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Who benefits from organic cotton? Intersectional labour dynamics of gender, caste and class in Central India

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Abstract

Sustainable agricultural practices integrated into organic agriculture have vast potential to improve rural livelihoods and food security. However, how different social groups adapt to, or are affected by the shift to these practices, is relatively understudied. In this study, we use concepts of agrarian political economy to understand how caste, class and gender intersect to shape labour relations and consequently affect food security. Our study examines these dynamics in central India, where a wide range of social groups, including tribal groups, are involved in cotton cultivation. Cotton, especially when grown organically, is a labour-intensive crop, involving a high proportion of women workers from marginalised and food-insecure groups. We found that labour bottlenecks in organic cotton farming (a) positively influence the bargaining power of marginalised labourers, and (b) strikingly influence gender norms by pushing non-marginalised women into farm work. Our findings indicate that through its influence on bargaining power, organic farming can increase wages, and thereby improve incomes and food security, particularly of marginalised landless labourers, who depend on wages to purchase food. Our study shows that practical necessities of farming systems challenge established social relations. Based on our findings and the literature, we develop a causal network to examine the linkages between organic farming and the different dimensions of food security. As increasing labour productivity can benefit both farmers and labourers, initiatives to promote organic farming should focus more explicitly on farm workers, particularly by including them in training programmes and incorporating decent working conditions and wages into certification standards.

Key Words

Farm labour, hired labour, organic farming, intersectionality, social relations of production, social sustainability, food security

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1. Introduction

Agri-food systems around the world face challenges to sustainably produce food, feed, fibre and fuel. In this regard, improving rural food security is particularly pressing, as one-third of adults living in rural areas in 2022 experienced moderate or severe food insecurity – a prevalence that is higher than in peri-urban (28.8%) and urban (26%) areas (FAO, 2023). This high rural food insecurity is closely linked to rural poverty (FAO, 2019; FAO, 2023). While it was previously assumed that the majority of rural people are both poor and smallholders (Sender, 2003), it is now recognized that extreme poverty is particularly prevalent among agricultural workers - while the share of extremely poor is much smaller among smallholder farmers (FAO, 2019). Although it is common for rural households to have multiple income sources including agriculture, the poorest households often need to seek agricultural wage labour as a last-resort activity and accept low wages and poor labour conditions (Campos et al., 2018; Davis et al., 2016). Moreover, women experience higher rates of food insecurity across all regions, with rural women being particularly affected (FAO, 2023). Any agricultural intervention should thus consider its intersectional effects on rural women and farm labourers.

At the same time, there is a need to adopt more sustainable practices to protect ecosystems (Giller et al., 2021). Citing food security concerns, sustainable agricultural approaches like organic agriculture are sometimes hastily dismissed given the lower yields associated with organic farming (Avinash & Batra, 2023). However, the effects of organic agriculture on food security are more complex, as organic agriculture can affect food availability, access, quality and stability in various ways (Altenbuchner et al., 2017; Jouzi et al., 2017). For example, Reddy et al. (2022) showed that in India, organic farmers achieved yields approximately 15 percent lower than conventional farmers. However, the expenses of organic farming were also lower, resulting in slightly higher profitability. Also, organic farming benefits the environment and reduces costs of external inputs (Forster et al., 2013). This, in turn, enhances the purchasing power and livelihoods of farmers, while also improving the health and food security of women (Altenbuchner et al., 2017; Jouzi et al., 2017). In other contexts, agro-ecological practices can enhance yields or profitability for resource-poor farmers unable to afford external inputs (Eyhorn et al., 2007; Forster et al., 2013; Graf & Oya, 2021). Nevertheless, implementing such approaches comes with challenges and trade-offs, including labour intensity, difficulties in soil nutrient management, and barriers related to certification and market access (Jouzi et al., 2017; Seufert & Ramankutty, 2017).

While the higher labour requirements of organic farming are acknowledged (Jansen, 2000; Orsini et al., 2018), there remains a research gap regarding how labour requirements impact the wages and employment conditions of farm workers from different social groups (Orsini et al., 2018). Especially the effects on women and agricultural labourers are often overlooked

(Singh, 2017), as are the intersectionalities of gender, class, caste, or ethnicity. These intersectionalities shape access to resources, employment opportunities, and decision-making power within farming communities worldwide (Leder & Sachs, 2019).

Organic cotton in India serves as a pivotal case for exploring these social ramifications because of both its high practical relevance and its unique case study context. Conventional cotton is considered one of the world's dirtiest crops accounting for about 12% of pesticides and insecticides used globally (EJF, 2007). The introduction of Bt cotton allowed for a considerable reduction in pesticide use. However, due to the development of resistance in the target pests and the rise of alternate pests, pesticide use is on the rise again (Kranthi & Stone, 2020). Adoption of organic cotton farming is one of the pathways for reduced pesticide usage. Women labourers might particularly benefit from a shift to organic cotton in terms of their health, as they face exposure to pesticides during the harvesting season, which has been reported to lead to skin and stomach problems, headaches, dizziness, nausea, and fever (Yasin et al., 2020). Organic cotton in India is particularly significant, as India is the world's largest organic cotton producer (FiBL & IFOAM, 2023). Cotton plays a vital role in the livelihoods and food security of farming households and labourers, as most of the other cash crops grown in India are mechanized (FAO, 2023; Singh, 2021). The conversion to organic cotton production has been associated with positive impacts on farmers' livelihoods, such as lower input costs, higher returns due to premium prices, and less financial risk (Bachmann, 2012). Women represent the majority of the agriculture workforce in cotton farming in India, representing 70% of the workforce for sowing and 90% for picking, compared to 55% and 65% globally (ITC, 2011).

Evidence on labour requirements for organic cotton farming in India is mixed. Overall, labour requirements were not significantly higher in organic cotton farming systems (Eyhorn et al., 2007), although this changes seasonally and for certain activities such as hand weeding, organic farmers need to hire more labour (Riar et al., 2017b). Tasks such as weeding are usually performed by women, shifting labour days from men to women. Higher labour requirements and the shift from men's tasks to women's tasks has been shown to benefit women labourers as they can work more hours and labour bottlenecks during harvesting can increase bargaining power and wages (Terstappen et al., 2013). However, agricultural labourers are often victims of exploitation and caste- and gender-based social, political and economic discrimination (Singh & Singh, 2016). Such discrimination can hinder labourers from accessing basic human rights to food and health. Food insecurity is closely linked to social disparities (Goli et al., 2021; Sarkar et al., 2020), especially to land ownership (Goli et al., 2021; Zahid et al., 2017) and class, which highly overlaps with caste and ethnicity. Indian agriculture is a particularly interesting context for understanding the intersectional labour dynamics of organic farming, given its unique social structure where social disparities are further amplified by the entrenched caste system. In India, marginalised castes (for example Dalits) are more

than three times more likely to be food insecure compared to other castes (Goli et al., 2021), and members of scheduled tribes and Dalits have lower dietary diversity and nutritional quality (Parappurathu et al., 2015). Within the family, women play a central role in the provision of food and food security (Farnworth & Hutchings, 2009).

This paper thus aims to assess the labour relations of organic cotton farming in India. Then, we analyse how organic cotton farming affects food security, especially food access. Our analysis highlights how gender, class, caste and ethnicity intersect to shape these relations. For this purpose, we analyse a unique case study integrated within the long-term systems comparison project (SysCom India, 2024). This project was initiated in the Kharghona district of Madhya Pradesh in 2007 by the Research Institute of Organic Agriculture (FiBL) in collaboration with the local organisations bioRe India association and Remei India limited (hereafter referred to as 'organisations'). These organisations offer an ideal platform for exploring gender and caste intersectionality and the labour aspects of organic and conventional cotton farming systems because their local collaborators closely work with marginalised men and women farmers from Scheduled Tribes (ST, hereafter referred to as Adivasi) and the majority of hired labour is from Scheduled Castes (SC, hereafter referred to as Dalits). We combine different qualitative social science research methods and use concepts of intersectionality and Agrarian Political Economy to interpret our results. Although challenges remain, our findings show that organic cotton can offer opportunities for improved livelihoods for both farmers and agricultural labourers, and also improve access to food for the most food insecure population groups.

1.1 Background - Description of the project

The main objective of the long-term System Comparison project (SysCom) is to provide evidence regarding the performance of organic cotton systems in comparison to conventional cotton systems across multiple parameters. Partner organisations include Remei India Limited (Remei hereafter), a company that offers purchase guarantees to organic cotton farmers and purchases organic cotton from contract farmers at a premium price.

Remei has set up its own program to breed high-yielding organic cotton varieties. Remei provides extension and training services to the farmers on topics such as water use efficiency and preparation of organic pest control products from locally available materials. Contract farmers also have access to organic seeds, drip irrigation systems and certain organic or biodynamic fertilizer preparations. Organic seeds are provided on a credit basis without any interest. After the harvest, Remei purchases the cotton and deducts the input costs, then pays the farmers for the cotton. The premium for organic cotton is paid after the cotton season, typically around March of the following year, three to four months after the harvest.

