regard. The labour for cotton picking usually comes from nearby *Mandals*, districts and other states. Some members in FGDs in another intervention village commented that a small number of children go to the fields during school days. Similar reports were made by interviewees in the qualitative data amongst control groups compared with treatment groups: therefore, with this limited evidence, it is difficult to conclude that child labour has reduced over the years in treatment areas as compared to control areas or that there are not instances occurring, especially amongst migrant workers. Overall, while awareness has improved somewhat, it is not clear that there has been an uptake of decent work principles and this is also unsurprising given the fact that the project only recently began to tackle children labour issues. A key question is also whether raising awareness and any perceived benefits of 'Better Cotton' production is sufficient to eliminate child labour. Tackling 'decent work' issues requires significant incentives and effective monitoring systems.

In the following paragraphs, further evidence is provided on change (from baseline to final evaluation, with comparison between intervention and non-intervention areas) on specific aspects of 'decent work' principles of the Better Cotton Standard.

4.2.3.1 Health and safety

Very limited change is observed between baseline and final evaluation in terms of awareness of improved health and safety practices, and adoption of improved health and safety practices. Farmers in both treatment and control areas continue to widely report on health issues relating to pesticide spraying specifically, and cotton farming in general. Specifically, many farmers reported experiencing on eye irritation, burns, skin rashes, dizziness and nausea/vomiting following pesticide spraying. Women especially report body and knee pains when working in the cotton fields. It is still widely seen as the responsibility of farm workers to obtain treatment themselves if they become sick post-spraying, rather than the employer playing a role.

There are a small number of reports of improved practices from the FGDs at final evaluation. One group of male farmers (Intervention Village Men's FGD) stated that they do not enter a plot treated with pesticides for four days after spraying. They also stated that they instruct female workers and pregnant women not to work in the fields after they have been treated with pesticide for about four days. After these four days, when they enter the field again, there is no smell of pesticides. This change is not reported in the control areas. Participants in other FGDs either made no mention of protective equipment or indicated that they merely tie a piece of cloth over their nose and mouth to prevent direct inhalation of pesticides (i.e. they are not taking any precautions).

Similarly, in the household case studies, there were reports of on-going health issues relating to pesticide spraying, e.g. dizziness, headaches, burns, which either required medication or in some cases hospitalization. Only a very few did not report such health issues. Few farmers report making changes in spraying practices and achieving resultant health benefits. In one case, a farmer said that he had reduced the amount of pesticides used and that many villagers were starting to prepare bio-sprays, which would help in future. A female hired labourer reported at final evaluation that on the farm where she worked 'the pesticide sprays go on one side and I keep on working on the weeds on the other side. Nothing much can be done. I rest in the field itself and then I have to go with my work. My sons who also do farm work and spraying pesticides, wash their hands after spraying and before eating food'. In one household case study, a farmer reported that he wears a helmet and a cloth covering his nose and mouth and a long-sleeved shirt, and he does not drink or smoke while spraying.

34. Children helping on the family farm out of school hours and holidays is not classed as child labour. The BCI standard is in line with the relevant ILO conventions.



Box 9: Focus Group Discussions (FGDs) and Health and Safety Issue Awareness and Practice Adoption

Awareness

Intervention Villages (19 FGDs)

- 6 of the 11 FGDs were held with Learning Groups (LG) members had low awareness of the health risks of pesticides (short-term and longer-term) or of the potential measures which should be taken to avoid these. One had low-medium awareness, 1 group had medium awareness, 2 groups provided no information.
- 2 of the 3 FGDs were conducted with non-LG members had low awareness and one had medium levels of awareness of health risks and potential measures.
- 1 of the 2, lead farmer FGDs had low awareness, while the other group had medium awareness.
- 2 of the three 3 hired labour interviews reported low awareness and one reported medium awareness.

Non-Intervention Villages (6 FGDs)

- 4 reported low awareness, 1 group reported low-medium awareness and 1 group reported medium awareness.

Adoption

Intervention Village (19 FGDs)

- In 8 of the 11 FGDs held with Learning Groups (LG) members did not share information on measures being taken and/or what was reported clearly indicates that no protective measures are being taken. 2 groups report specifically that no training has been received. In one case delayed re-entry was reported. In one case, farmers did report several measures such as wearing helmet, gloves and protective cloth around their mouths, not smoking and washing hands after spraying.
- 3 FGDs were conducted with non-LG members, 2 of which confirmed that no measures are taken, while the third group reported practicing several measures.

- Neither of the 2 lead farmer FGDs reported the uptake of health and safety practices relating to pesticide use and cotton farming more generally.
- Hired labour interviews - The findings were mixed. One group said that they had been trained, but no details were given. In one case, participants said that employers were asking pregnant women not to come to the fields, and re-entry for all workers is delayed for 4 days.

Non-Intervention Villages (6 FGDs):

- No measures on health and safety are being taken in the non-intervention villages as per the FGD participants. The situation remains largely the same as reported in the baseline.

4.2.3.2 Access to potable drinking water

There appears to be no major change in access to potable water for drinking for hired labourers working in the fields, between baseline and final evaluation or difference between intervention and non-intervention village groups. At baseline, the provision of water for drinking and handwashing was reported to be variable, and this continues to be the case at final evaluation. At final evaluation, the participants in the FGDs (including Learning Groups, Non-Learning Groups, and Hired Labour Groups) suggested that workers are given water, when they come from outside the village, i.e. migrant workers.

Box 10. Focus Group Discussions, Household Case Studies and Provision of Drinking Water to Hired Labourers

Focus Group Discussions

- 3 of the 11 Learning Group FGDs in the intervention village reported that drinking water is provided to hired labourers. [Some of them work as hired labourers themselves sometimes, and some hire others to work on their farms]. The other groups did not comment.
- 2 of the 3 non-Learning Group FGDs in the intervention village reported on the provision of drinking water for hired labourers, with one group noting that sufficient water is



provided for workers and the other group suggesting that hired labourers carry the water themselves from home or use the pond water next to their field (i.e. drinking water is not provided by the land owner). The other group did not comment.

- In the 3 hired labour FGDs in the intervention village, in both cases the participants confirmed that the land owner would supply drinking water for workers from adjoining villages (it is brought in the same vehicle that transports the workers to the field). One group said that larger landowners who also own lots of buffalo may also give buttermilk to the workers on occasion. The other group did not comment.
- In the non-intervention villages, farmers also report that the landlord provides water or that workers bring water from home.
- No major changes since baseline.

4.2.3.3 Child labour

The findings on child labour are somewhat mixed, but several farmers noted the recent trainings or notices put up by the implementing partner which farmers report have increased awareness, although not in every case, and it is not clear that this means farmers are convinced or motivated to change their practices. A couple of household case study farmers stated that there had been a reduction in the incidence of child labour. However, direct observation would be a more reliable measure of actual incidence, as previous research experience indicates that while awareness can increase, and incidence can be *reported* as declining, actual practice may not have changed significantly. Certainly, for migrant workers the challenge is much greater: as they may have travelled across states to find work, they must bring their children with them, and hence it is much more likely that the children work alongside them according to those interviewed and it also means the children are more likely to be missing vital schooling.

On the issue of child labour awareness and incidence, it is difficult methodologically to validate change in actual practices, without a dedicated study involving ethnographic research, because higher awareness levels may result simply in more informed responses, rather than a change in actual practices. At baseline, the qualitative data indicated that child labour is quite common, particularly amongst migrant workers, who have no option but to bring their children with

them, and who frequently work alongside them, but awareness is highly variable/limited. For example, one of the household case study farmers said that 'when women from the border area and neighbouring villages come to work, depending on the economic circumstances of their family, they also bring their children with them, who may or may not go to school. If the children are refused work by the farmer, then the women also do not work and as the tasks need to be completed, the farmers hire the women and give the children work as well. The children are paid the same wages as the adult workers.' This farmer also noted that 'children of the same village work on their own farms' and did not specify whether this was at weekends/school holidays or during the week.

In the final evaluation, awareness of the importance of not allowing child labour except children helping outside of school/in school holidays has been raised, according to the qualitative data, although not consistently amongst all, or on all related issues. There is stronger awareness in the intervention villages, compared with the non-intervention villages, but even in the non-intervention villages, farmers in one of the five groups were indicating that child labour does not occur now. Another non-intervention village FGD, group members told the study team that children are not forced to drop out of school, while acknowledging some incidence during harvest time. Mostly, children will drop out of school when the entire family leaves the rural area in search of work in the urban areas.

Box 11. Focus Group Discussions and Child Labour Findings

Intervention villages:

Amongst the 11 Learning Group FGDs, 5 did not give information on child labour incidence. 4 FGDs stated that there is no child labour in their village in cotton. In 2 FGDs they said that there is no child labour amongst villagers, but that migrants take children with them and that they may work in the fields. One of the groups that said there is no child labour also said that they had learned about the need not to practice child labour from a government campaign and they were not aware of the NGO activities despite posters being observed by the study team in the village

2 of the 3 FGDs conducted with non-LG members stated that there is no child labour and one group did not give information



Of the 2 lead farmer groups, both groups confirmed that activities are underway to promote understanding and practice changes on child labour, but neither group stated whether practices have changed as a result

Of the three hired labour FGDs, one group reported no child labour. A second group reported no child labour in their village, but they indicated that migrant workers take their children with them and they work in cotton picking the fields at harvest time. In the third hired labour FGD, the group gave no information.

Non-Intervention villages:

There were 6 FGDs with farmers from a non-intervention village. Of these two groups said that there was child labour on villagers' own fields, but they did not clarify when this occurs (i.e. it is not clear if it is in school time or the holidays). A third FGD group said that there is child labour amongst migrants but not amongst villagers. One stated that there is no child labour. 2 groups did not give information.

Some of the FGD groups interviewed said that at migration time farmers take their children with them, suggesting that the children may be involved. There was no mention by farmers of the training provided by the NGO or of the Child Labour Monitoring Committees, which PRDIS have established. Lead farmers in one FGD said that they had raised awareness themselves amongst farmers on child labour issues, convincing farmers not to send their children to work in the cotton fields but to attend school. The other lead farmer group said that teachers visit the homes of farmers with school age children to advise them not to use child labour on their farm. One women's group FGD reported that they had seen a positive change in child labour incidence as a result of a campaign by the government. The study team did not hear other reports of a government campaign.

Box 12: Household Case Studies and Child Labour

Of the 12 households interviewed at final evaluation, there were mixed reports.

- One farmer reported that child labour has reduced a lot and commented on the noticeboards against child labour which have been put up.

- Another said that children are engaged in harvesting, but awareness has changed. 'During harvest time children are involved and earn some money, but nowadays there are many wall writings written against child labour. Compared to earlier, it is now very rare to see children dropping out of school'.
- One farmer said that 'like every other village in this area, children do work in cotton fields... during Sundays and vacations children work in the cotton fields of their own families. However, he says that nearly 15-20 children also work in other farmers' cotton fields during week days and Sundays, especially during cotton picking'.
- One farmer reported that they 'do not have children in the house, and nor do they hire child labour in their fields'.
- One farmer said that 'children in the family do visit the family farm on Sundays, but do not work in the fields'.

The rest did not comment (one woman said she was not aware of the issue).

While there does appear to be a stronger awareness of child labour in the intervention villages (FGDs), practices may not have changed. It is still widely reported that migrant labourers continue to take their children with them and is highly likely that these children work alongside their parents, to earn money as the parents do not have other options. It is important to note that the implementing NGO has only recently begun activities on this front in the past year, and so it is perhaps unlikely to expect changes to have occurred in practice, but the question also arises as to whether smaller-scale and poorer farmers and in particular those working as migrant hired labourers will be able to comply with the Child rights related requirements of the BCI standard, without other aspects of the TOC being implemented which could address affordability.

The household case study data is consistent with that emerging from the Focus Group Discussions, with respect to child labour. Only two of the 12 case study farmers commented specifically on the NGO campaign (e.g. posters), with both indicating a causal link to the project. Many did not specifically comment – in two cases the farmers appeared to report a continuation of child labour.



4.2.3.4 Wages equivalent to minimum wage

No difference was observed between intervention and non-intervention villages in terms of the wages paid to hired labourers, and in terms of the gender pay gap which was found to exist. No clear differences emerged in terms of what was reported by the hired labourers themselves in the FGDs and the other FGD farmer groups. It is not known if the NGO has raised the issue of the gender pay gap or sought to address it in some way.

The government stipulated average daily wage rate for field labour in Andhra Pradesh³⁵ (2015-16) was Rs.295 for male workers and Rs.200 for female workers. However, this wage rate was revised in 2017. According to a labour ministry notification, cited by a newspaper³⁶, an unskilled agricultural labourer is now entitled to receive a minimum wage of Rs.300 per day. In practice, hired labourers in Adoni *Mandal* do not receive a minimum wage. Male workers receive wages of approximately Rs.200 per day, while female workers receive approximately Rs.150 per day. This situation is applicable to both intervention and non-intervention areas and there has not been a change observed between

baseline and final evaluation (FGDs). Wages were discussed in 19 of the FGDs and only in 7 cases were wage rates equivalent to the state minimum wage for unskilled agricultural workers (see Table 15). Affordability may be an issue for the farmers employing hired labourers, many of whom are small-scale farmers themselves.

The qualitative data also clearly indicates that women do not have the same access to higher paid activities (e.g. pesticide spraying, ploughing) due to socially ascribed gender norms. There is a strong gender division of labour in cotton cultivation: Men are involved in ploughing, ridging, spraying pesticides, inter-cultivation and harrowing with bullocks. Women do seed sowing, manual weeding, carrying water for pesticide spraying, cotton picking and collection of cotton after harvest. Men and women are paid equally at harvest, which is paid on a piece rate basis. However, for other work there is a pay gap, justified on the basis that men are doing more arduous or risky tasks, and in one FGD, participants report that women are always paid less than men.

Table 15. Comparative wage rate analysis based on FGDs with men and women farmers /agriculture workers

FGD with participants drawn from	Adoni wage rate Vs. national /state level stipulated minimum wage (Rs.300 per day)	Assessment of gender pay gap	Comparative details on wages for men and women
Intervention - LG (men)	Lower than minimum wages	Wage gap exists but for socially ascribed different roles	Men are paid Rs.200/day and women are paid Rs.120/day
Intervention - LG (women)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Men are paid Rs.150 – 200 Rs./day and women are paid Rs.100/day
Intervention - Non-LG (men)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Men: 200 Rs./day. Women – 150 – 200 Rs./day
Intervention - Hired labour (men)	Lower than minimum wages	No wage gap	Men 150 Rs./day and Women 150 Rs./day
Intervention - LG (men)	Equivalent to minimum wages	No wage gap	Men – 300 Rs./day for pesticide spraying. Women – 260 Rs./day weeding. Men and women paid equally at harvest (piece work)
Intervention - LG (women)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Women: Weeding – 100 – 150 Rs./day. Harvesting – 5 or 6 Rs./kg. (Rate goes up if good yields and demand for workers is high?)

35. Source: <https://eands.dacnet.nic.in/AgriWages2015-16.pdf>

36. Source: http://economictimes.indiatimes.com/articleshow/57408252.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

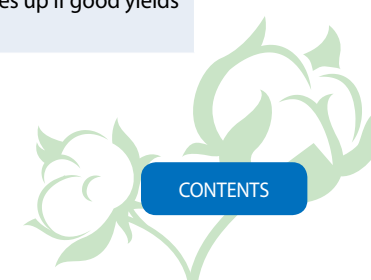




Table 15. Comparative wage rate analysis based on FGDs with men and women farmers /agriculture workers (continued)

FGD with participants drawn from	Adoni wage rate Vs. national /state level stipulated minimum wage (Rs.300 per day)	Assessment of gender pay gap	Comparative details on wages for men and women
Intervention - Non-LG (men)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Women: 200 Rs./day weeding. 8 Rs./kg for picking
Intervention - Hired labour (women)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Men: 200 Rs./day; Women: 100 – 150 Rs./day; Harvesting – 5 Rs./kg Can pluck approx. 60 kilos per day
Intervention - LG (men)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Weeding – Rs.150 – 200 / day for men and women. Harvest – 8 Rs./kg for men and women. Pesticide spraying Rs.200 – 300/day
Intervention - LG (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 200 – 300 Rs./day. Women: 150 – 200 Rs./day. Cotton harvesting: men and women get Rs.7 – 8/kg
Intervention - Hired labour (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 250 – 300 Rs./day. Women: 250 – 300 Rs./day. Cotton harvest they get more – Women 250 – 300/day and men 400 – 500/day
Intervention - Non-LG (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 250 – 300 Rs./day. Women: 100 – 150 Rs./day
Intervention - LG (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: Rs.250 – 300 per day; Women: 150 – 200 Rs.; But for harvesting equal for both male and female 7-8 Rs.per kg
Intervention - LG (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 200 – 300 Rs./day. Women: 150 – 200 Rs./day. Cotton picking – equal pay of 7-8 Rs./kg
Intervention - LG (women)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 200 – 300 Rs./day. Women 150 – 200 Rs./day; 10 – 12 Rs./kg at cotton harvest for both men and women
Non-intervention (men)	Equivalent to minimum wages	Wage gap exist but for socially ascribed different roles	Men: 300 Rs./day. Women – 150 – 200 Rs./day
Non-intervention (men)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Women: 150 Rs./day for sowing, weeding and fertiliser spraying, Men – Rs.200 for same job. Pesticide spraying 300 Rs. Rates for harvesting the cotton starts from Rs. 5 and can go up to Rs.10 depending on the demand.
Non-intervention (women)	Lower than minimum wages	Wage gap exist but for socially ascribed different roles	Women: 100 – 150 Rs. for sowing, weeding, fertiliser spraying. Rates for harvesting depend on quantity obtained.
Non-intervention (women)	Lower than minimum wages	Wage gap exist for same roles	Always 50 – 70 Rs. difference between women and men. Men – Rs.200/day. Women 150 Rs./day. Harvest rates by kg.



As estimated in section 4.4.2, the living wage for rural households should be around Rs.15,290 per month. If we consider this monthly living wage for 25 days of work in a month, then the living wage per day should be around Rs.612. Assuming two members in a farming family are earning, this would then be approximately Rs.306 per earning family member per day, which is almost equivalent to the minimum wages, with the assumption of 2 earning members in a family, with ability to get wage work throughout the year, which in reality is not the case. Therefore, it is possible to say that most Adoni farm workers are currently receiving much less than this minimum wage or living wage. It is reported by participants in the FGDs that the Government's minimum wage policy is not being implemented in the villages. The situation has remained the same between baseline and final evaluation for workers on both treatment and control farms.

4.2.3.5 Non-discrimination of women

There does not appear to have been an Implementing Partner intervention on tackling discrimination against women in cotton production. The gender pay gap is covered in the section above. Another aspect of discrimination is women's access to the Learning Groups, and associated training and information (see section 4.2.2). Mostly, women have no say in financial and farming-related decisions. They may be consulted in some instances, but generally their views are not valued by male members of the household. For example, one group of men said that they might consult women on seed choices, but that they disregard women's views and knowledge on pesticides and fertilisers. Women are rarely participating as lead farmers and their participation in the Learning Groups is low. See Table 15 on wage rates and the gender pay gap.

4.2.4 Catalysing partnerships and linkages

The Better Cotton Standards emphasise the need for engaging in partnerships to execute the 'Better Cotton' agenda. An Implementing Partner is not expected to have all the necessary skills and capabilities in all dimension of 'Better Cotton'. This makes partnerships essential. The implementing NGO in the study project have recently initiated a partnership with MV foundation for child labour related work. See section 4.2.3.3 above on child labour.

The implementing NGO have also initiated linkages with Andhra Pradesh Agricultural universities, the Government of India Department of Agriculture, for technical support. These partnerships are relatively recent (established since 2017) and so concrete benefits are not yet visible. The research team did not see any evidence of joint, collaborative working between the IP and these

partners during interactions with farmers and key informants at village level. Also, no specific documents on strategy and anticipated outputs, outcomes and impacts from these partnerships were available to the research team.

No partnerships are in place, facilitated by the project, to enhance farmer access to services, such as credit and crop insurance, or to tackle gender inequality. Similarly, there are no partnerships in place to tackle sector coordination for sustainability, e.g. engaging sector stakeholders, including government and buyers, as well as ginners and spinners, and farmer representatives.

4.2.5 Enabling mechanisms for farmers

Farmer enabling mechanisms are needed to improve the incentives for cotton farmers to become 'Better Cotton' farmers and to address the dependent and exploitative arrangements with commission agents and input dealers, in which so many farmers are trapped. The project has not implemented enabling mechanism interventions, such as providing access to a credit programme. The formation of the Producer Organisation/Company which might in future offer its members such services, or undertake collective bargaining to obtain higher prices, is only just underway.

As stated in section 3.3.2 (cotton value chain map), indebtedness is prevalent, with many farmers taking loans from the Adoni town commission agents (also known as *mandi* agents or *dalals*). At the baseline survey (2015), a large proportion of farmers (estimated to be more than 95%) were selling their cotton to commission agents from whom they had already borrowed money as a loan for cotton cultivation. Commission agents work as financiers, lending money to farmers without requiring any documents or security. They provide 5000 to 15000 Rs./acre to each farmer to cover input costs, with a recovery period of 5-6 months. Delays in repayments lead to indebtedness as these intermediaries charge a high interest of 24% (at Rs.2/100/Month). The intermediaries also take a 2% commission on the sale value of the cotton. At the baseline survey (2015), less than 5% of farmers sold directly to ginners (KII, FGD).

There are many banks in Adoni *Mandal*, such as commercial banks, cooperative societies, and pawn brokers. Very few farmers approach banks due to lack of documents or not closing old loans or waiting for government for loan waivers. Banks are providing Agri/crop loans at 7% interest but need 6 or 7 different documents. The sources of credit for farmers thus continue to be the same as at baseline, with no differences in interest rate or processes observed.



In terms of bargaining power on prices, farmers have very little with respect to the commission agents. They are rarely able to negotiate cotton prices with commission agents. Most farmers are not in a position to select the commission agent or traders to whom they sell cotton as they are indebted to them. It takes some time to build up a trading relationship between the farmer and the commission agent, and so it is not easy for farmers to change between them. No change to this unfavourable 'trading relationship' is reported in the final evaluation. The majority of the farmers continue to rely upon commission agents for loans, because these loans are easily accessible without any formal documents. Farmers continue to pay interest of about 24% per annum.

Box 13: Trading relationships with *dalals* as reported by the study panel

A study panel member reported at final evaluation, that her family continues to take loans from a particular *dalal* to meet farm-related expenditures. The *dalal* provides a loan of about Rs.5000 per acre. She said because this *dalal* gave financial assistance for her daughter's marriage and also helped her to construct a house, she will continue to sell her cotton harvest to this *dalal* only. Similarly, another panel member reported that he sells the harvest to the *dalal* as he gives him financial assistance when needed. Another panel member, however, reported that he does not need to sell his cotton to the same person every year, because he is taking inputs on credit from one of the input dealers in the village. He is then more able to select his buyer. However, if he does not pay for the past loans, the input dealer will not extend credit for next season. This panel member has taken a loan from a private micro finance group to meet his family and farm expenditures at the interest rate of 30%. He will pay an interest of Rs.9000 on the 30000-loan taken.

The participants who reported taking a loan from the cooperative society pay 12% interest. However, they cannot take another loan till they pay the outstanding loan.

The *dalal* credit system is accessible to small farmers, as the *dalal* takes the farmers word as guarantee and does not require any mortgage. At the bank, farmers have to provide a guarantor and need to mortgage their land. Those who have taken a loan from the bank cannot act as a guarantor. Farmers find it difficult to get a guarantor for their loan since most of the farmers have already taken loans from the bank, at some point in time. The *dalal*

credit system is exploitative not only because the *dalal* charges 24% interest rate, but also because if the cash is needed immediately, farmers reported that the *dalal* will charge an even higher interest rate, sometimes reaching 48%.

A study panel member has been able to avoid this 'trading trap', because she is a better-off farmer. She gets her agricultural inputs from Adoni from Grommor Angadi shop. She has money and does not depend on credit to buy agricultural inputs. She sells her cotton produce to whichever shops provide her with a better price.

Improved market access for the sale of cotton is another farmer enabling mechanism. During the final evaluation it was observed by ginners that farmers who are directly selling to ginners can potentially benefit by Rs.500-600/quintal due to better pricing, correct weighing, and by avoiding commission charged by the commission agents. However, a very small proportion of farmers (~1 to 2%) are directly selling to ginners. This status has not changed from baseline or for any category of farmers (treatment, spread or control groups).

Access to high quality and bio-based inputs for cotton production is another challenge which farmers must navigate in Adoni *Mandal*. Again, there have been no specific project intervention undertaken in this regard to date, although the Producer Unit could in future potentially bulk buy inputs for sale to members to reduce the costs and improve the quality of the inputs provided. Many farmers said that they could not obtain bio-sprays on the market, so improving access to these is also desirable.

As reported later (in section 4.3.4), a general improvement is seen in financial inclusion (bank accounts, crop insurance etc.) in the status of Adoni farmers between baseline and final evaluation, but this is the result of contextual changes, rather than causally linked to the BCI project.

In terms of access to information, the BCI project is extending farmer access to technical information, for example on pesticide usage, but this information is not reaching women farmers because of a lack of action and priority given to gender issues in this project.



4.2.6 Sensitization of ginners and spinners

The BCI project has contacted some ginners to raise awareness on 'Better Cotton'. Ginners are becoming aware of the imminent 'Better Cotton' availability in the market. Ginners, however, have expressed constraints and doubts about the ability of 'Better Cotton' to supply in the required volumes and on whether there will be sufficient market demand in the near future.

As reported in section 3.3.2, the ginning sector is very fragmented in Adoni *Mandal* with a high degree of competition amongst the 150+ ginners in the area. Ginners generally have volume-based contracts with spinners and their focus is on ensuring contractual compliance, i.e. supplying sufficient volumes to meet these contracts in a timely manner. Ginners are frequently hard pressed to obtain sufficient seed cotton and so they are willing to engage farmers groups directly, but this requires farmers to have alternative access to finance to avoid dependence on the commission agents. The ginners suggest that they are willing to offer price incentives where an assured supply and fibre quality can be provided by farmers groups. However, this has not been tested in practice as the Producer Organisation/Company has yet to be formed, and so attempts to undertake collective marketing have not yet happened, nor have farmers escaped the dependency relationships with input dealers and commission agents. It is not clear that the price incentives that ginners would offer in practice would be sufficient to incentivize farmers to adopt Better Cotton farming, including the perceived risks to their yields of changing their agrochemical usage. There has been no visible stimulation of the Better Cotton value chain by brands and retailers, i.e. international buyers and it is not clear if BCI globally has sought to engage them to send signals along the chain via spinners to ginners and farmers.

