Building resilience for cotton farmers in India

Evidence from Gujarat and Maharashtra

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About the All India Disaster Mitigation Institute (AIDMI)

AIDMI is a community-based action planning, research and policy support organisation working towards bridging the gap between policy, practice and research related to disaster mitigation and climate resilience (adaptation and mitigation) as laid out in the National Disaster Management Plan of the government of India of 2019. Established after the 1987–89 Gujarat droughts, AIDMI has worked over the years to cover a total of 18 types of disasters in 18 areas of India and beyond to nine countries in Asia. AIDMI links local communities to national and international levels of risk reduction, relief and long-term recovery programmes and policies to build resilience as envisioned in the Sendai Framework for Disaster Risk Reduction. AIDMI promotes and strengthens the convergence between humanitarian action, disaster risk reduction and climate resilience.

About the Self Employed Women's Association (SEWA)

SEWA is the single largest Central Trade Union for women workers in the informal economy in India. They currently have a membership of 2.9 million women workers in 18 states in India. SEWA strives to empower its members, who are often excluded from labour laws and social protection. The climate shocks have been increasing, pushing its members, including small-scale farmers, into vicious cycles of poverty. SEWA strives to build the resilience of its members. SEWA has piloted several climate adaptation and mitigation measures.

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India is the largest producer of cotton globally, but its position in the global textile supply chain is being increasingly threatened by climate change. Smallholder cotton farmers are particularly vulnerable to the effects of climate change, putting millions of livelihoods at stake. This study draws on original data from the Indian states of Gujarat and Maharashtra to explore the vulnerabilities of cotton farmers, their perceptions of and responses to climate and other shocks, and the current and potential use of insurance as a risk management tool. It presents a set of insights and recommendations on what different actors in the cotton sector can do to enhance the resilience of small-scale producers.

Contents

Summary 4

1 Introduction 6

2 India's cotton sector, climate change and the role of insurance 7

2.1 India's cotton sector and its vulnerability to climate change 7
2.2 Socioeconomic characteristics of cotton production 8
2.3 The role of insurance 8

3 Methodology and sample characteristics 10

3.1 Survey 10

4 Findings 12

4.1 Characteristics of the farming household 12
4.2 Income and livelihoods 13
4.3 Experiences of shocks, including climate events 14
4.4 Coping and mitigation strategies 16
4.5 Uptake and awareness of insurance 17

5 Conclusions and recommendations 20

Recommendations and priorities for action and research 20

References 22

Annexes 23

Annex 1. Supplementary tables and figures 23
Annex 2. Focus group discussions 36

Summary

India is the world's largest cotton producer, accounting for nearly a quarter of global production. The cotton sector is crucial for India's economy and supports the livelihoods of approximately six million farmers. However, climate change — specifically more frequent periods of extreme heat — poses a significant threat to the livelihoods of the smallholder farmers, especially women, who depend on this crop, and it is a critical risk to the global textile supply chain.

Crop insurance could help farmers manage the risks of an uncertain future. But there is room for improvement in its coverage, affordability and effectiveness. The links between crop insurance and other risk reduction and adaptation measures, including government programmes and community-led initiatives, could also be better understood.

This study draws on original data from the Indian states of Gujarat and Maharashtra to explore the vulnerabilities of cotton farmers, their perceptions of and responses to climate and other shocks, and the current and potential use of insurance as a risk management tool. Our hope is that insights derived from this report can inform risk-mitigating decisions by different actors in the cotton sector.

Data and methods

This report draws from three data sources: a literature review on crop insurance, a farmer survey, and focus group discussions (FGDs) with male and female farmers in Surendranagar (Gujarat). The study primarily focuses on farmers' perceptions of their context and needs, rather than factual information about environmental shocks or insurance coverage.

The survey, conducted in September 2023, involved 360 cotton farmers equally split between Surendranagar district in Gujarat and Sambhaji Nagar district in Maharashtra. These districts were chosen for their cotton production, presence of the Self-Employed Women's Association (SEWA), and contrasting characteristics in terms of average incomes and irrigation use. The sample was stratified to include equal numbers of SEWA members and non-members, with respondents randomly selected from farmer lists in villages across two blocks in each district. All respondents were women, evenly distributed across age groups (18–35, 35–45, and over 45). Most had little or no formal education, with only 20% having secondary education. Husbands were typically reported as the main earners, and about 70% of respondents had been farming for 11–30 years.

Key findings

Socioeconomic context and livelihoods

- Farmers are mostly landowners, with the majority of landholdings smaller than ten acres.
- There is some specialisation towards cotton farming in terms of area dedicated to cotton, but most farmers grow a wide variety of crops, including grain, spices and vegetables. Most keep livestock.
- Irrigation is prevalent in Gujarat, but much less common in Maharashtra.
- Households have mixed livelihood strategies, deriving income from farming but also some paid employment outside the farm.
- Income is seasonal, highest during harvest season (December to February) and lowest from April to June.
- Over half of survey respondents declared that income had somewhat or significantly increased, but the FGDs painted a somewhat more mixed picture.

Experience of climate change and its impacts

- Over the past five years, farmers have perceived higher average temperatures, lengthier dry spells and a greater number of days of extreme heat.
- For farmers, extreme weather events like erratic rainfall and heatwaves are becoming more frequent, occurring every one to three years.
- These changes have led to significant loss of crops. Half of the respondents reported major or complete losses as a result of drought and flooding.
- The impacts of these changes have affected women and men differently: men emphasised reduced incomes, while women spoke about broader challenges to the household and their livelihoods, including their children's nutrition and education.

Coping and mitigation strategies

- The most common measures used to cope with climate and other shocks are: using savings, reducing household expenditures and taking loans.
- To mitigate — that is, prepare for and prevent — the effects of future shocks, farmers use on-farm strategies such as crop rotation, intercropping or planting trees, as well as economic measures including saving, purchasing insurance or paying off debt.

Uptake and awareness of insurance

- Uptake of life, health and livestock insurance is relatively infrequent, but use of crop insurance is slightly higher, especially in Maharashtra (corresponding to the government's national crop insurance scheme, which is available in this state but not Gujarat).
- The main barriers to using insurance include lack of awareness of local schemes and unaffordability.
- There is mixed awareness of and use of the different government schemes.
- FGDs revealed confusion about what insurance products are available and who provides them. Farmers also voiced complaints about the burdensome processes for making claims and expressed lack of confidence in the ability of insurance to provide timely and fair compensation.

Recommendations

1. **Businesses, donors and farmer organisations should work to improve awareness among small-scale farmers of coping mechanisms, including insurance and government schemes.** There are several government programmes available to help farmers, but farmers are unclear on how to access them or what their benefits are, and they often have misperceptions that need to be addressed. The role of grassroots and other nongovernmental organisations should be enhanced and expanded.
2. **Stakeholders in the supply chain, including businesses, insurance and finance providers, and farmer organisations, must co-design new ideas for insurance products.** Available crop insurance products are insufficient and inadequate to help farmers. Technology can help overcome barriers like transaction costs, claims verification and payouts, but products must be co-designed with users to suit their particular needs and abilities. Some form of subsidisation is likely to be necessary to overcome affordability barriers.
3. **Businesses, donors, governments and nongovernmental organisations should consider resilience building beyond insurance.** Insurance is one of several tools for building resilience. Supporting community-based schemes like the SEWA Livelihood and Recovery Fund could help scale and sustain efforts that are already known and trusted by farmers. Other resilience-building mechanisms, including agroecological or water management practices, must also be considered.
4. **Industry, advocacy groups and research institutions should think beyond the cotton sector and beyond India.** The risks of climate change go well beyond the cotton supply chain, and affect farmers well beyond the study site. It is important to understand vulnerabilities in other populations and geographies, as a piecemeal approach is unlikely to reach the scale needed to make a difference.

1 Introduction

India is the largest producer of cotton globally. In 2023, it produced approximately 5.84 million metric tonnes – almost a quarter of the world's cotton — across 13 million hectares, engaging almost 6 million farmers (Cotton Corporation of India 2023; ILO 2021). It is a crop that holds significant importance for the Indian economy and the livelihoods of many of its farmers.

But India's position as a critical player in the global textile supply chain is being increasingly threatened by climate change. India is the seventh most vulnerable country globally with respect to climate extremes (Eckstein et al. 2020). Heatwaves are becoming more frequent and are lasting longer (especially in central and northwestern parts of the country), and this pattern is projected to continue (Mohanty and Wadhawan 2021). The Western and Central zones of India are more vulnerable to drought-like conditions, while the northern and northeastern zones are more vulnerable to extreme flood events (Mohanty and Wadhawan 2021).

Smallholder cotton farmers are particularly vulnerable within this ongoing climate crisis, putting millions of livelihoods at stake (Mohanty and Wadhawan 2021). It is urgent to find ways to protect small-scale farmers from the existing effects of climate change, as well as to enhance their ability to face future shocks. Crop insurance, which is currently not widely used, is a mechanism that could help manage the risks of an uncertain future. But many questions remain about its affordability and effectiveness, and its linkages with other risk reduction and adaptation measures, including government programmes and community-led initiatives.

In this study we explore the issue of cotton farmers' **vulnerabilities, perceptions and responses to climate and other shocks, and explore current and potential use of insurance**. We draw on survey data from Gujarat and Maharashtra, the two largest cotton-growing states in India, where significant volumes of rain-fed cotton are produced (USDA 2023). We also use data from FGDs with farmers and SEWA members, as well as interviews with insurance experts. We present a set of insights and recommendations for stakeholders in the cotton sector on what they can to do enhance the resilience of small-scale producers.

2

India's cotton sector, climate change and the role of insurance

2.1 India's cotton sector and its vulnerability to climate change

Despite the total size of production, **cotton yields in India are low compared to other large cotton-growing countries**. Average cotton yields in India are approximately 4.8 quintals of cotton lint per hectare, compared to 9.6 in the US, 17.1 in Brazil and 17.5 in China (Reindl et al. 2019). Bt cotton — a genetically modified variety — was introduced in 2002 partly to address this productivity gap, and yields have increased two- to threefold since. However, the increased use of synthetic pesticides and fertilisers associated with Bt cotton has led to declining soil quality and therefore productivity (Sahay 2019). Moreover, Bt cotton is more vulnerable to damage and leads to groundwater pollution, proliferation of insects and pests, and loss of surface water (Mohapatra and Saha 2019). Despite the introduction of Bt cotton, pests and diseases still cause significant losses in cotton production (Madasamy et al. 2020), and these are exacerbated by unfavourable soil and climatic conditions, which will become worse over time due to the heatwaves, wildfires and drier conditions predicted (Forum for the Future et al. 2021).

Another important challenge, and vulnerability, of the cotton sector is its dependence on rainfall. For example, in Maharashtra only about a fifth of its cotton-growing land is irrigated (this is the lowest of all the cotton-growing states in India), leading to some of the lowest yields in the country (Reindl et al. 2019). In Gujarat, where almost 60% of the land is under irrigation, yields are much higher than in Maharashtra, and higher than the national average cotton yield (Singh and Singh 2021).

In general, production costs in India are high, in part because of reliance on expensive hybrid seeds, which have to be bought afresh each season and cannot be germinated by farmers themselves. In addition, inputs such as chemical fertilisers and pesticides, many of which are used indiscriminately, are expensive and negatively impact soil health. Labour is also increasing in cost. Minimum wages for manual labour in rural settings are effectively set by the government under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), which guarantees a certain number of days of paid work for rural manual labour. This effectively increases wages for non-public-sector jobs in rural areas (Reindl et al. 2019).

Climate change is predicted to affect productivity in Gujarat and Maharashtra, with an increase in the number of days in a given year when temperatures over 40°C pose a significant risk to yields (Forum for the Future et al. 2021). Relative to other states, Gujarat may be particularly affected because temperatures there are predicted to exceed the thermal tolerance limit for cotton. Projections of climate and risk vulnerability show

that the "gender pay gap and absolute wages of cotton growers" are key drivers of vulnerability in Maharashtra, while in Gujarat, "high projected water stress, and low organic carbon stocks" are important sources of vulnerability (Forum for the Future et al. 2021).