During extreme weather events and pest and disease infestations, Remei supported contract farmers with in-kind transfers of organic inputs and extra premiums to help farmers to secure their cotton yield.

The bioRe India Association (hereafter referred to as bioRe) is linked to Remei and is responsible for the implementation of the research activities of SysCom and for dissemination activities, together with Remei. bioRe is further engaged in providing social services to the rural communities in the region, which include mobile healthcare, sanitary infrastructure and education services.

1.2 Description of the cotton farming system

The case study is located in the Narmada River belt in Nimar Valley where agriculture is the main livelihood activity (Riar et al., 2020). The dominant soil in the study site is vertisols, considered suitable for cotton production. Cotton (*Gossypium hirsutum* L.) has been grown for decades in the study region and plays a critical role in the livelihoods of the farming communities in the region. Recorded cotton yields in the Nimar valley region are often lower than the achievable yields, and the yield trends are inconsistent (Riar et al., 2017b).

There are three growing seasons per year: the Kharif (Monsoon) season, from June to October; the Rabi (Winter) season, from November to March; and the Zaid (Summer) season, from March to May. It is a common practice in the region to grow cotton in a two-year crop rotation. This is done in order to avoid the risk of soil-borne pathogens and to maintain soil fertility. A 2-year crop rotation entails that in a specific field, in the first year, cotton is grown during the monsoon season, followed by wheat grown during the winter season. Then the following year soybean would be grown in the same field during the monsoon season, followed by growing wheat again during the winter season.

It is noteworthy that the premium price is for cotton alone and the premium is approximately 12-15% of the market price. This premium is not provided for the other crops in the cotton system. There is also no local organic market for the additional crops, leading the farmers to sell these crops at the regular market price. This, in addition to the insufficient availability of organic seeds, has been a crucial reason in the past that discouraged farmers from growing organic cotton (Riar et al., 2017a). However, in recent years, organic farmers have been adapting the crops they choose to grow during the winter season, depending on the market prices. Chickpea is one of the crops that has become a prevalent winter crop (sown after the harvesting of cotton), and results from the long-term trial show that its inclusion has had significant positive effects on the overall profitability of the organic cotton systems (Riar et al., submitted).

Labour costs and availability are other significant challenges for organic cotton production in the region. Results from the long-term trial (SysCom) indicate that overall (averaging across years 2007 – 2022), organic cotton production requires 29% more labour time. Most of this labour demand comes from activities that are only done in organic farming such as the preparation of compost and organic pest control products, and the cultivation of green manure crops. Among the activities prevalent in both organic and conventional systems, labour time in organic systems was lower for cotton harvesting by approximately 21% and higher for weeding by approximately 18% (Riar et al. submitted). The total input cost, however, was higher in conventional systems by approximately 12%, compared to organic systems.

2. Conceptual Framework

The paper follows an agrarian political economy framework, focussing on the intersectionality of caste, class and gender. Agrarian political economy investigates the “social relations and dynamics of production and reproduction, property and power in agrarian formations and their processes” (Bernstein & Byres, 2001). Its themes revolve around four key questions: Who owns what? (distribution of means of production), Who does what? (social division of labour), Who gets what? (distribution of income and benefits), What do they do with it? (consumption, reproduction and accumulation). The four questions form a sequence, as one issue influences the next e.g. the distribution of means of production shapes the division of labour (Bernstein, 2010). We thus structured our theory of change along these four questions (see figure 1).

The concept of intersectionality, which emerged from black feminist scholarship, examines how various overlapping identities influence individuals' access to resources and experiences (Collins, 2002). We thus follow a relational approach (Mosse, 2010) that highlights the crucial role social relations play in perpetuating poverty and inequality through two main mechanisms: (1) economic exploitation based on social class and (2) the use of social categorisation and identity to justify and normalize exploitation.

2.1. Concepts and definitions

Class relations

The agrarian political economy literature distinguishes three classes of (smallholder) farmers: (1) Emergent capitalist farmers engage in expanded reproduction and accumulation by producing for the market, investing in agriculture (including innovations), and hiring labour (Bernstein, 2010; Lenin, 1964).

(2) Medium farmers, or petty commodity producers, sustain themselves through farming, engage in input and output markets, but typically do not hire in or out labour (Bernstein, 2010).

(3) In contrast, marginal farmers cannot sustain themselves from their small farms and need income from wage labour to sustain themselves (Bernstein, 2010; Kautsky, 1899; Lenin, 1964). In addition, some labourers might be completely landless (Bernstein, 2010; Oya & Pontara, 2015). Marginal and accumulating farmers operate fundamentally different farms. As emergent capitalists are more commercially oriented and face fewer capital and labour constraints (hiring if necessary), their farms tend to have larger fields, more monocropping, a smaller variety of plants and less crop-livestock interactions (Chambers & Ghildyal, 1985).

Caste and tribe

Beyond the General Category (GC) that includes the socially and economically advantaged castes, ranging from the highest to some lower castes with greater access to education and employment, are Other Backward Classes (OBCs), historically disadvantaged groups distinct from Scheduled Castes (SCs) and Scheduled Tribes (STs). SCs represent historically marginalized communities subjected to untouchability, while STs denote vulnerable indigenous tribal groups. The term "Adivasi" is interchangeably used for STs, emphasizing their distinct languages, customs, and traditions (Khare, 2018; Khubchandani et al., 2018). Caste has four main dimensions: (1) It has a hereditary dimension, as castes form endogamous kin groups (jatis) that restrict their members' diet, marriage and cohabitation. (2) Its economic dimension highlights caste as a division of occupations. (3) Its ideological dimension ascribes 'purity' or 'impurity' as well as spiritual entitlements (e.g. priesthood) or exclusion to different castes. (4) Lastly, its political dimension describes caste ideology as a system of dominance and rule (Mosse, 2018). Caste remains a major source of discrimination in contemporary Indian society (Johnson & Karlberg, 2017). Both differences in resource endowment and the caste occupational division result in a caste division of labour in agriculture (Lerche & Shah, 2018).

For the analysis, we categorised General Caste and Other Backward Castes as non-marginalised groups (non-MG) and Scheduled Castes (SC/Dalits) and Scheduled Tribes (ST/Adivasi) as marginalised groups (MG). This is a case-specific categorisation based on the economic conditions and social statuses of interviewed individuals as well as insights from a similar study conducted by Farnworth et al. (2023).

Gender relations

Gender relations describe the relationships between genders within and outside the household. Within the household patriarchy has disproportionate control over household

resources and decisions compared to women and junior men, leading some to falsely equate the peasant farm with a supposed male household head. However, the different interests of individual household members are crucial to explain de facto outcomes, with multiple studies documenting women attaching higher priority to food security than men (Razavi, 2009). In addition, there is usually a clear gender division of labour regarding the household's agricultural and reproductive work, which aligns with socially ascribed gender roles (Ferguson, 2013). These gender roles also affect women's role in the workforce, prescribing them to certain tasks which are often seen as less physically demanding (Hansda, 2017) and garnering much less remuneration than men's work (Kundu & Das, 2019).

2.2 Theory of Change

Organic agriculture can have effects on all four pillars of food security, i.e. food access, food stability, food utilization, and food availability (see figure 1 below). The effect of new agricultural practices, like organic agriculture, depends on both the characteristics of the new practice and the existing social structure (Byres, 1981). Given that marginal and emergent capitalist farms are structurally different, they are in a different position to adopt various agricultural practices (Chambers & Ghildyal, 1985) such as organic farming. While organic farming is scale-neutral (with no major economies of scale), it may not be resource neutral as complementary inputs are needed (see Bernstein, 1992 for the concept).