4.3 Outcomes

4.3.1 Cost of production

The largest cost (among all the other inputs) for cotton farmers is incurred in buying agrochemicals (pesticides and fertilisers) from shops in villages and Adoni town. This is about one-third of the total cost of cotton production. The next major costs are labour and land preparation costs, followed by seed costs. The household survey during baseline and at final evaluation captured farmers estimates of their costs of production. The cost of production of cotton per hectare, without full incorporation of opportunity costs (family labour costs) was worked out both at baseline and final evaluation stage, using same computation methodology.

The costs of production between baseline and final evaluation have increased for all groups, however the increase is least for the treatment group (6%), compared to control group (12%) and spread group (9%). This difference, however, is not statistically significant for treatment, control and spread groups. The difference becomes statistically significant when analysing the change in cost of production between baseline and final evaluation as shown in Figure 20. While the cost of agro-chemicals for all groups has increased between baseline and final evaluation, it has risen by a lesser amount for the treatment group and the results are statistically significant, although the absolute relative saving is very small. The costs have decreased for seed and sowing / thinning and manual weeding, particularly for the treatment group. Though limited in extent, these results indicate early signs of an impact of the introduction of 'Better Cotton' practices in Adoni area.

Cost of production Rs. per ha (Inflation adjusted)

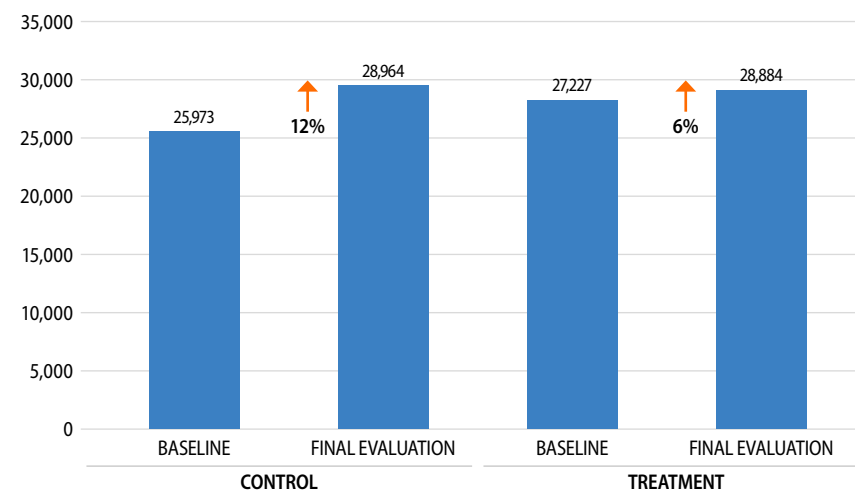


Figure 20. Cost of Production of cotton per hectare (for the season)





Table 16. Difference in Final evaluation values and Baseline values of cost of production of various inputs

EL minus BL costs	Control	Treatment	Spread	Trend	Significance
Labour cost	1826	1958	1921	Up	NS
Land preparation	4678	4972	5744	Up	*
Seed cost	-2556	-1175	-1389	Down	***
Sowing, thinning	-1201	-1732	-1244	Down	***
Manual weeding	-2404	-3615	-3081	Down	***
Organic fertiliser cost	-849	-646	-1034	Down	*
Inorganic fertiliser cost	2790	1550	851	Up	**
Pesticide costs	392	87	71	Up	*

Significance codes: 0 '****' 0.001 '***' 0.01 '**' >0.05 & < 0.1

However, the results do not indicate any significant influence of land size, soil or education levels (see Table 17). This means that trends in the cost of production between baseline and final evaluation are similar for all categories of farmers. Though non-significant, medium and large farmers have somewhat higher costs of production than small and marginal farmers. This is true for all groups of farmers (control, treatment and spread). Again, farmers are incurring somewhat higher costs on black soil than on other soils (mixed, red), but it is not a significant difference. This is true for all groups of farmers (control, treatment and spread). This indicates that farmers have slightly greater willingness to invest in cotton on black soil.

Table 17. Analysis of influence of soil, land and education factors in cost of production of treatment farmers.

Outcome of interest	Mean (EL-treatment)	SE (EL-treatment)	Significant interaction by (p-values)		
			Land category	Soil	Education
Cost of production (Rs. per ha)	28,680	673.3	0.19	0.11	0.40

Significance codes: 0 '****' 0.001 '***' 0.01 '**' >0.05 & < 0.1

The qualitative data from the FGDs presents similar findings. In terms of the costs of production the general trend emerges of rising costs of production. In two Learning Group FGDs, participants complained that overall their costs of production were rising. In the other 9 FGDs, most of the treatment farmers reported that their cotton incomes are declining, and costs are rising. In the one non-LG (spread group) FGD, costs of production were also reported to be rising by the participants. In one of the non-intervention / control villages, farmers also said that their costs were rising. Overall, the picture is clear that the costs of production are rising for farmers in Adoni *Mandal*.

However, amidst most farmers reporting a rise in costs, instances were also heard in the qualitative research of cost reductions being achieved as a result of the adoption of the promoted practices. Three of the household case study interviewees specifically said that they have obtained reductions in expenditure as a result of reduced applications of agrochemicals: Two male farmers gave estimates – one of Rs.6,000 (~85 USD) and another of Rs.20,000 (~280 USD). A female farmer said she and others have achieved less expenditure on chemicals and pesticides. However, it is not certain how many of the others have achieved savings. There were also a handful of instances in the FGDs, in which farmers reported benefits in terms of reduced costs as a result of adoption of the BCI promoted practices. For example, in Balladur Men's FGD, participants said that 'by cutting down on the use of pesticides and fertilisers, we have reduced our expenditure by 50% of the total costs of cultivation'. One of the women's FGD groups suggested that other farmers in their village had started using 'neem oil, bio-spray prepared by themselves using cow dung, urine and other bio products which are reducing inputs costs for them'.



The difficulties faced by farmers in recording and reporting on their costs of production, due to literacy challenges, have been noted above.

4.3.2 Yield

Data on the yield /productivity of cotton was collected from the farmers for their rainfed and irrigated plots. In most circumstances, cotton cultivation in Adoni is rainfed. Only 36 control, 14 treatment and 8 non-LG (spread) farmers have irrigated plots. At the same time, some farmers have reported having access to supplementary irrigation. It is possible that the farmers having only rainfed plots are also able to access very limited supplementary or protective irrigation. The following picture on baseline and final evaluation productivity levels for rainfed plots emerges from this analysis:

Rainfed Cotton Yield - kg per ha

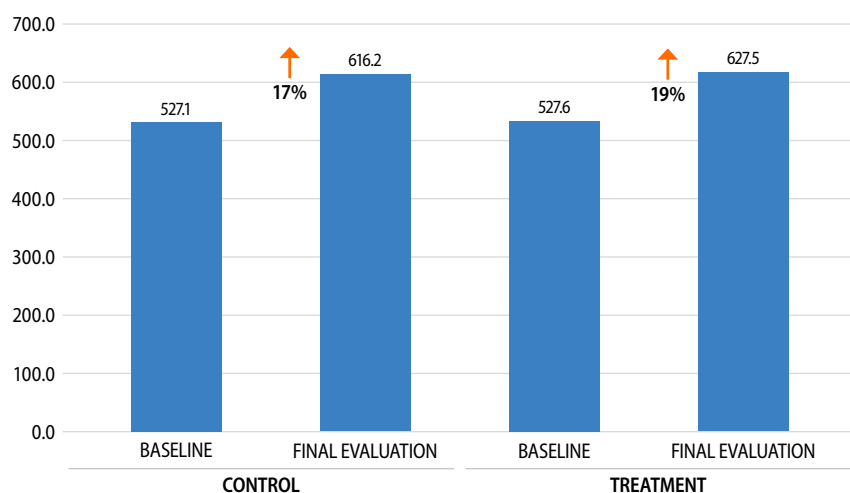


Figure 21. Cotton productivity – Lint cotton (kg/ha)

As can be seen above, cotton yields in Adoni have improved from baseline to final evaluation, for all groups of farmers. The yields have improved slightly more for treatment farmers (19%)

37. Please note that we refer to "Better Cotton" practices – these are more sustainable farming practices, but are not trademarked by BCI.

than for the control farmers (17%). However, this difference is not statistically significant. Adoni farmers' cotton productivity (rainfed) is higher than the state (541 kg/ha) and national (541 kg/ha) level average productivity for 2017-18 season. This is due to predominantly black soils in Adoni which are favourable for cotton production. The primary factors determining yields are rainfall and access to irrigation, and the availability (or lack thereof) of quality seeds (FGD). Yield, on a long-term basis can also be influenced by consistent adoption of 'Better Cotton' practices. As reported in section 4.2.2, some farmers are adopting 'Better Cotton' practices³⁷, but adoption is not yet consistent and may be partial in some cases. In the final evaluation household survey (2017 season), as suggested in section 3.3.3, rainfall was slightly better than the rainfall in the baseline year (2014 season), which may have affected yields positively for all groups of farmers.

Table 18. Analysis of influence of soil, land and education factors in cotton yields obtained by treatment farmers.

Outcome of interest	Mean (EL-treatment)	SE (EL-treatment)	Significant interaction by (p-values)		
			Land category	Soil	Education
Cotton yield rainfed (kg per ha)	627.5	8.10	0.90	0.12	0.74
Cotton yield irrigated (kg per ha)	638.0	20.36	0.52	-	0.18
Production efficiency (Rs. per kg)	46.6	0.21	0.95	0.83	0.46

Significance codes: 0 '****' 0.001 '**' 0.01 '*' >0.05 & < 0.1

The FGD data is somewhat variable, but the overall trend appears to be of declining yields, especially since 2014. It is important to note that at final evaluation, the interviewees were experiencing poor rains which may have affected their perspectives on their yields. The vast majority of farmers in the qualitative data report irregular rainfall affecting their yields at final evaluation (2018 season), and most also report that they have experienced challenges in this regard as well in the past, especially since 2014. Most of the farmers in the FGDs and household case studies are reliant on rainfed farming and yields are affected by rainfall, plus the quality of soils and pest incidence.



Box 14: Focus Group Discussion Findings on Yields

- 3 of the LG intervention village FGDs reported a yield trend (out of 11).
 - One LG intervention village FGD reported an upward trend, another a stable trend, and 1 reported a downward trend.
 - 1 of the 2 lead farmer groups reported on yield trends and they reported a downward trend. They all rely on rainfed farming and up until 2014 the yields were good at approximately 10-12 quintals / acre, but in recent years they can only obtain approximately 3 to 4 quintals (seed cotton yield) per acre.
 - 1 of the 3 non-LG groups from the intervention villages reported on their yield trends, and it was a downward trend.
- 1 non-intervention village FGD (out of 6) provided a yield trend and they reported a downward trend. The poor rains are consistently reported as a key challenge for these farmers relying on rainfed farming.

The data from the household case studies on yields is less positive compared to the household survey data. It is more comparable to the FGD data, although perhaps slightly less positive than the latter.

None report positive trends in yields, some report declining trends and the rest are unclear. Note, however, that at final evaluation, as with the FGDs, all the farmers interviewed were experiencing poor rains (2018 season) which may have affected their overall perspectives on yields, with many expressing concerns about how they will cover their debts due to on-going crop losses. In contrast, in the household survey respondents were reporting on the previous season harvest of 2017, during which the rains were relatively good.

Village level differences in yields also exist. According to the qualitative data Santhekudlur Village farmers tend to obtain higher yields than those in Ballardur, because some of the latter have their land in low-lying areas and are affected by water logging of the field, even with just a few days of rain.

Box 15: Household Case Study Findings on Yields

Out of the 12 household case studies interviewed at final evaluation, 4 household case study respondents reported better yields at baseline, with a clear deterioration at final evaluation due to the poor rains experienced. One farmer reported declining yields at baseline and even worse by final evaluation: 'In the year 2013 we obtained 10-12 quintals/acre, whereas in 2014 we got only 4-6 quintals/acre only. It's a drastic reduction in the yield due to less and untimely rain. Rain plays a vital role in farmer's life especially those who fully dependent on rain fed'. At final evaluation he reported major losses: 'Biggest change is in our livelihood; wage labour is the only the means for bread and butter... I am also worried how to repay the loan taken for seeds and fertilisers... Left with no options; I have to take care about two children and family so decided to go for daily wage labour'.

The other farmers are less clear about their specific yields, but none report an improvement over time. Most are concerned about how they can cover their costs of production for the final evaluation year (2017-2018) due to the poor rains.

At final evaluation, even the largest land-owning family in the group, which has 35 acres of land, realized how lucky they were and said they were not sure how they could pay back their loans. 3 households were not available for interview because they have moved away mainly to find work elsewhere – something which the poor yields are pushing households to do in order to cope.

One male farmer complained that in 2005 he obtained 50 quintals / acre, compared with 15- 20 quintals on average currently.

4.3.3 Fibre quality

BCI Principle 5 says that 'Better Cotton' is produced by farmers who care for and preserve the quality of the fibre, as this is fundamental to its marketability and value. The diverse range of quality characteristics includes aspects that are directly influenced by genetic and seasonal considerations and conditions, as well as those which can be influenced by farm management decisions. BCI has not established a base quality grade that has to be achieved to meet this Production Principle. Rather, the focus is on promoting the adoption of practices that are aimed



at producing the best quality cotton possible under the prevailing circumstances – taking into account the market that the cotton is being produced for. This study therefore assessed the level of knowledge and application among farmers related to BCI recommended practices which can enhance the intrinsic and extrinsic characteristics of the cotton fibre. The other practices relate to how seed cotton is harvested, managed, and stored to minimise contamination and damage.

The efficiency of the ginning process, according to ginners interviewed, will be affected by the level of trash and contamination of the seed cotton; the quality and therefore value of yarn that can be spun is directly related to the quality of the lint cotton delivered to the spinning mill. The cost of the cotton can represent up to 65 % of the total operating costs for a spinning mill. The value of cotton lint is thus related to both the quality of yarn that can be produced from it, and the efficiency with which this yarn can be produced.

Three broad characteristics of the cotton are important: the inherent fibre characteristics, the level of trash (i.e. waste), and the level of contamination. As per a ginner interview during the final evaluation, colour, staple length, and moisture are key determinants of the price, apart from market demand. According to the ginners interviewed, usually, the 1st pick staple length will be around 32”mm, 2nd pick will be approximately 28”mm, and the 3rd pick will be 26”mm. There is good market demand for 29” mm and above. BCI India, however, notes that generally speaking there is limited variation in staple length and in most of India, medium staples predominate.

The household survey data shows some improvement in cotton harvest management, storage and transport practices that can enhance fibre quality. Evidence emerging from final evaluation (household survey) shows that:

- 79% of treatment farmers have reported harvesting mature cotton in the final evaluation, as against 62% of control farmers
- 60% of treatment farmers have reported cotton moisture level below 7%, as against 53% of control farmers
- 51% of treatment farmers have reported use of coloured bags instead of white bags and/ or staking the cotton in open method and transport, as against 47% of control farmers
- 54% of treatment farmers have reported their cotton free from white polypropylene fibre, as against 43% of control farmers

The quality of the cotton is very good in the current year (2018) in comparison to the baseline according to one ginner. It can be estimated from the available evidence that the BCI project has contributed to a small increase in the proportion of farmers adopting better cotton harvest and storage practices. However, there continues to be wide-scope for improving the knowledge and adoption of management practices which can enhance the fibre quality of cotton.

4.3.4 Improved service provision to the farmers

The implementing partner has not implemented actions to improve service provision to participating farmers with respect to access to finance, information and inputs. The Producer Unit (PU) has now been formed, and licensed for three years, starting from 2017-18 season. The PU can potentially work towards improving service provision to treatment farmers in the future. Both the qualitative and quantitative data presents a similar picture of no differences observed between intervention and non-intervention village farmers, as a result of the project, in terms of access to finance and quality inputs, although there has been increased access to agricultural information directly via the IP some changes have been observed with respect to access to information on agricultural practices, with 20% of treatment and 8% of spread Group in the intervention villages reporting the BCI project as their third main source of agricultural information. This is a relatively limited change, but it does show that the NGO is becoming established as a source of agricultural information. Other key sources were TV and Radio and fellow farmers, and internet/mobile, the latter increasing since the baseline. The qualitative information indicates that most farmers in Adoni *Mandal* have a long-standing relationship with input dealers, upon whom they rely for access to inputs and loans to cover wedding expenses, and who give them information. Usually, if a pesticide does not control a pest, the input dealer merely advises the farmer to increase the dose. Overcoming this dependency and close ties to private agro-dealers represents a major challenge for the BCI project, which is seeking to persuade farmers of improved agrochemical use. As the IP has not yet implemented actions to change service provision which would reduce this dependency, it is unsurprising that the changes in farmers practices have not been more far reaching to date, but the opportunity still exists to make these transformative changes. Overall, there has been an improvement in farmers’ financial inclusion, but this is not the result of the project. Farmers’ access to and benefits from crop insurance in the area has significantly increased, plus there has been rising farmer access to bank accounts (including a rise in women’s access to bank accounts, although from a low starting point), but more farmers are relying upon bank overdraft facilities.



Further information was provided in the FGDs on farmers' access to finance: Many farmers, especially poorer farmers, are completely reliant upon the commission agents in Adoni who lend them money to obtain inputs, and then charge them interest. The farmers have no option but to sell the cotton to them being trapped into a dependency relationship. One group explained how a relationship builds between the commission agent, known as a *dalal*, and the farmers. When the latter need to obtain inputs or face other major expenditures such as a family wedding, they turn to the *dalal* who knows their cotton production and credit history. If the rains fail, the *dalal* may extend further credit to the farming household, but the issue is the high rates of interest. Several groups mentioned an interest rate of 4% interest charged by the commission agents on their loans. However, one group mentioned 3% interest and another group reported 6% interest rates. Many farmers cannot obtain bank loans as they do not have land title and/or are not keen to mortgage their land to take the loan or cannot manage the paperwork involved. Others said that mortgaging the family gold is another option if they have any.

Box 16: Agricultural Information, Financial Services and the BCI project

The main source of agricultural information for all categories of farmers (treatment, spread and control) in the area continues to be TV and Radio: 40 to 60% of farmers reported TV and Radio as their primary agricultural information source. The second main source of agricultural information for all categories of farmers (treatment, spread, control) continues to be 'fellow farmers': almost one third of respondents report this is their primary source of information. The third main source of agricultural information has become the BCI project (Implementing Partner), as 20% of treatment and 8% of spread (non-LG within treatment areas) farmers have reported this to be their main source. Overall, about 60% of farmers have reported receiving some form of agricultural information from the Implementing Partner. This is an improvement compared with the baseline, when the Implementing Partner was non-existent in the area. The FGD data also supports this finding.

Interestingly, internet and mobile were reported to be a source of agricultural information for only 2% of farmers at the baseline. At the final evaluation stage, close to 30% of farmers have reported receiving agricultural information from the internet or mobile phone. This is true for all category of farmers (treatment, spread and control). This shows the potential of internet and mobile based extension in the future.

A negligible proportion of farmers report that government extension systems are their primary source of information. But as a secondary or tertiary source of information, government extension services are cited by about one-fifth of farmers. A similar status is observed for all categories of farmers.

In all the villages (intervention as well as non-intervention), private company representatives raise awareness of their products through television advertising. Pesticide dealers also give information directly to farmers about the type of pesticide they should spray, as well as providing other cotton farming-related information. FGD participants in one group said that if the advice of the trader fails to control the pest, then their follow-up advice is to spray a more powerful pesticide. This situation continues to be the same for most farmers, even though for treatment farmers a new source of information (BCI project) has been made available to them. In the FGDs, many farmers also complained of their difficulty in obtaining reliable, high quality inputs, such as seeds or agrochemicals. Many farmers, especially smaller farms, must sell to the commission agents, from whom they have obtained a loan. They lack market information on prices and do not have any bargaining power, as they sell individually. One FGD complained that effectively the traders are preventing outside traders from buying at a fair price by forming a kind of cartel. Some larger landowners are selling to ginners directly and therefore, getting better price. In future the PU could support collective marketing by the farmer members in order to increase their bargaining power. Almost 95% of farmers had bank accounts at the baseline, and no change was observed at final evaluation. However, the level of women having bank accounts has improved from about 15% to about 50%, although this is not the result of the BCI project but is a result of MNREGA intervention. This improvement is similar for all category of farmers. Only about 5% of farmers reported to have kisan (Farmer) credit cards at the baseline stage. No change is observed by final evaluation. One important change noticed at final evaluation stage is that about 60% farmers are now availing bank credit facility. It used to be taken up by about 30% at baseline. This change has happened for all category of farmers. Another important change occurring is that an increasing proportion of farmers are taking up crop insurance - this has improved from about 5% (BL) to about 30% (EL). This is true for all category of farmers. Among those who have taken



crop insurance, the majority has taken it for the cotton crop. Among those who have taken cotton crop insurance, close to two-thirds of them have also filed claims for crop damages and among those who filed for claims, close to 80% of them were successful. This indicates a general improvement in financial inclusion status of Adoni farmers and does not indicate any specific higher-order improvement for the treatment farmers.

4.3.5 Reduced Pesticide use and increased bio-pesticide usage

The research team in consultation with BCI India team developed a benchmark of recommended doses for each chemical ingredient. For this exercise, the recommendations of the CICR, AP state universities and TN Agriculture University were also taken into account. Based upon these consultations, an assessment framework of pesticide usage has been developed which has been applied to farmer-reports on the type and doses of pesticide application at baseline and at final evaluation from household surveys, to produce an estimation of any changes in the extent of appropriate use and pesticide-use rates over three years of the study. Aligned with the Principle 1³⁸, the BCI project has targeted the following:

- Reduction of *monocrotophos* (listed in Rotterdam convention)
- Reduction in use of cocktails (a mixture of two different pesticides by the farmers)
- Promotion of various integrated pest management strategies, recommended by the Principle 1

We analyse here the progress on these fronts from baseline to the final evaluation.

It is evident from the household survey data that the incidence of attacks by secondary pests (such as Jassids, Thrips, Aphids etc.) have increased on the Bt crop over last few years. Pest incidence is assessed based upon the proportion of farmers-reporting the incidence of a pest attack in the baseline and final evaluation surveys. Close to 80% of farmers have reported Jassids incidence during the final evaluation survey compared with 65% at baseline. Thrips incidence is reported by 35% of farmers, compared with 30% at baseline. Aphids incidence is reported by about 35% farmers, compared with 25% at baseline. Clearly, between baseline and final evaluation, secondary pest incidence has increased which explains the increased use of chemicals to control these pests. Also, pink bollworm incidence has increased between baseline

38. Principle 1 of Better Cotton Standard (October 2013) says that Better Cotton is produced by farmers who minimize the harmful impact of crop protection practices

39. ETL definition - In integrated pest management, the economic threshold is the density of a pest at which a control treatment will provide an economic return. An economic threshold is the insect's population level or extent of crop damage at which the value of the crop destroyed exceeds the cost of controlling the pest.

40. Cocktails are not a combination of active ingredients (which may be sold premixed in the market) but a mixture of two different pesticides (which are sold separately in the market) by a farmer e.g. in a tank

and final evaluation: variable weather conditions may also have contributed (see section 3.3.3. for more details). Although the Economic Threshold Level (ETL)³⁹ is recommended to farmers (before using pesticides) in extension messages by the BCI project, farmers generally did not have any understanding and grasp of this concept at final evaluation. The BCI project has trained LG farmers on many IPM practices as this has been the clear priority and focus of the BCI intervention in Adoni during 2015-18, however ETL related topics have not been covered intensively in trainings. IPM adoption behaviour of farmers in the study area has been analysed in two-ways:

- The change in the number of farmers using chemical pesticides between baseline and final evaluation household survey;
- The change in doses of the pesticide active ingredient used between baseline and final evaluation household surveys, also comparing this with the recommended benchmarks.
- Level of adoption of specific IPM strategies

In terms of the number of farmers using chemical pesticides, the household survey data indicates the following:

- A significantly reduced proportion of treatment farmers are using cocktail⁴⁰ of pesticides. Only 8% of treatment farmers have reported using cocktails of pesticides compared with 51% who reported using cocktails of pesticides during the baseline. This reduction in the cocktail use of pesticides is also reported by control farmers - from 64% at baseline to 49% at final evaluation. The reduction is much lower in proportion amongst control farmers compared with treatment farmers.
- Use of *monocrotophos* is reported by 52% of farmers in the final evaluation survey (against 100% farmers who reported its use in the baseline survey). However, a similarly reduction in proportion of farmers using *monocrotophos* is reported by control farmers as well (from 99 to 55%).
- The proportion of farmers using Acephate- and Fipronil-based pesticides have increased between baseline and final evaluation, for all groups of farmers, without any significant difference.



Proportion of farmers reporting use of a Pesticide Active Ingredient

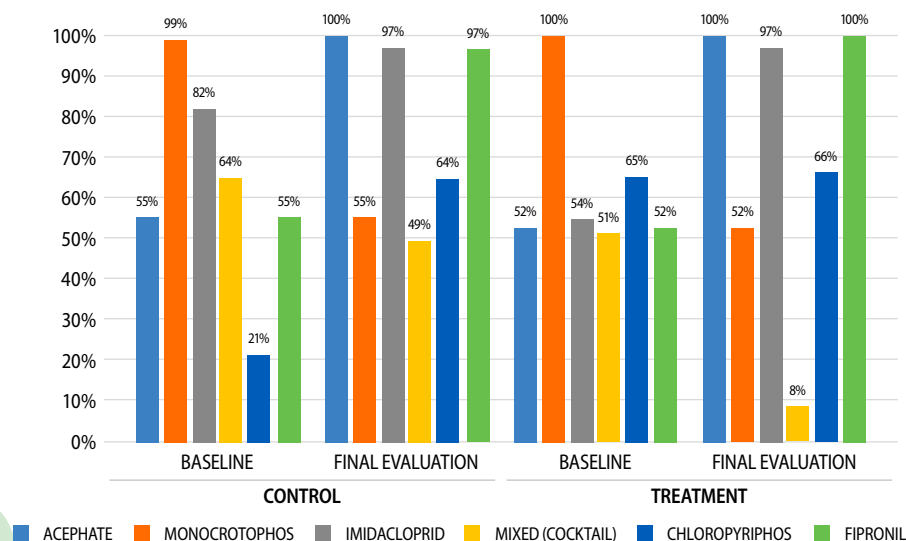


Figure 22. Trend in prevalence of use of main pesticide active ingredients in Adoni

Balanced doses / use of main chemical constituents in pesticides is indicated by the prescribed benchmarks of usage⁴¹. If the benchmark is exceeded, then usage is unbalanced, and this indicates an excessive use of pesticides to address a pest problem. The data on pesticide use was collected in two rounds of surveys (baseline and final evaluation) with the following results:

- The study results show a marked reduction in the doses of all pesticides used (except Imidacloprid and Fipronil) by treatment farmers. These results are statistically significant as while the control groups have also shown reduction in doses, there is a smaller reduction.
- This shows that while treatment farmers continue to use *monocrotophos*, their usage is in much reduced doses, which are within the prescribed benchmark.
- At the same time, treatment farmers have increased the doses of use of Imidacloprid- and Fipronil-based pesticides. This usage is possibly to counter the Pink Bollworm and Jassid pests. These are also expensive chemicals and can increase costs for the farmers. It is observed that farmers follow the recommendations of dealers’ who tend to push these products to meet their business targets.
- The pack size of pesticides available in the market also tends to promote their excessive use – see Table 19 below.