2.2 Socioeconomic characteristics of cotton production

Cotton production in India is overwhelmingly small-scale. Over two-thirds of farming households in India cultivate farms of one hectare or less (Birthal et al. 2015). In Maharashtra, average farm sizes are 1.44 hectares (Reindl et al. 2019), as compared to 1.88 hectares in Gujarat (Gulati et al. 2021). It is common for small-scale farmers to employ some workers on their farms either on a long-term basis or for short time periods during harvesting.

Women play a central role in cotton production in India, carrying out 70% of cotton planting, 90% of hand-picking, as well as weeding and storage (Technoserve 2018). Manual labour ("time-consuming and drudgery-prone") is typically the remit of women alongside taking care of household tasks and children, while work requiring machinery is undertaken by men (Singh and Dusanj-Lenz 2019). Despite their central role, "women are rarely viewed as cotton farmers in India" (Singh and Dusanj-Lenz, 2019), in part because men usually own the agricultural land due to dominant sociocultural norms around inheritance of land by sons. Women also have a limited role in finances and decision making in relation to cotton (Singh and Dusanj-Lenz 2019). A gender-sensitive approach is therefore required when designing interventions or schemes for cotton.

Depending on the state there are various downstream actors who purchase cotton from small-scale farmers. Farmers may deliver directly to local ginneries, where cotton is separated into cotton seed and lint. Or they may sell to intermediaries, such as traders at the farm gate or in local markets, who then transport the cotton on to ginners. In Maharashtra, sales to local intermediaries/aggregators are dominant (Reindl et al. 2019). Government-run markets — Agricultural Produce Market Committees (APMCs) — are another sales outlet, where cotton is sold via auction. The government also buys cotton from farmers through the Cotton Corporation of India, under its Minimum Support Price. Ginners are then paid a fixed fee to convert the government stocks into lint bales and seed (Reindl et al. 2019).

The national government annually sets a Minimum Support Price (MSP) to ensure there is a margin of at least 50% over production costs for cotton sold to government procurement agencies (Press Information Bureau 2020). In recent years the MSP for cotton has been below market prices, meaning that government agencies have not been a dominant buyer (Reindl et al. 2019).

However, alongside cotton prices increasing, input prices have also increased. The price of Bt seeds increased in 2023 from the previous year. This, in addition to higher labour costs, has resulted in higher production costs overall (USDA 2023). Interestingly, cotton producers in Gujarat are using unapproved hybrids for their higher yields and resistance to pink bollworm, which has also led to improvements in the quality of harvested cotton. It is expected that these hybrids will also be adopted in other cotton-growing states in central India (USDA 2023).

2.3 The role of insurance

Crop insurance is an important tool to help farmers manage risk in the face of a challenging market and climate, but in India **the picture of agricultural insurance remains mixed**. At one point India had one of the world's most dynamic micro-insurance sectors, opening up this market for people on low incomes (Churchill et al. 2012). However, the penetration of insurance, and specifically crop insurance, is relatively low compared to other countries. Prior to the introduction of the Pradhan Mantri Fasal Bima Yojana (PMFBY), a government crop insurance scheme (Box 1), both farmers insured and area covered had remained stagnant since the early 2010s (Gulati et al. 2018). The government introduced the PMFBY in 2016 to boost coverage of agricultural insurance for small-scale farmers, and there was a significant surge in uptake when launched, as it was initially compulsory for farmers taking loans from banks. But since 2020, when it became voluntary, participation has declined by 30% (Tiwari et al. 2020).

BOX 1. PMFBY: NATIONAL CROP INSURANCE SCHEME

The PMFBY is the crop insurance scheme supported by the national government. For cotton and other commercial crops, farmers pay 5% of the premium, with the balance paid jointly by state and central governments. The insurance is frequently bundled with bank loans, offering loanees protection from defaulting in case of crop losses. There is also an option for non-loanees in which payouts are given against verified crop losses. Some states (including Gujarat) have opted out of this scheme and set up their own (Press Information Bureau 2023).

While the national crop insurance scheme has greatly increased access, there is still room for improvement in areas like uptake, processing times and geographical coverage (Tiwari et al. 2020).

A literature review conducted by IIED in the context of this study (see Blackmore et al. 2024) summarises some key features of crop insurance that have been shown to improve its accessibility, effectiveness and impact on women. Given how important women are in cotton farming, the gender aspects of insurance design are critical. Table 1 summarises the main findings from the review, which inform the interpretation of our data and the recommendations in Section 5.

Table 1. Priorities and actions to improve the accessibility and effectiveness of crop insurance for smallholder farmers (source: based on Blackmore et al. 2024)

HOW TO…	ACTIONS
Improve demand and awareness of insurance	▪ **Invest in raising farmer awareness**, sensitisation and outreach ▪ Include farmers in the **co-design of insurance schemes**: through a combination of information gathering to understand farmers' realities, and education/awareness-raising with and for farmers ▪ Invest time and resources in **trust building** ▪ Identify and develop **distribution channels that are relevant** to small-scale farmers.
Enhance **affordability** and uptake of insurance products	▪ **Co-finance or subsidise premiums** to reduce the costs of insurance for small-scale farmers ▪ Offer **prefinancing options** for insurance premiums and flexible payment methods ▪ **Reduce transaction costs** of subscription, claims assessment/verification and payments ▪ **Bundle products** to reduce costs of delivery, support productivity gains and ensure mutual gain across the services being provided.
Enhance **reach and benefits for women**	▪ **Adapt and simplify registration** and other processes ▪ Use structures **already used and trusted** by women for outreach ▪ **Build gender responsiveness** into insurance products.
Enhance **effectiveness** (in payouts and to reduce transaction costs)	▪ Improve the **accuracy of assessments** of damage for payouts ▪ **Improve the speed** at which payouts are made to farmers.

3

Methodology and sample characteristics

This report is based on three sources of data: a comprehensive literature review on crop insurance, a survey of farmers, and FGDs with farmers. Two FGDs were conducted in November 2023 with male and female farmers (separate groups) in Surendranagar to explore the results of the survey in greater depth. No FGDs were conducted in Sambhaji Nagar due to time constraints. The details and results of the FGDs are presented in Annex 2.

It is important to note that this study focuses primarily on farmers' perceptions of their context and needs, rather than on factual information about the environmental shocks or actual insurance coverage or costs. Because the findings are based on farmers' opinion and recall, there are sometimes contradictions between the findings of the survey and the FGDs. While this approach has some limitations (for example, people's perceptions are biased and often misaligned with facts), understanding perceptions of risk are fundamental for the design of policy and risk management strategies.

3.1 Survey

We surveyed 360 cotton farmers in September 2023, half of them in the Surendranagar district of Gujarat state, and the other half in Sambhaji Nagar district of Maharashtra state. These districts were chosen because they are both in major cotton-producing regions and SEWA and its members are present there. They also provide an interesting contrast as Surendranagar has relatively higher average incomes and more widespread use of irrigation than Sambhaji Nagar.

Within each district we sampled villages in two blocks, as described in Table 2. In each village, we drew potential respondents at random from a list of farmers. The sample was stratified so that half of the respondents were known SEWA members and the other half were non-members.

Table 2. Summary of sampling locations and sizes

DISTRICT (STATE)	BLOCK	SAMPLE SIZE
Surendranagar (Gujarat)	Drangadhra	80
	Halvad	100
Sambhaji Nagar (Maharashtra)	Phulambri	100
	Vaijapur	80
Total		**360**

The main characteristics of the sample are summarised in Table 3. All respondents were women, roughly equally divided into age groups of 18–35, 35–45, and older than 45. Most had none or only primary education, and only a fifth had secondary education. In most cases the husband was stated as the main earner. About 70% of respondents had been farming for between 11 and 30 years. In the final sample, 53% of respondents were members of SEWA.

Table 3. Summary of socioeconomic characteristics of respondents

	GUJARAT	MAHARASHTRA	COMBINED
Age			
18–35	26%	48%	37%
36–45	31%	33%	32%
46–55	31%	10%	20%
56–65	12%	8%	10%
Over 66	1%	1%	1%
Highest educational level			
None or pre-school	58%	25%	42%
Primary	38%	34%	36%
Secondary	2%	36%	19%
University or equivalent	1%	5%	3%
Years farming			
Fewer than 20 years	27%	30%	29%
11–30 years	63%	80%	71%
More than 30 years	37%	20%	29%
Main earner in household			
Father	1%	0%	1%
Father-in-law	5%	7%	6%
Husband	75%	81%	78%
Other	1%	0%	0%
Self	4%	3%	4%
Son	14%	8%	11%
Membership of SEWA or other organisation			
SEWA member	57%	54%	53%
Other	1%	7%	4%

4

Findings

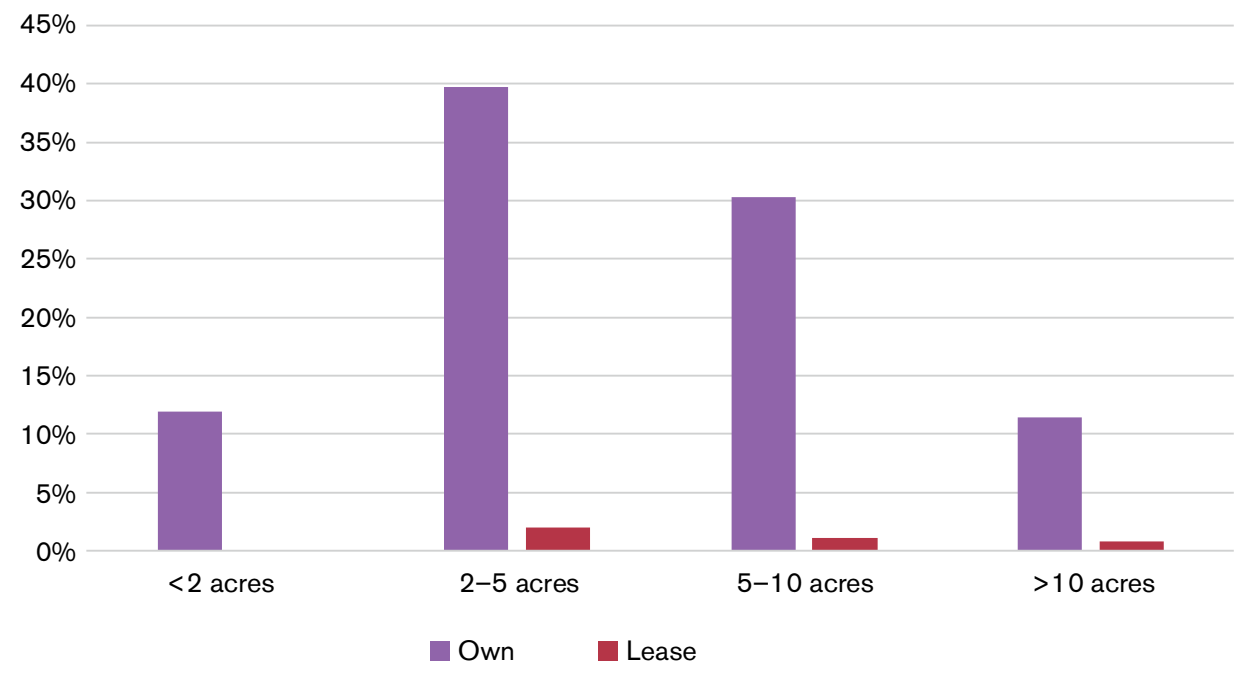
4.1 Characteristics of the farming household

Most families have been farming for 10 years or more — close to a third of them for 30 years or more, suggesting rootedness (Table A1). There is a **prevalence of small-scale farmers**, overwhelmingly owners (94%) rather than renters. More than 80% of landholdings were 10 acres or less, and half were 5 acres or less (Figure 1). Landholdings in Gujarat were, however, larger on average than in Maharashtra, with almost 45% of households owning land of 10 acres or more.