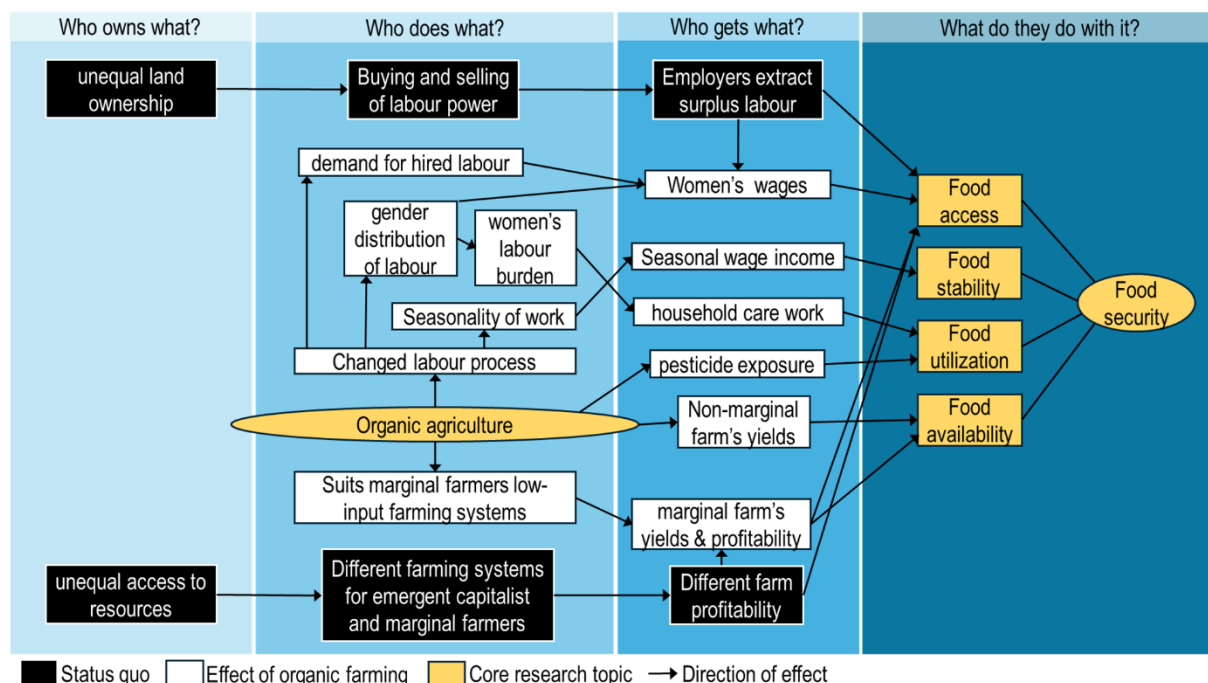


Fig. 1 Causal network on how organic agriculture can affect food security

2.4 Organic agriculture and agrarian labour relations

As organic agriculture changes the required labour inputs for certain agricultural tasks (Seufert & Ramankutty, 2017), it can affect labour relations. Where technological change leads to higher labour inputs, marginal farmers and landless labourers can benefit from increased labour demand (Graf & Oya, 2021). During the peak agricultural season, any additional labour inputs are typically carried out by hired labour, whereas during the off-season, these additional tasks may also be performed by family labour (Kerr et al., 2019). Qualitatively, different labour processes can also be linked to various class relations (Byres, 1981).

Who loses or gains employment opportunities following technological change further depends on the division of labour between genders and caste/tribes. New practices can change the gender association of a task, e.g. women weed by hand while mechanical weeding may become a male activity (Hansda, 2017). Such shifts can also enable some women to cultivate more independently from men; even though this might be framed as caretaking for absent husbands (Rao, 2012). Additionally, in North India, caste and tribe shape wage-earning opportunities with female wage labour being confined to MG women, whereas non-MG women try to conform to their role of housewives by abstaining from (publicly visible) agricultural labour (Rao, 2012).

2.5 Effects on livelihoods and food security

Through farm income: As a cash crop, the profitability of organic cotton directly affects farmers' income. It is also important for food access as farmers often buy food, with well-off emergent capitalists buying ingredients like meat or vegetables, while marginal farmers need to buy grain (Sarkar et al., 2020). While resource-intensive green revolution technology mainly favoured (resource-rich) emergent capitalist farmers in favourable environments (Byres, 1981; Chambers & Ghildyal, 1985), organic or agro-ecological farming is also accessible to marginal farmers practicing low-input farming systems and potentially increases their yield and profitability (Graf & Oya, 2021; Kerr et al., 2019; Panneerselvam et al., 2010).

Through wage income: Organic farming can also impact farm labourers' livelihoods and food access through its effect on wage incomes. This effect can be based on three potential mechanisms: (1) a changed volume of work and thus wage-earning opportunities, (2) changed bargaining power of workers versus employers and associated changes in wages, and (3) a qualitative shift in labour relations (see e.g. Byres, 1981; for examples Scott, 1985). Where organic agriculture increases labour inputs during the off-season this could contribute to income-earning opportunities during times when finding work is particularly difficult. This can contribute to increased food stability. Where wages are paid in kind, e.g. grain, they impact food security even more directly.

Through changed gender relations: Rural women are more likely to be food insecure than rural men and urban women (See FAO, 2023b). As organic agriculture can change the timing, intensity and kind of required labour inputs, it may have implications for the gendered division of labour in farming. This can impact rural women differently, depending on whether they work as hired or family workers, belong to non-marginalised or not or whether they belong to landless or landholding households. For example, the gendered division of labour means that the former are responsible for non-mechanised tasks such as weeding and harvesting (Hansda, 2017), while the latter are more likely to be restricted to wage employment in agriculture, as self-employment and labour migration are out of their reach, or replaced by men labourers if tasks are mechanised (Garikipati, 2009; Hansda, 2017). Changes in female labour inputs only have a positive effect if they concern landless women workers, as their wages are more likely to be spent on buying food (Kotzé, 2003).

It is also important to note that increased requirements for female family labour can merely overburden women with a higher workload (Altenbuchner et al., 2017). Increasing women's agricultural workloads comes with the side-effect of decreasing their capacity for care work within the household, which can affect nutrition (Rao & Pingali, 2018; Vemireddy & Pingali, 2021).

Our intersectional analysis takes into account these gendered differences and the different mechanisms through which organic farming can contribute to improved food security for the different groups of women.

3. Research Design

We used a comparative case study design, where we sampled both conventional and organic farmers and additionally interviewed project staff and hired farm workers in both farming systems. Fieldwork was conducted between November 2022 and February 2023. We used seasonal calendars, transect walks, focus group discussions (FGDs), in-depth interviews, and participant observation as data collection methods. The first author also attended one project closing ceremony and training activities conducted by the local organisations. Qualitative data is complemented with a semi-structured questionnaire which we employed during in-depth interviews.

3.1 Sampling

Within the Kharghone district, the organisations are active in three geographic areas: Kasrawad, Maheshwar and Nimrani. We selected Maheshwar and Kasrawad due to practical considerations, given that project settings and organisational mechanisms were similar in all three areas. There was a total of five farm clusters in Maheshwar and Kasrawad, out of which

we selected the most distant from the main research centre, the closest, and one between these.

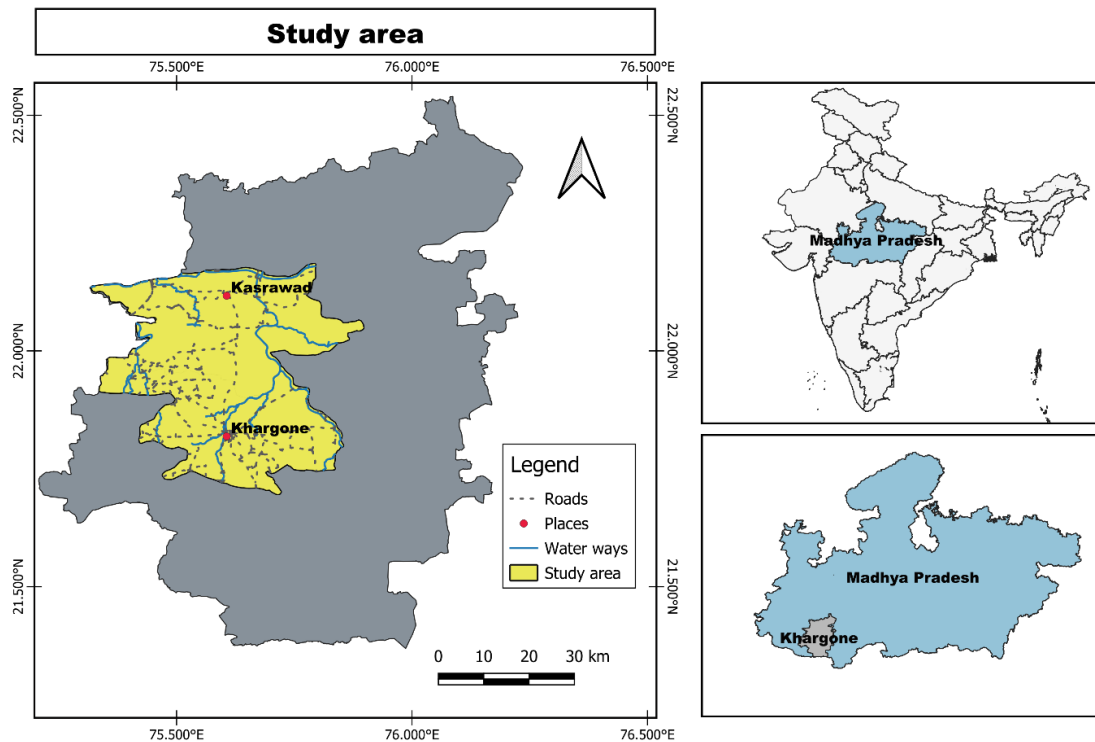


Fig. 2 Study area

We used a combination of purposive and snowball sampling to ensure the inclusion of organic farmers, conventional farmers and labourers – and individuals from different castes and genders. In the first step, we purposefully selected organic cotton producers from a list of project participants. To ensure equal representation across different castes we selected our respondents based on their surnames, with the help of project staff, since it was not advised to discuss caste openly.