Table 19. Pesticide doses of Active Ingredient used by farmers*

Main Pesticide constituents	Control		Treatment		Benchmark doses proposed by State Agriculture Universities (benchmark followed by the BCI project)	Current practice
	Baseline	Final evaluation	Baseline	Final evaluation		
Acephate (gm/acre)	230	143	278	83	Acephate 75% SP WP - 120 gm/acre (300 gm/acre)	Jassids (cause of curl leaves) mainly but applied for most other pests; generally applied 45 days after sowing
<i>Monocrotophos</i> (ml/acre)	2628	435	2872	54	<i>Monocrotophos</i> 36% SL - 320 ml/acre (320 ml/acre)	Whitefly mainly but applied for most other pests; some farmer believe <i>monocrotophos</i> 's role as a growth factor in cotton; Mainly 500 ml pack is available, leading farmers to apply more than the recommended doses.

41. The reference values or prescribed benchmarks are taken from recommendations of the CICR, AP state universities and TN Agriculture University. We have also used the benchmarks which BCI project have followed, which are, generally, on the higher side than the ones suggested by State Agriculture Universities.

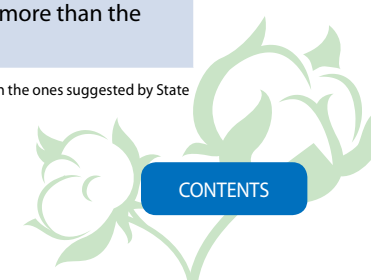




Table 19. Pesticide doses of Active Ingredient used by farmers* (continued)

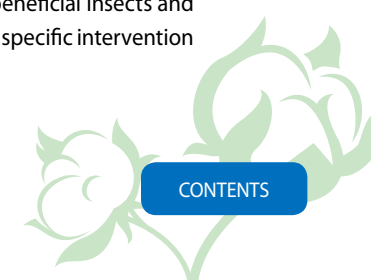
Main Pesticide constituents	Control		Treatment		Benchmark doses proposed by State Agriculture Universities (benchmark followed by the BCI project)	Current practice
	Baseline	Final evaluation	Baseline	Final evaluation		
Imidacloprid (ml/acre)	38	153	25	99	Imidacloprid 17.8% SL - 60 ml/acre Imidacloprid 30.5% M/M SC - 25 gm/acre (50 ml/acre)	Mostly applied as precautionary measure; costly pesticide, dealers are pushing the product. Super Confidor is applied for Jassids if damage is very high. Available in 100 ml/200 ml/500ml/1000 ml packings. Applied between 75 - 90 days of sowing. Farmer tend to apply 100 ml per acre instead of 60 ml as recommended
Mixed (cocktail) (ml/acre)	277	187	226	36	Acephate + Imidacloprid - 60 gm + 500 ml/acre Fipronil + Acetamiprid - 40 ml + 40 ml/acre	Applied for bollworms; high farmers' trust; farmers inability to understand the mix of dosage
Chloropyriphos (ml/acre)	163	121	391	108	Chloropyriphos 20% EC - 450 ml/gm/ha Chloropyriphos 50% EC - 500 ml/acre (500 ml/acre)	Only controls the bollworm. Mostly applied as precautionary measure. 250 ml pack is available and therefore farmer applies 2 packs (500 ml) per acre instead of recommended 450 ml per acre.
Fipronil (ml/acre)	134	255	174	294	Fipronil 5% - 100 ml/acre (400 ml/acre)	Main pest target is for Mealybug / Pink bollworm. Packing of 500 ml is available; farmer tends to apply 1 packs for 2 acre, still exceeding the recommended dose of 100 ml/acre.

*coloured boxes above indicate where the dosage is above (in orange) or lower (in green), than the benchmark

At the baseline survey, none of the farmers were using bio control practices that would control pests (FGD). Some change is noticed here as in a number of FGDs, the treatment farmers reported preparation and application of the bio-pesticide - *Jeewamruth*. Some farmers explained that land degradation would be reduced if they sprayed this organic material, demonstrating an understanding of the value of the bio-pesticides compared with agrochemicals.

Overall, the study results indicate a positively picture, with a lower proportion of treatment farmers using harmful agrochemicals and in lower doses. However, this should be understood as just the beginning of a process: more work is needed to scale up and sustain this trend in a challenging context, in which private agro-dealers are aggressively pushing their products to farmers, many of whom are tied to them through debts taken. Also, the market is promoting inappropriate usage by providing their product in larger pack sizes. Currently, this market is under-regulated in the district.

With variable weather conditions, and with growing pest resistance for the Bt seed, there is an increasing incidence of pest attacks. The study results show that treatment farmers are tending to adopt expensive alternatives, which further increase their costs of production, even though they may have reduced doses on other cheaper alternatives (such as *monocrotophos*). In this context, farmers may return to earlier practices, as 'fear' of the pests among all groups of farmers is clearly still evident. As the concept of ETL is not well understood or followed by the vast majority of farmers, the precautionary application of pesticide still continues which can damages the crop, leading to a build-up of resistance among pests, and is clearly harmful to beneficial insects and to the environment. These issues will need more research in Adoni, to guide specific intervention strategies for the BCI project.





4.3.6 Improved efficiency and balanced fertiliser use

According to the Central Institute of Cotton Research (CICR), the cotton crop should be treated with farmyard manure or organic compost at least once every 3 years at the rate of 12 to 15 tonnes/ha. Farmyard manure use has increased between baseline and final evaluation for all farmers. At final evaluation, 30% of treatment farmers reported using farmyard manure compared with 13% at baseline. 36% of control farmers reported using farmyard manure compared with 14% in the baseline. The change in use pattern of farmyard manure is not statistically significant amongst different categories of farmers, indicating that there has not been an influence of the BCI project. Further, the amount of farmyard manure being used (~2.5 to 3 t per ha) is considerably lower than the recommended doses. The volume or amount used has reduced between baseline and final evaluation, which means even though larger number of farmers are using farmyard manure at final evaluation stage, the quantity of farmyard manure used has reduced to around 1.5t per ha. In other words, although more farmers report using farmyard manure, individual farming households are using lower amounts.

In analysing Nitrogen (N):Phosphorus (P):Potassium (K) balanced fertilizer use, we have used benchmarks recommended from the Central Institute for Cotton Research CICR⁴² and others⁴³ and have also consulted with the IP team regarding the benchmark they use. The household survey collected actual use data from the farmers during baseline and final evaluation surveys. The data is analysed in two ways:

- The proportion of farmers reporting excess use of NPK fertilisers and those who are reporting using fertilisers in a balanced way, in two rounds of surveys
- The quantity of NPK fertilisers reported to be used by farmers at baseline and final evaluation stages

The study findings suggest that between baseline and final evaluation, the excessive use of fertilisers has increased as a higher proportion of farmers are reporting excessive use. This is true for all category of farmers – treatment, control and spread. There is no statistically significant different in this excessive use. Excessive use of N is reported by 30% of treatment farmers, compared with 28% who reported excessive use at baseline. Excessive use of N is reported by 39% of control farmers, compared with 35% who reported excessive use at baseline. Interestingly, a very large number of farmers are now reporting excessive use of Phosphorus at the final evaluation. However, all groups of farmers are reporting excessive use: the results are not statistically different between the groups.

42. Source: http://www.cicr.org.in/Database/db_fert-app.html

43. Source: <http://naasindia.org/Policy%20Papers/policy%2042.pdf>

Table 20. Trend in proportion of farmers reporting excess use of NPK

Nutrient	Control		Treatment	
	Baseline	Final Evaluation	Baseline	Final Evaluation
N	35%	39%	28%	30%
P	53%	87%	48%	82%
K	26%	28%	21%	18%

The excessive use is further demonstrated by actual use (kg/ha) reported by the farmers over baseline and final evaluation survey rounds (see Table 21).

Table 21. Trend in NPK (kg/ha) use in Adoni

Nutrient	Control		Treatment	
	Baseline	Final Evaluation	Baseline	Final Evaluation
N	418	582	396	522
P	127	176	120	158
K	152	212	144	190

As indicated in Table 21, excess use of fertiliser (N,P and K) have increased (from baseline to the final evaluation) for both treatment and control groups. This increase doses though is marginally lower for the treatment group than for the control group, though not in statistically significant way. The study uncovered following reasons for excess use of fertilisers by farmers in Adoni:

- Farmers tend to over-use Nagarjun Urea (46:0:0) post sowing to compensate for not using Urea pre sowing. This tends to provide excess Nitrogen to the crop than is needed. Nitrogen fertiliser dose is used in excess 30 Days after Sowing (DAS) when it is not used during sowing
- Phosphorus use is recommended 45 DAS. However, farmers are generally using at 30 DAS and 60 DAS



- We noticed many instances when Phosphorus, Nitrogen and Potash fertilisers are mixed up by the farmers and then applied rather than applying as per right timing and as per individually recommended doses for N, P and K. By following this practice, farmer is presumably saving on the labour costs
- Third dose of N and K is used by the farmers depending on the rains. If rain comes, then farmers use N and K in excess. This leads to greater flowering and green leaves, a situation farmer like but this also attract pests to the crop

Overall, the farmers in Adoni are mixing up the timing and doses of N, P, K fertiliser use leading to unbalanced and excess use.

Provision of soil testing advice has not changed between baseline and final evaluation. Given that soil nutrients are being used without soil test advice, the inappropriate and unbalanced use of fertilisers is not only increasing the costs of production for the farmers, but also leading to the depletion of soil nutrients (macro and micro, and organic carbon). With a predominantly black soil profile, Adoni *Mandal* farmers can potentially achieve better technical and production efficiencies in cotton, if agro-chemicals are appropriately and judiciously used, but the current findings do not demonstrate a change on this outcome indicator as a result of the intervention.

4.3.7 Working conditions for hired labour

4.3.7.1 Origins and recruitment

Farmers hire labour from the local community, within the village and from neighbouring and more distant villages. During sowing, they usually hire local labour and during harvesting they hire both local labour and workers from further afield. Demand for hired labour spikes during the cotton harvesting period and so during this time they hire both men and women (see also section on child labour). Most farmers obtain hired labourers by informing auto-rickshaw and mini-van drivers of their need for hired labour and the intermediaries then seek the workers from nearby locations (usually within twenty to thirty kms), bringing mostly women to work on the farm. The situation is similar at baseline in both intervention and non-intervention villages.

4.3.7.2 Contracts

At baseline, contracts are not given to hired labourers by farmers (FGDs). The situation has not changed by the final evaluation, in this highly informal sector. The household case study interviews also confirm this.

4.3.7.3 Drinking water and sanitation facilities

As noted in the section 4.2.3.2, there does not appear to be a clear improvement in access to potable water between baseline and final evaluation. At baseline, the provision of water for drinking and handwashing was reported to be variable, and this remains the case at final evaluation. Migrant workers are most likely to be provided with water, because they do not have access to drinking water.

The baseline data indicates that hired labourers are not provided with sanitation facilities and the final evaluation indicates no change in this situation.

4.3.7.4 Equal Pay

As noted in section 4.2.3.5, there is a clear gender pay gap, which also has not changed over the study period.

4.3.7.5 Child labour

See section 4.2.3.3. There are some improvements on awareness of child labour resulting from the project, but limited evidence of changes in child labour incidence.

4.3.8 Observance of Health and safety measures

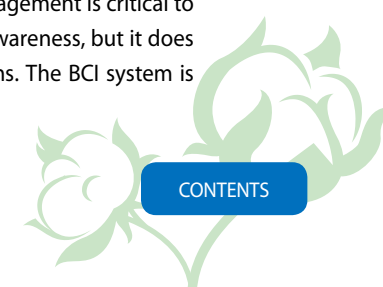
As reported in section 4.2.3, No changes are observed with respect to working conditions, wages and health and safety measures to protect workers. Challenges are particularly intense for migrant workers who are migrating with their children.

4.3.9 Functioning of producer unit

A Producer Unit (PU) was licensed in the first year of operation (2015-16), but this was later withdrawn by BCI India for the next season (2016-17) due to reported non-compliances. The license was then reinstated (in 2017-18) according to BCI India and IP.

4.3.10 Licensing & recognition of better cotton in the supply chain

In the BCI system the main driver for expansion in the value chain is commitment from brands and retailers towards sustainable sourcing of the raw material. The BCI system is increasingly being funded through volume-based fees (~ 12-15 Euros per tonne) paid by the brands and retailers. Essentially, BCI is a farm-based standards system and market engagement is critical to the success of the standard. BCI is working towards increased consumer awareness, but it does not rely on consumer demand to generate market demand and premiums. The BCI system is seeking to increase the uptake of Better Cotton by brands and retailers.





Percolation of uptake ('market pull' from brands to textile mills/spinning mills /gins) is likely to be slow in countries like India. By final evaluation (2018), no brand level uptake of 'Better Cotton' has sent market signals to the ginners in Adoni. As per the ginners interviewed, none of the spinners have so far demanded the separation of Better Cotton from conventional cotton. Cotton bales are sent to Tirupur, Mumbai and Guntur for next level processing. One of the factors is the fragmentation of the Indian ginning sector (unlike many other countries, such as China and the USA, where cotton companies are consolidated entities serving international markets). In addition, India has significant labour issues in ginning mills though studying these was beyond the scope of this research and it is not an issue that is addressed in the BCI system specifically, although potentially it does merit further consideration within BCI as part of sustainable cotton approach which tries to cover decent work issues.

Box 17: The opportunity and barriers to direct sales by farmers to ginners

The main source of agricultural information for all categories of farmers (treatment, spread) The majority of the farmers continue to rely upon commission agents for loan. During the final evaluation, very few farmers are selling direct to ginners. Those that can, are capturing a gain of approximately Rs.500-600/quintal due to correct weighing and absence of any commission (~2 to 5%). However, a very small proportion of farmers (~1 to 2%) are directly selling to ginners. This status has not changed from the baseline or for any category of farmers (treatment, control or spread).

A field facilitator from the BCI IP project team suggested that ginners are willing to buy cotton directly from the farmers as it is advantageous for the mill to do away with the labour charges of loading and unloading which is Rs.55 (< 1 USD) per every bag of 2 quintals. According to one ginner, the cotton rate provided by him is always Rs.50-100 (about 1 to 1.5 USD) higher than commission agent rate. With a direct sale to the ginner, farmers do not need to pay transport from mandi (market yard) to ginning, thus avoiding wastage of cotton in the market yard, and reducing the scope for cheating in loading /unloading/weighing etc. Therefore, farmers can potentially get more money for every quintal of cotton. However, ginners have not been engaging with farmers, other than their known suppliers from the villages, because the farmers require advance loans which the mill cannot provide. Hence, the mill buys the cotton from the yard and from some farmers who come directly to them who are better off and do not require loans. The direct market linkages with ginners is beneficial to farmers, as ginners charge only Rs.150 (~2 USD) per quintal (as 'processing fee') and give the farmer immediate cash as well. In comparison the commission agent deducts Rs.5 for every Rs.

100 (~1.5 USD). For example, if the farmer sells his seed cotton at the rate of Rs.6000 (~85 USD) per quintal at the yard, he would get Rs.5700 (~80 USD) from the commission agent, whereas the ginner would give him Rs.5850 (~82 USD). Farmers who are directly selling to ginners can potentially benefit by Rs.500-600/quintal (~60-70 USD) due to better pricing, correct weighing, and absence of any commission. Whereas commission agents charge us Rs.5 - Rs.2 for loan interest, Rs.2 for commission, and Rs.1 for loading /unloading charges.

4.3.11 Chain of custody system established with identified gin

The supply chain in Adoni does not currently recognise 'Better Cotton'. The cotton processed at gins in Adoni goes to the spinning mills in Coimbatore, Madurai, Dindigal and Aruppukottai in Tamil Nadu. Gins are given volume-based targets from the spinning mills, so the key challenge for BCI is to ensure that ginners can secure the necessary volumes of 'Better Cotton' and spinners are willing to buy in – with both following chain of custody requirements. This shows that demand can potentially pick up if supply is in place. More active engagement along the supply chain will be necessary and especially growth of and communication of demand from buyers to spinners. BCI India reports that they have invited spinners and traders to regional meetings, but it is not clear if they have been willing to engage and whether strong signals from brands and potentially incentives attached to these, are required to interest them.

4.3.12 Improved farmer and household access to markets

As reported above in section 4.2.6, most farmers in Adoni are not in a position to select the commission agent or traders upon whom they sell cotton as they are indebted to them. No change to this unfavourable 'trading relationship' is reported in the final evaluation.

4.3.13 Collective procurement and sale

Collective procurement, price negotiation and sale are potential roles that a PU or a producer company can play for the benefit of its members, although BCI India suggest that the volatility of the market will not render this easy. The PU achieved a licence, but it was then revoked and subsequently awarded again. Of importance is the fact that the BCI project is planning to form a Producer Company (which is a registered entity unlike a PU, and can legally be a business operator /trader /dealer in the value chain), but this has not yet been developed. Such a Producer Company can facilitate negotiations with ginners on price and direct sales etc. The project has reported that the formation of a Producer Company is in process, and it is urgently required to facilitate the achievement of other elements of the theory of change.



4.4 Impacts

4.4.1 Cotton profitability

Profitability (gross margin per ha) is one of the eight key result indicators of BCI. Profitability is calculated as gross margin per ha for each farmer, based on cost of production, yield and market price data provided by the farmer.

The gross revenues and gross margins (Rs. per ha) from cotton have improved for all groups, with no statistically significant difference. No treatment effect on this outcome is observed. Adjusted for inflation, overall farmers in Adoni are earning a gross margin /profit of about Rs.45,000 per ha. This profit from cotton per hectare of crop, as explained in section 4.3.1, is arrived at without considering the opportunity cost of family labour, which if considered, may potentially bring down the profits to a very small amount.

Gross Revenues and Profits from Cotton Rs. per ha (Inflation adjusted)

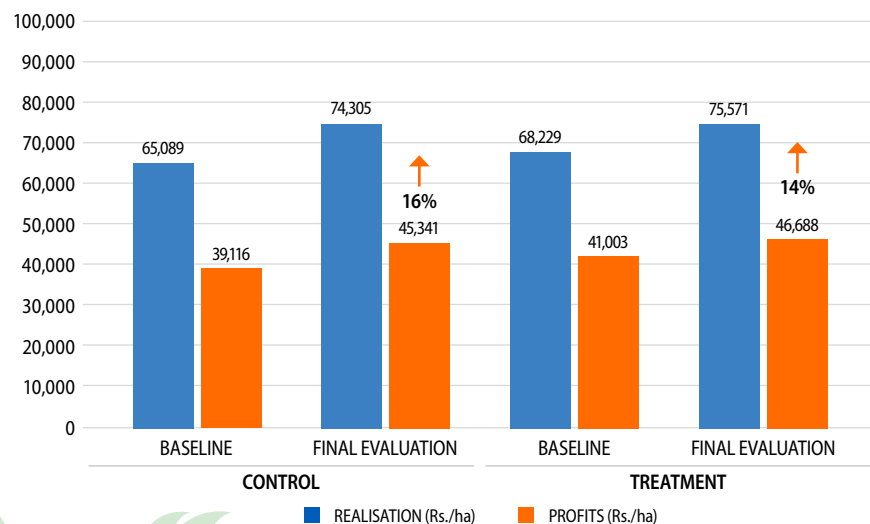


Figure 23. Trend in gross revenues and gross margin (Rs. per ha)

The study results show that larger-scale farmers are getting lower levels of profits per hectare than the medium-scale farmers, who, in turn, are achieving lower levels of profits per hectare

than the small and marginal farmers. This is not due to higher yields being obtained by small and marginal farmers. Yield levels are not significantly different between different categories of farmers. The yields depend on the quality of seeds, rainfall patterns and farm management factors. Yield levels are not necessarily dependent on the size of landholdings. The higher profits per hectare of small and marginal farmers can be explained due to their relatively lower costs of production. This finding provides validity to the approach of the BCI project which focuses on reducing the cost of production leading to an increase in profitability.

Table 22. Analysis of influence of soil, land and education factors on cotton profits of treatment farmers

Outcome of interest	Mean (Final evaluation-treatment)	SE (Final evaluation-treatment)	Significant interaction by (p-values)		
			Land category	Soil	Education
Gross revenue (Rs. per ha)	627.5	803.7	0.47	0.33	0.24
Gross margins (Rs. per ha)	46,668	945.1	0.06*	0.52	0.94

Significance codes: 0 '****' 0.001 '**' 0.01 '*' >0.05 < 0.1

The profits margins are not significantly influenced by soil or education factors.

The profitability (gross margins per ha) from cotton varies across the treatment and control households and is well-represented in a Gaussian bell-shape curve for the baseline and an almost linear straight-line curve for the final evaluation (see Figure 23 in the first column). The shape of the curve is almost identical for treatment, control and spread groups further indicating the absence of any 'treatment effect'. The baseline curve shows that for treatment, control and spread group of farmers, a lower proportion of farmers are in the extreme lower and extreme higher profit ranges, with a maximum proportion of farmers in the middle profit range. At the final evaluation, the situation has changed almost equally for all three groups, with an increasingly higher proportion of farmers achieving higher profit ranges. Minimum support prices – Government declared floor rates - for cotton have seen upwards trend over last three years and this has led to increase in realisation and profits especially in good cotton year (when rainfall is appropriate for the crop). This is one of the reasons why profits have gone up consistently for all groups of cotton farmers.



Proportion of households in a profitability (Rs. per ha) range

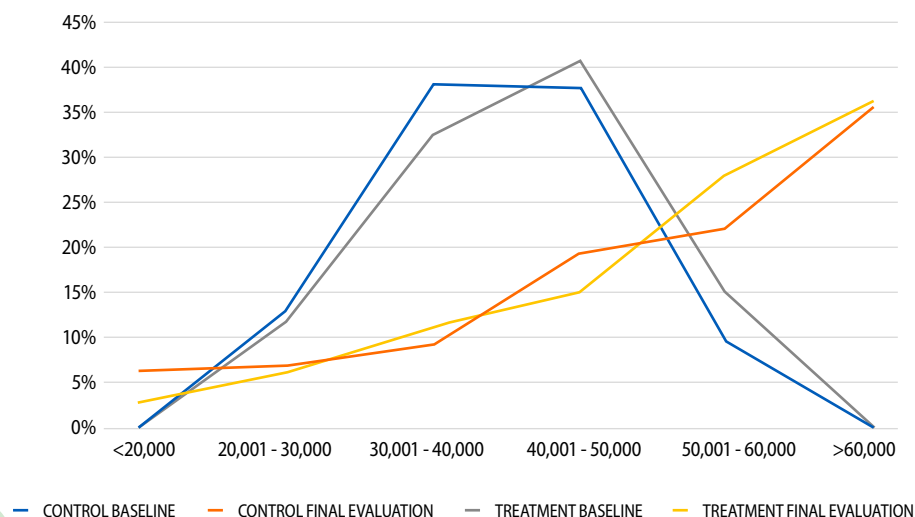


Figure 24. Proportion of households in a profitability range

Differences exist in terms of cotton profitability between the villages / clusters studied. Two intervention villages reported low levels of increase in cotton profits between baseline and final evaluation. The remaining three clusters /villages in the treatment group have reported similar levels of profits and profit increase levels between baseline and final evaluation. The reasons for the low levels of profitability lies either in low yields or high costs of production or difficult terrains. One of the treatment villages has low-lying lands prone to water logging, which is likely to have affected cotton profitability.

In contrast to the quantitative data, the qualitative data (FGDs, household case study interviews) indicates a downward trend in cotton profits, with most farmers reporting this decline over the past three years. However, the majority of farmers also note that they intend to continue in cotton cultivation despite this decline in profitability, if they can, because in seasons where the rains are better, the crop can be profitable and help them to clear their debts. However, in many cases, the FGD farmers report that since 2014 the rains have been quite poor. As is the case

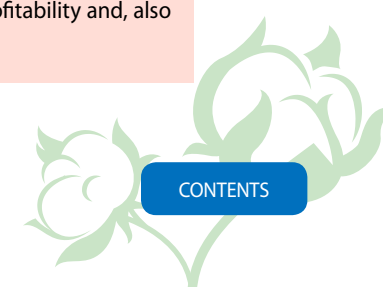
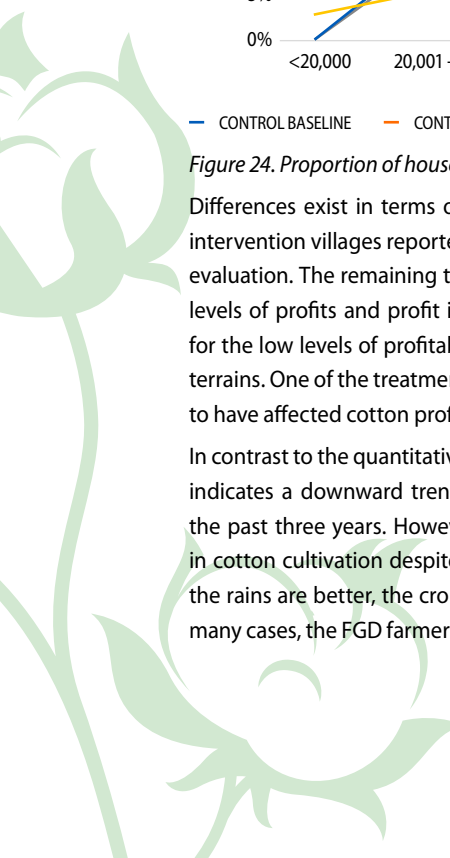
with yields, it is to be noted that FGDs and panel interviews in the final evaluation (2018) were done, when rains have mostly failed, and farmers were witnessing extensive crop losses. It was observed that farmers were feeling very pessimistic when focus groups and panel interviews were being conducted. The divergence between the qualitative and quantitative data can possibly be explained by the fact that the quantitative data was gathered for the previous season (2017) when rains were reasonably good, while qualitative data is reflecting present situation in 2018, when the rains failed.