There is **some specialisation towards cotton farming**, but it is uneven and different between Gujarat and Maharashtra. Overall, 44% of respondents use 75% or more of the land for cotton — but this is 67% in Gujarat and only 21% in Maharashtra, implying that farmers in Gujarat are more specialised in cotton farming than farmers in Maharashtra (Table A2). Of those who produce cotton, **98% grow Bt cotton** (Table A3)**.**

In addition to cotton, farmers grow a variety of crops including grain (92% of respondents), spices (50%), vegetables (60%), pulses (68%) and fruit (15%); and 68% keep livestock (Figure A1). Within

Figure 1. Land tenure, by ownership type and land size (acres)



each of these groups there is a lot of diversity, and there are interesting differences and commonalities within and between states with regard to the range of crops produced. This suggests that crop diversity is closely linked with environmental and market contexts, and responds to multiple livelihood strategies. For example, spices are very widely grown in Gujarat but not Maharashtra; the opposite is the case with maize. The detailed list of crops grown can be found in Tables A4 to A9.

Irrigation is much more common in Gujarat, where more than 90% of the farms have at least half of their land irrigated, compared to just over 50% of the farms in Maharashtra (Figure 2). This suggests that Maharashtra farms would be more vulnerable to changes in rainfall (almost a third have no irrigation at all) but, as discussed in section 4.3 (and shown in Table A21), the reported effects of erratic rainfall on crop losses across states do not neatly support this assumption. For those farms that do have irrigation, the main sources of water are canals and groundwater (Table A10).

4.2 Income and livelihoods

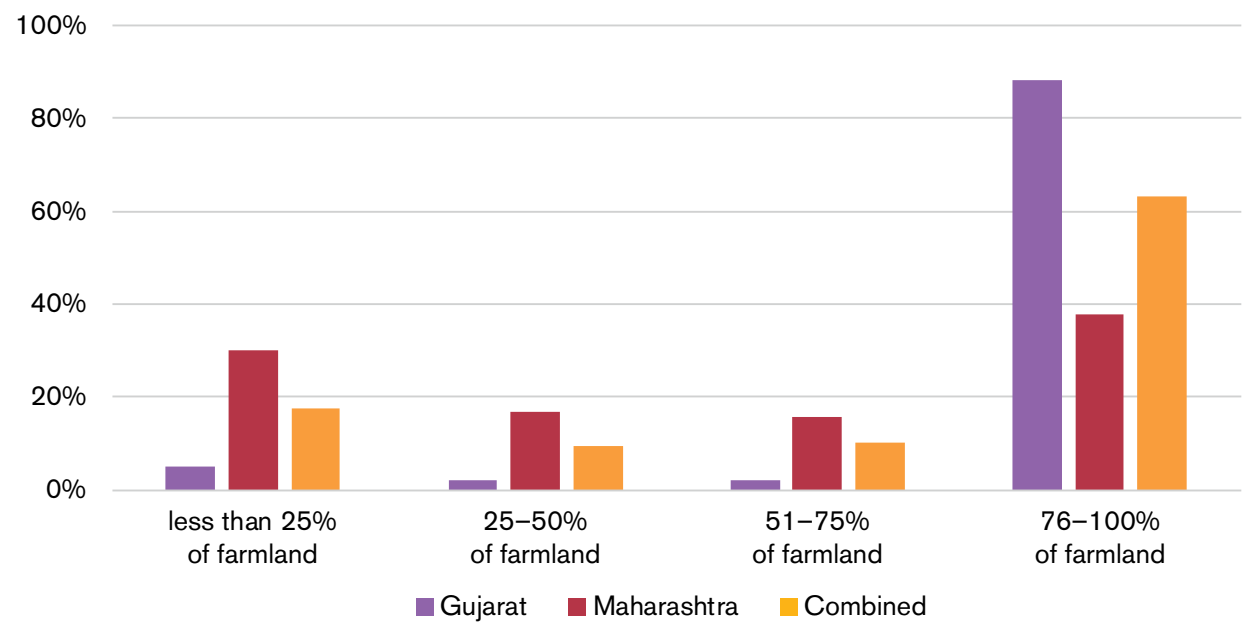
Farmers have **mixed livelihood strategies**: 60% of the farms are solely dependent on farming for their income. Even in households that do have outside sources of income, these other sources account for a relatively low share of the total household income (Table A11). The **most common source of outside income is paid employment** (60% of responses), primarily part time or seasonal, on and off farms (Figure A2). **Cotton** was by far the most frequently cited crop as an income source (by 84% of respondents across states). Corn was the second most cited by more than half of respondents in Maharashtra (but none in Gujarat), while cumin occupied second place in Gujarat (47%) but was not mentioned in Maharashtra (Table A12).

Over half of the respondents declared that their household income had somewhat or significantly increased over the past two years, 26% said it had remained stable, and 21% said it had somewhat or significantly decreased (Table A13). These trends appear broadly consistent across states. The main reasons for increase were prices (22%), use of fertiliser (19%) and adoption of better farming practices (16%) (Table A14). Prices were the main reason given in Gujarat, while adoption of improved agricultural practices and access to inputs were more frequently mentioned in Maharashtra. Respondents who perceived their incomes to have decreased mentioned mainly unseasonal rainfall. This was consistent across states (Table A15).

It is worth noticing that, unlike in the survey, in FGDs most participants described stagnating or declining income, which they attributed to lack of access to water, healthcare costs and soil degradation. Irregular rain was one of the factors mentioned as a reason for declining incomes during FGDs, even though in Gujarat (where these took place) there is a high percentage of irrigated land (Figure 2). This could point to the inadequateness of irrigation systems to cope with increased heat.

Income shows a very clear seasonal variation, with highest incomes occurring in December–February, which is the harvest season, and the lowest incomes in April–June (Figure A3). **The effects of**

Figure 2. Percentage of farmland under irrigation



the 'lean season' appear to be generally mild for the majority of respondents. Only about 4% of the respondents said there was a month during which they did not have enough income to buy enough food, and about 10% said there was a month during which they could not afford other basic needs (Table A16). Of the respondents who had school-age children, about half said they were able to meet all their children's educational needs throughout the year without taking out a loan, and 25% said they could meet only some of their children's schooling needs. A further 28% said they were unable to pay for the school fees (Table A17). Similarly, about half of the respondents said they could afford healthcare throughout the year, 40% said they could only partly afford it, and 8% said they could not (Table A18).

4.3 Experiences of shocks, including climate events

Many households have experienced a hotter, drier climate over the past five years. Most respondents reported experiencing longer dry spells (72%), higher average temperatures (64%), greater number of days with extreme heat (64%) and reduced number of rainy days (69%) (Figure 3). We found that in Maharashtra the reports of higher average temperatures (84%) were almost double those in Gujarat (43%, with most respondents declaring temperatures had been lower or remained the same) (Table A19).

The most frequent extreme weather events were heatwaves, which were experienced yearly or every one to three years by nearly 90% of respondents, and erratic rainfall, which was reported to happen every year or every one to three years by more than 80% of respondents (Figure 4). Droughts and floods were reported to be much less frequent. These numbers are quite similar in both states (Table A20).

While drought and flooding are reportedly less frequent than heatwaves or erratic rainfall, their effects are more catastrophic. **More than half of the respondents reported major or complete crop losses as a result of drought and flooding**. Erratic rainfall and heatwaves were also frequently associated with some or major crop losses, and FGDs suggested that cotton quality can be affected as well (Figure 5). Table A21 shows that "some losses" are very common as a result of erratic rainfall in Maharashtra (80% of responses), but severe or complete losses are reported to be higher in Gujarat. In FGDs, increased salinity — and its effect on soil fertility — was also mentioned, but the reason for this was not stated. The percentage of land irrigated did not appear to be correlated to the losses suffered from drought, heatwaves or erratic rainfall.

The FGDs suggest that **climate shocks impact men and women differently**. **Men emphasised their reduced incomes** and reduced or threatened social standing. **Women emphasised the broader impacts on the household**, ranging from quality of education of children to the inability to provide nutritious food to children. Women also spoke about how shocks affect