Snowball sampling was then employed to find conventional cotton households, obtaining referrals from interviewed organic cotton farmers. This helped us achieve equal representation across castes. We also recruited female labourers for 2 FGDs, by asking farmers to provide contacts of labourers who work in their fields. All of the female labourers who participated in FGDs were Dalits. Table 1 provides an overview of interview techniques, sampling methods and the number of respondents.

Table 1 Detailed overview of data collection methods

Method	Type of respondents	Gender	Group	Research instruments	Sampling method	Number of interviews
Focus group discussions	Organic cotton farmers	Both (separately)	OBC, dalits, adivasi	Net-Map, seasonal calendars, transect walks,	Purposefully (caste)	5 (3 female, 2 male)
	Labourers	Women labourers	Dalit	Semi-structured questionnaire	Snowball	2
In-depth interviews	Organic cotton farming households ¹	Both (separately)	OBC, dalits, adivasi	Semi-structured questionnaire	Purposefully (caste)	30
	Conventional cotton farming households	Both (separately)	OBC, dalits, adivasi	Semi-structured questionnaire	Snowball Sampling	20
Key-informant interviews	NGO staff	Men	GC, OBC	Semi-structured questionnaire	Project staff	3
	Labour contractor	Man	OBC	Semi-structured questionnaire	Snowball	1
Total						61

¹ 47% of these organic cotton-growing farmers had both conventional and organic cotton plots and could provide a comparison for their own farm.

3.2 Data Collection

Data collection was conducted from November 2022 to February 2023, allowing for prolonged engagement and persistent observation. FGDs were conducted separately according to gender and farmer caste categories (SC/ST, General, and OBC). The Net-Map tool, a participatory social network mapping technique (Schiffer, 2007), helped stimulate and structure the discussion on roles in cotton farming. Seasonal calendars were used to understand the farming systems and the roles of women and men in each activity. After each FGD, we conducted a 15-20-minute transect walk with a few respondents to understand their village community and farming systems.

In-depth interviews with organic cotton farm households were then conducted to gather quantitative and qualitative data on resources, organic and conventional cotton production, and

the challenges people face. Interviews were conducted when both the husband and wife were at home. In approximately 50% of the interviews, we conducted separate interviews with men and women by asking the women to come to a separate place or asking the men to leave the discussion after their interview.

Additionally, we conducted key-informant interviews with the head researcher of the organisation, the ginning head, an NGO extension officer and a labour contractor. These interviews helped to triangulate and cross-check data while obtaining further insights. Participant observation was conducted at the research station and during trainings with women.

Ethical approval was obtained from the Ethics Committee of the University of Hohenheim. Respondents were informed verbally and gave written consent before the interviews, for both interview participation and audio recording. Confidentiality was strictly maintained, and the results are presented anonymously.

3.3 Data analysis

We performed a content analysis with a focus on creating a causal network (see Miles et al 2014 p.236-247). After transcribing, interviews were coded using MAXQDA 2022 software, with both deductive coding and inductive coding (Silverman, 2011). Deductive codes were derived from the conceptual framework and literature, and included gender, caste and class, division of labour and wage differentials. Inductive codes emerged from interviews and included workers' bargaining trends, concerns in organic cotton farming, and challenges during crop failures. In chapter 4, we provide direct quotes from the research participants to illustrate our interpretations.

To develop a robust causal network, we used several quality assurance strategies for qualitative research (Bitsch, 2005). This included triangulating data obtained from different sources and through different methods, thick description, and theory and researcher triangulation. In addition, we discussed our initial findings with project staff and at several scientific conferences. Through these techniques we continuously reappraised the plausibility and robustness of each statement as well as the coherence of the overall causal network.

4. Results

This section presents the results, organised according to the key questions from the agrarian political economy framework. We begin the results by offering a descriptive statistical overview of the respondents and the farming systems.

4.1 Characteristics of interviewed farmers and farming communities

In both in-depth interviews and FGDs, respondents' ages ranged from 22 to 70. Most households had extended family structures (66%), while the rest had nuclear family structures (33%). In extended family structures, two or more married brothers and their wives and children live together in a single large house, sharing the living space with their parents. Lands are not divided between brothers, but jointly farmed. Nuclear families consist of only the mother, father, and unmarried children. Both family structures were observed in MG and non-MG households. Among all interviewed households, 52% were from non-MG (38% OBC and 14% from General castes), and 48% from MG (42% tribal households and 6% Dalits). Respondents have been involved in organic cotton for three to twenty years, and included unmarried sons, young daughters, and elder men and women. All the labourers participating in the FGDs were Dalits (MG households), with their ages ranging from 20 to 34 years.

In general, non-MG households were prominent landowners and their farming lands were concentrated in well-irrigated areas. Their residential areas were situated in proximity to the village centre. The main crops of non-MG farmers were wheat, soybean, cotton, chickpea, maize, sugarcane and vegetables such as tomato, chilli, onion, and potato on a commercial scale. Orchard farming of custard apples and lemons was also popular among them. Their livelihood strategies also included cattle and buffalo keeping as a source of milk and cow dung for crop farming. Some farmers also sell extra milk to the market. Livestock resources are essential in organic cotton farming because they provide manure and serve as draft power for ploughing. Additionally, cows and goats play a crucial role in grazing fields after harvest, which is an effective method for applying manure. Even today bullocks play a crucial role in their farming practices, in ploughing fields, pulling carts, transporting agricultural produce, and labourers. Those who had a pair of bullocks also worked in other's fields in land preparations. Machinery such as tractors, and drip irrigation systems were also common among non-MG farmers. None of the non-MG farmers were illiterate.

Tribal farming households were primarily located in rainfed areas. Their residential areas were situated in the outskirts of the village centre and the tribals live on their farms. Farming practices and livelihoods for tribal households involved the cultivation of crops such as wheat, soybean, chickpea, maize, pigeon pea and cotton under rainfed conditions with fewer inputs. In contrast to non-MG farmers, tribal farmers mostly reared goats and chickens, and bullocks were common for all households. Women and children significantly contributed to the care and management of small ruminants. Chickens lived in the fields and assisted in pest control, particularly against cotton stainers (red cotton bug). As livelihood diversification measures, men mainly worked as wage labourers in non-farm activities, such as construction. Women worked as wage labourers in agriculture, but not regularly and rather for specific seasonal tasks such as seeding, weeding or harvesting.

4.2 Who owns what? Distribution of Means of Production and Reproduction

The first main question that Agrarian Political Economy is concerned with is resource distribution. This section includes results relevant to land size, land quality, and irrigation across caste, class and gender.

Land

Several factors, such as gender, class, caste, and cultural taboos, influenced land distribution among farmers in the region. The prominent landowners in the study were from the non-MG category and have substantial agricultural land holdings. Tribal farmers also possessed significant land holdings, however, their land lacked access to irrigation and infrastructure, such as electricity and roads. The average total land size was highest among organic non-MG farmers. Since a few conventional tribal farmers had large landholdings, the average land size of conventional MG farmers was higher than for conventional non-MG farmers. Figure 3 shows the average land size for organic and conventional farms and for MG and non-MG farmers. Most organic non-MG farmers only managed part of the farm organically (20-100%), and a small group of MG farmers also managed part of their farm conventionally, but all partially organic farmers are registered with bioRe. Therefore, in figure 3, we have grouped the partially organic farmers as organic.

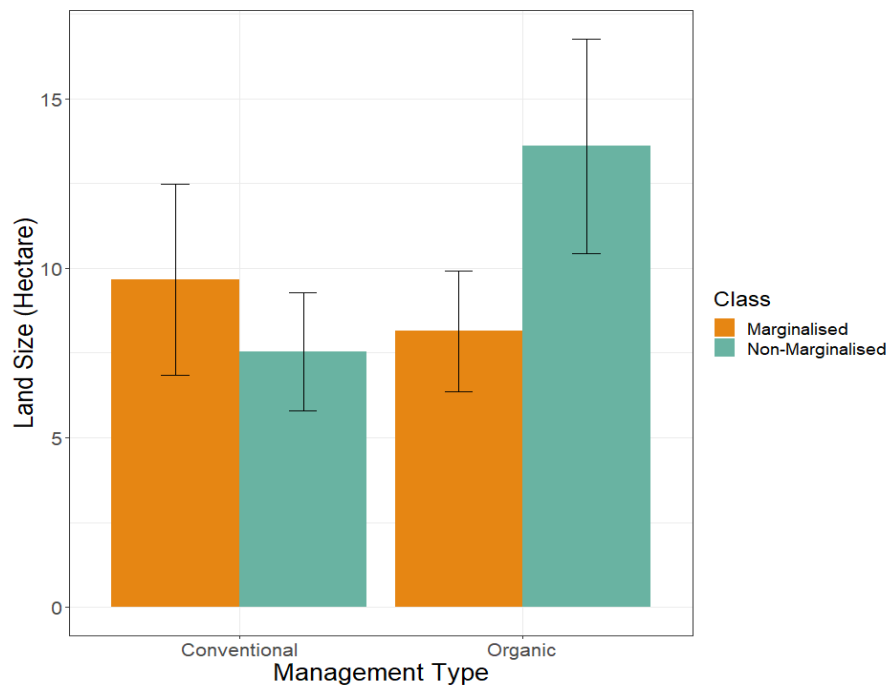


Fig. 3 Average land size of MG and non-MG households in organic and conventional farms