Box 18: Focus Group Discussions Findings on Cotton Profitability

In the Learning Group FGDs in the intervention villages, 3 FGDs out of the 11 reported on overall profitability. All noted that profitability is on a downward trend. For example, one farmer in the group said: ‘Our incomes are largely reliant on cotton and these are decreasing. Income from farming is enough only to meet our feed needs for 8-10 months. The remaining months must be met through wage work or MNREGA. In recent times, cotton cultivation does not have any advantage. Over the last few years the returns are bad. Last year was bad and this year is very bad. The main advantage of cotton is that it gives good income when yields are good and other crops are not doing so well, and hence we are sticking to cotton. With irrigation, black soils give good yield’.

1 of the 2, lead farmer, FGDs reported on overall cotton profitability: they found that cotton is becoming less economic. ‘Up to 2014 we could get good profits. But, for the last three years there has been no cotton income. The situation is very bad in 2018 Kharif’....’ We will stay in the village until the end of November and then leave the village. We will return during the first showers. Migration earnings help us to meet the food requirements of family members. Yield of every variety of cotton is good only during first two years. There were yield fluctuations with an overall decrease. One of the reasons why farmers shifted to cotton is that If family labour is available the cotton crop can be managed. Ground nuts are totally dependent on external labour. Previously we used to grow castor, but it had diseases. We suffered yields losses of ground nuts and hence switched to cotton’.

1 of the 3 non-LG FGDs in the intervention village reports on overall profitability and, also reports that cotton is becoming uneconomic.





In the household case studies, a similar picture emerged compared with the FGD data (see box 18). The challenges relating to cotton profitability are significant with some farmers becoming indebted and forced to sell their lands and move away to cities. For those able to continue, however, most plan to definitely continue in cotton production, which is seen as a profitable if there are good rains.

Box 19: Household Case Studies: Cotton Profitability Findings

- Only some farmers could give detailed information on their costs of production, yields and prices, and gross margins. This reflects the high levels of illiteracy amongst the farmers in this area.
- There is a strong consensus that cotton production is still an attractive option for farmers. This is because in a good year (good yields and good profits) they can make a good profit and clear their debts. This is the case even for those relying upon rainfed production.
- However, cotton yields are highly variable for rainfed farmers and some report declining levels, especially in the current year due to the poor rains some farmers are particularly affected, reporting 'huge losses' on their investments in agrochemicals, seeds etc. Re-sowing is also costly. Several interviewees report that prices are influenced by quality.
- Pressure is felt even by larger land owners in the final evaluation year, although cotton remains an attractive option: One larger land owner expressed concern that his yield this year is so poor. However, he also noted that compared to other crops cotton attracts better or more stable prices compared to other rainfed crops. Thus, it is better to continue with cotton production'. Another relatively large land owner stated at baseline that they have 25 acres but lease out 5. They have 20 acres under cotton but 10 are irrigated. On average they achieve 15 quintal / acre on irrigated lands and 3 to 6 acres under rainfed conditions with appropriate rainfall. They obtained good prices in the 3 years prior to the baseline, which even led them to stop crop rotation and the income helped them to pay for their children's education and to buy a house, with an estimated 70% of their income from cotton production. But in 2005 they obtained yields of 50 quintals / acre and now they only obtain 15 – 20 quintals / acre at final evaluation. In the year preceding the final evaluation he obtained 20 quintals / acre, but a price of only Rs.3,800 to 4,000, with rising costs of cultivation. As such he is considering leasing the entire land area.

- Farmers with smaller landholdings are particularly challenged by the poor rains and yields at final evaluation: For example, a farmer with only 1 acre, after meeting all his expenditures (approx. Rs.25,000) he obtained a profit of little more than Rs.20,000. For example, one farmer with 5 acres of irrigated lands under cotton said that 'in the first year of his cultivation (3 years prior to baseline) he obtained 24 quintals / acre and for three acres of irrigated land he harvested 72 quintals. Fortunately, the cotton price was also high – at Rs.7,500 / quintal. The earnings allowed him to pay off the mortgage on his land taken in 2011 when his daughter got married'. However, at final evaluation he has only 3 acres under irrigated cotton and the crop is very poor, and the price last year was only Rs.3,200 / quintal'.
- Three of the household case study households have moved away – at least in one case due to the need to sell lands and others report having to engage in off-farm activities because of the poor rains (at final evaluation).

4.4.2 Poverty Impact

4.4.2.1 Incomes

Cotton incomes are measured through a profitability analysis (see section 4.4.1). The main sources of income for Adoni households are agriculture and wage labour (both local and more distant). Close to 80% of farmers /households have reported cotton to be their main source of income, both in the baseline and final evaluation surveys and as indicated in the household survey and FGD data. This proportion is almost the same for treatment and control group of farmers. Agricultural wage labour (~9%), other agriculture crops (4%), casual labour (~3%), private service (~2%), domestic household worker (1%), petty business (~0.5%) are some other reported primary sources of income for households in Adoni. This is consistently same for treatment and control groups of farmers. Other crops grown include *ajwain* (carom seeds), groundnut, chilli, jowar (sorghum), paddy, kora and millets. Farmers growing other crops, such as paddy, chilli, and groundnuts, tend to have some access to irrigation. The primary source of income is cotton cultivation for which the research team has done rigorous validation and computation, using benchmark ranges. The secondary sources of income are estimated based on overall income reported by the farmers. Unlike cotton, the research has not carried out detailed income-based questionnaires for secondary and tertiary sources of income. While estimating the overall



household annual incomes therefore, a small adjustment factor has been applied to secondary sources of incomes to account for general under-reporting of incomes, if any. The same adjustment factor is applied in both baseline and final evaluation round of research to maintain the comparability of time-series income data.

Table 23: Annual household income estimation (average for study respondents) from combined primary and secondary income sources

Income estimation	Control		Treatment	
	Baseline	Final Evaluation	Baseline	Final Evaluation
Primary source: Cotton incomes (Rs. per ha)	39,116	52,722	41,003	54,288
Average land holding under cotton (ha)	2.9	2.0	3.2	2.4
Average annual household income from cotton (Rs.)	114,680	105,226	130,554	130,543
Average annual household income from other crops (estimated, Rs.)	27,845	30,939	27,845	30,939
Average annual household income from wage labour (estimated, Rs.)	33,750	37,125	33,750	37,125
Total average annual household income (Rs.)	176,275	173,290	192,149	198,607
Average household income per day (Rs.)	483	475	526	544
Per capita per day (Rs.)	93	90	107	109
Per capita per day (USD)	1.43	1.26	1.65	1.53

The baseline values for per capita per day income is \$1.65 for treatment group of households and even lower at \$1.43 for control group of households. This average per capita income is much lower than the poverty line defined by the World Bank at \$1.90 a day (2011, Purchasing Power Parity). The final evaluation income estimations suggest an almost similar (non-significant difference) level of household income across baseline to final evaluation. The lack of an increase in household income despite an increase in cotton profits is due to a reduction in land under cotton, poor rains and various other factors for both treatment and control households. Given this situation, it means that the average income of cotton farmers in Adoni is well below the internationally defined poverty line at both 2005 PPP and recent 2011 PPP. However, Adoni cotton farmers household income is significantly higher than the nationally defined poverty line. Tendulkar panel (2011-12) defined the national poverty line based on Rs.27 per capita per day expenditure. C Rangarajan Panel (2014-15) has updated this poverty line to Rs.32 per capita per day expenditure as the threshold for determining poverty count. As per this base poverty line, the annual household expenditure for consuming minimum calories should be around Rs.58,400. An average Adoni cotton farmer is able to manage about three times this poverty threshold annual income.

Currently, there is no living income estimation benchmarks for cotton farmers in Andhra Pradesh, India. Therefore, a comparison to living wage estimations is discussed here to allow a comparison with income (from cotton, other crops and wage labour). The family living wage in India, for a typical family with 2.5 children, 1.6 working, is estimated to be around Rs.13,900 to 19,700 per month⁴⁴. Another estimation of a family living wage is around Rs.19,400 per month⁴⁵. These estimations are for both urban and rural areas combined. In rural areas, the cost of living is expected to be lower and so we can consider the lower definition of the living wage i.e. Rs.13,900. However, this wage is estimated for 2.5 children, while we know the average family in Adoni has more than 3 children. Therefore, an adjustment factor of 10% is needed at the lower level of the living wage to arrive at the estimated living wage that can be assumed to be applicable for Adoni cotton farming households. This works out to be Rs.15,290 per month or Rs.183,480 per annum. With reference to income estimation (see Table 23), we can say that an average land holding farmer (~2 ha) in Adoni is earning close to the living wage from multiple sources of incomes (cotton, other crops and wage labour - three main sources of income as indicated by the household survey). However, this is applicable only when farmers obtain decent cotton

44. Source: <https://wageindicator.org/salary/living-wage/india-living-wages-2018-country-overview>

45. Source: <https://tradingeconomics.com/india/living-wage-family>



profits which is possible only in situations of favourable rains. As the rainfall data (see section 3.3.3) of the last five years show - farmers have experienced a good rainfall year (2016), average years (2014, 2017) and a bad year (2018).

Using this living wage estimation to compare with farmers' income (cotton, other crops and wage labour), our indicative analysis shows, that in a good year, farmers can earn more than the living wage and will be able to create a family level surplus, paying off some of their accumulated debt. In an average year, farmers will be able to earn near (but not quite) living wages, while in a bad year, farmers will accumulate losses and debts. There are no observable significant differences between treatment and control groups of farmers in terms of their average incomes and the relationship of their income to living wage levels⁴⁶: i.e. there is no 'treatment effect' in terms of poverty impact so far.

4.4.2.1 Impact on poverty and livelihoods

Pressure on households to sell land, migrate and find off-farm livelihood activities emerged as a clear trend in the household case studies. One case study farmer had to sell his lands to pay off his debts and had gone to find work as a security guard or petty trade in Bangalore. The others have moved village or gone to Bangalore in search of work. Several other household case study farmers expressed concerns about their levels of debt and said they were experiencing pressure to sell their land as a result. It is thus clear that certain households are facing serious challenges to their livelihood security. A similar picture emerged in the Focus Group Discussions.

4.4.2.2 Multidimensional poverty index

As per the Multi-Dimensional Poverty Index (MPI), 55% of treatment households are found to be deprived, but not poor at the final evaluation stage. This is an improvement from the baseline, when 48% were found to be deprived, but not poor according to the MPI. A similar improvement is seen among the control households also from 48% to 49%. These differences in changes in poverty profile for treatment and control groups from baseline to final evaluation are not statistically significant (p-value 0.99).

Trend in Poverty Incidence - MPI: Proportion of Households

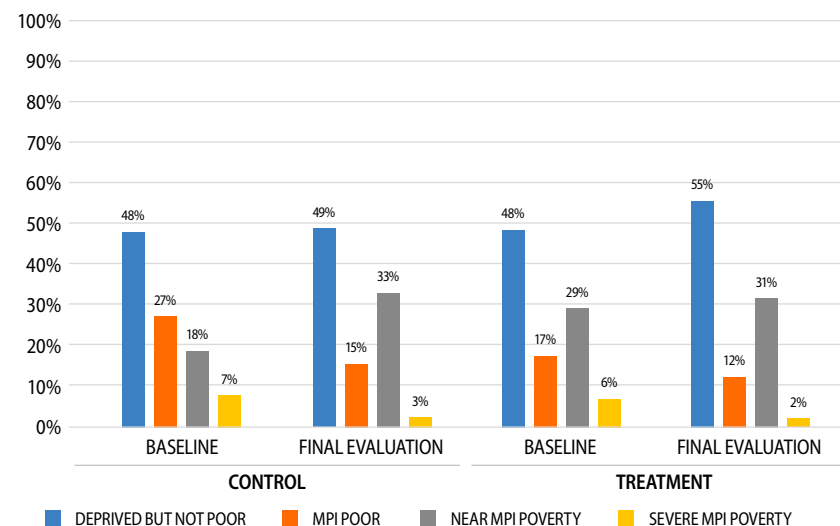


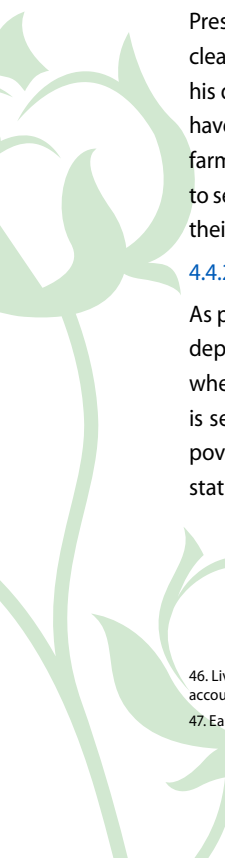
Figure 25. Distribution of MPI weighted scores among respondents from baseline to final evaluation

4.4.2.3 Poverty Probability Index⁴⁷

When measured by the international poverty line of \$1.88/day (at purchasing power parity –PPP), the poverty rate has decreased for all groups of farmers (treatment, control and spread). This reduction in poverty levels among the different groups between baseline and final evaluation is not statistically significant (p-values 0.13).

46. Living wage comparisons are used here for providing a better perspective on poverty impact as expenditure-based poverty lines are woefully inadequate to capture full-scale of living incomes required in rural areas to afford a basic living standard. Expenditure-based poverty lines just account for what is needed for a minimum calorific consumption.

47. Earlier called Progress out of Poverty Index - PPA





Trend in Poverty Rate (% households), Among Difference Adoni Cotton farmers as defined by International Poverty Line 1.88 PPP

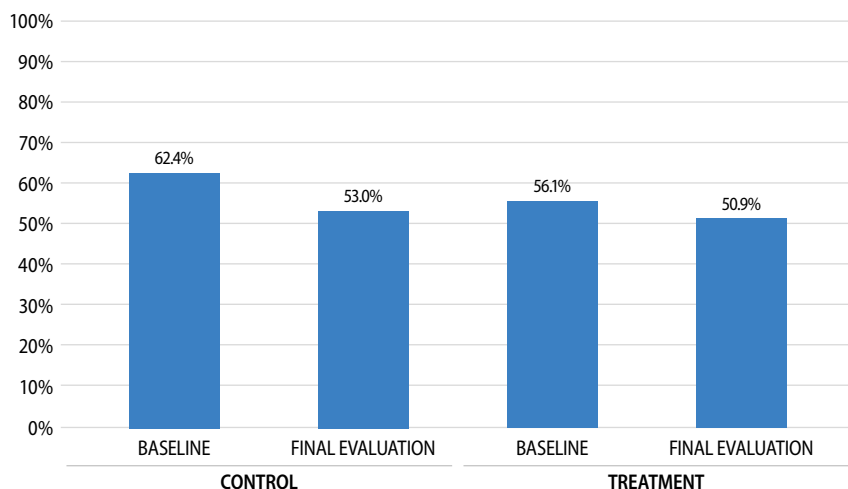


Figure 26. Poverty likelihoods trend

The poverty rate /likelihoods for different categories of farmers is as shown in the Figure 27 in the next column. It shows the same pattern, with slight reduction in poverty over last three years for all category of farmers (small and marginal, medium and large farmers), and for both treatment and control groups. The reduction in poverty rates is statistically non-significant for treatment and control groups and so it can be deduced that there is no poverty impact so far.

Trend in Poverty Rate (% households), Among Difference Category of Cotton farmers as defined by International Poverty Line 1.88 PPP

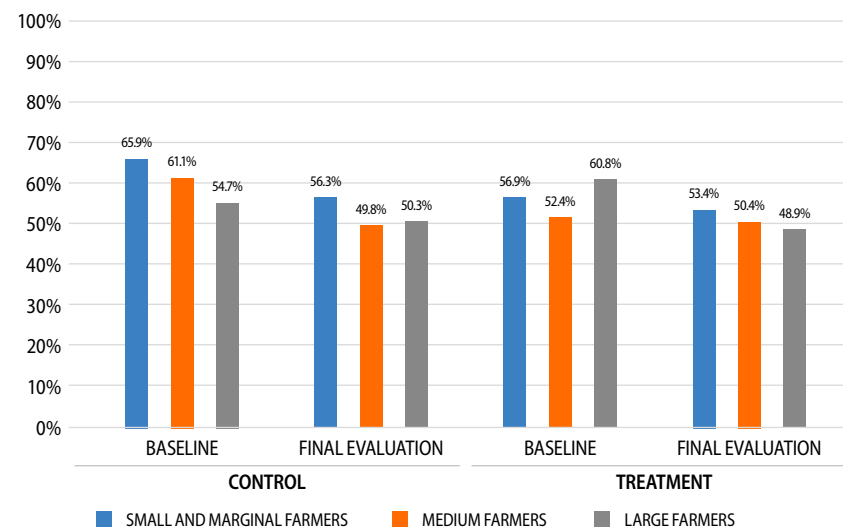


Figure 27. Poverty likelihoods trend, among different categories of farmers

The poverty rate /likelihoods for different education levels of farmers is as shown in the Figure 28 on page 76. It shows the same pattern, with slight reduction in poverty over last three years for all education levels (illiterate, primary, secondary, higher), and for both treatment and control groups. The reduction in poverty rates is statistically non-significant for treatment and control groups and so it can be deduced that there is no poverty impact so far.





Poverty Rate (% households) by Education Levels

as defined by International Poverty Line 1.88 PPP

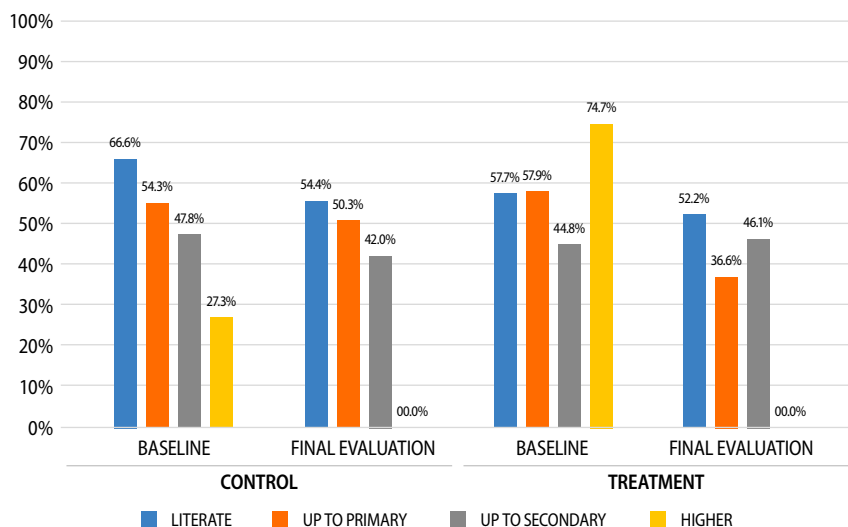


Figure 28. Poverty rate by education levels

When analysing the poverty rates / likelihoods for cotton farmers in Adoni, for one national (Tendulkar) and two international poverty lines (see Figure 29 in the next column), the same pattern of slight reduction in poverty rate is observed across three different poverty lines. Across all these measures of poverty, the differences in change from baseline to final evaluation for treatment and control farmers is non-significant. **Therefore, there is no poverty impact so far.**

Poverty Rate (% households), Among Cotton Farmers in Adoni

as defined by National and International Poverty Line

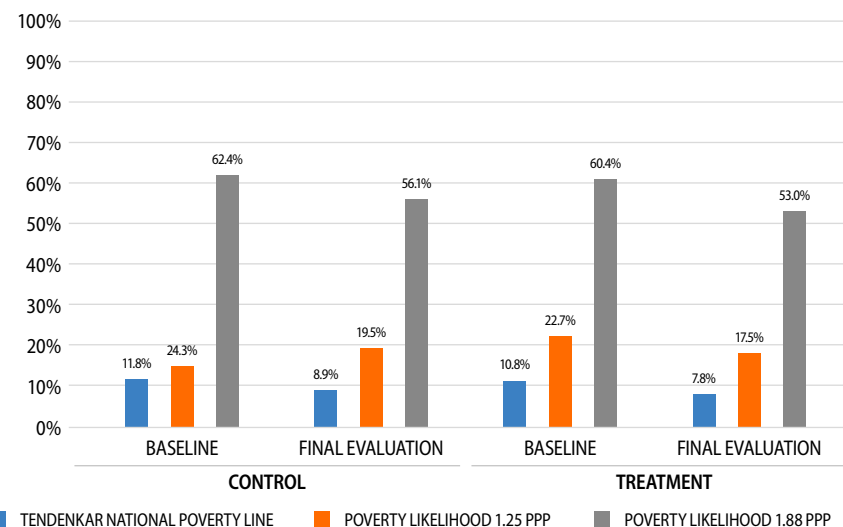
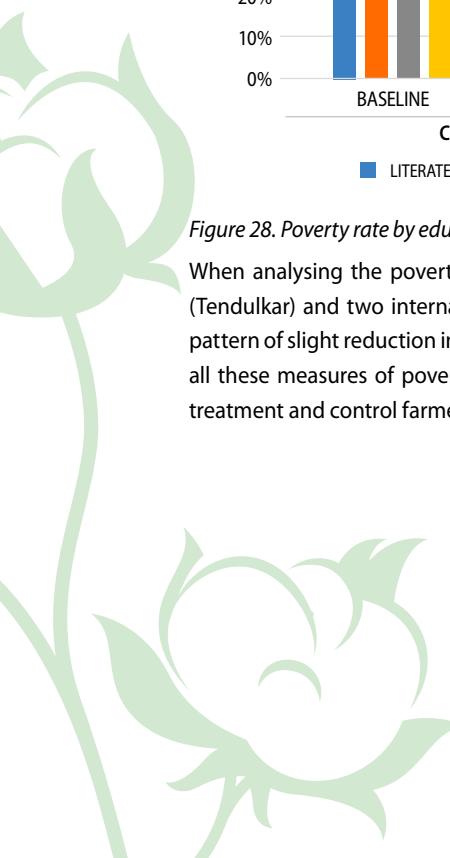


Figure 29. Poverty rate among cotton farmers in Adoni, national and international poverty lines

Both the PPI and MPI methodologies for poverty estimation are based on household assets.

4.4.3 Food security

Food security levels of Adoni *Mandal* households appears to be reasonable, but levels have not changed over the period of the study as a result of the project intervention. Livelihoods remain dominated by agricultural production and casual work, both in cotton production, but there is a degree of precariousness in many farming household livelihoods, with many having to seek hired labour and off-farm work when the rains fail and yields are poor, including migration to other cities.





In the household survey, both baseline and final evaluation, all households reported that they have not spent days without sufficient food for the family. This suggests there is a basic level of food security, in terms of access and availability of food amongst Adoni households. There is no difference between the treatment and control groups. One indication of food security is the level of household indebtedness, which has not changed between baseline and final evaluation. In the final evaluation survey, 52% of treatment farmers reported having outstanding loans. Similarly, at the same time, 52% of control farmers also reported having outstanding loans. This compares to the baseline, when 58% of treatment and 60% of control farmers reported having outstanding loans. The change is not statistically significant for treatment farmers.

There has, however, been a wider positive trend on some aspects of household financial inclusion, such as increased access to crop insurance amongst farmers, but this is not the result of the project intervention (see section 4.3.4 for more information). There has not been a major change in livelihoods between the baseline and final evaluation amongst FGDs participants, although some farmers report having to find work off-farm or considering seeking work elsewhere, either relying upon the MNREGA scheme and/or construction work in cities. Diverse livelihood activities are reported by farmers in the FGDs, but livelihoods largely depend upon agriculture, especially cotton production, and agricultural casual labour and off farm work in construction and masonry. The MNREGA scheme has clearly provided an important safety net for many families, especially small and marginal farmers, when times are hard, as has recently been the case with the poor rains. Without MNREGA income (cash for work scheme) or access to work in town, (e.g. Bangalore for masonry work, Guntur for work in chilli fields, Tirupathi for wage labour and Mumbai for drying and catching fish), many families would struggle to achieve food security. Many families have to seek work off farm and even undertake migration to find work when the rains fail.

At the same time, the vast majority plan to continue growing cotton in the future, although many farmers in the FGDs also note that their capacity to grow cotton successfully depends on rainfall patterns. Several farmers report that they think that yields will continue to decline. In several cases, FGD participants noted that the youth are less interested in farming, and are

migrating to find work in cities, although one LG said that in a good year the young can still be attracted to cotton production. No clear differences emerged between the intervention and non-intervention villages on these issues of food and livelihood security.

Households of the intervention and non-intervention villages mostly consume jowar (Sorghum) roti, rice and Dal (pulses), bajra (pearl millet) roti. Substantial numbers of households are eating reasonable quality food, including millets and non-vegetarian products (FGD). However, small and marginal farmers and migrant labourers consume rice purchased through Public Distribution System (PDS). Assessing malnutrition levels was not within the scope of the study.

The household case studies indicate a mixture of food security and insecurity. Several of the individual panel case studies reported being food secure – either through having sufficient land-holdings and access to labour (i.e. they can pay for hired labour), or through working as hired labourers themselves in cotton picking. Those who are poorer engage in hired labour to survive. Three case study households report being food insecure⁴⁸. For households who have educated children and who have obtained jobs in formal economy, for example in textiles or working as a livestock para-vet, they report relatively better income and livelihood security. For several households their grown-up children are working in informal activities off farm, such as a shared auto business or renting out agricultural equipment, where the family can afford to buy this.

4.4.4 Improved soil health

Improvement in soil health is plausible after the adoption of better soil health practices by farmers over multiple seasons. To date, there has been limited uptake of better soil health practices (adoption processes are just beginning). Application of farmyard manure in terms of number of households applying has increased (while this has decreased in terms of total quantity of application). There is some evidence of adoption by some farmers of cover legume rotations and inter-cropping. However, there is not consistent and widespread adoption of soil health practices (See section 4.2.2). While pesticide use has reduced by treatment farmers, synthetic fertiliser use has not seen much change over the study period. In addition, the use of

48. Three case study households have moved away; At least in one case this is due to hardship at home forcing a sale of lands



bio-pesticides and bio-fertilisers has improved only in a limited manner. These findings suggest that there has not been an impact on soil health as yet and that this will take many seasons of consistent and more widespread adoption of 'Better Cotton' practices.