Figure 3. Perceived changes in weather in the past five years

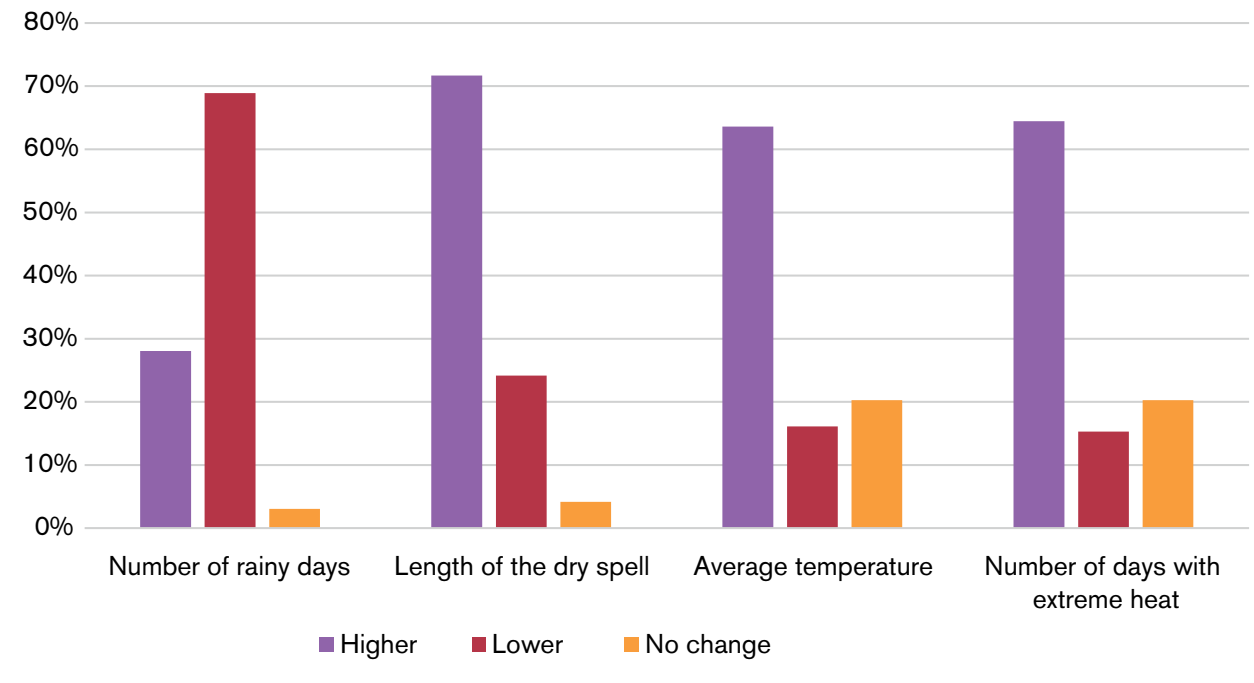


Figure 4. Perceived frequency of extreme events

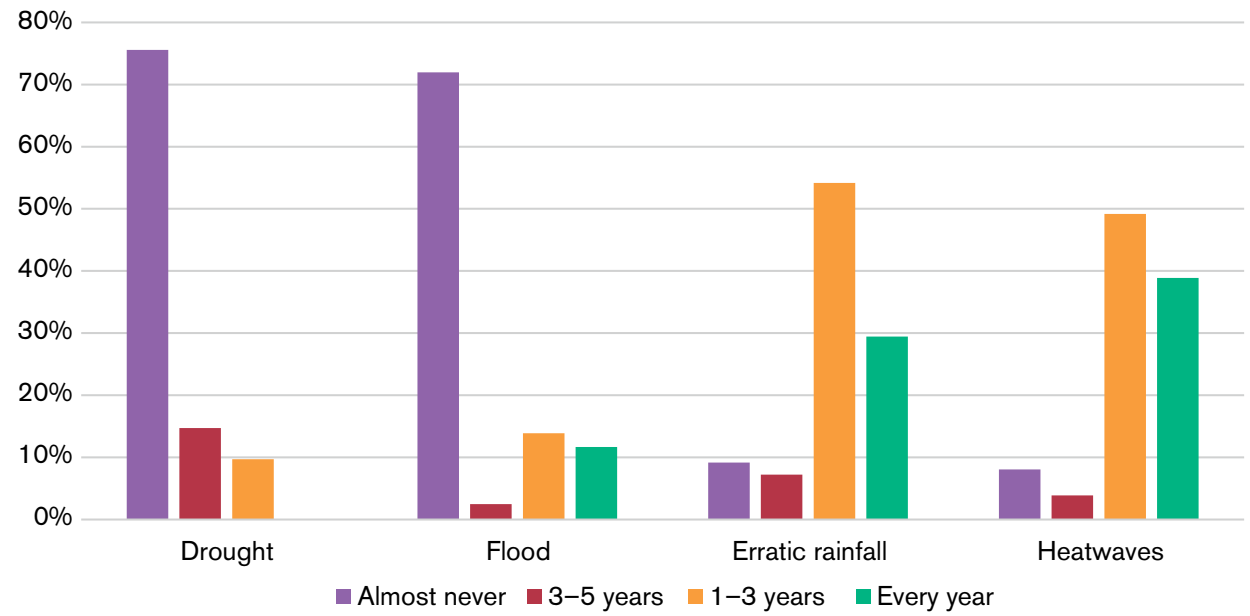
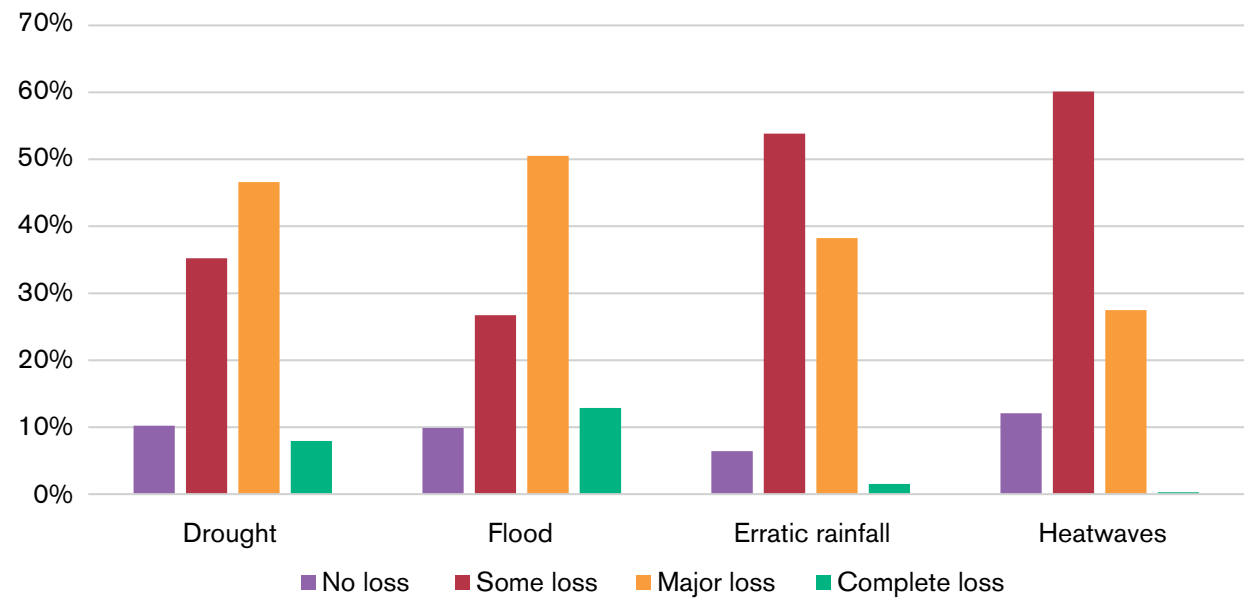


Figure 5. Reports of crop loss due to extreme events in the past five years



other aspects of daily life that traditionally fall under women's responsibility, such as animal husbandry, and reported decreases in their animals' milk quality as a result of drier and hotter weather.

Other than extreme climate, **the other shocks most commonly mentioned by survey respondents were the COVID-19 pandemic** (65% of responses) and crop and livestock pests and diseases (37%) (Table A22). During FGDs, participants mentioned an increase in pink bollworm. Cyclones and earthquakes were frequently mentioned in Gujarat only.

Asked more generally about the **top three challenges faced by farmers, three out of four survey respondents mentioned erratic rainfall**, which is consistent with the responses about extreme weather above (Table A23). Other common challenges were **affordability of inputs** (60% of responses), **pests and diseases** (43%) and **low crop price**s (37%). The ranking was similar in both states, but erratic rainfall was mentioned by many more respondents in Maharashtra (86%) compared to Gujarat (64%), while pests and diseases were more frequently mentioned in Gujarat (58%) compared to Maharashtra (28%).

4.4 Coping and mitigation strategies

Farmers use a variety of strategies to cope with these shocks. More than half of the survey respondents said they use their **savings**, almost 45% said they **reduced their household expenditures**, and about a third said they **took out a loan** (Table A24). In the FGDs participants elaborated on these coping mechanisms. Some participants said they had to **move children out of private education or avoid using healthcare, while others said they reduced food intake**. Some farmers often have to reduce fertiliser inputs, which in turn leads to lower yields. In FGDs, farmers said that they could save using savings accounts (for example, offered by the post office) or through SEWA. The discussion suggested that 'saving' by putting money aside is not as common as reinvesting any surplus earnings directly into the farm. On the issue of loans, farmers in FGDs suggested that landowners and those with land titles could easily arrange to take loans from state or private banks, including Grameen and other micro-credit institutions. Those without titles (which is the case for many) resorted to local moneylenders.

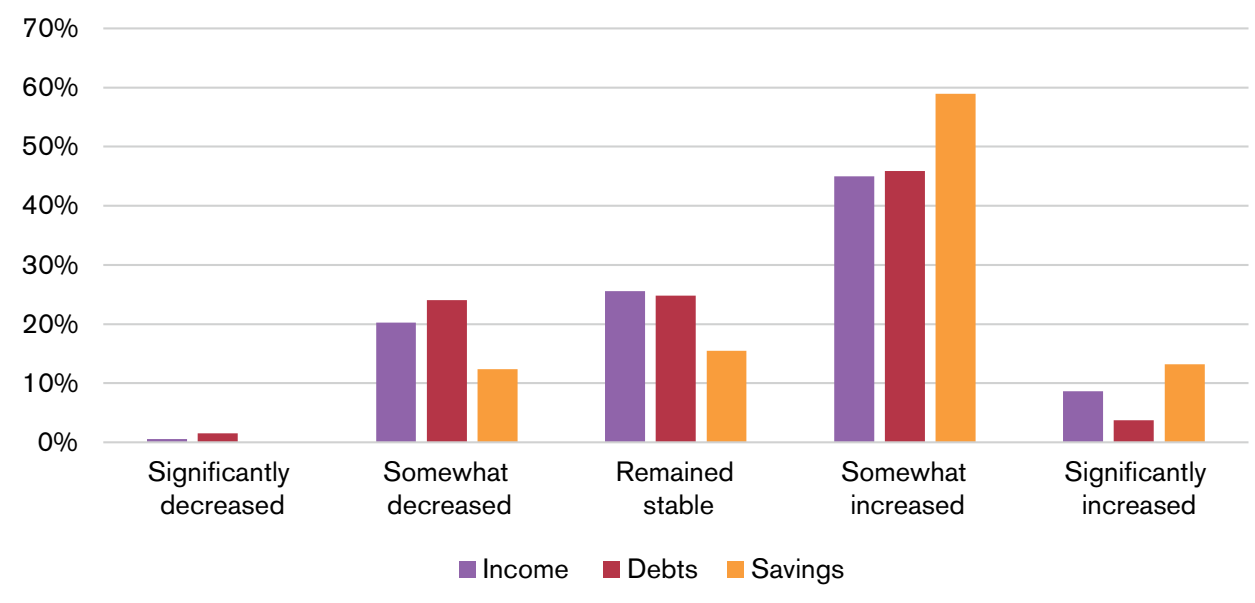
Despite the stated importance of savings, **the survey shows that only about a third of respondents have savings, while a similar number have outstanding debts** (Table A25). About a third of individual respondents had neither debts nor savings, and only 8% said they had both. For those who do save, the **saving capacity is low**. Over 70% of respondents said they could save 10% or less of their monthly income (Table A26), which is consistent with what we found in FGDs.

Somewhat surprisingly, the survey suggests that **both debts and savings increased in the past two years**: about half of the respondents said that household debt had somewhat or significantly increased, with only 26% saying it had decreased (Figure 6). At the same time, 72% of respondents said household savings had increased, while only 12% said they had decreased.

While savings and loans are important tools to deal with the seasonality of income (see section 4.2), the relationship between these variables is not straightforward: **debts go up and savings go down in response to declining income** (which is intuitive), **but debt also increases when incomes rise.** The picture is mixed and there are too few data points to make any generalisations, but it is important to note that **debt is not just a coping mechanism when incomes go down, it is also a preventative measure**: in FGDs farmers said they take out loans to invest in irrigation and other inputs to prepare them for future shocks. Farmers noted that the government and banks provide low-interest loans that also come with risk insurance coverage.

The survey shows that farmers take different measures to mitigate — that is, to prepare for or reduce the negative effects of — shocks. The **most common on-farm mitigation strategies were crop rotation** (73% of all respondents, and 93% of Gujarat respondents), **intercropping** (60%), tree planting (40%) and crop diversification (34%) (Table A27). In FGDs, farmers indicated that these measures help to

Figure 6. Perceived changes in income, debts and savings in the past two years



build up the quality and fertility of the soil, and act as natural buffers against flooding or drought. About 55% of the survey respondents said these on-farm measures were somewhat effective, while a third said they were not effective at all (Table A28).

With regard to **financial mitigation measures, about half of the survey respondents mentioned increasing savings and purchasing crop insurance** (Table A29) although, as explained in section 4.5, in FGDs there was a lot of scepticism about crop insurance. Reducing debt (which, as discussed previously, is both a coping and a preventative mechanism) and purchasing health insurance were mentioned by a quarter of the respondents. Over 60% of respondents found these measures somewhat effective, while a third found them not effective (Table A30). While the survey did not probe why people found measures effective or ineffective, the FGDs provided some possible explanations. Some farmers complained that payouts took too long or were too difficult to process, and that the monitoring of weather-related triggers was inadequate. We discuss these and other possible explanations in section 4.5.

4.5 Uptake and awareness of insurance

Current insurance coverage

Overall, we found **fairly widespread use of insurance products. The most common one was crop insurance**, which was claimed to be used by nearly two thirds of all respondents, with a big difference between Maharashtra (81%) and Gujarat (42%) (Figure 7). In Maharashtra, all of those with crop insurance said they were covered under the government's PMFBY, while in Gujarat, where this government scheme is no longer running, respondents referred to an unnamed "crop insurance in crop loan", which could refer to the Mukhya Mantri Mahila Kisan Sashaktikaran Yojana (Chief Minister Women Farmer Empowerment Scheme, MMKSY), the Gujarati state-backed version of the PMFBY. In both states, the majority of respondents (almost 85%) said their crop insurance provided compensation against losses (Table A31). As we point out in Box 1, the PMFBY is frequently bundled with bank loans, so the coverage against losses would mostly likely mean protection of the loaned quantity, not direct compensation.