Generally, the men owned the land, as illustrated by the following quote from an FGD with non-MG men: *“Why should we give our sisters lands? (giggle) They will just bring our wealth to an outsider. Only sons receive land from fathers. According to our culture, we take care of our sisters even after they are married.”*

However, there were a few exceptions. One was a non-MG woman who inherited land from her late husband. The other two exceptions were tribal women, both of whom received land independently from their parents upon marriage. Both MG and non-MG farmers also had access to land as tenants. Rental agreements involved either cash payments (USD 72-240, based on the location, soil quality, and irrigation access) or sharing the yield on a 50-50 basis. In both cases rent was typically paid at the end of the season. However, we found no instances of women renting land to cultivate independently.

Irrigation

Farmers utilised various irrigation resources, including tube and bore wells, canals, and rivers. Households could have multiple irrigation resources. However, MG farmers and especially tribal farmers were primarily in regions where accessible irrigation resources were lacking. Water scarcity and declining groundwater levels posed a significant challenge to all farmers in the region. Low access to irrigation water burdens MG women and children as they are responsible for fetching water.

To cope with this challenge, non-MG farmers, who often owned larger land holdings, installed tube wells. Some even went as far as purchasing lands with better groundwater sources and establishing pipelines to supply water to their other cultivated lands. The local organisations promoted drip irrigation systems as water-saving and efficient mechanisms for irrigating cotton plants. Farmers who joined the project received subsidies to establish such technology. However, the adoption of such relatively expensive investments was only observed among non-MG farmers.

Typically, MG farmers reported growing organic or traditional *Gossypium arboreum* cotton varieties because they have limited access to irrigation and lack financial resources to purchase inputs such as pesticides and fertilizers, which are required for the cultivation of Bt cotton.

4.3 Who does what?

In this section, we first describe the crop calendar for cotton in general, secondly, explain the labour division between caste, class and gender, and third, highlight changes due to the shift to organic cotton. In a second subsection we then explain changes in labour processes that arise from a shift from conventional to organic cotton cultivation.

Crop calendar

The cotton farming cycle for summer sowing cotton typically begins between the end of April and the beginning of May after harvesting of chickpeas and wheat. Field preparation for cotton is usually done by men, either by family labour or hired labourers. Usually, farmers used either bullocks or tractors for ploughing. We did not observe a clear caste division for these tasks. Organic farmers are also required to attend training sessions, with women participating in sessions on compost preparations, biodynamic farming methods, and organic pesticide applications. In organic households usually, both man and women are involved in these activities.

Sowing usually takes place in the latter half of May followed by gap filling ten days later. Farmers in rain-fed areas must wait to plant cotton until the arrival of monsoon rains, typically around June. Monsoon sowing cotton is practised predominantly by tribal farmers. Mainly women are involved in cotton sowing and gap-filling. MG women often work as hired labourers on medium and large farms. Typically, non-MG farmers hire Dalit women labourers for sowing. Tribal farmers managed this work through labour exchange groups among neighbours. When tribal women finish their work, they also hire out their labour for sowing.

Approximately three weeks after germination, organic farmers apply compost and manure to their fields. Conventional farmers owning livestock also apply manure, but not to the same extent. Large non-MG farms have a permanent male labourer or hire one or two men for this task, whereas in small farms, both men and women work on manure and compost applications. Irrigation is done from May to August as needed. Large non-MG farms use permanent male labour, whereas in small and tribal farms male farmers are involved.

In organic cotton, manual weeding is crucial, which results in more extensive labour opportunities for hired female workers. The following quote from a non-MG farmer who does a combination of organic and conventional cotton depicts how higher labour demand for manual weeding hinders the full adoption of organic cotton *“We can't do fully organic because I'm old now, also we have a lot of lands, it's difficult to manage organic farming in all fields, it requires lot of manual labour for weeding.”*

Harvesting is mainly done during October and November. Other crops like soybean, maize, sorghum, pigeon pea, groundnut, sugarcane, and various vegetables are also planted during this period, with harvesting periods often overlapping. This creates a labour bottleneck during the harvesting season for cotton. Cotton harvesting on large and medium-scale farms is mainly carried out by hired Dalit women labourers. In tribal households, women collectively exchange labour and after harvesting their own cotton, hire out their labour to large-scale farmers. **Error!**

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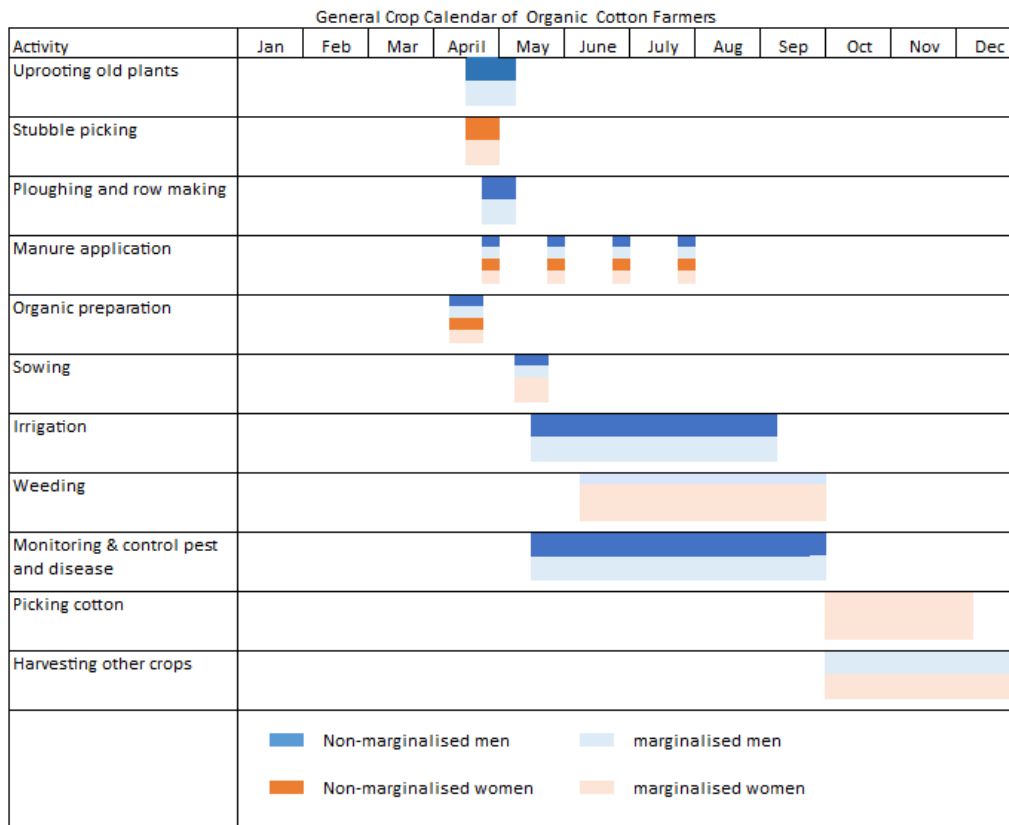


Fig. 4 Crop calendar and labour division by class and gender among organic cotton farmers

During our field interviews with labourers revealed the concerns regarding the combined effect of increasing temperature and associated difficulty in working in the field during summer days generally between late March to June. Even though they have significant wage income opportunities, the summer period also results in significant physical strain.

Changes in labour process

Organic cotton farming changes the labour process in two main ways. First, since more labour days for weeding are needed, and weeding is mainly carried out by female workers, the volume of labour increases. These additional labour days in the agricultural off-season are shifted from men, who carried out spraying herbicides, to women weeders.

Second, the smaller cotton balls lead to slower cotton picking. This is offset by the lower yield; the overall labour days therefore do not change. Yet, since the peak cotton harvesting season coincides with the harvesting of soybean and sugarcane, maize and vegetables, this creates an important labour bottleneck. Sugarcane is usually harvested by machinery, while soybean is harvested manually by uprooting the whole plant or cutting it with a sickle, an activity often done by women.