4.4.5 Reduced incidence of child labour

As reported in section 4.2.3.3 and in section 4.3.7.5. A limited increase in farmer awareness on child labour observed, but no clear evidence of impact on child labour incidences in practice.

4.4.6 Reduced discrimination of women

The BCI project is increasing its work on gender issues in cotton sector. Initially, the project did not address decent work issues, but some actions have been initiated over the past year (e.g. the Implementing Partner reported that they have now employed a women co-ordinator and have started engaging with more women in the project activities), no impact has been observed as yet.

Women play an active role in all activities of cotton farming, except ploughing and pesticide spraying. A few women in female headed households are participating in the Learning Groups and are adopting practices (qualitative data), but these are small in number. In male headed households their participation is rare. Women are not receiving information and training. There is thus a risk that women are excluded from benefits or potentially even further marginalized. Entrenched gender norms present significant challenges. As reported in section 4.2.3.5, there is a clear gender pay gap, which has not changed over the study period (FGD data). Men are widely reported to be paid Rs.200 – 300 (~3 to 4 USD)/day (the higher amount for pesticide

spraying) and women are paid Rs.100 – 200 / day for their respective roles, excluding cotton picking. In cotton picking most are paid the same rates. Men's role in cotton farming (ploughing and pesticide spraying) is considered to be more demanding and therefore deserves to be paid more, but women do not have the opportunity to conduct such jobs as they run counter to socially ascribed gender norms.





5. Discussion

5.1 Key Findings on the theory of change

In this section, we present a synthesis of the study findings focusing upon what has worked in the conditions of Adoni *Mandal* and what has worked less well, identifying the key reasons. We have used an evidence-based rating scale, with change assessed at four levels (shown in four colour codes) – See Figure 26 on page 75. The assessment is made comparing the extent of change between baseline and final evaluation as experienced by treatment farmers compared to control farmers. Figure 30 provides a summary visualisation of the study findings:

Colour Code	Based on all evidence, assessment of the extent of change from baseline (2015) to end line (2018)
●	Significant change observed
●	Limited change observed
●	A small change observed
●	No / negligible change observed

Figure 30. Evidence-based Rating Scale* used in assessing progression on the ToC

*change is subject to both endogenous and exogenous factors

It is to be noted that we have assessed the extent of change between baseline and final evaluation as experienced by treatment farmers compared to the control farmers. So, if the change is significant, it means that treatment farmers have observed significantly more change than that experienced by the control farmers. Wherever change is similarly observed by both treatment and control farmers, it is indicative of no 'treatment effect' and therefore change levels are assigned as no change so far (red dot).

5.1.1 Inputs and Activities

Promotion of Learning Groups ●

The project has successfully facilitated the establishment of 98 Learning Groups with 3425 members. Women memberships in LGs have improved from baseline (79) to final evaluation

(148). Overall women constituted 4% of the total membership at baseline stage while they now are about 6% of the total membership at final evaluation stage.

Producer Units established ●

All the members of the Learning Groups are now considered part of the Producer Unit (PU), which has been established.

Training sessions, Farmer Field Schools and demonstrations ●

Many training activities have been conducted by the implementing NGO, such as on various practices related to integrated pest management, soil health, decent work etc, including some practical demonstrations. Initially, the focus has been on capacity strengthening with respect to Principle 1 and Principle 3 (related to integrated pest management and soil health practices). Training on decent work has only started relatively recently in 2017. Sensitization of ginners has been very limited, and no sensitization of spinners is reported.

Internal Control System (IMS) ●

An Internal Management System (IMS) has been developed. However, the system requires significant improvement, because of the challenges that many cotton farmers face given the high levels of illiteracy and to ensure a regular, timely and accurate flow of data from the farmers to PU.

Partnerships and linkages catalysed ●

Since 2017, the Implementing Partner has begun to establish important partnerships with other organisations in order to be able to implement the BCI theory of change more fully. The partnerships appear to be important and relevant, including a partnership to facilitate action on child labour, a partnership on decent work and a partnership to improve technical support on agriculture. However, there is no information available about how these partners were selected, the type of partnerships and results envisaged, about the capacity of the partner organisations to support the Implementing Partner and about the resources available to support them to do so, and if any concrete benefits have so far emerged. For example, while the selected organisational partners may be able to deliver more information on agricultural technologies, it is also important they can advise on appropriate extension methodologies.

Additional partnerships and linkages may also be required, based upon a strategic analysis including a focus on scaling and necessary systemic changes. For example, linkages are needed



Figure 31: Summary of Findings on the Theory of Change of the BCI project (2015-18)

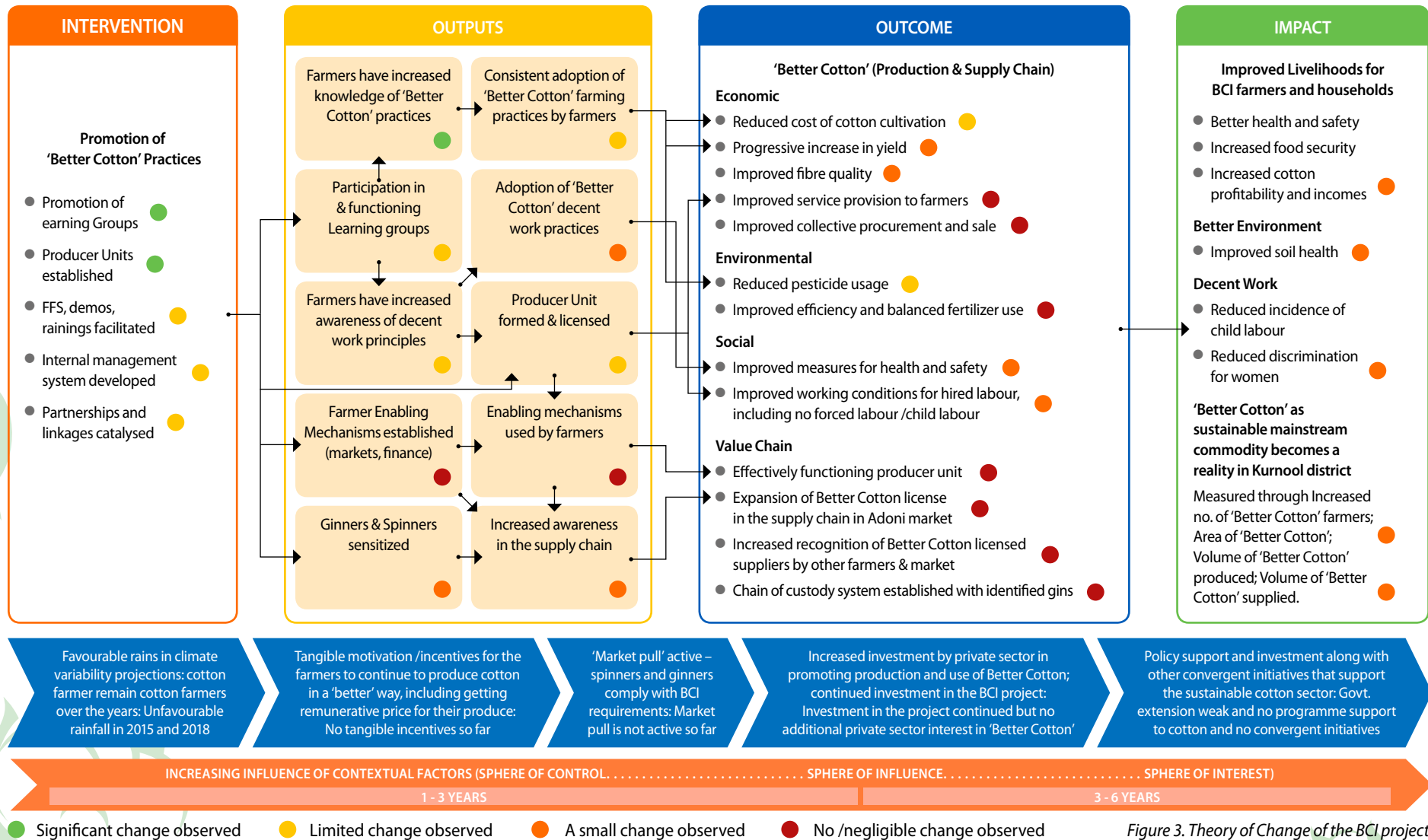


Figure 3. Theory of Change of the BCI project



along the value chain to ensure market signals are adequately communicated up and down the chain and to build market demand. Engagement and advocacy of government is necessary to ensure that relevant policies support agricultural development, including more sustainable cotton. Development partnerships are needed to increase farmers access to finance, inputs, crop insurance etc.

5.1.2 Outputs: Participation, Awareness Raising and Adoption

Knowledge and adoption of Better Cotton farming practices ●

There is strong evidence of increased knowledge on 'Better Cotton' production practices amongst treatment farmers: Awareness levels have seen a significant increase on a range of practices such as preparation of bio pesticides, use of neem oil, balanced use of fertilisers, adopting inter crop, border crop, refugia crop etc. The observed improvement is statistically significant for treatment farmers. Many farmers can explain the newly learned practices. However, the spread of new knowledge on cotton practices is largely limited to men.

BCCI adoption score has improved from 0.46 to 0.71 for treatment farmers and 0.53 to 0.62 for control farmers. Interestingly, a clear correlation (and possibly causation) is seen between treatment exposure and knowledge and adoption levels. Those who are exposed to treatment at higher level (indicated by higher % participation rate in the BCI project) have significantly better index score e.g. the application index score of those with a high participation rate is 0.75 as compared to 0.59 for those with a low participation rate. The application index score of those with a medium participation rate is 0.64.

Participation in and functioning of Learning Groups ●

The intensity of exposure (e.g. in terms of NGO visits and trainings) has increased over time, from a low bar at baseline and interim monitoring. At baseline and interim monitoring stages farmer interviewees indicated that the intensity of NGO implementation should be increased, but by final evaluation the feedback from farmers about the Learning Group was generally positive. The regularity of meetings appears to have improved in the third year. 59% of Learning Group (treatment) farmers reported participation in trainings and field demonstrations in the final evaluation. 26% of non-LG farmers also reported participation, which is indicative of spread effect within the treatment clusters. Control farmers did not receive any such support from the project. Note that Farmer Field Schools were not implemented in the fullest sense, involving joint

farmer learning and experimentation involving a shared learning plot. About 70% of Learning Group and 27% of non-Learning Group farmers reported participating in field demonstrations. Similarly, nearly 70% of Learning Group farmers have reported participation in various trainings related to BCI production principles. Women's participation remains very low. Training on decent work only began in 2017.

The approach to extension may not have been as effective as anticipated, given the fact that some farmers remain unconvinced of the promoted practices. There is considerable scope for improvement in terms of the agricultural extension approach employed and in the intensity of exposure of farmers to extension advice and experiential learning. Although the latter has cost implications, it may be more effective in overcoming entrenched mind-sets on pesticide use.

The selection of lead farmers and formation of the Learning Groups was not particularly systematic and could be improved. Challenging weather conditions have meant that lead farmers could not necessarily use their plots to demonstrate new practices to other farmers.

In terms of targeting and reach, it is mainly men that are actively participating. There are very few women actively participating in the Learning Groups, especially those in male headed households, due to the prevailing cultural norms which constrain women's participation in household decision making on cotton farming. These same entrenched gender norms restrict the sharing of agricultural information and participation in decision-within the household, and the evidence indicates that information is not usually being shared at the intra-household level.

Knowledge of decent work principles ●

As training began relatively recently on decent work, the study team suggests that it is relatively early to expect to see outcomes and impacts. The implementing NGO did not cover these issues in the first couple of years, but it has increased their activities and inputs on decent work in the third year. Child labour campaigns, such as putting up posters in villages, have been undertaken. The NGO also reports the establishment of Child Labour Monitoring Committees, but no farmers mentioned this in our fieldwork. Farmer and hired labourer awareness have slightly increased on child labour issues, which are particularly prominent in migrant-worker situations. On other decent work issues, such as working conditions for hired labourers (including health and safety, payment of minimum wages, contracts, and non-gender discrimination), no major changes are observed. There is some limited qualitative evidence on improved farm land owner awareness on health and safety impacts and measures, but the picture is not consistent.



Farmer enabling mechanisms established ●

Farmer enabling mechanisms have not been initiated to date. The project envisages that these will be implemented by the Producer Company, once this is operational. Partnerships with other development agencies may be required, for example, in providing farmers with improved access to finance, crop insurance, and in procuring inputs, including sustainable cotton farming inputs, such as bio-sprays. However, to date no implementation has been carried out.

The sensitization of ginners and spinners ●

This has not advanced to date. Activities are only just starting to begin.

Consistent adoption of Better Cotton farming practices ●

As indicated above, adoption levels have increased. Treatment (Learning Group) farmers are adopting significantly than control farmers.

Adoption does not, however, appear to be a straightforward, yes/no, linear decision. Change processes in individual farmer farm systems are frequently more complex than this and the qualitative data indicates that this is the case in the BCI project. External factors play a role – poor rains, for example, have frustrated the efforts of participating farmers, including lead farmers, in implementing some practices. Others expressed reservations about some of the practices or remain to be convinced that their yields will not be affected by a reduction or change in pesticide use. Access to resources and necessary inputs may also be an issue. Many indicated that they are indebted to commission agents, raising loans to buy inputs at high interest rates and to whom they have no option but to sell their cotton, with low bargaining power. Very few farmers can sell directly to the ginners, who also need adequate volumes to meet the volume-based targets given by spinners. Input dealers also have significant influence over the farmers that they supply, and consistently encourage over and inappropriate use of agrochemicals. For female farmers, the majority lack adequate information and knowledge on the promoted practices to be able to make changes in their farming, because they are not able to participate themselves in the Learning Groups and there is inadequate intra-household information sharing. It is also the case that in some cases it is important for farmers to have practical opportunities to learn how to do new techniques and/or should be facilitated to develop their own tailored solutions and innovations for their own specific contexts.

Adoption of Decent Work Principles ●

The adoption of decent work principles is not observed to date, apart from limited instances of health and safety measures being adopted which do not require a cash outlay (e.g. delaying re-entry to the field after cotton spraying, especially for pregnant women) which were reported in the qualitative data. This is unsurprising given the fact that the implementing NGO only began work on decent work issues in the latter stages of the study period, Awareness has increased on child labour amongst treatment farmers, but it is not possible to validate changes in child labour practices without more in-depth ethnographic observation. The data emerging in the qualitative data on child labour was fairly inconsistent in nature, with some reporting that there is no child labour (e.g. children working in fields during school hours) and others reporting that there is, especially amongst migrant households. No clear distinction emerged between treatment and control groups. No major changes were observed in terms of the working conditions for hired labourers on wages and health and safety. On average, all workers in Adoni *Mandal* are paid below the minimum and living wage levels as guided by the state government of Andhra Pradesh. The household survey indicates that the index values for adoption have improved from 0.46 to 0.58 for decent work (PP6) while it has improved from 0.46 to 0.78 for IPM ((PP1).).

Formation and licensing of the Producer Unit ●

The Producer Unit has been established, and has about 3,300 members. It now has a license, but the Producer Company has not yet been established. The latter is planned, and will seek to engage in collective marketing for improved bargaining power or to improve services to members (access to inputs, finance etc). It is perhaps unsurprising that the Producer Company has not yet been established given the time and levels of investment that producer organisation capacity strengthening takes and how essential its services will be to farmers to enable them to adopt and sustain Better Cotton practices. More realistic timeframes are needed, and attention to producer organisation management, business skills and accountability to members.

Enabling mechanisms used by farmers ●

Majority of farmers continue to rely upon commission agents for loans, which do not require formal documents, but carry a hefty interest rate (24% per annum). In terms of accessing markets, farmers who are currently sell directly to ginners can benefit by Rs.500-600/quintal due to better pricing, correct weighing, and absence of any commission. However, only a very small



proportion of farmers (~1 to 2%) are currently able to make such direct sales. There has been no change between baseline and final evaluation, and this is not anticipated as the intervention has not yet been implemented.

Increased awareness in the supply chain of Better Cotton ●

The BCI project has contacted a limited number of ginners, compared with the number of ginners operating in the area. As a result, their awareness is just beginning to increase and more could be done in this regard. However, ginners expressed doubts and identified some constraints regarding the supply and demand for 'Better Cotton' in the required volumes in near future. This indicates that the business case for ginners is not yet established. The ginning sector is very fragmented in Adoni, with a high degree of competition amongst the 150+ ginners in the area. Ginners generally have volume-based contracts with spinners and so their focus is on ensuring contractual compliance. Ginners are frequently hard pressed to obtain adequate supply of seed cotton and therefore are willing to buy from farmers groups directly. They state that they are willing to offer price incentives based on an assured supply and adequate fibre quality to farmers collectives. But they will need incentives, e.g. spinners demanding it or offering incentives, to source and comply with chain of custody requirements of BCI. Due to the lack of implementation, the sensitisation of ginners has been limited. It is also not clear what kinds of activities have been undertaken by BCI with global brands and retailers to stimulate market demand for sustainable cotton.

5.1.3 Outcomes - Economic

Reduced cost of cotton cultivation ●

Comparing the reported increases in the costs of cotton production across treatment and control groups, the treatment farmers experienced a smaller increase in the costs of production (6%), compared with control group farmers (12%) and spread farmers (9%). This difference, however, is not statistically significant for treatment, control and spread groups.

The difference in difference (final evaluation minus baseline) becomes statistically significant when analysing the difference in cost of production. While, the cost of agro-chemicals for all groups have gone up between baseline and final evaluation, it has increased by a smaller fraction for treatment group and the results here are statistically significant. However, amidst most farmers reporting rises in costs, some instances were also heard of cost reductions resulting

from the project promoted practices in the qualitative data. Three of the household case study interviewees specifically said that they have obtained reductions in expenditure as a result of reduced applications of agrochemicals: Two male farmers gave estimates – one of Rs.6,000 (~85 USD) and another of Rs.20,000 (~280 USD). A female farmer said she and others have achieved less expenditure on chemicals and pesticides. It is not certain how many of the others have achieved savings.

Progressive increase in yields ●

Cotton yields in Adoni have improved between the baseline and final evaluation for all groups of farmers according to the household survey. The yields have improved slightly more for treatment farmers (19%) than for the control farmers (17%). However, this difference is not statistically significant. Adoni farmers' cotton productivity (627 kg/ha) is higher than the state (541 kg/ha) and national (541 kg/ha) level average productivity for the 2017-18 season. This is due predominantly to the black soils in Adoni, which are favourable for cotton production. The primary factors determining yields are rainfall and access to irrigation, and the availability (or lack thereof) of quality seeds according to farmers qualitative reports. In the qualitative data, farmers were more negative about yield trends, but this may be partly due to the qualitative interviews occurring in 2018 when the rains were late and crop losses were expected. Yields may be improved in the longer term with the consistent adoption of Better Cotton practices, but adoption is not yet consistent (see above).

Improved fibre quality ●

The household survey data shows some improvement in cotton harvest management, storage and transport practices are observed that can enhance fibre quality. 79% of treatment farmers have reported harvesting mature cotton in the final evaluation, as against 62% of control farmers. 60% of treatment farmers have reported cotton moisture level below 7%, as against 53% of control farmers. 51% of treatment farmers have reported use of coloured bags instead of white bags and or staking the cotton in open method and transport, as against 47% of control farmers. 54% of treatment farmers have reported their cotton free from white polypropylene fibre, as against 43% of control farmers. The quality of the cotton is very good in the current year (2018) in comparison to the baseline according to one ginner. It can be estimated from the available evidence that the BCI project has contributed in increasing a small proportion of



farmers adopting better cotton harvest and storage practices. However, there continues to be wide-scope for improving the knowledge and adoption of management practices which can enhance the fibre quality of cotton.

Improved service provision to farmers ●

As the Producer Unit has been formed, but it is not yet fully functional it is not able to deliver improved services to farmers. It may take some time for the Producer Unit to build up adequate capability to deliver improved service provision, such as improved information and extension services. There are some changes in farmer financial inclusion (e.g. women's access to bank accounts has increased, all farmers have improved access to crop insurance schemes for cotton), but this is not causally linked to the BCI project, but due to external factors.

Improved collective procurement and sale ●

As above. The theory of change anticipates that this will be delivered via the functional Producer Company, but this has yet to be established. Therefore, there is no evidence of improved procurement and sales to date. Most farmers continue to rely on commission agents for loans, and then are forced to sell to them. Similarly, many farmers buy inputs from private input traders, and in some cases take loans from them, and must sell their cotton to them. Farmers who selling to ginners directly are getting additional benefit (approx. Rs.500-600/quintal) due to correct weighing and absence of any commission (~2 to 5%). However, a very small proportion of farmers (~1 to 2%) are directly selling to ginners.

5.1.4 Outcomes - Environmental

Reduced pesticide usage ●

The BCI project prioritised BCI standard Production Principle 1, namely Integrated Pest Management, followed by soil health-related interventions. Some significant results are being achieved with a significantly reduced proportion of treatment farmers using cocktails of pesticides. Only 8% of treatment farmers report using cocktails compared with 51% at baseline. A reduction in cocktail use is reported by control farmers as well, but on a smaller scale- from 64% at baseline compared to 49% at final evaluation.

Both treatment and control farmers report a reduction in the use of *monocrotophos*, a dangerous pesticide. Reported use among treatment farmers reduced from 100% at baseline to 52% at the final evaluation, while for control farmers the reduction was from 99 to 55%. The use-dose of

monocrotophos have also seen marked reduction for both groups, but significantly lower for the treatment group.

The proportion of farmers using Acephate and Fipronil based pesticides has increased from baseline to final evaluation, for all groups of farmers, without any significant difference. Overall, the study results show a marked reduction in the doses of all pesticides used (except Imidacloprid and Fipronil) by treatment farmers. These results are statistically significant as control groups have also shown reduction in doses, but in a smaller proportion. The study results show that while treatment farmers continue to use *monocrotophos*, they are doing so in much reduced doses, which are within the prescribed benchmark. At the same time, treatment farmers have increased the dosages of Imidacloprid and Fipronil based pesticides. This is possibly to counter the pink bollworm and Jassids. These are also expensive chemicals and can increase costs for the farmers.

Farmers follow dealers' recommendations who tend to push these products to meet their business targets. The pack size of pesticides available in the market also tends to promote their excessive use. Overall the study results indicate a positive trend, with a smaller proportion of treatment farmers using harmful chemicals and in smaller doses. This reduction in pesticides is desirable from an environmental and human health perspective, as they promote reduced use of chemical-based inputs and use of more bio-inputs⁴⁹. This, in the long run, improves soil health and biodiversity and decreases the negative impacts of agrochemicals polluting water bodies. However, sustaining and expanding these practices require continued efforts. Farmers remain highly influenced by the advice of input dealers, plus there are variable weather conditions, and building pest resistance for the Bt seed, with increasingly secondary pest attacks.

5.1.5 Outcomes - Social Impact Pathway

Improved measures for health and safety of BCI farmers ●

For BCI farmers, very limited changes are observed between baseline and final evaluation in terms of farmer awareness of the health risks of cotton farming in terms of safe pesticide usage, and of improved health and safety measures which can and should be adopted to avoid negative health impacts, including longer-term ones. There continues to be widespread reporting in treatment and control groups of health issues linked to working in the cotton fields and to pesticide spraying, such as eye irritation, burns, skin rashes etc. Some other issues are also

49. *Monocrotophos*, for example, is highly hazardous to humans. (WHO classifies it as Highly Hazardous; Rotterdam Convention classifies it as PIC; EU GHS – fatal if inhaled). From environmental perspective: high aquatic toxicity, highly toxic to honey bees, and highly toxic to birds.



reported, especially by women, of body pains resulting from arduous work. There are instances reported in the qualitative research whereby treatment group farmers adopt improved measures, but these were not consistently reported, suggesting small-scale changes may be beginning. For example, there were some reports of reduced or changed pesticide use, and delayed re-entry into fields, especially by pregnant women, post-spraying was mentioned. Such instances are not reported at all in the control areas. However, mostly these changes relate to measures that do not require a cash outlay. There were limited reports of changes made to the use of protective equipment by farmers at spraying.

Improved working conditions for hired labour, including forced and child labour ●

There is insufficient evidence to establish whether child labour incidence has reduced compared with baseline levels. At baseline it was clear that child labour does exist in Adoni *Mandal*, especially amongst migrant workers who need to bring their children with them to the field. The qualitative findings reported by farmers at final evaluation (treatment and control groups) are somewhat mixed and do not establish a very clear pattern. Although awareness has increased, it is not clear if child labour has been eradicated and more ethnographic study is likely needed to establish changes in actual practices, beyond what is reported by farmers. It is also likely that more time is needed for changes in child labour incidence to occur, and issues of affordability arise, particularly for migrant workers. No issues of forced labour emerged during the study fieldwork.

In terms of the health and safety of hired workers, no changes were observed resulting from the project. It is still widely seen by farmers that health is the responsibility of farm workers – if the latter become sick, they must organize their own treatment.

Reports on the provision of drinking water are comparable between treatment and control groups, with most consistent provision to migrant workers. No hired labourers are given sanitation facilities, which is likely to be unaffordable for many cotton farmers in Adoni *Mandal*. In terms of the risks of pesticide spraying, there does not appear to be a change in farmer-employer practices or in the understanding and measures adopted by hired labourers.

Beyond child labour and health and safety issues, the wages paid to hired workers fall below minimum and living wage levels set by the state government. There is a clear difference in terms of women's and men's access to work, which is shaped by cultural gender norms, although women and men are involved in cotton harvesting, and are paid on piece rates. Further, workers are not given contracts, although this is not unusual in an informal farming sector given the challenges of enforcement.

5.1.6 Outcomes - Value Chain

Effectively functioning Producer Company ●

The Producer Unit has been formed, and not has a licence (although it was revoked for one year), but a Producer Company is yet to be established. No further information is available, allowing for an assessment of the functionality of the Producer Unit.

Expansion of certification in the supply chain in Adoni market ●

Licensing has not yet begun in Adoni *Mandal* cotton market and there is no evidence that key value chain actors are aware of Better Cotton initiative. The Implementing Partner has not been able to implement activities on this front.