About a third of the respondents said they had life insurance (85% of whom said it was with Life Insurance Corporation (LIC)), **and 36% said they had health insurance**, with important differences between Gujarat (56% of respondents) and Maharashtra (only 16%). Almost all of those with health insurance (90%) said they had the government digital healthcare card, the Ayushman Bharat Health Account, which gives access to the government's health insurance. **Only about 8% of respondents had livestock insurance**.

The survey suggests that it is relatively common to have access to several different types of insurance products (life, health, crop, livestock or something else). While a fifth of the respondents had no insurance, more than 25% had access to two different types of insurance, and almost 15% had access to three or more. The largest proportion of respondents (38%) had access to only one type of insurance.

There are several government insurance schemes on offer: PMFBY (crop insurance — as mentioned

Figure 7. Percentage of farmers reporting to have life, health, crop and livestock insurance

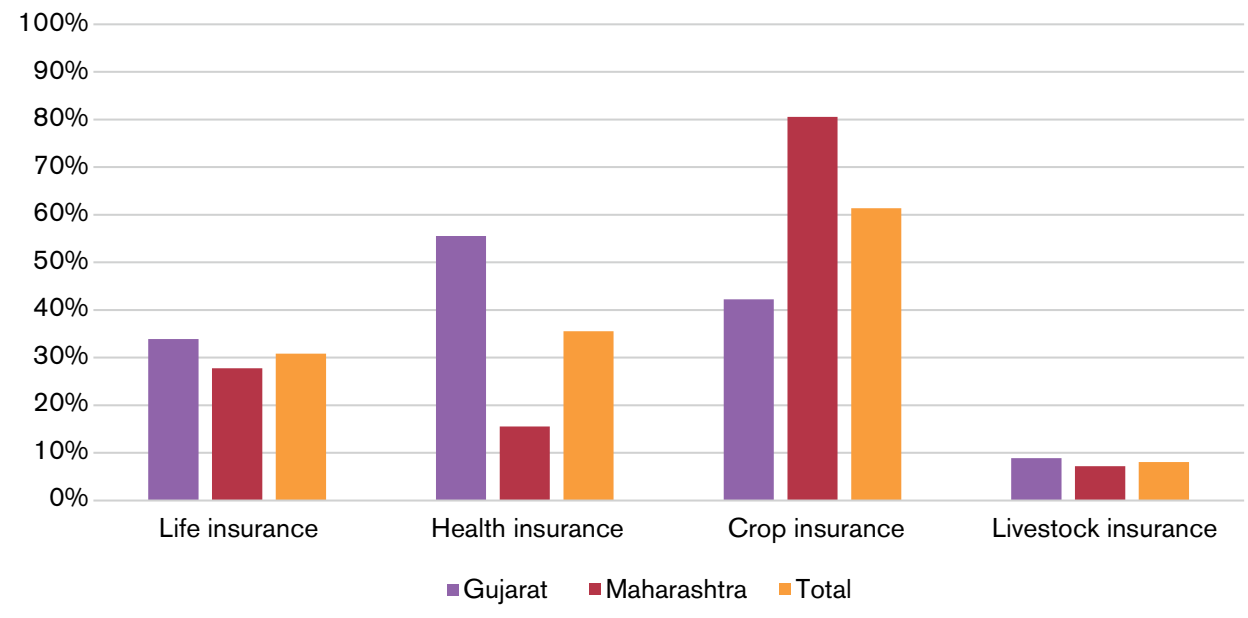
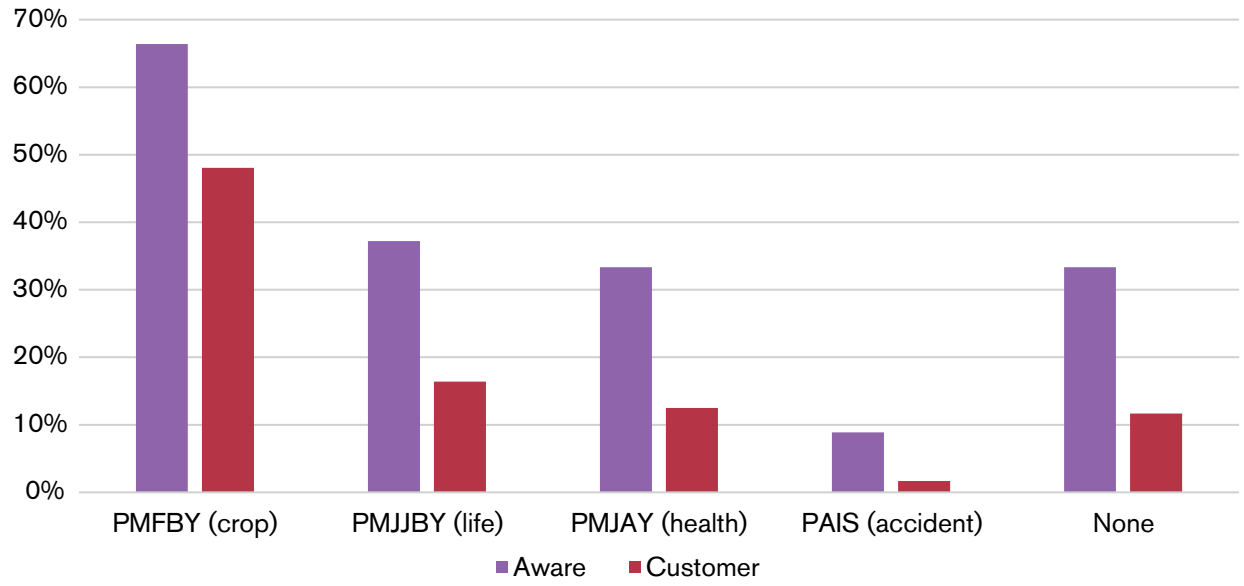


Figure 8. Percentage of farmers who are aware and who are customers of government insurance schemes



above), PMJJBY (life insurance), PMJAY (health insurance) and PAIS (accident insurance). We note a **considerable gap between levels of awareness of the insurance schemes and levels of use,** with levels of use up to 20% lower than awareness across the different insurance schemes (Figure 8). The PMFBY is known by almost two thirds of respondents, and used by almost half of them, with big differences between Gujarat and Maharashtra as mentioned above. PMJJBY and PMJAY are known by around a third of respondents, and used by less than 15%. No significant differences between the two states were observed (Table A32).

The results suggest that uptake of government insurance schemes is uneven (Figure 8). Almost half of the respondents only had access to one of the government schemes, 15% had access to two, and only 4% had access to three or more. A third of those surveyed said they had no access to any government schemes at all.

Barriers and opportunities for insurance uptake

The above survey results should be taken with caution, however, as the FGDs suggest there is **misunderstanding about the different types of insurance** schemes available. In discussions, some participants were unsure about the insurance they had (especially if it was bundled with a loan), what was covered or how compensation worked. For example, some participants assumed (incorrectly) that insurance bundled with a loan would offer compensation of losses to the farmer — when in reality it would help the bank recover the value of the unpaid loan.

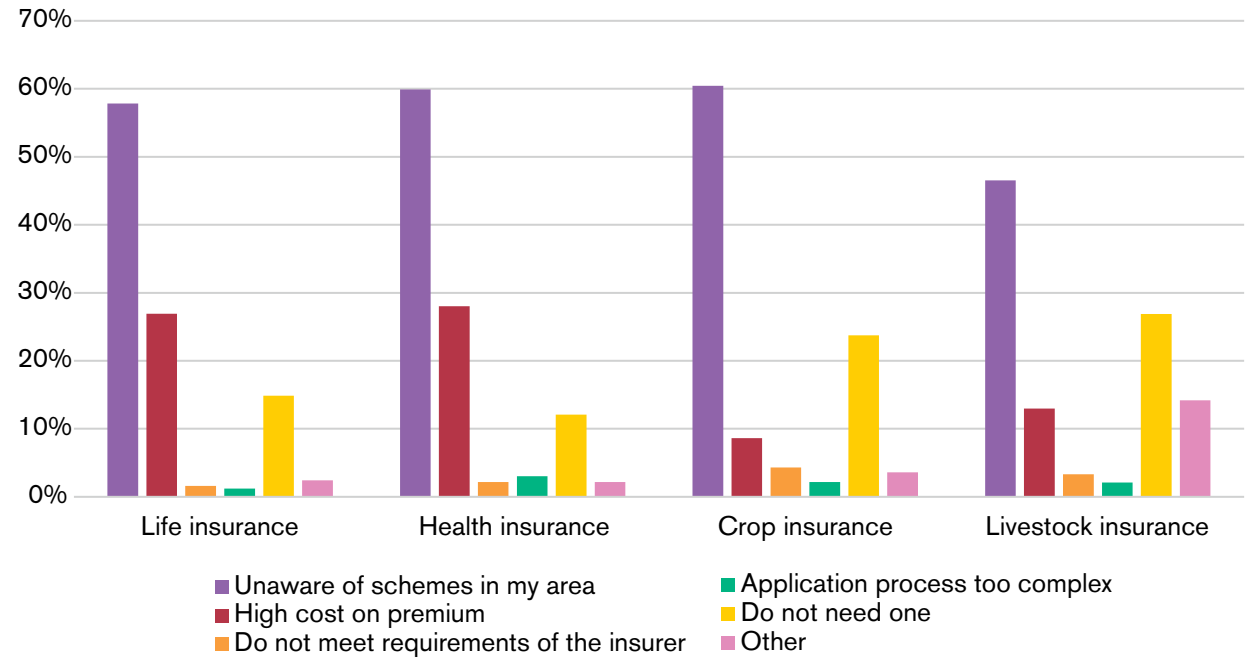
These misunderstandings may be related to lack of awareness: just under half of all survey respondents have received orientation or information with regard to insurance (Table A33). Most of them have received this information from an organisation such as SEWA (78%), and to a smaller degree from the media (30%) or a friend or relative (20%).

By far the most mentioned reason for not joining an insurance scheme of any type was lack of awareness about local providers (Figure 9). Specifically for crop insurance, over 60% of respondents were not aware of schemes in their area, and almost 25% said they did not need one. Significantly, the high cost of premiums was mentioned as a reason by less than 10% of respondents.

Although the high cost of premiums did not figure prominently in the survey as a reason for not having insurance, there are other clues that affordability may remain a key obstacle for access. In FGDs, participants mentioned the high cost of premiums as one of the main reasons for not having insurance, even if they are aware of the benefits. Furthermore, the survey shows that farmers are very constrained in their ability to pay for insurance, with over 90% of respondents saying that they could not afford insurance even if it cost 5% or less of their monthly income (Table A34). This sentiment was echoed in the FGDs.

Previous bad experiences are also deterring farmers from acquiring insurance. In FGDs, participants said that they are less willing to take out insurance — particularly crop insurance — because it is seen as time consuming, due to the amount of paperwork required, and ineffective at offering compensation. This can be related to misunderstandings about how loan-bundled insurance works. Women specifically mentioned that lack of legal tenure of the land created additional complications that were difficult to work around. Farmers said that current index crop insurance schemes frequently did not offer payouts as the weather stations are not accurate enough to pick up farm-level changes. And when the payouts come, they are much too late to offer relief in times of crisis. SEWA's Livelihoods Resilience and Recovery Fund (see Box 2) was mentioned as an attractive source of additional support.

Figure 9. Reasons given by farmers for not having life, health, crop or livestock insurance (combined responses from Gujarat and Maharashtra)



BOX 2. SEWA'S LIVELIHOODS RESILIENCE AND RECOVERY FUND (LRRF)

The LRRF is part of SEWA's offer to its members, and builds on farmers' solidarity and trust in SEWA. Under the LRRF members can get a 0% interest loan to deal with an immediate need. Requests are assessed by local committee members and decisions are made quickly, with farmers typically receiving the funds within one to two weeks after applying for them.