Organic farmers are affected more by this labour bottleneck, as workers prefer picking on conventional farms, where they can pick higher amounts of cotton in the same time. Out of 50 interviewed farmers, 32% reported difficulties to hire labourers. This was confirmed by the interviewed labour contractor. As labour shortages became a heightened issue during the peak harvesting period, different groups implemented different strategies to address this. MG farmers, who traditionally worked in their own fields, were less affected by these shortages. Non-MG farmers, on the other hand, typically did not have the practice of labour sharing among neighbours. However, in response to the shortage of labour, they organised labour-sharing groups and introduced rosters for the cotton harvest. In this system, groups agree to work together, taking turns in the farmer's fields.

Furthermore, non-MG women, who were traditionally considered housewives or had non-farm jobs and were not involved in cotton harvesting, also began participating due to the labour shortage. Out of the 26 interviews conducted with non-MG farmers, in four interviews, women emphasised this issue. To overcome these challenges, non-MG farmers pushed for the mechanisation of cotton harvesting. The quotes below show the perspective of a non-MG woman from an organic farming household on labour scarcity: *"I am a midwife. I help women and also work with them to check the health of their kids. And after my work, I go to the field, to harvest cotton. If we only depend on labourers, we cannot manage a timely harvest. My mother-in-law and all in the house go to the field"*; and *"Working with labourers is very difficult during the picking time. They demand a lot of money which even we cannot afford"*. Even though she herself is an exceptional case, being a midwife, she also mentions other non-MG women taking part in cotton harvesting. The two quotes also highlight how women's labour burden increases, adding to the care work, household chores, preparing food for labourers and sometimes even off-farm work.

In four interviews, it was mentioned that welfare benefits such as energy and grain subsidies, and public works for lower-caste individuals decreased their demand for agricultural work. This is reflected in the quote above from a non-MG organic farmer: *"You know lower caste people have a lot of support from the government. They get 2 kilograms of wheat monthly, grain subsidies and now they are too lazy to work. So, we can't find enough labour. Also, many men come to work drunk. Then we ask them to go."* During key-informant interviews, this was validated with the staff of the local organisation.

4.4 Who gets what?

In this section, we delve into the intricate dynamics of benefit distribution within organic cotton farming. Rather than examining income distribution, we explore how different people perceive their gains and what benefits they obtain through their involvement in organic cotton.

Effects on farm income

Organic cotton farmers could offset the slightly lower yield and the additional labour cost incurred through lower input costs and the premium they receive for organic cotton (as reported by 16 out of 30 respondents). The premium paid by the buyer is a fixed amount per tonne of cotton, which farmers receive three to four months after delivering cotton.

Organic cotton was reported to be more profitable for MG farmers on rainfed land, since they cannot afford inputs and benefit from the project support such as inputs and farmgate collection of cotton. High-input conventional BT cotton was adopted on more fertile, irrigated land. These aspects are reflected in the following quotes by two MG organic farmers: *“We get help from bioRe, therefore we don't need to spend lot of money for conventional farming, because all the inputs for organic farming are easily found, also then we don't have to spend a lot of money for chemicals, and we get proper trainings so that we know how to prepare manure”*, and *“they [the buyer] come to collect the cotton to our doorstep”*.

Furthermore, women farmers reported that their involvement in harvesting ensured timely harvest and therefore secured household income from cotton. Delay in harvesting can lead to significant income losses for the farmers. When harvesting is delayed, the bolls have a higher chance of being exposed to dust, pests and adverse weather conditions, leading to lower lint quality.

Effects on wage income

Cotton-related work is an important income source for agricultural labourers: During our FGDs, labourers mentioned that it allows them to work an average of 65-70 days per year and earn a daily wage of 200-250 Indian Rupees (USD 2.4-3). This is considerable compared to the 100 days of public works per year each MG household has the right to. Other employment opportunities for labourers involved planting onions, seeding, weeding, and harvesting other field crops such as chili, tomato, and vegetables which do not provide continuous work for a longer period.

For cotton, labourers were paid either a piece rate or a daily wage, depending on the activities they performed. There was a clear wage distinction between women’s work and men’s work. The average daily wage for men was USD 3.6 (300 Rupees), while it was USD 2.4 (200 Rupees) for women. [Table 2](#) Table 2 provides an overview of wages associated with different farming tasks.

Table 2 Labour wage rates paid for the various agriculture activities in cotton farming

Activity	Piece rate/ wage	Payment (USD)	Payment (Rupees)
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Land Preparation (if bullocks are provided by the farmer)	Daily wage	3.6-4.8	300-400
Land Preparation (if bullocks brought by the labourer)	Daily wage	12-14	1,000-1,200
Land Preparation by Tractor	Daily wage	16-18	1,400-1,500
Pesticide/ Fertilizer Application	Daily wage	3.6	300
Pesticide Application	Piece rate basis	0.4/pump	30/pump
Seeding	Daily wage	2.4	200
Weeding	Daily wage	2.4	200
Harvesting	Piece rate basis	0.1-0.2/kilogram	7-13/kilogram
	Daily wage (During the last harvesting cycles)	2.4	200

As explained in section 4.2, the shift from men spraying to women weeding, benefits women workers more and generates additional wage incomes in a season with low demand for agricultural labour. In contrast, the volume of work did not change for cotton picking. However, organic cotton bolls are smaller and thicker and therefore more challenging to harvest than conventional cotton. As a result, the average amount harvested per unit of time is lower in organic cotton. Given that picking was generally paid on a piecework basis, this let labourers and labour contractors to prioritise conventional cotton harvesting and only then move on to harvesting of organic cotton fields. This often led to tensions between labourers and employers.

We now describe the observed bargaining trends during cotton picking, to provide a nuanced understanding of the context.

Labourers are mainly paid on a piece rate basis for harvesting cotton. The price per kilogram for harvesting fluctuates from the beginning to the end of the season, differing between conventional and organic cotton. Price fluctuations for cotton harvesting were reported by 14% of farmers, and in two in-depth interviews, a detailed explanation of how the price fluctuates was given. In conventional cotton, one kilogram of cotton is priced at 7-8 Rupees at the beginning of the season, while in organic cotton, labourers demand a higher price of 8-10 Rupees. Towards the end of the season, labourers increased this amount to 10-11 Rupees for conventional cotton and 11-13 Rupees for organic cotton.

Additionally, in two interviews, farmers reported that at the end of the harvesting season, labourers decide whether they want to be paid a daily wage or on a piece-rate basis, depending

on their harvested yield at the end of the day. These arrangements are discussed within the first one to two hours of starting work, as illustrated by the quote of a non-MG conventional farmer: *“Labourers bargain, around after 15 minutes they start cotton picking, they try to bargain for a reasonable price, if they feel that they can't pick enough amount of cotton they go for daily wage basis, otherwise they go for a per kilogram basis”*. If both parties are dissatisfied, the labour contractor may also intervene and discuss the matter with both parties.

As explained in chapter 4.2, the increase in bargaining power is not only due to organic cotton, but also to the fact that the cotton and soybean harvest seasons overlap. This creates a bottleneck that exacerbates the labour shortage experienced by farmers and allows workers to negotiate a higher piece rate from organic cotton farmers to compensate for the smaller and more difficult harvest.

Potential health benefits of reduced pesticide exposure

In our FGDs, labourers did not express concern about the potential threats to their health while working in conventional cotton fields treated with heavy pesticides, nor did the labour contractor. However, all organic farmers were concerned about the impact of conventional farming on their own health. In an in-depth interview with a non-MG farmer who grows both organic and conventional cotton, concerns were also raised for labourers. The quote below reflects the perception of health risks: *“Labourers don't refuse to come to my field for cotton harvesting. But Bt cotton is very allergic. One time my field cotton was very allergic to labourers. That time it was very difficult to find labourers. It is not good for our health as well as labourer's. Lots of health problems.”*

4.5 What do they do with it? Social relations of consumption, reproduction and accumulation

In this section, we present the differing objectives of involvement in cotton farming among different farming groups and labourers.

There is a significant difference in the objectives of labourers, MG and non-MG farmers for the income generated from cotton farming. For labourers this income was critical for their food security. Women labourers primarily allocated their earnings for their basic needs, including the purchase of food and the settlement of their family debt. They also saved for their marriages. In addition, labourers used to work under one labour contractor so that they could get support in the event of a funeral, such as receiving firewood free of charge.

Thirteen percent of MG farmers responded that they wanted to build a house from the income generated through cotton. Marriage of their children (3%), education (2%), and digging a well (2%) were other objectives mentioned by MG farmers. There was equal interest in buying new

lands among MG and non-MG farmers (6% each). However, while MG farmers wanted to expand cotton lands, non-MG farmers wanted to buy lands for orchard farming or buy lands with more groundwater to build tube wells. Non-MG farmers had objectives to use the money for the education of their children (11%), buying new tractors (6%), starting new income flows (6%), pilgrimage and retirement (6%), marriages (5%), construction of houses (5%), and digging wells (3%). There was also a significant portion of both MG and non-MG farmers, 16% and 11%, respectively, who expressed a sense of uncertainty and the inability to make specific plans with their income. This uncertainty was due to the unpredictable weather events that occurred and the crop failures they had to overcome during the prior two to three years. Table 3 shows the summary of the objectives we described here.