Increased recognition of licensed suppliers by other farmers and the market ●

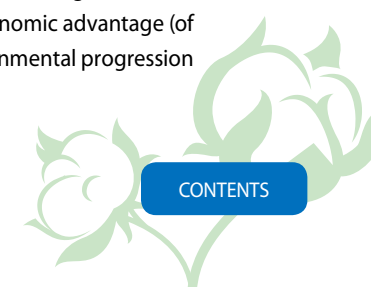
The Implementing Partner has not been able to implement activities on this front and evidence suggests no change has occurred. Essentially BCI is a farm-based standards and market engagement is critical to the success of the standard. BCI system is dedicated towards increasing uptake of Better Cotton by brands and retailers. Percolation of uptake ('market pull' from brands to textile mills/spinning mills /gins) could be slow in countries like India. By the final evaluation (2018), no brand level uptake of 'Better Cotton' has percolated down to the ginners in Adoni.

Chain of custody system established with identified gins ●

The Implementing Partner has not been able to implement activities on this front and evidence suggests no change has occurred, i.e. the supply chain does not yet recognize 'Better Cotton'. As per the ginners interviewed, none of the spinners so far demanded physical segregation of Better Cotton. Gins operate under volume-based targets from the spinning mills.

5.1.7 Interconnections between the pathways

The ToC anticipates all four impact pathways (social, economic, environmental and value chain) being implemented and leading in combination to BCI project impacts. The economic progression observed so far is limited to increasing knowledge and adoption of 'Better Cotton' practices. The theory of change on economic dimension has not progressed to consistent adoption of various 'Better Cotton' practices which could then result in higher order gains such as reduced cost of cultivation, increased yields or better fibre quality. The economic advantage (of being a 'Better Cotton' farmer) is not yet realised by the farmers. The environmental progression





is seen to a limited extent as there has been reduced use of certain harmful chemical ingredients (such as monochrotophos, cocktail). However, optimum use of fertilizer is not seen yet. Farmers' use of bio-pesticides is currently at low level. Some small steps and incremental effects are seen on social progression, which are expected to build up as the BCI project is ramping up its intervention on decent work issue. Value chain progression has not begun yet but is expected to happen when Farmer Producer Company comes into being and ginners are sensitised to engage in the 'Better Cotton' procurement.

The inter-connections between different impact pathways are not strong as several key elements of the theory of change have not been implemented, such as enabling measures for farmers, value chain sensitization, and decent work training (until recently), which has affected the overall achievement of change. The lack of enabling measures such as improvements to farmers access to finance and inputs undermines farmers' ability to adopt 'Better Cotton' farming practices, in a context in which farmers are highly reliant upon commission agents, indebted and forced to sell to these agents and / or reliant on input dealers for inputs, associated with inappropriate advice, and on occasion loans. In other aspects, the theory of change may require modification, to ensure a greater emphasis on tackling gender equality, and stimulating market demand through engagement of buyers to create adequate market signals and incentives for ginners and spinners and facilitating coordination and dialogue in the sector amongst ginners and spinners.

Where the project has focused, for example training on Principle1, there have been more positive change recorded, in farmer practices, as reported in the household survey.

5.1.8 Impacts

Increased food security ●

In the household survey, all households reported that they had not spent any day without enough food for the family in both baseline and final evaluation surveys. This suggest that basic level of food security in terms of access and availability of food is being achieved by Adoni households. There is no difference in treatment and control areas on this count.

Increased cotton profitability and incomes ●

The gross revenues and gross margins (Rs. per ha) from cotton have improved for all groups, with no statistically significant difference. The treatment effect on this outcome is not observed. Adjusted for inflation, overall farmers in Adoni are earning a gross margin /profit of about

Rs.45,000 per ha The study results show that the larger-scale farmers are getting lower levels of profits per hectare than the medium farmers, who in turn are achieving lower levels of profits per hectare than the small and marginal farmers. This is not due to higher yields being obtained by small and marginal farmers. The yield levels are not significantly different between different categories of farmers. The yields depend on the quality of seeds, rains and management factors and not necessarily on the size of landholdings. The higher profits per hectare of small and marginal farmers can be explained due to their lower costs of production. This finding provides validity to the approach of the BCI project for focusing on reducing the cost of production leading to increase in profitability. Note, however, that it is difficult for many farmers to estimate their gross margins, because of high levels of illiteracy.

Most farmers stated that they intend to continue in cotton production, because a good year can be profitable, helping them to build assets and clear debts. However, this continued cotton production does rely on the rains not being too variable.

There are also indications that many farmers are having to find undertake temporary migrations (e.g. daily and seasonal) to undertake off-farm work (e.g. MNREGA scheme) or construction and masonry in the towns and cities. Further, there is evidence that some poorer farming families have had to sell their lands completely, suggesting a possible process of land concentration is occurring. The incentives available resulting from the BCI cotton project may not be enough to fully motivate some to actively participate in the Better Cotton process and to fully adopt the promoted practices, given that no statistical difference has been observed between the treatment and control groups.

Improved soil health ●

Improvements in soil health can plausibly occur after the adoption of better soil health practices for many seasons by many farmers. Application of farmyard manure has improved. Use of cover legume rotations and inter-cropping have improved as well. However, consistent adoption of these soil health practices is not observed. While pesticide use has reduced by treatment farmers, chemical fertiliser use has not seen much change between baseline and final evaluation. In addition, the use of bio-pesticides and bio-fertilisers have improved only at a small scale. These findings indicate that achieving impact on soil health will take many seasons of consistent adoption of 'Better Cotton' practices.



Reduced incidence of child labour ●

Actual practices on child labour are seen to be improving generally in both treatment and control areas, but it is not possible to validate the impact of project without more in-depth ethnographic research. In various focus group discussions, it is reported that some children participate in farm work during weeding and cotton picking. Child labour is most prevalent amongst migrant labourer families. The implementation activities by the project are relatively recent.

Reduced discrimination against women ●

Women play an active role in all cotton farming tasks, except ploughing and pesticide spraying, but some tasks are socially ascribed. A few women in female headed households are participating in the Learning Groups and state that they are adopting promoted practices (household panel), but in male headed households their participation is rare. Women's involvement in the Learning Groups is very low and there is evidence that information is not shared within the household. Perspectives still prevail which marginalize women from cotton farming decisions. Entrenched gender norms present significant challenges, and there is thus a risk that women are excluded from benefits or potentially even further marginalized. The BCI project is increasing its work on gender issues in the cotton sector, but initially this was not a focus, and it is not clear how far-reaching the initiatives will be. No impact is observed from activities undertaken. There is a clear gender pay gap, which also has not changed over the study period. Men are widely reported to be paid Rs.200 – 300 /day (the higher amount for pesticide spraying) and women are paid Rs.100 – 200 / day for their respective roles, excluding cotton picking. Men's role in cotton farming (mainly ploughing and pesticide spraying) is considered to be more demanding, but women do not have access to similar tasks and the notion that women's work is less valuable, reflects biased gender norms.

5.1.9 Ultimate Goal: Sustainable mainstream commodity

In terms of the overall goal of achieving Better Cotton as a sustainable mainstream commodity in *Adoni Mandal*, the evidence clearly demonstrates that this sectoral change has not been achieved in practice to date. **It is relatively early to expect mainstreaming to have occurred, given the challenging context of implementation.**

It is also not clear whether all the elements of the Theory of Change have been given as much prioritization as other elements. The study demonstrates that without implementation of all

aspects of the Theory of Change simultaneously, it will be not possible to achieve ultimate goals. Given that the capacity of the implementing partner has been revealed to have several key gaps, which were not identified initially and addressed, leading to non-or weak implementation of several core pathways of the theory of change, it is unsurprising that impacts for participating farmers, and more progress towards the achievement of a sustainable sector cannot yet be seen.

The number of farmers adopting Better Cotton practices has increased. The Producer Unit is now licensed; however, the number of farmers is still a small proportion of those in the region. There is also no change in the supply chain in terms of demand for Better Cotton. A clearer plan for transformative change (i.e. scaling and systemic changes) in an area is recommended.

5.2 Analysis of Assumptions

There are assumptions at each stage of the BCI project theory of change. An analysis of these assumptions supports lesson learning on what works and why, and barriers to success.

5.2.1 Context-based assumptions

An assumption identified at baseline was 'normal timely rainfall' in *Adoni Mandal*, given the predomination of rainfed cotton farming in the area. However, given the changing climate, it is important to consider what exactly is a 'normal' rainfall pattern. We do not have access to climate projections for the region, but certainly rainfall patterns during the study have not been favourable, although of course both treatment and control group farmers will probably have been similarly affected. However, there were reports in the qualitative data that treatment group farmers and especially the lead farmers had sometimes been frustrated by the poor rains, especially in 2018, which has led to crop losses and prevented them from implementing certain new practices, such as intercropping. Rainfall has been good during only one year (2016) over the past three years (2015-18), with late rains occurring in 2017 and 2018. Late rains also affect the incidence of pests, with more pest attacks if sowing and harvest occurs later, and hence farmers' use of pesticides will be affected.

5.2.2 Design and implementation assumptions

Design and implementation assumptions were not fully articulated at baseline stage. The relevant assumption at this stage of the causal pathway are that the project design closely follows the BCI theory of change and is relevant to the *Adoni Mandal* context, and that there is high quality implementation. We now discuss each of these in turn.



- **Project design closely follows the BCI theory of change**

The study examined the extent to which project design and implementation adheres to the anticipated theory of change of the Better Cotton Initiative standard as well as the extent to which it addresses specific local contextual challenges. In this case planning and implementation did not closely follow the theory of change, with no or late implementation of key components. Priority has been given to certain agronomic practices, with lesser attention given to enabling measures, decent work, and value chain sensitization, yet changes are required on all of these areas to achieve the desired outcomes.

Additionally, there may be newer components which should be added to the theory of change, at least based on the Adoni *Mandal* project case study, such as advocacy and engagement of governments, partnerships with other development actors to build capacity of Implementing Partners and of producer organisations, social learning amongst area stakeholders to identify joint problems and solutions and value chain dialogue, demand side measures to build demand through engagement and advocacy of buyers and potentially consumers real-time monitoring linked to learning feedback loops to decision-making, and campaigning and advocacy to reduce overall consumption of cotton.

- **Project design fits local context**

Farmers report major challenges in cotton production, including health challenges, pests and diseases of the crop, poor rainfall, and a lack of access to services. Therefore, the project is highly relevant to cotton farmer challenges. However, it is also important to note that the Andhra Pradesh government does not currently prioritize cotton production in its policies and extension services, instead focusing on more climate resilient crops. More analysis is needed of the climate projections for dryland areas such as these, to understand how far cotton-based livelihoods are desirable. An initial area based analysis would also highlight the importance of farmers escaping the reliance on commission agents and having access to credit and crop insurance, as well as issues of gender inequality, all of which need to be tackled to enable farming households to adopt Better Cotton practices. It is not clear why interventions on enabling mechanisms were deprioritized.

- **High quality implementation**

The selection of lead farmers and formation of the Learning Groups could be improved, and incentives provided to motivate lead farmers in fulfilling their roles. More monitoring is needed on a real time basis of the functionality of the Learning Groups, feedback from participants on the quality of the Learning Group process and from Lead Farmers on the IP extension, and the functionality of the Producer Company when it is set up.

The intensity and quality of support from the Implementing Partner to the Learning Groups, through facilitators, is a key issue, with a need for an appropriate skill mix amongst project staff and including adequate numbers of women. The Learning Groups appear to have become stronger over time, with more farmers gaining awareness of their membership of the group, for example. However, especially in the earlier years, farmers did comment on the irregularity of meetings.

The pedagogical approach could potentially be improved. Although farmer awareness has increased, this does not mean that all farmers are convinced of the need to act, and women are not able to participate. Given the challenges faced by farmers and the need to overcome strong countervailing pressures, such as inappropriate advice from input dealers on pesticide use, in order to change farmer mindsets, a 'learning by doing' approach may be required, such as experiential learning facilitated through Farmer Field Schools (FFS). The latter offer more collective approaches to learning focused upon farmer experimentation in shared learning plots, rather than the hierarchical lead farmer approach, although there are cost implications to the adopting an FFS approach.

The capacity of the NGO Implementing Partner is an issue requiring attention, and this should be properly appraised by BCI at the outset, using an appropriate checklist and local analysis, including stakeholder consultations. Plans should be made to fill specific capacity gaps, analysed according to the theory of change, in terms of staffing levels and the range of skills available. More female facilitators are necessary, but this is not adequate. Given the levels of gender inequality and the lack of women's participation, a specific gender strategy should be developed and adequately resourced, otherwise there are risks of exacerbating women's marginalization. Partnerships represent one avenue for strengthening an Implementing Partner's capacity: the NGO in this case has recently established new partnerships, but a more strategic approach may be necessary.



Adoption assumptions

- **Farmers have tangible incentives to continue to farm following 'Better Cotton' practices**

The BCI approach does not rely upon a fixed premium to incentivize farmers, but rather on benefits such as reducing the costs of production, or providing access to extension. These benefits need to be of sufficient magnitude to incentivise farmers to make changes in their practices. Collective procurement and marketing were envisaged in the project theory of change (approved by BCI, BCI India and ISEAL); the former can reduce costs of buying inputs for farmers and the latter can potentially increase bargaining power to improve price, and / or facilitate direct sales to ginners who want to buy more cotton, but in adequate volumes to meet their contracts. These mechanisms are not yet underway as the Producer Company is not yet established. However, reducing costs of production can also be achieved through reduced use of pesticides. The study finds that treatment farmers are benefiting from reduced costs compared to control group farmers, although so far only to a limited degree. More time is needed to see if more farmers can achieve reductions, for example, as there is fuller adoption of the set of BCCI practices. A 'learning by doing' FFS approach to extension may help to convince more participating farmers that cost reductions can be achieved.

Higher yields can be an incentive. Adoption levels of Better Cotton practices have increased, but the consistency of adoption remains a concern and the gains have not yet translated into concrete production level improvements. While treatment farmers have achieved higher yields than control group farmers, the difference is not statistically significant. Hence, the degree of difference may not be large enough to encourage farmers to sustain such practices, to adopt a fuller set of promoted practices and for others to 'crowd in'. In 2018 the poor rains meant that farmers held negative perceptions on their cotton yields. Some farmers still fear that their yields will be negatively affected if they reduce applications, and they also are persuaded of this by the private input dealers. It is not easy to take risks when resource constrained or on the poverty line.

The challenges in cotton production in Adoni *Mandal* are quite significant and interlocking for smallholder farmers, including limits on access to land and irrigation, lack of access to finance and reliance on commission agents and indebtedness from variability of rainfed agriculture crop yields, cost and poor quality of inputs, and cost of household expenses such as weddings, plus

pests and wild animals. High levels of illiteracy present a challenge in terms of farmers being able to understand guidance on pesticide packaging and to estimate gross margins: many farmers struggle to complete the Farmer Field Books. They are also vulnerable to the pesticide dealers, who operate in an unregulated manner and push their products onto farmers with limited literacy. Many farmers also have long-standing trading relationships with the dealers, who may also provide them with loans in times of need and to whom they are then obligated to sell their product.

- **Active market 'pull' for the BCI cotton incentivizing spinners and ginners to comply**

There do not appear to be market signals reaching spinners and ginners that there is a demand for BCI cotton. Further, there is insufficient understanding amongst spinners and ginners of the BCI system and its traceability requirements. It is not clear what steps BCI globally has taken to stimulate market demand and to catalyse buyers to signal this demand to spinners and ginners in Andhra Pradesh.

- **Continued investment in the BCI project**

This assumption recognizes that achieving the outcomes of the BCI theory of change will take time and that there is likely need for continued support in Andhra Pradesh. This is found to be the case.

- **Policy support and convergent initiatives supporting the sustainable cotton sector**

Government policy and investment in cotton farmers is minimal and has been over the study period and therefore is not supportive to a sustainable cotton sector. The Indian Government is aiming to reduce the area under cotton due to the problems of heavy pesticide use. BCI should consider advocacy to promote sustainable cotton sector development, but also there is a question as to whether cotton production should be a development priority for individual smallholders, especially in a possible context of rural land concentration.

Government extension services remain weak. There has been no obvious change in extension services over the study period, and this means that it is mostly private companies advertising their products and who have a presence at the local level and an influence on what farmers are doing to control their pests.



5.2 Key Findings on the evaluation questions

The answers to the evaluation research questions are presented below, with cross-reference to where the data is presented in more detail in preceding sections.

Q1. To what extent has the process of becoming or being licensed under BCI sustainability standards had an impact (positive or negative, expected or unexpected) upon smallholders (farmers and households) in Kurnool district? What are the economic (cost of production, yield, incomes, food security) and social (child labour, farm workers, no discrimination in wages for women) impacts?

Adoni has received the BCI intervention for the first time. The Producer Unit has been formed, and was initially given a licence, but this was then revoked due to non-compliances, and later reinstated. The project itself has reached a large number of farmers, although this also only represents a proportion of farmers in the Adoni *Mandal*.

In terms of the impacts upon smallholders, it is too soon to evaluate impacts. The timeframe for the theory of change only anticipates the achievement of outputs and early outcomes by year 3. The in-depth theory of change analysis presented in section 5.1 above, shows the extent to which these have been achieved and who has benefited or not.

3,425 farmers are now participating in learning groups and training facilitated by the project, although women’s participation is low, with most participants being male heads of household who hold land titles, and it is clear that information is not being effectively shared with female spouses on an intra-household basis. There is strong evidence to show that the awareness of participating farmers of the promoted practices has significantly increased. There are also instances whereby farmers have begun to adopt some of the promoted methods, but this adoption is in some cases partial or incomplete, or hindered by contextual factors such as poor rainfall (see sections 4.2.1 and 4.2.2.)

At the early outcome level, economic benefits are being achieved with respect to costs of production, but these are of limited magnitude. While yields have increased, this is not statistically significant for the treatment effect. No major changes have been observed with respect to fibre

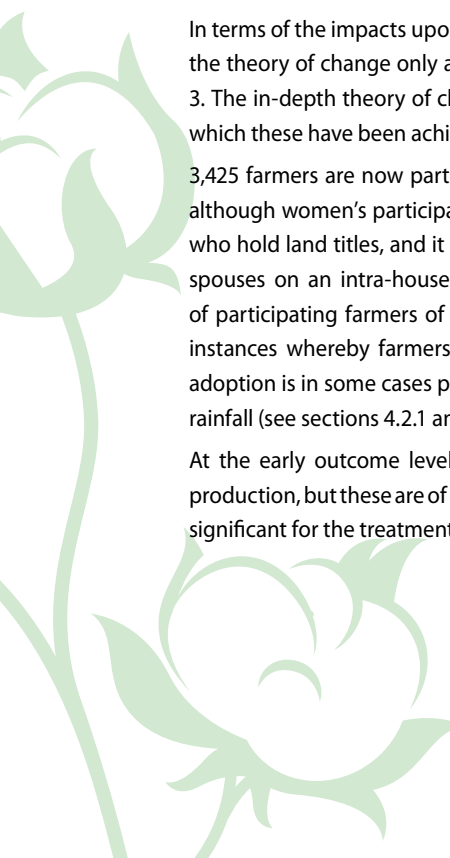
quality (see sections 4.3.1 to 4.3.3). Positive impacts on yields, incomes and food security have yet to be felt. The analysis of effect sizes on key outcome indicators (cost of production, yield and profits), based on final evaluation data, shows very small effect between treatment and control farmers. The margin of error is around 3%.

Table 24. Effect sizes and Margin of Error for key outcome indicators

Indicator	Treatment (N=223)		Control (N=352)		Effect Size (Hedges' g)*	Margin of Error (95% confidence interval)
	Mean	Standard Deviation	Mean	Standard Deviation		
Cost of production	33585.5	10055	33679.6	10054	0.00935	3.1
Yield	627.5	121	616.2	120	0.091	2.0
Profits	54288	14113	52721	14113	0.111	2.8

*Cohen'd and Gates delta values are also very similar to Hedges' g

The qualitative data indicate that there have not been observable changes on food and livelihood security to date, while also revealing the multiple stressors farmers in this region are experiencing. Relying upon rainfall, they are affected by increasingly unpredictable rains with climate change, and are also commonly highly indebted to *dalals* and trapped in these relationships, as well as highly influenced by the input dealers with whom they have close ties. Public extension services are very weak. In some cases, farmers have had to sell their lands during the study, travelling to towns to find work. Many others have to rely upon government public works schemes such as MNREGA, for livelihood security. Cotton remains an attractive crop for most farmers – a good year can deliver profits which help families to clear their debts and to pay for key expenditure items. But there are also questions for BCI given climate change projections in terms of the sustainability of the cotton crop per se. Does it make sense for all cotton farmers to continue growing cotton in this region? What kinds of diversification might be advisable and more environmentally desirable?





Implementation by the IP of activities focused upon decent work has only occurred in the third year of the project. However, awareness of child labour issues has risen. It is not possible to validate whether changes have occurred in terms of child labour practices – qualitative self-reported data from farmers and hired labourers were mixed. There were some reports of continued incidence of child labour at harvest time in cotton picking especially amongst migrant families. No changes were reported in terms of conditions for hired labourers or in terms of reducing discrimination against women in wages which has been found to exist. There were some instances reported of early behaviour changes in farming families on health and safety issues, such as delaying re-entry into fields for pregnant women after spraying with pesticides (see sections 4.2.3 and 4.3.5)

Q2. To what extent do we see an improvement in environmental variables connected with cotton production (uptake of fertiliser use, reduction in pesticide use, efficient water use, soil health, habitat /biodiversity)?

Overall some improvement in environmental variables is reported; pesticide use has been reduced, and at the same time, bio pesticide use is increasing, but the excessive use of fertiliser has not improved. Many soil health related practices are being adopted, but adoption processes are not consistent as yet. Farmers do not always make simple yes/no decisions on technologies and they are continually facing challenges such as poor rainfall and a lack of access to credit/over-reliance on *dalals*.

Q3. To what extent can the Producers Unit and /or Farmer Producer Company ‘empower’ cotton farmers and households – both economically and socially?

Enabling mechanisms have not yet been fully implemented. Farmers participating in the project have been formed into a Producer Unit, which now has a licence. The Producer Company has not yet been established and so the anticipated enabling mechanisms such as collective procurement of inputs and direct sales have not yet been implemented and so farmers have not yet been able to benefit. No observable market demand is filtering down the value chain to ginners, which might generate a demand for ‘Better Cotton’ (market pull).

In terms of social empowerment, no social outcomes have been observed. Participants generally gave positive feedback on the project, but women’s participation is low and requires attention. It is not clear if the Producer Unit has a democratic structure and what plans there are for capacity strengthening of the Producer Company. Capacity strengthening on governance and business skills will be essential for both of these entities, and the resource intensity and time required should not be under-estimated.

Ginners interviewed suggest that there are potential benefits to be achieved through direct sales, but this also requires the Producer Unit and Producer Company to have bargaining power. This relies upon them having good negotiating skills, access to diverse buyers, and be viable as a business unit that can market sufficient quantities and qualities of cotton, achieving a fair price.

There is also a question on the definition of empowerment: while economic empowerment is central to the BCI theory of change, socio- political empowerment is less of a focus for BCI, although the two are inter-linked and the latter requires better definition and implementation of enabling mechanisms for producers. Systemic changes will also be required to facilitate producer empowerment, including shifts in government policy and regulations (e.g. public service provision such as extension to farmers, investment in infrastructure), greater coordination and social learning on an area-sector basis, and buyer and consumer engagement.

Q4. Can we see an increase in Better Cotton availability and uptake in the district /beyond? How can this be strengthened? What are the relative benefits and costs of meeting BCI standards and achieving licensing for intended beneficiaries and supply chain actors?

The study findings indicate a spread effect within the treatment villages. At the farm level, more producers are adopting more of the Better Cotton practices, which can potentially lead to enhanced yields and higher profitability, but consistency is lacking, and there are factors which create barriers to adoption. The levels of benefit on costs of production for farmers are also of limited magnitude so far. However, the proportion of farmers reached so far is very limited as a proportion of the total in Adoni *Mandal*. The Producer Unit has been licensed, but a Farmer Producer Company is not yet established and will take time to develop and to have the capacity to offer members such services. There has been an expansion in the farmers participating in the project and who are now part of the Learning Groups and Producer Unit so Better Cotton production in the broadest sense is expanding. However, it can still expand much further in terms of the number of farmers participating and hectares covered as currently it is a relatively small proportion for the area.

Farmers can potentially benefit from direct sales, according to ginners interviewed, by avoiding the commission and interest rates of commission agents in Adoni *Mandal*, but this has not yet occurred and would need to be tested in practice to see if farmers and the Producer Company can realize such benefits in practice.



In terms of value chain dynamics, the evidence finds that scaling has been limited at the sector level. There has been no participation by ginners and spinners approached by BCI project or BCI India or crowding in by companies in an autonomous fashion. This will not occur until there is a) a strong business case and b) this business case is communicated to companies. Buyers making commitments and sourcing only Better Cotton would potentially contribute to such a business case. However, it is not clear whether there is sufficient demand for sustainable cotton. Ginners did express an interest in buying from Better Cotton farmers if the Producer Unit can offer adequate supply and suggested that both would make savings as a result and thus increase their returns.

The Producer Company needs to be established to see if it can enable farmers to participate in collective procurement and accessing of services – but the latter might also include services such as crop insurance and climate services. More time is needed so that the key enabling conditions, such as collective access to finance via the Producer Company can be facilitated – this will help farmers to escape the trap of indebtedness to *dalals*, which also pulls them back to unsustainable practices. New efforts are needed to tackle gender inequality from the outset, such as work on Gender Action Learning Systems (GALS).

Systemic changes may also be required to encourage scaling and to tackle root causes of unsustainability in cotton production in Adoni *Mandal*. Such systemic changes include changing government policies and regulations (e.g. introducing regulations prohibiting dangerous pesticide sales), linking to other development partners to extend the range of services available to farmers, including climate services and financial services, social learning and coordination in the sector-area. Ideally, an area-based strategy would be developed in this regard.

However, Government has not been engaged to date by BCI India or the project, and has not responded and provides minimal support to the cotton sector. This also undermines the plausibility of a sector effect to date and requires attention.

5.3 Overall Conclusions

Overall, this study demonstrates the feasibility of Theory-Based Impact Evaluation, including experimental design and mixed methods, for assessing the impact of a voluntary sustainability standard. Not all of the elements detailed in the project theory of change have been implemented, therefore it is unsurprising that on some issues such as decent work and enabling mechanisms, such as collective procurement and sales, changes have not been observed. This has affected

the extent to which the overall achievement of outcomes is realised in terms of the uptake of practices by cotton farmers.