The LRRF is popular with the members we spoke to because it requires very small pay-ins compared to the interest rates of commercial loans or private moneylenders. The simple application process, independence from potentially inaccurate weather stations, and immediate relief provided, are all pluses of the LRRF relative to current insurance schemes.

5

Conclusions and recommendations

This study explored the perceptions of cotton farmers in the Indian states of Gujarat and Maharashtra about the impacts of climate change, their coping and mitigation strategies, and the possible role of insurance as a tool to build their resilience. The main findings of the survey and FGDs are:

- **Climate change presents clear threats to farmers' livelihoods**, **especially women**. This is evident from the perceived loss of income related to the increased frequency of climate-related challenges like heatwaves and erratic rainfall. Evidence from this study confirms the high impact of heatwaves on small farmers, and the uptick in frequency of extreme events.
- **But farmers are not passive victims**. They have multiple ways of coping with and mitigating threats, including seeking outside sources of employment, diversifying their on-farm production, saving, borrowing money to invest in resilience and joining organisations like SEWA.
- **However, there is a need for more and better coping and mitigation mechanisms**, especially to recover from shocks when they occur and to better prepare them for future shocks.
- **Insurance — particularly crop insurance — can be an important tool to build resilience**, but uptake is currently relatively low. This is linked to: limited understanding of what is available and how it works; unaffordable premiums; paperwork required which is seen to be burdensome and excessive; and a lack of confidence in the ability of insurance to compensate promptly and fairly.

Recommendations and priorities for action and research

1. **Businesses, donors and farmer organisations should work to improve awareness among small-scale farmers of coping mechanisms, including insurance and government schemes**. There are several government programmes available to help farmers, but farmers are unclear on how to access them or what their benefits are, and they often have misperceptions about the programmes that need to be addressed. Grassroots organisations like SEWA already play an active role raising awareness of the government and other schemes, and this work should be enhanced and expanded.
2. **Stakeholders in the supply chain including businesses, insurance and finance providers, and farmer organisations must co-design new ideas for insurance products.** Available crop insurance products are insufficient and inadequate to help farmers. Our review suggests that while technology is helping to overcome many of the barriers around transaction costs, claims verification and payouts, it is crucial that products be co-designed for the particular needs and abilities of users. It is also important that they cover other hazards, beyond crop insurance. Affordability is an important hurdle to overcome, so a form of subsidisation is likely necessary. Learning from SEWA's weather-related insurance pilots could be valuable in informing the design of new schemes.

3. **Businesses, donors, governments and nongovernmental organisations should consider resilience building beyond insurance**. There are limits to what insurance can do, and premiums are likely to be a sticking point. Schemes like SEWA's Livelihoods Resilience and Recovery Fund may be worth supporting, because it is known and trusted by the farmers. But its sustainability and scalability must be further assessed. Other resilience-building mechanisms — for example, use of new agroecological practices that improve soil quality, or water management practices — must also be considered.
4. **Industry, advocacy groups and research institutions should think beyond the cotton sector and beyond India.** The challenges identified here go beyond the cotton sector and affect farmers well beyond the study site. It is important to understand vulnerabilities in other populations and geographies, as a piecemeal approach is unlikely to reach the scale needed to make a difference.

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Annexes

Annex 1. Supplementary tables and figures

Table A1. Number of years farming

YEARS FARMING	GUJARAT	MAHARASHTRA	COMBINED
Fewer than 20 years	27%	30%	29%
11–30 years	63%	80%	71%
More than 30 years	37%	20%	29%

Table A2. Percentage of farmland dedicated to cotton growing during the last growing season (2022–2023)

PERCENTAGE OF FARMLAND	GUJARAT	MAHARASHTRA	COMBINED
Less than 25%	7%	4%	5%
25–50%	11%	39%	25%
51–75%	16%	36%	26%
76–100%	67%	21%	44%

Table A3. Percentage of farmers growing Bt and desi cotton

	GUJARAT	MAHARASHTRA	COMBINED
Bt cotton	98%	98%	98%
Desi cotton	2%	0%	1%

Figure A1. Percentage of farmers growing or keeping crops or livestock in addition to cotton

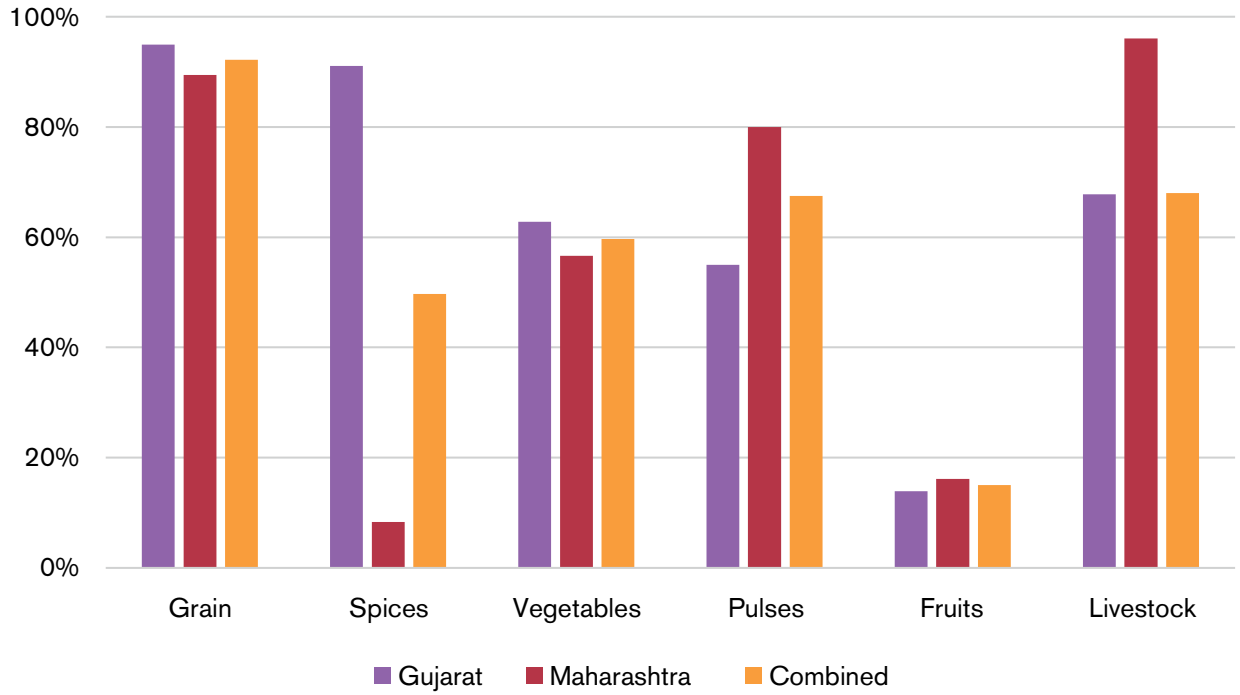

Table A4. Percentage of all respondents growing different grains

GRAIN	GUJARAT	MAHARASHTRA	COMBINED
Wheat	93%	67%	80%
Maize	9%	73%	41%
Bajara	21%	48%	34%
Castor	53%	2%	28%
Sesame	47%	7%	27%
Jowar	46%	7%	26%
Groundnut	16%	16%	16%
Other	0%	1%	1%

Table A5. Percentage of all respondents growing different spices

SPICE	GUJARAT	MAHARASHTRA	COMBINED
Coriander	72%	7%	39%
Cumin	76%	0%	38%
Fennel	66%	0%	33%
Mustard seed	60%	1%	30%
Celery	5%	0%	3%
Chilli	1%	4%	3%
Other	7%	1%	4%

Table A6. Percentage of all respondents growing different vegetables

VEGETABLE	GUJARAT	MAHARASHTRA	COMBINED
Fenugreek	42%	42%	42%
Ladyfingers	54%	28%	41%
Chilli	41%	32%	36%
Tomato	37%	31%	34%
Bringel	46%	21%	33%
Cluster beans	33%	19%	26%
Onion	14%	23%	19%
Spinach	12%	21%	16%
Garlic	14%	12%	13%
Ridge gourd	16%	3%	9%
Bottle gourd	14%	4%	9%
Bitter gourd	14%	3%	9%
Cabbage	11%	3%	7%
Cucumber	11%	3%	7%
Potato	4%	9%	7%
Carrot	9%	3%	6%
Other	24%	23%	24%

Table A7. Percentage of all respondents growing different pulses

PULSE	GUJARAT	MAHARASHTRA	COMBINED
Pigeon peas (Tuver)	37%	76%	56%
Green gram (mung)	49%	58%	53%
Black gram (urad)	22%	54%	38%
Other	12%	11%	11%

Table A8. Percentage of all respondents growing different fruits

FRUIT	GUJARAT	MAHARASHTRA	COMBINED
Guava	6%	5%	5%
Lemon	8%	2%	5%
Custard apple	1%	8%	4%
Pomegranate	7%	2%	4%
Mango	2%	6%	4%
Other	11%	9%	10%

Table A9. Percentage of all respondents keeping different types of livestock

LIVESTOCK	GUJARAT	MAHARASHTRA	COMBINED
Cow	49%	53%	51%
Buffalo	48%	4%	26%
Goat	0%	23%	12%
Other	0%	1%	1%

Table A10. Source of water for irrigation

WATER SOURCE	GUJARAT	MAHARASHTRA	COMBINED
Canal	56%	1%	28%
Groundwater	56%	69%	62%
River	2%	1%	1%
Pond	0%	3%	1%
Other	7%	29%	18%

Table A11. Percentage of household income generated on-farm and from other activities

% OF HOUSEHOLD INCOME	GUJARAT		MAHARASHTRA		COMBINED	
	Farm	Other	Farm	Other	Farm	Other
None	0%	63%	0%	57%	0%	60%
Up to 25%	1%	1%	0%	6%	1%	3%
25–50%	4%	33%	19%	29%	12%	31%
51–75%	19%	4%	18%	8%	19%	6%
76–100%	76%	0%	63%	1%	69%	0%

Figure A2. Other sources of income

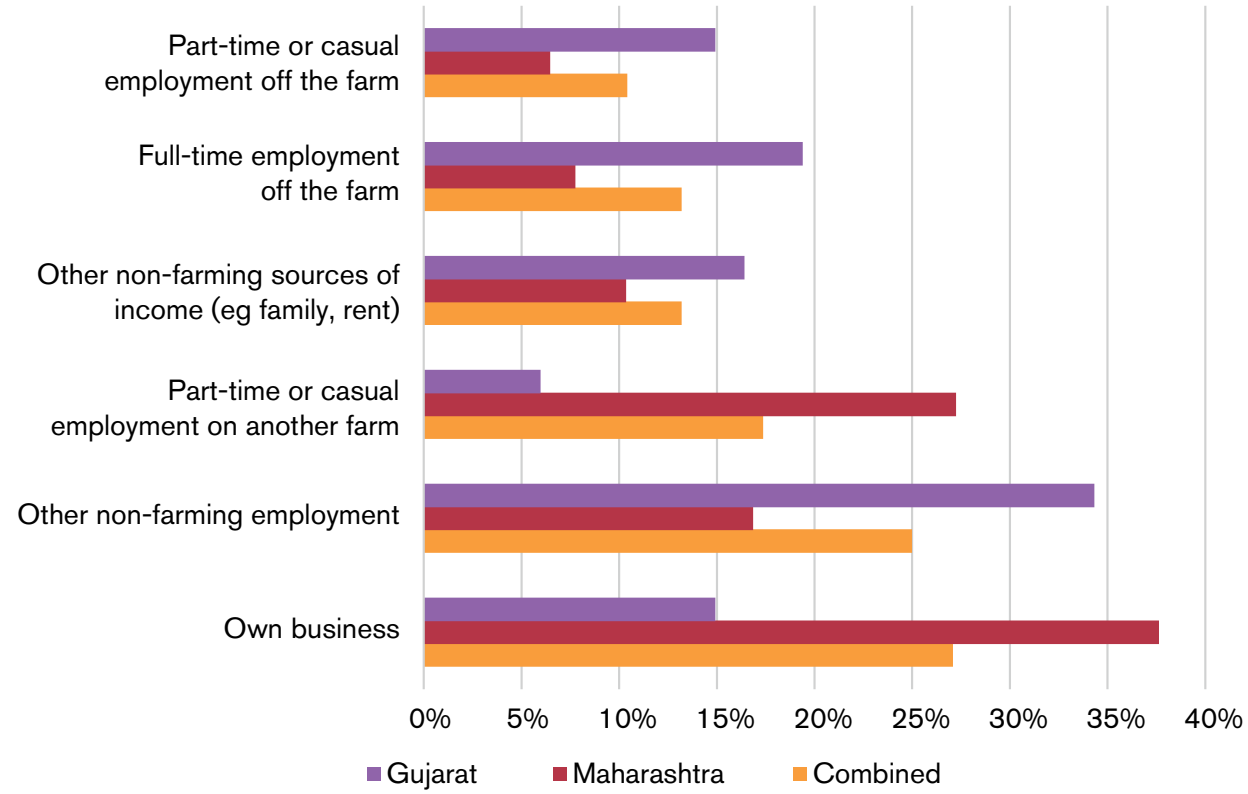

Table A12. Crops perceived to generate the most income for the household (top three for each respondent)