Table 3 Objectives of Cotton Farming

Key question asked	Responses	Marginalised	Non-marginalised	Total
What are your objectives for farming cotton?	Construction of house	13%	5%	18%
	Education of children	2%	11%	13%
	To buy a new land, improving land	6%	6%	12%
	Marriage of their children	3%	5%	8%
	Buy a new tractor	0	6%	6%
	Pilgrimage and retirement	0	6%	6%
	Dig a well	2%	3%	5%
	To start another income source from farming	0	3%	3%
	Convert to orchard farming	0	3%	3%
	“We can’t make plans; things are very uncertain.”	16%	11%	27%

Finally, as crop failures were frequently mentioned by households, we looked at how farmers coped with such shocks. Organic cotton could lead to lower crop losses, for example e.g. through greater crop diversification or mulching. Furthermore, the organisations also provided in-kind support, for example organic fertilisers and pest control products, and continuous inspections by extension staffs to secure the cotton yield. However, we did not find differences in coping strategies between organic and conventional households, but we did find differences

between MG and non-MG households. While all farmers took out loans to invest in farming, none of the non-MG households reported coping strategies such as reducing expenditure that affected their food intake. Seven out of twenty-five MG farm households (28%) reported that they reduced their expenditure and sought credit to buy food, relied on neighbours to lend them wheat or maize with the promise to return it the following season. In more severe cases, farmers coped by reducing the size of their meals or even the number of meals they ate each day. One of the MG women said: “Yes, sometimes we get wheat from the government when we lose our crop. We also skip meals when our crops fail. Sometimes we only have one meal a day”. The support to organic farmers was reported to benefit both farmers and labourers, as farmers could secure their main income of the season and labourers could secure their wage income.

5. Discussion

We employed a mixed-method case study design to assess the labour relations of organic cotton farming in India, and examine how these relations influence food security, especially food access. Below, we describe different mechanisms through which organic cotton in our case study - and organic agriculture more broadly - can influence food access, food stability and food utilization. These mechanisms are depicted as a causal network in figure 5. While we acknowledge the debate around organic agriculture and food availability in figure 5, we do not discuss them below, as we cannot contribute empirically to this debate based on our findings. Our findings contribute to a better understanding of the causal network that underpins food security, particularly access to food for persistently food-insecure populations such as landless labourers and poorer tribal farm households.

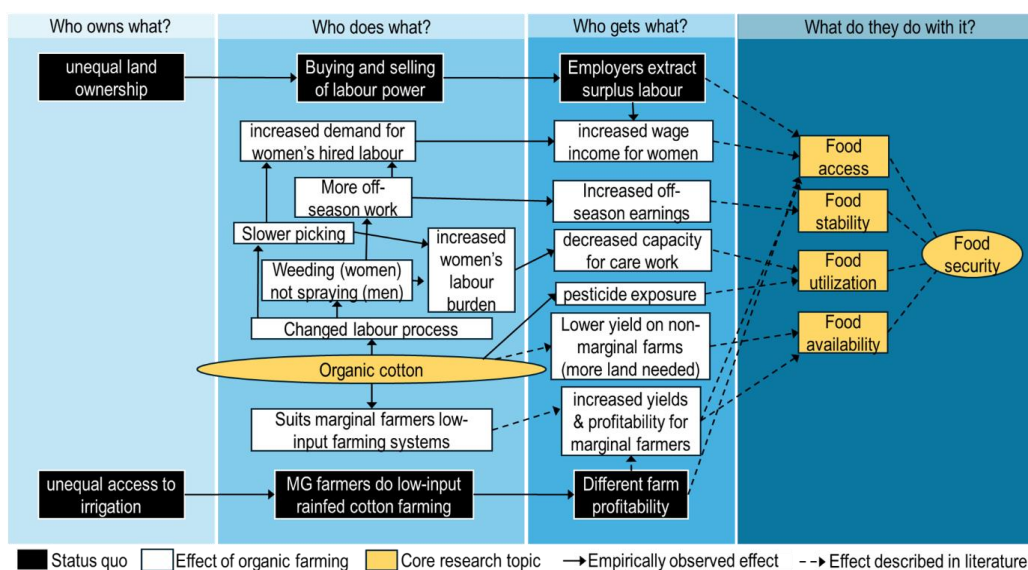


Fig. 4 Causal network on how organic cotton farming affects food security

5.1 Food access

Organic farming can improve farm incomes of marginal farmers

Our results suggest that organic farming suits especially marginal farm households who do low-input farming. These households are often composed of tribal farmers with limited access to irrigation, high quality inputs and credit. Through support mechanisms provided by the organisations they can experience increased yields and profitability. These include replacing external inputs with cheaper locally available ones, reduce marketing costs, and get access to high-quality organic seed, input credit through the buyer and training on water use efficiency and other management practices. This is in line with other studies which have found that small farmers benefit from organic farming due to lower costs (Bachmann, 2012; Kerr et al., 2019; Panneerselvam et al., 2010), access to inputs and services (Flachs, 2016), and reduced indebtedness (Panneerselvam et al., 2010).

Labour-intensive farming practices can enhance food access by increasing (women's) wage income

Labour-intensive farming practices can benefit workers due to increased labour demand. In our case, this was mainly attributed to weeding and manure application – tasks that are given to hired labour, both men and women from marginalised groups. In our case study, additional labour was related to agricultural tasks commonly performed by women, often as hired labour. As organic farmers do not use herbicide, considerable additional weeding labour is used. Particularly for women workers, (nutritious) diets are highly unaffordable in India and they spend a higher share of their wages for food, so wage income is directly related to better access to food (Raghunathan et al., 2021).

Labour bottlenecks can increase bargaining power, wage incomes and access to food

Beyond changing the volume of available work, organic cotton also influenced the bargain for wages: For harvesting, absolute labour use is comparable to conventional cotton, as the lower yields counter the slower harvesting speed. Nevertheless, labourers were able to draw increased bargaining power from the labour bottlenecks during the harvest season. The increased bargaining power has the potential to increase the very low incomes of Dalit labourers and thereby improve access to food and food security of often food-insecure Dalit labourers. This aligns with previous research that shows West African labourers benefit from labour intensification in rice farming (Graf & Oya, 2021).

For this effect to occur, the seasonal distribution of additional work is crucial: additional labour inputs during peak agricultural season are likely done primarily by hired labour, while family labour can manage additional work during the off-season (Kerr et al., 2019). In our case study, the relative smaller size of organic cotton bolls and the labour bottlenecks during the harvesting season increased the bargaining power of Dalit labourers (see section 4.3). While labourers in both organic and conventional cotton can switch from piece rates to daily wages in the later cotton harvesting cycles (Reddy et al., 2021), we found that labourers in organic cotton could demand higher piece rates throughout the harvesting period. While they thus achieved daily earnings comparable to conventional cotton, labourers still preferred picking on conventional farms. Existing literature shows that the higher bargaining power is quite remarkable and often not the case. For instance, Singh (2021) found that women cotton workers in Punjab could not improve their wages or working conditions, since they lack structural and associational power, and farmers tend to replace them with migrant workers and push for mechanization. Garikipati (2009) found for Andhra Pradesh that regardless of increased wage labour opportunities, severely poor working conditions and wages prevailed for women agricultural workers. Other studies show that agricultural mechanisation, among other factors, has led to underemployment of landless agricultural workers, especially for women who have few alternatives for wage work (Farnworth et al., 2022).

Although the organic premium is paid months after the cotton sales and depends on the amount sold as organic-certified, the premium can enable employers to spend more money on labour. As the labour bottlenecks originate in the competition for labourers with other crops such as sugarcane and soybean during the peak harvesting period, it is also important to not only look at the cotton value chain, but at the farming systems themselves. Changes in the production of other crops, agricultural mechanisation and dynamics around migrant labour might influence the labour dynamics that we have observed here (Elzakker & Eyhorn, 2010; Terstappen et al., 2013). For instance, Singh (2021) shows that in Punjab, the labour shortage stems from landless labour migration from Punjab and Haryana to other states like Gujarat for cotton picking. This is due to caste-based discrimination, mistreatment from farmers, lower earnings and a lack of non-farm employment opportunities in their own state. Singh (2017) describes how farmers use migrant labour and mechanisation to maintain their power and to keep wages low and refutes the existence of labour shortage in India.