There are also some positive changes observed: the project has established 98 Learning groups, reaching 3,425 farmers. The intensity of exposure to trainings and practical demonstrations has increased over time, mainly focusing on Integrated Pest Management and Soil Health practices, but more recently incorporating aspects of decent work. The Producer Unit (PU) has been established, and the PU now has a licence to sell Better Cotton. The Farmer Producer Company is yet to be established, however and cotton sales have not yet begun. The quality of training and demonstrations has been limited (more experiential learning opportunities exist), and more intensive support is required to build farmer capacity and encourage practice change. Value chain, marketing and financial linkage interventions have largely not been undertaken, and this has affected the capacity of farmers to adopt many of the promoted practices, not least because of their common indebtedness to commission agents or *dalals*.

Knowledge levels on Better Cotton practices have significantly increased for treatment farmers, on a range of practices including the preparation of bio-pesticides, the use of neem oil, balanced use of fertilizers, inter-cropping, border crops, refugia crops, and the cleaning and grading of cotton. However, the spread of knowledge is limited to men, because of low levels of women's participation in the Learning Groups and non-sharing of information within the household, due to the lack of attention to and measures on gender issues in this project.

Adoption levels have increased significantly, with a clear correlation between treatment exposure and adoption levels. However, the consistency of adoption appears to be variable, and poor rains and indebtedness act as barriers to full adoption. Instead of simple yes/no decisions, qualitative data indicates that some farmers only partially adopt. Many farmers are not yet convinced that they will benefit by reducing synthetic pesticide use in terms of their yields, and input dealers, commission agents (to whom they are trapped in debt relations) and package sizes all encourage farmers to over-use pesticides.

Treatment farmers were slightly better off in terms of costs of production compared with control groups, (statistically significant) and with slightly better yield (not statistically significant), and slightly higher profits from cotton – but the differences are small and so may not be sufficient to persuade such farmers to fully adopt and sustain BCI promoted practices and to convince others to do so as well. Qualitative enquiry generated slightly more negative feedback from all farmers



on their cotton yields, profits, and costs of production, and this may be due to the on-going failure of rains when they were interviewed in 2018. The vast majority of those interviewed plan to continue growing cotton, so it clearly remains an attractive crop, although the panel studies also showed that some farming households have been forced to sell their lands and move to the cities and many rely upon public works schemes and informal urban and rural work to survive.

Some significant results were observed in terms of the reduced proportion of farmers using cocktail applications of pesticides. There has been a marked reduction in the doses of all pesticides, except two, by treatment farmers, and including the highly toxic *monocrotophos* – changes known to have environmental benefits. However, we have not observed similar levels of reduction and appropriate use of synthetic fertilizers. Awareness on child labour has risen in treatment areas, but the evidence on practices is uncertain and there is limited evidence of changes on other aspects of decent work to date. No changes are observed in the value chain, with ginners not expressing demand for ‘Better Cotton’ so far.

There is no evidence that desired impacts have been achieved, but this should also be contextualized in terms of the partial implementation of the theory of change, the anticipated timescale of the project theory of change and a recognition of the time taken to change farming practices and build farmer organisations in contexts of high levels of poverty and illiteracy.

BCI does not have a clear definition of sector change and this could be strengthened. Beyond simple scaling increasing outreach beyond that already achieved, systemic actions should be identified that can tackle root causes of unsustainable cotton production and levers for change. This includes advocacy of government to provide greater policy support for sustainable cotton production, and improved pesticide policies and regulations. A social learning process engaging diverse stakeholders in an area and along the value chain should be facilitated to jointly identify such systemic challenges and potential solutions. Greater dialogue and coordination on an area-based level is likely to be required to overcome systemic challenges, such as how to deliver improvements to services to enable farmers to escape indebtedness and increasing, interlinked rural stressors, including the changing climate.





6. Recommendations

The recommendations are organised by actors involved in the Better Cotton Initiative - for the BCI headquarters team, for the Implementing Partner and national BCI team, and for the sectoral stakeholders.

6.1 For the Better Cotton Initiative

Recommendation 1: BCI should strengthen its approach to sector transformation in its theory of change, flowing into the design of specific projects. The study demonstrates that the following are necessary to realize meaningful benefits for farmers to incentivize more consistent and widespread changes in their farming practices:

- a. improvements in farmer access to services, such as improved access to finance, collective input sourcing and marketing are required to improve farmers' returns and help them to escape indebtedness, improved access to climate services to strengthen climate resilience, and improved access to livelihood diversification opportunities in contexts of climate change.
- b. producer organizational development is critically important to build viable producer groups that can help deliver such services to farmers, to strengthen internal accountability to members and to increase their bargaining power in the value chain and capacity to engage in direct sales to ginners and to access finance, etc.
- c. affirmative measures on gender equity from the outset, to avoid re-enforcing inequalities and to maximize women's participation in better cotton farming processes and outcomes.
- d. strengthening the business case via market demand measures and engaging value chain actors for enhanced coordination and sensitization, to increase demand for sustainable cotton, to build support for direct sales opportunities and fair contracts to realize higher benefits for producers, and to tackle over-consumption through circular economy and reduced buying.
- e. advocacy measures for more supportive national government policies and legislation in consumer and producer countries. Relevant policy issues include social protection, infrastructure, agricultural extension provision, climate information services, regulation of the private sector in agrochemicals, land governance, supportive taxation and procurement policies;
- f. develop partnerships and learning between development actors to facilitate delivery of services to farmers, enhancing farmer bargaining power, tackling gender equity and child labour issues to support learning, more effective joint responses and advocacy. At a local level, an area-based approach is proposed.
- g. Invest in monitoring, evaluation and learning systems that include tracking of systemic change: Build up the MEL system to support improvement and enhance BCI impact. This should include assessing transformative change both in area-based projects, but also at national scales and globally. This would begin with setting out the kinds of transformative change that is envisaged and identifying the specific contributions of BCI and those actions that others may need to undertake, which BCI can lobby for. Emergent change indicators should be identified to capture 'early' changes on systemic issues.

Recommendation 2: BCI projects should pilot the adoption of an area-based approach based upon a social learning approach and if successful, seek to roll this out. A key strength of BCI is in its relative flexibility for local interpretation responding to local contexts. This study shows that many challenges are both context specific, but also require simultaneous actions by different stakeholder groups to achieve desired goals. Thus, learning, coordination and motivation are needed for success. We suggest piloting an 'area-based' approach, with the following features:

- h. BCI should invest in bringing together key stakeholders in a geographic target area, ideally prior to project design, but also on a continual periodic basis, to enable joint analysis of problems and development of solutions. This should include projections of future scenarios for the geographic area, including the implications of a changing climate, plus biodiversity and land degradation trends.
- i. A social learning approach involves structured facilitation of such learning processes between different kinds of stakeholders, building trust and new relationships, but, done well, can also challenge received wisdom to positive effect, and builds ownership and motivate action, including at policy levels. Overall, this has the potential to improve BCI project implementation.
- j. A diversity of stakeholders should be supported to participate. All key stakeholders, including farmers, ginners, spinners and buyers, to ensure from the outset that diverse perspectives are engaged. Farmer representation should include women farmers and marginalized groups. Value chain, government and civil society actors should be

50. <https://bettercotton.org/resources/bcis-theory-of-change/>



involved. By engaging value chain actors, including buyers, there is the potential to support coordination and information sharing along the value chain, but ultimately commercial actors will respond to the strength of the business case in making decisions. Such an approach should involve local authorities and state governments to encourage favourable procurement and policy reforms, which have been shown in wider evidence to advance the effectiveness of sustainability standards by creating a more level playing field. Further, such an approach could help to identify and build area-based partnerships from the outset to address decent work, market and financial linkages.

- k. The methods for facilitating learning should be tailored to context, designed by participants and reflect their needs: Learning should move beyond workshop-based events, to include field visits and creative approaches to surfacing diverse understandings and solutions, and should seek to unearth the root causes of unsustainable cotton production and systemic responses. This involves engagement with a diversity of stakeholders, consideration of issues such as necessary policy and legislative changes, and enhanced coordination.
- l. Initial engagement and on-going reflection for adaptive management: An area-based approach would involve facilitation of initial stakeholder problem analysis and solution identification in an area where BCI intends to intervene, leading to an initial project design. It is not a one-off process, but it should continue with regular collection of monitoring data linked to regular stakeholder reflections upon the project theory of change to enable adaptive management. Contracts for project implementers should enable such flexibility.

Recommendation 3: BCI should recognize the climatic challenges faced by farmers and support climate resilience interventions to strengthen farmer resilience, including for some, livelihood diversification away from cotton. Analysis of climate projections should be a key part of an area-based approach in which stakeholders review climate projections and explore scenarios for the geographic area to understand the implications and options for sustainable cotton farming. BCI should support enhanced access to weather and seasonal forecast information by integrating this in the BCI theory of change (under service provision for farmers) and may require partnerships with meteorological agencies. Exploring livelihood diversification strategies as part of a farming system approach is also important, beyond the focus solely on cotton for all farmers.

Recommendation 4: BCI should strengthen project design and implementation. The BCI project theory of change should flow from an area-based approach involving stakeholder participation and social learning. Project designs should set out how all key components of the agreed theory of change will be delivered, and by whom, accompanied by realistic assessments of stakeholder capacity and the time taken to achieve change in poor rural areas that are largely reliant on rainfed agriculture. In each focal country, BCI should seek to undertake national-level advocacy as well as supporting engagement of state- or provincial-level governmental bodies, and support value chain coordination. It should facilitate or provide oversight of the area-based approach in specific target areas and support reflection and learning processes to improve implementation on an on-going basis. Adequate support and oversight should be provided for implementing partners to ensure they have access to key capacities and capabilities, including adequate resources.

Recommendation 5: BCI should conduct a review of the most effective approaches to agricultural extension and ensure that area-based processes have access to such information to inform project design. Given the centrality of agricultural extension to any BCI initiative, it is important to ensure that the most effective approaches are being employed. The approach in the current study did not include strong experiential learning as facilitated in farmer field schools and farmer networks, yet the latter may be more effective in achieving change in contexts where there are strong countervailing forces, in combination with changes in farmers' access to services and bargaining power, such as farmers trapped in debt relations with commission agents and heavily reliant on private input dealers for advice and inputs.

Recommendation 6: BCI should support market demand-side measures for 'Better Cotton' and seek to demonstrate the business case. Key avenues include engaging national and meso-scale government bodies in producing countries – an area-based approach would support coordination amongst such entities, either to enforce better cotton standards in a jurisdiction and/or to support scaling via integration into public procurement policies. Changes may be required in policies and regulations, but also engaging buyers is a key strategy, combined with consumer, government and buyer awareness and market-building campaigns in consumer countries. Changing global market trends mean that a focus on Asia is likely to be important in terms of engaging consumers and buyers.



6.2 For Implementing Partners & National BCI team

Recommendation 1: Continue to provide support to farmers in Adoni Mandal and complete the project implementation. The IP should be given adequate time to implement the project, with additional attention to the theory of change (implementation of all components). This has the potential to strengthen farmer awareness and to drive practice changes leading to farmer capture of benefits, although further monitoring and evaluation is advisable, with strong learning feedback loops to inform decision making.

Recommendation 2: Improve the lead farmer system and pilot more experiential forms of agricultural extension. The lead farmer system could be improved with a system of incentives to motivate farmers to make practice changes and to share lessons with other farmers. However, it is also important that BCI and IPs consider both the issues with non-consistent adoption to date and the uncertainties faced by rainfed smallholder producers which are increasing due to climate change. The study shows that farmers are not always able to change their practices due to such uncertainties, e.g. increasingly unpredictable rains preventing implementation of intercropping. Such high levels of uncertainty and challenges mean that farmers need to be able to evaluate technologies within their own contexts to develop and innovative appropriate agricultural solutions. The study also shows that changing the mindsets of farmers in Adoni Mandal is not easy, given countervailing tendencies. This suggests that experiential forms of agricultural extension could be more effective than lead farmer approaches, such as joint learning and experimentation by farmer groups focused upon a shared learning plot. While such an approach might be more expensive, it may prove to have greater value for money if it ultimately leads to greater changes in farmer attitudes and practices. Hence it is important that such approaches are piloted, with the IP given adequate support if that is needed for implementation.

Recommendation 3: Advance other key components as a matter of priority other key interventions such as enabling mechanisms, value chain sustainability, and decent work to drive change at the local level. Priority needs to be given to enabling farmers to escape their relationships with commission agents and to gain access to credit so that they can change their farming practices towards greater sustainability. An organizational development plan should be developed for the Producer Unit beyond registration as a Farmer Producer Company. Support is needed to develop the business and management skills of the organization and to ensure it

has adequate capacity to deliver services to members, as well as governance/ accountability mechanisms in the Farmer Producer Company. The time and resources required can be significant and should not be under-estimated. However, if done properly, the Farmer Producer Company can facilitate direct sales to the ginner, as well as organize the collective procurement of inputs, including ensuring members' access to biopesticides and bio-fertilizers. Monitoring capacity is also required, including a stronger Farmer Field Book system. The functionality of the Learning Groups within the PU should be monitored, as well as the quality of the extension and other services provided to members, as measured by farmer satisfaction, cotton farming practices and profitability.

Recommendation 4: Develop a gender and social difference strategy and new partnerships to support implementation in order to enhance participation and a fair distribution of outcomes. To overcome deep seated cultural and gender norms which marginalize women and other social groups from decision making and contribute to inequitable outcomes, a gender and social difference strategy is required. This would involve identifying challenges and solutions jointly with other area stakeholders to create coordination and partnerships to support change.

Recommendation 5: Identify partners and support delivery of improved weather and seasonal forecast information for smallholders in Adoni Mandal, as well as identifying and responding to climate projections for the area. Analyse climate projections for Adoni Mandal and Andhra Pradesh to inform resilience strategies for smallholder farmers as part of an area-based approach. This kind of analysis should consider future scenarios for the region and the appropriate role of cotton production. As well as reviewing climate projections for the region and supporting farmer climate resilience in general, it is important that farmers have improved access to climate services.

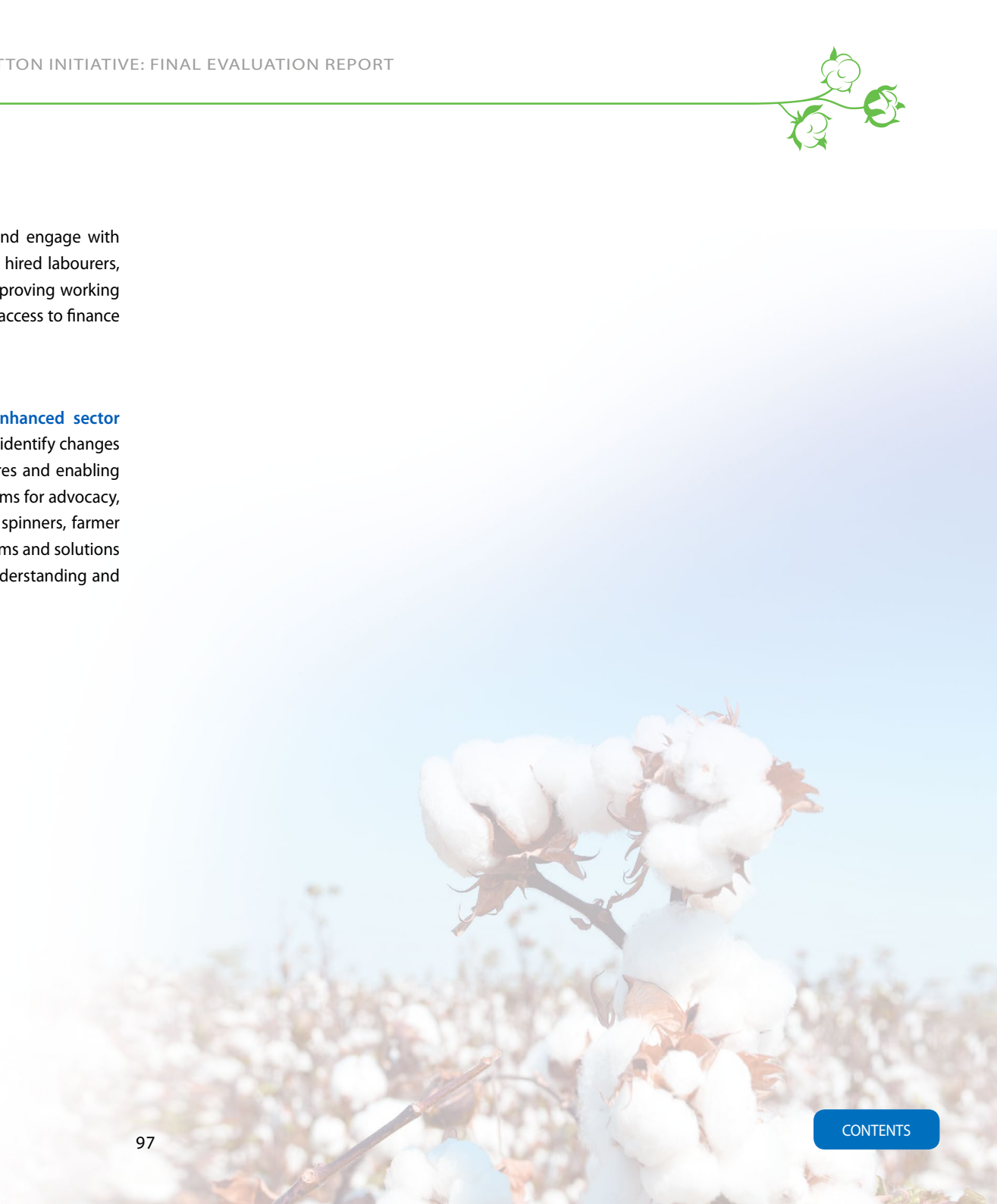
Recommendation 6: Engage actors along the value chain to raise awareness, especially at buyer level, to promote changes in buyer sourcing practices, such that market demand increases, and engage local government in this regard. Increased efforts are needed to raise awareness in the value chain, but particularly to stimulate buyers to commit to purchasing Better Cotton. Without greater demand and clearer market signals it will be challenging to transform the value chain. Engaging with local government is also necessary to support scaling.



Recommendation 7: Develop a hired labour strategy. Conduct research and engage with stakeholders to identify affordable actions that can be taken with respect to hired labourers, including migrant labourers. This could include longer-term strategies for improving working conditions and wages, based on improved cotton profitability and enhanced access to finance at an area level.

6.3 For the sectoral stakeholders

Recommendation 1: Engage in the area-based approach, supporting enhanced sector learning, coordination, commitment to and action on sustainability. Jointly identify changes which support systemic change of the market, such as demand side measures and enabling environment measures (e.g. policy and legislative reforms; stakeholder platforms for advocacy, learning and monitoring; etc.). All stakeholders should participate – ginners, spinners, farmer representatives, buyers, government and civil society to jointly analyse problems and solutions (i.e. using a Social Learning approach), with the aim of developing shared understanding and collective action on sustainability in cotton production and farming.





References

- Adkisson, Perry L. et al (1959), chemical, cultural and mechanical control of pink boll worm
- Cohen, J. 1988. Statistical Power Analysis for Behavioural Sciences, <https://www.sciencedirect.com/book/9780121790608/statistical-power-analysis-for-the-behavioral-sciences>
- Cotton exporters guide, Understanding all aspects of international cotton trade – from farm to shirt, <http://www.cottonguide.org/cotton-guide/the-world-cotton-market/overview/>
- Djimeu, Eric W. 2015, & Deo-Gracias Houndolo (2016) Power calculation for causal inference in social science: sample size and minimum detectable effect determination, Journal of Development Effectiveness, 8:4, 508-527, DOI: 10.1080/19439342.2016.1244555
- Fraser, N. (2008) Scales of Justice: Reimagining Political Space in a Globalizing World. New York: Columbia University Press.
- Grameen Foundation (2012) India Progress out of Poverty Index® (PPI®): Scorecard and Lookup Tables. Available from: <http://www.progressoutofpoverty.org/country/india>
- Kai H. 2018. Cotton Report - cotton production and trade trends, International Cotton Advisory Committee, accessed from https://www.wto.org/english/tratop_e/agric_e/item_3_icac_cotton_yields_29_november.pdf
- Kranthi K. R., M.V. Venugopalan, M. Sabesh, M.S. Yadav. 2011. CICR–Vision 2030. Central Institute of Cotton Research, Nagpur, pg.19.
- Mancini, F., A.H.C. Van Bruggen, J.L.S. Jiggins, A.C. Ambatipudi, H. Murphy. 2005. 'Acute Pesticide Poisoning among Female and Male Cotton Growers in India'. International Journal of Occupational and Environmental Health 11(3): 221–232.
- Mihalic S. 2002. The importance of implementation fidelity, Centre for the study and prevention of violence, Colorado, USA <http://www.incredibleyears.com/wp-content/uploads/fidelity-importance.pdf>
- Ministry of Agriculture and Farmer Welfare, Govt of India, 2016. Agriculture Wages in India (2015-16). <https://eands.dacnet.nic.in/AgriWages2015-16.pdf>
- M. Sabeesh, 2007. Approved package of practices for cotton in Andhra Pradesh, published by Central Institute of Cotton Research
- N. Lalitha and P K Viswanathan eds (2015) India's Tryst with Bt cotton: Learning from the First Decade, Concept Publishing Company Pvt.Ltd, New Delhi.
- Loevinsohn M, Sumberg J, Diagne A (2012) Under what circumstances and conditions does adoption of technology result in increased agricultural productivity? Protocol. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
- Pesticide Action Network, UK, 2018, Is cotton conquering its chemical addiction? – a review of pesticide uses in global cotton production, published by PAN UK
- Prasad R., Pathak P.S. Crop Response and Nutrient Ratio, Policy paper no 42, National Academy of Agriculture Sciences, New Delhi, pp15, <http://naasindia.org/Policy%20Papers/policy%2042.pdf>
- Pravin D.W., S.W. Martin, F.Cooke, Jr. and B.B.Freeland, Jr. (2005); Effect of Harvest Season Rainfall on Cotton yield. The J. of Cotton Science 9:115-120 (2005). <https://www.cotton.org/journal/2005-09/3/upload/jcs09-115.pdf>
- R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- UNDP (2014) UNDP's Multidimensional Poverty Index: 2014 Specifications. Available from: <http://hdr.undp.org/en/content/undp%E2%80%99s-multidimensional-poverty-index-2014-specifications>



Annexes

A. STUDY TOR

ISEAL is now launching a Call for Expressions of Interest and Qualifications for one of the three impact evaluations that the ISEAL Alliance will commission under the auspices of the Demonstrating and Improving Poverty Impacts project: a study of the early impact of Better Cotton Initiative on Smallholder Cotton Producers in Kurnool district, India. The total budget for this evaluation is US\$260,000. More detail on this evaluation can be found in the Terms of Reference.

About the commissioning organisation

ISEAL Alliance is the global membership association for credible sustainability standards, who work together to improve the impact and effectiveness of current and potential future members. We distinguish and promote credible standards and support cooperation among our members and other interested parties to shape an effective standards movement. By building a collaborative movement we aim to achieve a significant and increasing impact on the sustainability of products and services worldwide.

Our members are multi-stakeholder sustainability standards and accreditation bodies that demonstrate their ability to meet the ISEAL Codes of Good Practice and accompanying requirements and commit to learning and improving. One of our Codes of Good Practice is the ISEAL Impacts Code. Implementing this Code enables organisations to build robust and effective.

Monitoring and Evaluation (M&E) systems

The ISEAL Alliance Secretariat works with members on various projects aimed and strengthening M&E systems, learning more about the impacts of standard systems, and determining how to increase the effectiveness of standards. One such project is the Demonstrating and Improving Poverty Impacts project, through which ISEAL will commission three evaluations of the impact of sustainability standards.

Overview of process and timelines

The deadline for response to this Call for Expression of Interest and Qualifications is Tuesday, February 24, 2015. If you plan to submit a response to the Call, please inform Marta Maireles as soon as possible of your intentions (marta@isealliance.org). Should additional information

about the evaluations or ISEAL's intentions become available during the Call period, we will submit this information to all teams that have informed us of their interest.

Responses to the Call for Expression of Interest and Qualifications will be reviewed by a selection committee. This committee will consist of representatives of the ISEAL Alliance, the Ford Foundation, Better Cotton Initiative and at least one other standard-setting body involved in the Demonstrating and Improving Poverty Impacts project, plus two external experts from the International Initiative for Impact Evaluation (3ie). The selection committee will evaluate the submissions and recommend which research team should be awarded the commission. Evaluation of the submissions will be based on:

- The research team's qualifications regarding
- Experience with experimental designs and relevant qualitative methods
- Experience conducting mixed-method studies
- Experience with the study context, the issues addressed by the study and with research regarding sustainability standards
- The capacity of the research team and supporting organisation to manage the evaluation
- Research team's ability to conduct the work within the time period allotted for the study, including to be immediately available during the month of March 2015 to work with the project Implementing Partner on the farmer selection process (which is necessary to make an experimental research design possible)
- Organisational capacity and experience with impact evaluations
- Local partnerships and researchers in research area
- Research team's initial ideas about how to achieve ISEAL's research and learning objectives for the study (including preliminary proposal for research design)

The final decision and contracting lies with the ISEAL Alliance. The short-listed research teams will be asked to participate in a phone interview between Wednesday, Feb 25 and Tuesday, March 3, 2015. A decision will be made by Wednesday, March 4, 2015.

ISEAL will commission the selected research team initially for Phase 1 of the project (see TOR description of 3 phases). In the first phase, the research team will propose a detailed study design for the evaluation.



Moving forward on Phase 2 (baseline study) is contingent on ISEAL's approval of the research team's proposed study design, work plan and budget for the research (following a review and comments by the project steering committee and technical experts). Once approved by ISEAL, this design will form the basis of the terms of reference for Phase 2 and Phase 3.