CROPS	GUJARAT	MAHARASHTRA	COMBINED
Cotton	82%	86%	84%
Corn	0%	53%	26%
Cumin	47%	0%	23%
Wheat	11%	22%	16%
Fennel	15%	0%	8%
Kapas	0%	11%	6%
Millet	0%	9%	4%
Coriander	7%	0%	4%
Sesame	7%	0%	3%
Castor	6%	0%	3%
Tuver	0%	6%	3%
Ginger	0%	5%	3%
Groundnut	4%	1%	2%
Makka	0%	3%	2%
Onion	0%	3%	2%
Others	4%	9%	7%

Table A13. Perceived changes in household income, debts and savings over the past two years

	GUJARAT	MAHARASHTRA	COMBINED
Income			
Significantly decreased	1%	1%	1%
Somewhat decreased	21%	20%	20%
Remained stable	28%	23%	26%
Somewhat increased	46%	44%	45%
Significantly increased	6%	12%	9%
Debts			
Significantly decreased	1%	2%	2%
Somewhat decreased	25%	23%	24%
Remained stable	20%	33%	25%
Somewhat increased	52%	37%	46%
Significantly increased	2%	6%	4%
Savings			
Significantly decreased	0%	0%	0%
Somewhat decreased	9%	14%	12%
Remained stable	13%	17%	16%
Somewhat increased	71%	52%	59%
Significantly increased	7%	17%	13%

Table A14. Reasons for income increases

REASON	GUJARAT	MAHARASHTRA	COMBINED
Price	45%	6%	22%
Use of fertiliser	20%	18%	19%
Adoption of improved farming practices	9%	21%	16%
Better seeds/inputs	6%	20%	14%
Irrigation	3%	10%	7%
Changes in the selection of crops	9%	5%	7%
Access to more land	5%	3%	4%
Other	4%	14%	11%

Table A15. Reason given for the perceived decrease of income

REASON	GUJARAT	MAHARASHTRA	COMBINED
Unseasonal rainfall	58%	45%	52%
Pests and diseases	17%	15%	16%
Other weather-related issues	8%	19%	13%
Prices	11%	9%	10%
Other	6%	8%	7%
Don't know/not applicable	0%	4%	2%

Table A16. Perception about the month, during the past two years, when income from crops is lowest and highest, and during which the household cannot afford food or other basic needs

MONTH	MONTH OF LOWEST INCOME	MONTH OF HIGHEST INCOME	MONTH IN WHICH HOUSEHOLD CANNOT AFFORD ENOUGH FOOD	MONTH IN WHICH HOUSEHOLD CANNOT AFFORD BASIC NEEDS
January	1%	55%	0%	0%
February	2%	32%	0%	0%
March	19%	11%	1%	0%
April	33%	8%	1%	0%
May	41%	2%	1%	3%
June	39%	1%	1%	4%
July	27%	1%	1%	2%
August	20%	1%	1%	2%
September	8%	3%	0%	0%
October	8%	27%	0%	0%
November	5%	20%	0%	0%
December	2%	34%	0%	0%
No such month	0%	0%	96%	94%

Figure A3. Reported month of highest and lowest household income

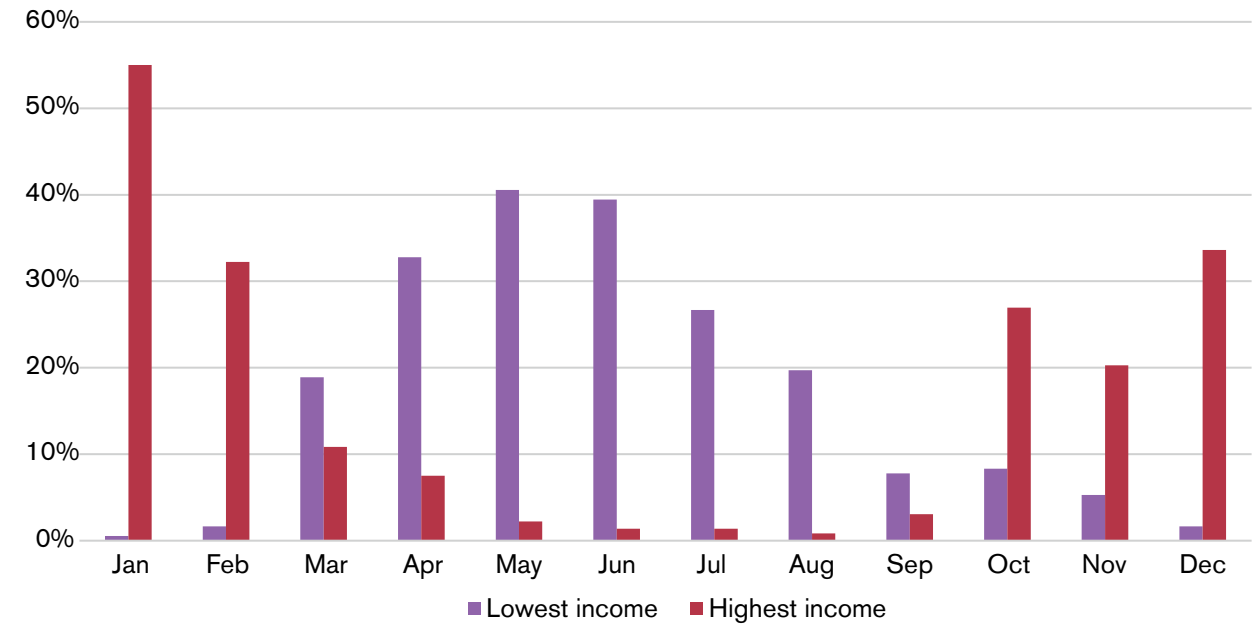

Table A17. Percentage of farmers who are able to meet their children's educational expenses throughout the year without taking a loan or a bursary

	GUJARAT	MAHARASHTRA	COMBINED
Unable to pay for any children	8%	29%	19%
Not applicable	47%	18%	33%
Able to pay for all children	26%	39%	33%
Able to pay for some children	18%	14%	16%

Table A18. Percentage of farmers who are able, throughout the year, to pay for the family's healthcare costs without taking a loan

	GUJARAT	MAHARASHTRA	COMBINED
Not able	8%	8%	8%
Partly able	50%	27%	39%
Fully able	42%	64%	53%

Table A19. Perceived changes, over the past five years, in the number of rainy days, length of the dry spell, average temperature, and number of days with extreme heat

	GUJARAT			MAHARASHTRA			COMBINED		
	Higher	Lower	No change	Higher	Lower	No change	Higher	Lower	No change
Number of rainy days	28%	70%	2%	28%	68%	4%	28%	69%	3%
Length of dry spell	76%	23%	2%	68%	26%	7%	72%	24%	4%
Average temperature	43%	20%	37%	84%	12%	4%	64%	16%	20%
Number of days with extreme heat	48%	16%	37%	81%	15%	4%	64%	15%	20%

Table A20. Perceived frequency of the occurrence of drought, flood, erratic rainfall and heatwaves

	GUJARAT				MAHARASHTRA				COMBINED			
	Almost never	3–5 years	1–3 years	Every year	Almost never	3–5 years	1–3 years	Every year	Almost never	3–5 years	1–3 years	Every year
Drought	73%	14%	13%	0%	78%	16%	7%	0%	76%	15%	10%	0%
Flood	77%	10%	12%	2%	67%	13%	16%	3%	72%	3%	14%	12%
Erratic rainfall	7%	7%	53%	33%	11%	8%	56%	26%	9%	7%	54%	29%
Heatwaves	5%	3%	48%	44%	11%	5%	51%	33%	8%	4%	49%	39%

Table A21. Extent of crop loss as a result of drought, floods, erratic rainfall and heatwaves in the past five years

	GUJARAT				MAHARASHTRA				COMBINED			
	No loss	Some loss	Major loss	Complete loss	No loss	Some loss	Major loss	Complete loss	No loss	Some loss	Major loss	Complete loss
Drought	6%	21%	65%	8%	15%	53%	25%	8%	10%	35%	47%	8%
Flood	7%	0%	81%	12%	12%	46%	29%	14%	10%	27%	50%	13%
Erratic rainfall	4%	29%	65%	2%	9%	80%	11%	1%	6%	54%	38%	2%
Heatwaves	12%	44%	43%	1%	13%	77%	11%	0%	12%	60%	27%	0%

Table A22. Percentage of farmers reporting experiencing other shocks during the past five years

	GUJARAT	MAHARASHTRA	COMBINED
Health epidemic	58%	72%	65%
Pests and diseases affecting crops	49%	25%	37%
Cyclone	67%	1%	34%
Earthquake	60%	1%	31%
Other	17%	32%	24%
Personal accident or injury	2%	4%	3%
Fire	3%	1%	2%
Own medical/health issues	1%	1%	1%
Family medical issues	2%	1%	1%

Table A23. Top three challenges faced by farmers

	GUJARAT	MAHARASHTRA	COMBINED
Erratic rainfall	64%	86%	75%
Unaffordable inputs	62%	58%	60%
Too many pests and diseases	58%	28%	43%
Low price	39%	36%	37%
Labour too expensive	25%	21%	23%
Heatwaves	38%	2%	20%
Drought	3%	25%	14%
Insufficient demand	17%	8%	13%
Not enough labour	13%	12%	13%
Other	8%	11%	9%
Flood	2%	10%	6%
Excessive cold	9%	3%	6%
Variable or unpredictable demand	2%	8%	5%

Table A24. Coping mechanisms used by farmers in response to shocks to their livelihoods over the past two years

	GUJARAT	MAHARASHTRA	COMBINED
Used savings	60%	43%	52%
Reduced household expenditure	51%	36%	44%
Took a loan	52%	21%	36%
Other	12%	34%	23%
Sought employment off farm	11%	2%	6%
Sold land	12%	1%	6%
Sold livestock	6%	5%	5%
Relied on help from friends and family	7%	4%	5%
Reduced household food consumption	7%	3%	5%
Skipped cultivating one season	7%	0%	3%
Defaulted on existing loan	3%	1%	2%
Government compensation	1%	3%	2%
Reduced investment on the farm	0%	3%	1%
Sold other assets	1%	1%	1%
Made an insurance claim and received payment	2%	1%	1%
Made an insurance claim and have yet to receive payment	1%	0%	1%

Table A25. Percentage of farmers reporting that the household has savings (at home or in the bank) or outstanding debts