Next to the effects of farming systems and practices themselves, we found other dynamics that are part of a wider shift towards improved working conditions and less dependence of rural labourers on agricultural wage work. Non-MG farmers who hire workers also mentioned that the welfare benefits of the Indian government, such as the Public Distribution System or the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) could disincentivise workers from agricultural work. Studies that looked specifically at the effects of MGNREGA on

rural wages and labour shortage found substantial effects on poverty reduction, bargaining power of workers and increases in wages, which were especially pronounced for women (Reddy et al., 2014; Veeraraghavan, 2017). The effects on labour supply to agriculture were rather minimal, and sometimes even positive due to higher labour market participation of women and higher land use (Reddy et al., 2014). However, smaller farmers that neither participated in MGNREGA nor received MGNREGA workers on their farms were worse off (Reddy et al., 2014). Kaba (2022) shows how off-farm wage labour opportunities in construction led to less oppressive labour relations and higher bargaining power of landless workers in relation to land-owning employers in Madhya Pradesh. These studies emphasise the interconnectedness of labour relations with factors such as agricultural mechanisation, labour migration patterns, and government welfare schemes. Understanding these complex interactions is crucial for devising effective interventions to promote food security, especially for the most food insecure and often-neglected groups such as migrant or landless labourers.

5.2. Food Stability

The seasonal distribution of agricultural wage work influences food stability

Additional tasks manually carried out in organic farming, such as weeding and manure application extend throughout the cropping calendar. This increases income-earning opportunities for female labourers during the off-season, in which marginalised households are more likely to be food-insecure (see e.g. Rao & Raju, 2020). This additional labour requirement benefits women as seasonal distribution of work ensures stable wage-earning opportunities, reducing their vulnerability to seasonal hunger and food insecurity. The predictability of employment can allow both men and women workers to better plan their expenditures and manage their food resources more effectively throughout the year.

5.3. Food utilization

Where labour-intensive agricultural practices increase women's labour burden, this can undermine women's ability to provide household care work and thus food utilisation

Our findings show that MG women are heavily involved in cotton farming and wage work. Non-MG farm women were also involved, such as supervising labourers and cooking food for labourers. While some non-MG women might de facto not do any agricultural labour, the housewife image is mainly achieved by downplaying women's labour contributions and

confining their agricultural labour to the family farm – secluding them from (publicly visible) wage labour but also independent income (Rao, 2012). An increased workload during harvesting could reduce the time spent on food preparation (Vemireddy & Pingali, 2021) or foregone income from off-farm opportunities, and their larger engagement in cotton cultivation could potentially reduce wage work opportunities for MG women. Higher involvement in farm activities does not necessarily mean women have more access to cotton income or other benefits (Pattnaik & Lahiri-Dutt, 2022). Nonetheless, our results have shown that being among women outside the home such as attending a training on organic cotton, has the potential for building female solidarity networks which might eventually be empowering.

The health benefits of decreased pesticide exposure can enhance food utilization

Reduced pesticide exposure in organic cotton farming offers significant health benefits, which can directly enhance food utilization. In conventional cotton farming, extensive pesticide use is prevalent, posing long-term chronic illnesses, respiratory issues, and skin disorders (Kannuri & Jadhav, 2018; Koussé et al., 2023; Koussé et al., 2024). Women, in particular, are affected due to their prolonged exposure to chemically treated fields during lengthy harvest periods. These negative impacts of pesticide exposure can diminish the physical capacity and overall well-being of workers, affecting their ability to work efficiently and secure a stable income.

Notwithstanding these positive effects of switching from pesticide application to weeding, there are also potential negative effects of weeding for MG women labourers on their health, food utilisation or care work, especially in the hot season (Khayat et al., 2022).

5.4 Limitations

Our study faces several limitations. Most importantly, we were not able to interview migrant workers, so our results do not include the perspective and experience of migrant labour with regards to wage bargaining dynamics. It is possible that migrant workers are not in a position to claim a share of the higher labour productivity. This should be investigated further in future studies. Since we focus on the farm level, we also cannot make any statements regarding employment in the subsequent value chain. For example, Engels (2023) described how smallholder cotton farmers and workers in cotton processing effectively allied to reduce exploitation. Another limitation in our study is that we could only identify a few scheduled caste farm households, as they are usually landless. Our findings on MG farmers therefore represent mostly tribal farmers who have access to land.

Notwithstanding these limitations, we can make a number of recommendations for organic cotton farming systems and for organic agriculture more in general.

5.5 Recommendations

Improving the wages and thereby food security of labourers is dependent on the enhanced capacity of farmers to pay higher labour costs. It is thus important to achieve higher labour productivity, which can be affected by several factors.

Improved working conditions could increase labour productivity, and higher wages could be an incentive for labourers to harvest timely, which has the potential to improve cotton quality. Labourers have not been a community of interest within the project framework so far, but the partnering organisations have recently started the process of designing training programs. Training female workers has been suggested by other scholars as well, to avoid their exploitation (Singh, 2021). Such a strategy has been successful in tea cultivation, where timely and careful picking is equally relevant for quality. Studies in India and Sri Lanka showed that labour productivity and tea quality was improved through training tea workers (Balasuriya et al., 2013; Das Gupta, 2017).

Crop rotation with high-value crops such as chickpeas is a strategy that makes cotton farming systems more economically viable. A study within the SysCom project found that the higher market price for chickpeas improves the overall profitability of the organic cotton systems and hence, may potentially compensate for the higher labour costs for organic cotton (Riar et al., submitted). Developing organic markets for such crops might further increase the economic viability of organic cotton systems and reduce economic dependence on cotton.

Further breeding of organic cotton varieties with larger boll size could be another strategy to make organic cotton more economically viable. It is not the higher labour intensity of organic cotton per se that leads to labour bottlenecks, but the smaller boll size that discourages labourers from harvesting organic cotton, specifically when labourers are paid by the amount of cotton they harvest. These attributes could be addressed through breeding programmes, and then awareness raised among both labourers and farmers regarding these improvements.

Moreover, it is important to acknowledge the vital role of this kind of programme in supporting farmers during challenging weather conditions. The provision of in-kind support by organisations, such as organic fertilisers and pest control products, and constant guidance through extension, helps secure crop yields, thereby ensuring food security for both farmers and labourers. This support is particularly crucial during adverse weather conditions when crop failure can lead to economic losses, forcing farmers and labourers to cut back on meals.

Mechanization of cotton harvesting has been proposed to reduce the need for manual work. Our results indicate that especially larger farmers eagerly anticipate adopting mechanical harvesters when they become available. Seufert et al. (2023) point out that the success of organic farming depends on addressing the concerns of both poor smallholder farmers and

large-scale farmers. On the one hand, there are potential technical challenges with introducing mechanical harvesters, such as increased inclusion of plant materials, resulting in reduced cotton quality and additional cost in cleaning cotton. It is unlikely that mechanical cotton harvesters will be available in the mid-term in India. On the other hand, mechanisation would lead to the displacement of labour and a decrease in wage labour and their bargaining power. Farnworth et al. (2022) show how mechanisation in wheat in Madhya Pradesh benefited non-MG men and women as it reduced drudgery on their own fields, and freed men to do off-farm jobs, while it led to a high loss of labour days for women of all social groups. Similarly, Hansda (2017) showed that mechanisation led to wage labour being given to men rather than women, even for traditional female tasks such as weeding. A decrease in wage labour for women would have direct negative effects on access to food by landless labourers.

Given that labour bottlenecks hindered farmers from growing more organic cotton, promoting labour exchange groups could also help in the short run to overcome these bottlenecks.

6 Conclusion

We used a qualitative case study on organic cotton farming in India, and concepts of intersectionality and Agrarian Political Economy, to assess the intersectional labour relations of sustainable agricultural approaches and their consequent effects on food security.

Our findings show that especially hired women workers benefit from increased labour demand related to organic cotton and that labour bottlenecks during the harvesting of cotton leads to increased bargaining power for landless Dalit workers. It is likely that labourers could successfully claim part of the increased labour productivity through increased wages and thereby improve their very low incomes. Since a large majority of the labourers did not have access to land or own food cultivation, this directly contributes to accessing food and alleviating food insecurity.

Training cotton workers could be an important policy action to benefit both smallholder farmers by increasing labour productivity and agricultural workers by increasing their bargaining power. Further increasing labour productivity might be a precondition for the viability of organic cotton farming and a pathway towards improved livelihoods and alleviating food insecurity of India's most food insecure populations. The organic standard is so far not concerned with hired labour issues. The increasing focus on living wages, decent working conditions and gender wage gaps as well as more evidence on the effects of sustainable agricultural approaches on labour relations could aid in making hired labour issues in value chains more visible.

Our findings also show that non-MG women are more and more involved in cotton farming. Including non-MG women in trainings to facilitate their involvement in cotton cultivation might

eventually contribute to increased decision-making or bargaining power within their households and their societies.

Our contribution to the literature is two-fold. First, we analysed how the labour relations of organic cotton farming in India, and how these are shaped by gender, class, caste and tribe intersectionalities. Second, we describe how these lead to differential effects on the different dimensions of food security and provide a causal network that helps to analyse the mechanisms through which sustainable agricultural practices can influence food access, food stability and food utilization.

Availability of data and material Available upon request.

Compliance with Ethical Standards Ethical approval was obtained from the Ethics Committee of the University of Hohenheim. Respondents were informed verbally and gave written consent before the interviews.

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