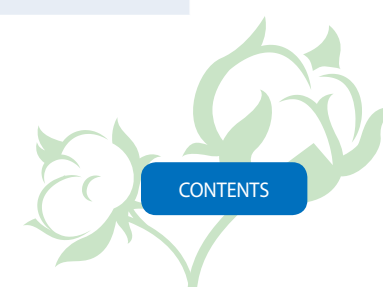
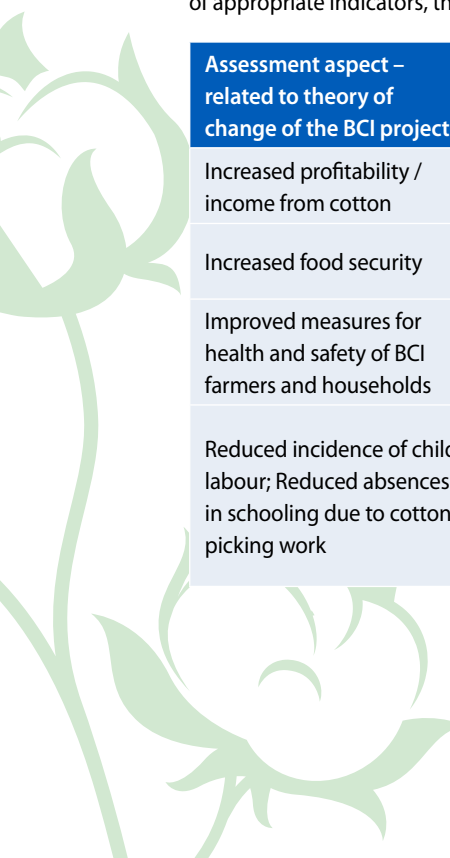
The commissioning of Phase 3 is contingent on satisfactory completion of Phase 2, and of ISEAL being awarded the planned grant for phase three of the Demonstration and Improving Poverty Impacts project.

B. OBSERVATIONS ON ISEAL COMMON CORE INDICATORS

The main methodology for the study is Theory Based Impact Evaluation (TBIE). The selection of indicators for the study therefore is guided by the overall theory of change and accompanying four impact pathways – social, economic, environmental and value chain. During the selection of appropriate indicators, the research team conducted extensive consultations with the

Implementing Partner and with COSA. The ISEAL common core indicators and BCI indicators were the main guidance points along with the COSA indicators. The research team also reviewed the indicators proposed by International Cotton Advisory Committee (ICAC), Cotton made in Africa (CmiE) and Textile Exchange. Overall inspirations from drawing the definitions and scope of selected 38 theory of change indicators were drawn from all those sources. The ISEAL common core indicators are generic, given that serve all sustainability standards. The uniqueness of ISEAL common core indicators lies in their focus on process, output and outcome dimensions of sustainability. Specific indicators related to women (more than gender disaggregation), pesticide, partnership, decent work, working condition, enabling, finance and supply chain are less emphasized in the ISEAL indicators and therefore the study has adapted indicators related to these issues from COSA, BCI and other indicator references. The ISEAL common core indicators where inspirations are drawn for developing the indicator framework of the study are captured in the table below:

Assessment aspect – related to theory of change of the BCI project	ISEAL core indicators used	Remarks
Increased profitability / income from cotton	Net revenue over last year from product produced according to standard	As the study is currently working with the pre-certified group, the definition of the indicator as 'According to the standard' will be applied once the groups are certified /licensed
Increased food security	Months and days of in adequate access to food (Household Hunger Score +)	As per ISEAL guidance document, this indicator is under development; we have designed the food security assessment as per the currently defined scope of the indicator
Improved measures for health and safety of BCI farmers and households	Producers, trained on health and safety	Both the producers and hired labourers' level of access to health and safety trainings are being assessed by the study
Reduced incidence of child labour; Reduced absences in schooling due to cotton picking work	% of children under 12 at grade level, by gender, School attendance of children under 12, by gender	The study is exploring the issue of child labour in both household surveys and through qualitative discussions. The school data on attendance can be taken in participating villages but the research team feel that analysing /attributing this data will be difficult in the context of children role in cotton picking as there can be many reasons for absence of children from schools and not all these absences are tracked by the school attendance system





Continued...

Assessment aspect – related to theory of change of the BCI project	ISEAL core indicators used	Remarks
Reduced discrimination of women	Perception of change in level of control over household decisions, by gender	This indicator is being tracked in both household surveys and qualitative enquiries
Reduced cost of cultivation	Net revenue over last year from product produced according to standard	ISEAL does not have cost of production related indicator
Reduced pesticide use	Reduction in use of highly hazardous substances (indicator still in development)	The study is following the BCI proposed methodology in this regard. The data is obtained from the farmers for different pesticides (trade names) being used by them along with the quantities used. Based on this data, the calculations of chemical load and comparison of that with the recommended benchmarks are carried out
Increased yield from cotton	Reported yield (in kg per hectare) at certified entity level over last calendar year – using reported actual production and reported cultivation area	We are tracking this indicator as per ISEAL suggestion
Improved efficiency and balanced fertiliser use	Efficiency of fertiliser use (indicator still in development)	Like pesticide consumption (explained above), we are using BCI methodology for computation of efficient and balanced fertiliser use
Improved service provision to farmers	Support services provided by group to certified/verified group members in last calendar year	We are tracking this indicator as per ISEAL suggestion
Improved working conditions for hired labour, including no forced labour	Lowest weekly wage (based on standard work week), report with and without in-kind benefits, for permanent/full-time workers or contractors vs. temporary/seasonal workers or contractors, and by gender	Given the informal nature of hired labour market in Adoni, it is difficult to estimate the lowest weekly wage as farmers who are hiring the labour do not keep records and may not want to share this information correctly. We will try to develop a methodology for understanding hired labour situation and their weekly wages during the monitoring rounds
Increased knowledge and consistent practices adoption by targeted farmers	People trained in last calendar year in preparation for entry into programme or as requirement of standard, by gender and type of training	We are tracking this indicator as per ISEAL suggestion and are covering more grounds in terms of understanding levels of adoption of BCI recommended practices



Continued...

Assessment aspect – related to theory of change of the BCI project	ISEAL core indicators used	Remarks
Farmer have increased knowledge of decent work principles and Adoption of decent work practices	Lowest weekly wage (based on standard work week), report with and without in-kind benefits, for permanent/full-time workers or contractors vs. temporary/seasonal workers or contractors, and by gender	Besides the wages, the ISEAL common core indicators does not have indicators on decent work and therefore we have gone by the BCI guidance on this
No. of farmers participating in FFS, exposures, trainings, demos and other events	People trained in last calendar year in preparation for entry into programme or as requirement of standard, by gender and type of training	We are tracking this indicator as per ISEAL suggestion

C. BETTER COTTON COMPOSITE INDEX METHODOLOGY

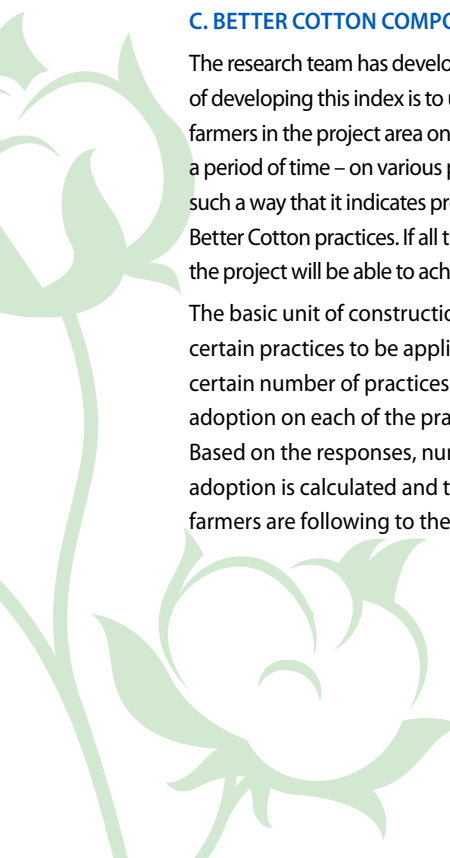
The research team has developed an index called Better Cotton Composite Index (BCCI). The purpose of developing this index is to understand the overall /cumulative status of a farmer or for all the farmers in the project area on 'Better Cotton' practices. The index is useful in tracking change over a period of time – on various practices and cumulatively on all practices. The index is constructed in such a way that it indicates progression as farmer demonstrate increased knowledge and adoption of Better Cotton practices. If all the farmers in BCI project adopt 80% of the Better Cotton practices, then the project will be able to achieve the maximum index score of 1.

The basic unit of construction of BCCI is the six principles within which BCI has recommended certain practices to be applied by the 'Better Cotton' farmers. Within each principle, there are certain number of practices. The farmers' perception (self-reporting) on their knowledge and adoption on each of the practice within a principle is recorded during the household survey. Based on the responses, number of practices where farmers are indicating knowledge and adoption is calculated and then a percentage score is developed based on number of practices, farmers are following to the total number of practices.

Based on the score obtained on a principle, the farmer is assigned to one of the following categories:

- Category 1: less than 30% practices, where farmer is reporting having knowledge or achieving adoption
- Category 2: 31 to 50% practices, where farmer is reporting having knowledge or achieving adoption
- Category 3: 51 to 80% practices, where farmer is reporting having knowledge or achieving adoption
- Category 4: more than 80% practices, where farmer is reporting having knowledge or achieving adoption

Similar procedure is followed for all the principles when each farmer is assigned a category based on their self-reported level of knowledge and adoption. Then the category scores of a farmer are cumulated and divided by total possible score as if the farmer is in category 4. This generates the index score for a farmer. The index scores of treatment and control farmers are then cumulated and compared over baseline and final evaluation. Various descriptive and inferential statistics were used on the index values.

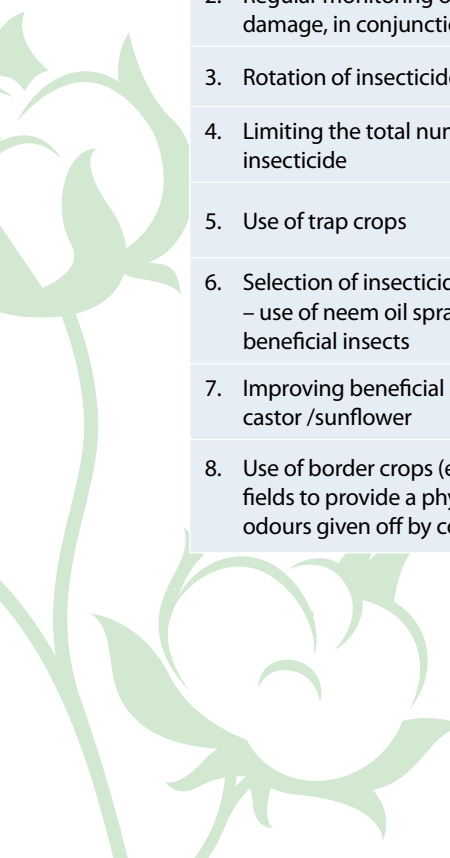




The table below provides the descriptions of various 'Better Cotton' practices by BCI principles. The table also highlights the practices which are recommended by the BCI under minimum production principles.

Practices by Production Principle	Minimum reduction Principle as per BCI
Production principle (1) Better cotton is produced by farmers who minimise the harmful impact of crop protection practices	
1. Use of pest control techniques - bio-control agents, pheromones and hormones	No
2. Regular monitoring of the crop for pests, beneficial insects and crop damage, in conjunction with the use of appropriate pest thresholds	No
3. Rotation of insecticide groups	No
4. Limiting the total number of applications of any one class of insecticide	No
5. Use of trap crops	No
6. Selection of insecticides that are least disruptive to beneficial insects – use of neem oil spray /neem extract which are least disruptive to beneficial insects	No
7. Improving beneficial insects by sowing random /gap filling with castor /sunflower	No
8. Use of border crops (e.g. maize, sorghum, pearl millet) around cotton fields to provide a physical barrier to pests and which mask the odours given off by cotton plants	No

Practices by Production Principle	Minimum reduction Principle as per BCI
9. Use of correct and registered brand of pesticide, if any (Use of a pesticide on a crop for which it is registered)	Yes
10. Correct rate of application	No
11. Following pesticides are not to be used: 12 pesticides are included on the list: Aldrin, chlordane, chloredecone, dieldrin, ichlorodiphenyltrichloroethane (DDT), endrin, heptachlor, hexachlorobenzene, hexachlorocyclohexane, lindane, mirex and toxaphene	Yes
12. Workers using pesticides are trained	Yes
13. Workers using pesticides are healthy and are 18 years older	Yes
14. Workers using pesticides are not pregnant or with a small baby (in lactating period)	Yes
15. Protective and Safety equipment are used in pesticide application	Yes
16. Pesticides not stored in drink or food containers	No
17. No pesticide containers are used for any household or other purposes	No
Production principle (2) Better cotton is produced by farmers who use water efficiently and care for the availability of water	
1. Use of cover crops	No



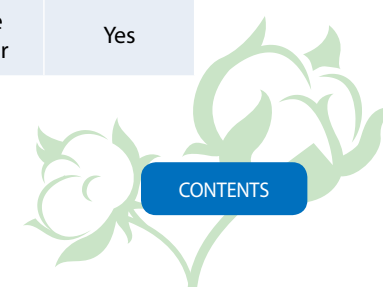
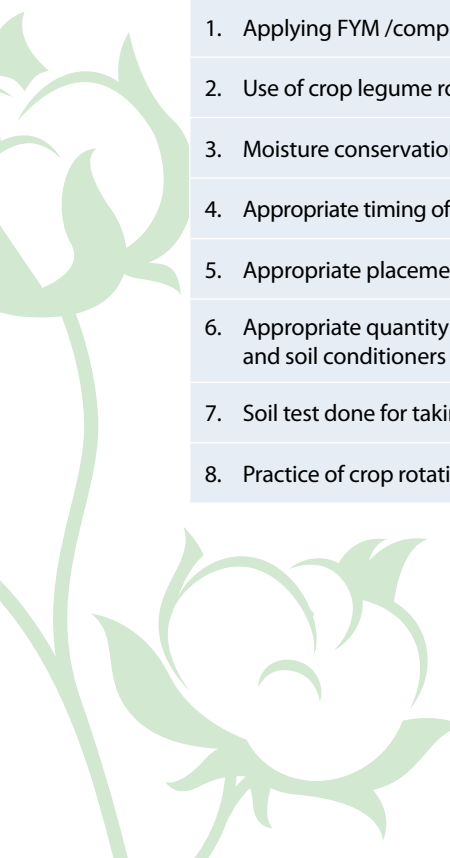


Continued...

Practices by Production Principle	Minimum roduction Principle as per BCI
2. Monitoring and maintenance of infrastructure, pump, plant (only for irrigated plots)	Yes
3. Proper irrigation practices (methods) and scheduling (only for irrigated plots)	Yes
Production principle (3) Better cotton is produced by farmers who care for the health of the soil	
1. Applying FYM /compost	No
2. Use of crop legume rotations, inter-cropping	No
3. Moisture conservation using mulching	No
4. Appropriate timing of application of any fertilisers and soil conditioners	No
5. Appropriate placement of any fertilisers and soil conditioners	No
6. Appropriate quantity (as per the demand of the crop) of any fertilisers and soil conditioners	No
7. Soil test done for taking decisions on nutrient applications	No
8. Practice of crop rotation for improving/maintaining soil health	No

Practices by Production Principle	Minimum roduction Principle as per BCI
Production principle (5) better cotton fibre quality	
1. Planting rate (seed rate) and row spacing are appropriate for the variety, soil type and seasonal conditions	No
2. Level of contamination is low	Yes
3. Good management of the harvest	Yes
4. Proper storage	Yes
5. Proper transport	Yes
Production principle (6) Better cotton is produced by farmers who promote decent work	
1. Access to potable and washing water is provided for workers/hired labour	Yes
2. Workers receive regular health and safety training appropriate to the work that they perform	No
3. There is no child labour, in accordance with ILO Convention 138	Yes
4. For hazardous work, the minimum age is 18 years	Yes
5. Employment is freely chosen: no forced or compulsory labour, including bonded or trafficked labour	Yes
6. Waged workers are paid wages at least equivalent to the applicable legal national minimum wage or regional norm, whichever is higher	Yes

OVERALL = 39 indicators for irrigated conditions, 37 for rainfed





Additional Indicator suggestions from PRDIS	MPC
PP1	
Pesticide cocktails not used	Yes
Pesticides are applied in appropriated weather conditions, according to lable directions - in line with air flow not against wind	No
PP2	
Deep ploughing	Yes
Ridge and furrow method of sowing	Yes
Drain for every 10 rows	No
PP3	
Residue management	Yes
PP4	
Land should hold survey number and no encroachments of the govt / forest land are encouraged	Yes
PP5	
Matured cotton is harvested.	Yes
Moisture level below 7%	Yes

Use coloured bags instead of white bags and or Stalking the cotton in open method and transport	Yes
Cotton free from white polypropline fibre	Yes
PP6	
Part of farmer learning groups/ producer unit	Yes
Collective bargaining	Yes
Women representation in producer organisation	Yes
Families of child labour are provided with alternative source of income	Yes
Formation of Child labour monitoring committees	Yes

D. MPI AND PPI METHODOLOGY

The UNDP’s Multidimensional Poverty Index was used as a measure of poverty. This index measures deprivations in three dimensions: Education, health and living standards. We used the methodology from the technical paper (UNDP, 2014). The composition of the index can be seen in the Table 17.

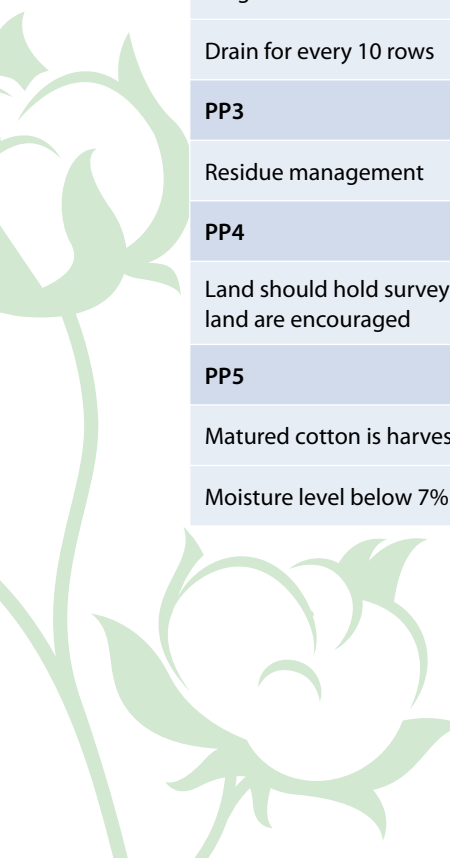




Table 17: Dimensions and indicators of Multidimensional Poverty Index (Adapted from: UNDP, 2014)

Dimension	Indicator: Household is deprived if...	Weight
Education	At least one child aged 6-14 is not attending school	1/6
	No one in the household has 6 years or more of education (among those old enough)	1/6
Health	A child has died within the last 5 years	1/6
	Any child or adult in the family is malnourished	1/6
Living standards	It has no access to electricity	1/18
	There is no source of clean drinking water within a 30-minute walk from home	1/18
	It has no improved toilet	1/18
	Wood, charcoal or dung are used for cooking	1/18
	The floor is made of dirt, sand or dung	1/18
	It has no assets that allows access to information or no assets for mobility or livelihood support	1/18

After assigning scores to these values, a total weighted score was calculated for each household. If this MPI score is higher than or equal to 1/3, the household is considered poor. The other scales are visualized in Figure 23.



Figure 32. Scales of poverty in MPI (Source: UNDP, 2014)

The MPI of a population is calculated as the incidence of poverty (H) * the poverty intensity across the poor households (A).

$$MP = \frac{\text{Number of poor people}}{\text{Total sample size}} \times \frac{\text{Sum of scores of poor people}}{\text{Number of poor people}}$$

The Mann-Whitney U test for difference of distributions was used to compare the MPI scores across different groups. This was done because the scores are not normally distributed.

Progress out of Poverty Index

The Progress out of Poverty Index is a tool developed by the Grameen foundation. It consists of 10 indicators that can be easily assessed for each household (see Table 8). It results in a score between 0 and 100. This score is converted to a poverty likelihood value by using a lookup table. These tables are provided for different poverty lines. In this baseline study we have used the international \$1.88/day 2005 PPP poverty line.

Table 18: Scorecard for PPI (Source: Grameen Foundation, 2012)





Question	Points per answer
1. How many household members are 17-years-old or younger?	
A. Four or more	0
B. Three	7
C. Two	11
D. One	17
E. Zero	26
2. What is the general education level of the male head/spouse?	
A. No male head/spouse	0
B. Not literate, no formal school, or primary or below	0
C. Middle	3
D. Secondary or higher secondary	5
E. Diploma/certificate course, graduate, or postgraduate and above	7
3. What is the household type?	
A. Labour (agricultural, casual, or other)	
B. Self-employed (agriculture or non-agriculture), regular wage/salary-earning, or others	5
4. What is the primary source of energy for cooking?	
A. Firewood and chips, dung cake, kerosene, charcoal, coke or coal, gobar gas, or others	0
B. LPG or electricity	3
C. No cooking arrangement	9

Question	Points per answer
5. Does the household possess any casseroles, thermos, or thermos ware?	
A. No	0
B. Yes	5
6. Does the household possess a television and a VCR/VCD/DVD player?	
A. No, neither one	0
B. Yes, only one	4
C. Yes, both	9
7. Does the household possess a mobile handset and a telephone instrument (landline)?	
A. No, neither one	0
B. Yes, only a mobile	9
C. Yes, a landline, regardless of mobile	15
8. Does the household possess a sewing machine?	
A. No	0
B. Yes	1
9. Does the household possess an almirah/dressing table?	
A. No	0
B. Yes	5
10. Does the household possess a bicycle, motorcycle/scooter, or motor car/jeep?	
A. No, none	0
B. Yes, bicycle only, no motorcycle/scooter, or car	1
C. Motorcycle/scooter, but no car (regardless of bicycle)	13
D. Motor car/jeep (regardless of others)	18



The Mann-Whitney U test for difference of distributions was used to compare the MPI scores across different groups. This was done because the scores are not normally distributed.

Discussion:

According to the MPI there is no significant difference in poverty between the control and treatment group. But according to the PPI there is a significant difference. Some differences between the methodologies might explain this. The MPI is broader in certain aspects. It does not only look at the education level of the household head, but also at those of other household members. In this sense, children may have a positive effect on the MPI. In the PPI, having a lot of children is always a negative factor. The health indicators of child mortality and nutrition are absent from the PPI. One factor that is only present in the PPI and not in the MPI, is the type of income (labour or own enterprise/farm).

There are also slight differences in which households were counted for the indices. In the MPI, a household without children aged <5 is not eligible and so cannot be part of the sample.





E. ADOPTION LEVELS ON KEY 'BETTER COTTON' PRACTICES

% Farmers reporting adoption of 'Better Cotton' practices related to 6 BCI principles:

'Better Cotton' Practice	Treatment		Control	
	Baseline	Final Evaluation	Baseline	Final Evaluation
Use of pest control techniques - bio-control agents, pheromones and hormones	6	75	10	63
Regular monitoring of the crop for pests, beneficial insects and crop damage	54	85	60	68
Rotation of insecticide group	41	78	50	68
Limiting the total number of applications of any one class of insecticide	28	82	45	67
Use of trap crops	10	50	14	39
Use of mechanical means to control a pest	28	72	31	43
Selection of insecticide that are least disruptive to beneficial insect	17	78	30	51
Improving beneficial insects by sowing random /gap filling with castor /sunflower	13	65	13	41
Use of border crops (e.g. maize, sorghum, pearl millet)	50	83	42	64
Use of correct and registered brand of pesticide	50	75	57	58
Correct rate of application	56	82	66	67
Correct time of application	50	87	70	65
Banned pesticides are not used	50	60	65	47
Workers using pesticides are trained	22	73	29	33



Continued...

'Better Cotton' Practice	Treatment		Control	
	Baseline	Final Evaluation	Baseline	Final Evaluation
Workers using pesticides are not pregnant	84	88	82	77
Protective and safety equipment are used in pesticide application	64	79	60	66
Pesticides are not stored in drink or food containers	85	84	82	73
No pesticide containers are used for any household or other purposes	82	86	82	68
Use of cover crop	9	45	15	44
Monitoring and maintenance of irrigation infrastructure, pump, plant	19	43	33	40
Proper irrigation practices and scheduling	25	52	40	50
Zero or no tillage conservation tillage or minimum tillage system	0	28	8	26
Applying FYM /compost	64	70	72	60
Use of cover legume rotation, inter-cropping	33	71	38	59
Moisture conservation using mulching	5	56	9	46
Appropriate timing of application of any fertilizer	36	75	55	66
Appropriate placement of any fertilizer	43	75	53	64
Appropriate quantity of any fertilizer	42	75	53	65
Soil test done for taking decision on nutrient application	3	68	14	66



Continued...

'Better Cotton' Practice	Treatment		Control	
	Baseline	Final Evaluation	Baseline	Final Evaluation
Workers receive regular health and safety training appropriate to the work that they perform	38	71	48	62
Waged workers are paid wages at least equivalent to the applicable legal national minimum wage	49	53	64	49
New indicators used in the final evaluation:	-	-	-	-
Pesticide cocktails (mixed) not used	-	76	-	64
Pesticides are applied in appropriated weather conditions, according to label directions - in line with air flow not against wind	-	86	-	73
Deep ploughing	-	85	-	80
Ridge and furrow method of sowing	-	77	-	72
Drain for every 10 rows	-	71	-	59
Residue management	-	43	-	30
Land should hold survey number and no encroachments of the government / forest land are encouraged	-	85	-	78
Matured cotton is harvested.	-	79	-	62
Moisture level below 7%	-	60	-	53
Use coloured bags instead of white bags and or Stalking the cotton in open method and transport	-	51	-	47
Cotton free from white polypropylene fibre	-	54	-	43
Formation of Child labour monitoring committees	-	35	-	27

Contacts

Ravinder Kumar, Associate Professor of Monitoring and Impact, Natural Resources Institute - r.kumar@gre.ac.uk

Valerie Nelson, Professor of Sustainable Development, Leader of the Sustainable Trade and Responsible Business Programme, Natural Resources Institute - v.j.nelson@gre.ac.uk

Adrienne Martin, Director of Programme Development, Professor of Development Studies, Natural Resources Institute - a.m.martin@gre.ac.uk

Natural Resources Institute (NRI), University of Greenwich, Medway Campus, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK

t: +44 (0)1634 88 0088 e: nri@greenwich.ac.uk w: www.nri.org



[@nrinstitute](https://twitter.com/nrinstitute)



[naturalresourcesinstitute](https://www.facebook.com/naturalresourcesinstitute)



[/company/natural-resources-institute](https://www.linkedin.com/company/natural-resources-institute)