	GUJARAT	MAHARASHTRA	COMBINED
Savings	25%	47%	36%
Debts	45%	29%	37%

Table A26. Percentage of annual household income that farmers report to be able to save

	GUJARAT	MAHARASHTRA	COMBINED
Up to 10%	76%	82%	80%
Up to 25%	18%	17%	17%
Up to 50%	4%	1%	2%
More than half	2%	0%	1%

Table A27. On-farm measures taken by farmers to mitigate future shocks and risks

	GUJARAT	MAHARASHTRA	COMBINED
Crop rotation	93%	52%	73%
Intercropping	56%	64%	60%
Planting more trees	44%	35%	40%
Crop diversification	33%	35%	34%
Bio-fencing	32%	9%	21%
Building of terraces/trenches	13%	21%	17%
Mulching	6%	27%	16%
Investing in irrigation	19%	14%	16%
None	6%	24%	15%
Investing in livestock production	9%	19%	14%
Changing what is planted where	3%	18%	11%
Changing the timing of planting	8%	8%	8%
Reducing reliance on external inputs	3%	11%	7%
Planting under shade trees	2%	9%	6%
Other	1%	5%	3%

Table A28. Reported effectiveness of on-farm measures to mitigate the negative impact of shocks on the household

	GUJARAT	MAHARASHTRA	COMBINED
Not effective	29%	34%	32%
Somewhat effective	59%	53%	56%
Very effective	12%	13%	13%

Table A29. Financial or economic measures taken by farmers to mitigate future shocks and risks

	GUJARAT	MAHARASHTRA	COMBINED
Increased savings in the bank	55%	48%	51%
Purchased crop insurance	36%	56%	46%
Reduced debt	25%	27%	26%
Purchased health insurance	32%	16%	24%
None	16%	23%	19%
Working more off-farm	23%	8%	16%
Increased debt to invest in the farm	9%	6%	8%
Increased formal savings	5%	6%	6%
Enhanced access to market information	5%	5%	5%
Other	4%	3%	4%
Sent the family to work off-farm	6%	3%	4%
Purchased cattle insurance	5%	4%	4%

Table A30. Reported effectiveness of financial or economic measures to mitigate the negative impact of shocks on the household

	GUJARAT	MAHARASHTRA	COMBINED
Not effective	34%	27%	31%
Somewhat effective	61%	66%	63%
Very effective	5%	7%	6%

Table A31. Protection offered by crop insurance, reported by farmers who have crop insurance

	GUJARAT	MAHARASHTRA	COMBINED
Compensation against loss	83%	84%	84%
Don't know	16%	12%	14%
Changes in weather affecting potential harvest	4%	13%	10%
Changes in yield	3%	12%	9%
Changes in prices	0%	1%	1%
Other	1%	0%	0%

Table A32. Percentage of respondents who are aware of and who are customers of government insurance schemes

GOVERNMENT SCHEME	GUJARAT		MAHARASHTRA		COMBINED	
	Aware	Customer	Aware	Customer	Aware	Customer
PMFBY	50%	21%	83%	76%	66%	48%
PMJBY	44%	18%	30%	14%	37%	16%
PMJAY	41%	9%	26%	16%	33%	13%
PAIS	14%	2%	4%	2%	9%	2%
None of above	49%	17%	17%	6%	33%	12%
Other	0%	1%	0%	1%	0%	1%

Table A33. Percentage of farmers who have received information about insurance, and the source of the information

	GUJARAT	MAHARASHTRA	COMBINED
Has received information on insurance	44%	47%	46%
Source of information			
Organisation (SEWA/farmer associations)	79%	77%	78%
Media (billboards, posters, advertisements, TV)	34%	27%	30%
Relative or friend	23%	18%	20%
Government extension worker	20%	10%	15%
Other	10%	7%	9%

Table A34. Price point (as percent of monthly income) at which farmers said they would be able to afford crop, life, health or livestock insurance

	GUJARAT	MAHARASHTRA	COMBINED
Less than 5% of monthly income	64%	44%	54%
Up to 5% of monthly income	32%	47%	40%
Up to 10% of monthly income	3%	8%	6%
Up to 15% of monthly income	0%	1%	0%

Annex 2. Focus group discussions

The following is a summary of notes taken by Alejandro Guarín, Emma Blackmore and José Morell-Ducós of IIED during two FGDs. The FGDs were held on 31 October 2023 at SEWA's Dhangandhra office.

The first FGD was composed of approximately 10 male SEWA 'members' (husbands of SEWA members). The second FGD was comprised of approximately 30 female SEWA members. The major themes of the discussions were livelihoods shocks, resilience needs and behaviours (coping mechanisms) and insurance. The FGD was led and moderated by Vishal Pathak of the All India Disaster Mitigation Institute (AIDMI).

The summary of notes below reflects the core of the discussions and explorations held. In general, both groups tended to have converging views on the topics. Unless specifically differentiated, what follows are the views of both FGD cohorts.

Livelihood shocks

COVERING QUESTIONS SUCH AS:

- What kinds of shocks do you experience?
- How do the shocks affect your farming system and your household's wellbeing?
- How are these experienced differently between men and women?
- What are the main reasons income has changed over the past couple of years?

FGD participants stated that to their reckoning, shocks such as dry spells, extreme heat and erratic rainfall reduce their potential income by 30–50% per year. Aside from the primary shocks, secondary effects also affect incomes and have an impact on members' and their families' quality of life. Secondary effects include:

- Disruption of supply chains including destruction of storage capacity
- Reduction in purchasing ability
- Reduced availability of inputs
- Reduced availability of staples.

Male and female participants shared distinctively different priorities when addressing the shocks they face. Men emphasised their reduced incomes and reduced or threatened social standing. Women emphasised the broader impacts on the household, ranging from quality of education of children to the inability to provide nutritious food to children. Women also spoke about how shocks affect other aspects of daily life that traditionally fall under women's responsibility. For example, animal husbandry is largely done by women, and, according to participants, income from the sale of milk to cooperatives is kept by women and helps finance the purchase of staples. Therefore, shocks causing an increase in the cost of animal feed will ultimately affect milk production and therefore the quantity or quality of staples purchased.

Reasons given for stagnation and decline in income over the past couple of years were primarily:

- Irregular rain
- Lack of or decay of irrigation systems
- Increased cost of water
- Salinisation of water
- Generally, increased water scarcity
- Increase in heat-related healthcare costs
- Degradation of soil quality
- Increase in pink bollworm.

While some members had reported increases in their incomes over the past couple of years, no participant was able to give a reason as to why this might be. A likely cause is diversification of crops, where multiple crops compensate cotton losses.

Resilience needs and behaviours

COVERING QUESTIONS SUCH AS:

- What sort of coping mechanisms are available to you?
- What sorts of risks would you need protection from?

The two main coping mechanisms mentioned by both male and female participants were the reduction of children's education (moving from private schools to government-funded schools) and avoiding healthcare. Participants were very interested in schemes that might safeguard children's schooling and family healthcare in particular.

All participants reported that a general reduction of expenses is necessary when faced with shocks. At farm-level this includes reducing soil testing and usage of inputs, which in turn leads to lower yields. Additionally, some participants discussed proactive coping mechanisms which they either implement or have tried in the past. These include:

- Tree planting at field borders (hedge creation)
- Reduction of synthetic fertiliser and increase in natural fertiliser
- New planting techniques including intercropping, high-density planting, crop rotation, etc.
- Agreeing on fixed prices with ginners
- Purchasing soil
- Taking out loans (formal and informal).

Some participants reported exploring income diversification and moving away from cash crops altogether. Women reported an increased engagement in factory work, skilled embroidery and animal husbandry.

As mentioned previously, taking out loans is one of the many coping mechanisms implemented by participants. The loans are often used to dig boreholes, rent tractors, invest in drip irrigation, fish farming, etc. Participants stated that loans are easy to arrange, particularly if one is a landowner and land documents are up to date. However, this is not the case for many.

Insurance and savings

COVERING QUESTIONS SUCH AS:

- How do people normally save?
- Do you feel you understand what insurance is?
- Why have you not adopted these schemes?
- What other resources help you survive, ensure you can afford food, healthcare, etc?

Participants reported that there are a number of different government insurance, savings and loans schemes that they can make use of. These, however, tend to be plagued by overly bureaucratic processes, onerous conditions, problems with payouts, and high transaction and opportunity costs. Most participants agreed that if there were financial products available that did not carry these problems, they would be willing to pay for them. Importantly, an emphasis was made on these services being something that participants would gladly pay for. Most men said they would be willing to spend up to 10% of their income on an insurance premium; the majority of women reported they would be willing to spend around 5%. Some participants reported having personal injury, life and damage to property insurance (caused by wildlife, conflict or fire). It is likely that these are group-cover schemes from their cooperatives.

Generally, participants seemed to be suspicious of insurance products, often citing that payouts are very rare. At times there was confusion between what a loan is and what insurance is. Participants claimed to understand what insurance is, but there was little consensus on what kind of insurance is provided by which popular loan option. Additionally, participants expressed frustration at the obligatory bundling of insurance with loans as well as the methods used to decide whether a payout is to take place. One of the examples given related to weather insurance which was largely based on the consistent measurement of high temperatures over a period of time. Unfortunately, there are not enough weather stations to properly capture high-heat events throughout participants' farming regions.

Participants emphasised the need for rapid payouts, clear criteria and their desire to be involved in the design of insurance schemes. One participant said that to receive an insurance payout, they took the insurance company to court and was successful. Some land-owning farmers receive hardship support from government.

Other

Decision making

Men state that decision making in the family unit is joint, and that they will often concede on certain decisions to their wives in order to 'keep the peace at home'. Women also report that decision making is joint and that both husband and wife have a right to veto decisions relating to their farms.

Agreements with ginners

As mentioned above, the women's FGD stated that they would often come to agreements with ginners to sell their cotton at a below-market price prior to harvesting. Follow-up discussions were held with SEWA where it was explained to the IIED team that such agreements often led to a poor outcome for their members, with ginners having an inordinate amount of control over farmers' decision making. Often farmers find themselves unable to fulfil the quantities they had promised the ginners or experience a significant loss in profit as the agreed prices were below market value at time of harvest.

Livelihoods Resilience and Recovery Fund (LRRF)

The LRRF is a scheme provided by SEWA. Members are able to receive a loan at 0% interest (while elsewhere farmers would be charged up to 22% interest). The scheme allows farmers to replough and purchase seeds and generally get back on their feet following a shock. Members pay 20 rupees a day into the scheme; one member explained that they received 20,000 rupees following a flood. Repayments must be made within four months.

Farmers must fill in a form to apply for the loan. A committee decides who they grant the loans to. SEWA bank, the leader of LRRF and members from the SEWA trade facility are on the committee. There is also a district committee, which assesses and verifies damage claims and feeds into the central committee on decision making. The assessment process can take one to two weeks and after that there are 3–4 days for payment to be made/received.

LRRF is popular with the members we spoke to because it requires very small pay-ins as compared to loans, and it builds on farmers' solidarity and trust in SEWA. LRRF is seen as part of the package of what being a SEWA member offers. LRRF provides a different type of support to government and private insurance, because it assesses actual damage instead of relying on weather stations that may not be close enough. LRRF was set up for farmers and labourers who need financial support as a result of shocks. It was a way to avoid the use of private moneylenders.

India is the largest producer of cotton globally, but its position in the global textile supply chain is being increasingly threatened by climate change. Smallholder cotton farmers are particularly vulnerable to the effects of climate change, putting millions of livelihoods at stake. This study draws on original data from the Indian states of Gujarat and Maharashtra to explore the vulnerabilities of cotton farmers, their perceptions of and responses to climate and other shocks, and the current and potential use of insurance as a risk management tool. It presents a set of insights and recommendations on what different actors in the cotton sector can do to enhance the resilience of small-scale producers.

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