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Demand for Crop Insurance in India: Evidence from National Representative Surveys

The Indian Economic Journal
1–27

DOI: 10.1177/00194662251334801
journals.sagepub.com/home/iej
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Abstract

Over the decades, both the national and state governments in India have implemented various measures to enhance the adoption of crop insurance as it diversifies the risk associated with agricultural income. In 2016, the Government of India commenced Pradhan Mantri Fasal Bima Yojana (PMFBY) and restructured the Weather-based Crop Insurance Scheme (WBCIS). Despite the continuous efforts of government agencies and subsidies, the adoption rate is low. Under this backdrop, this study has three objectives: (a) assess the current status of the adoption of crop insurance in India, and in particular, for landholding size, caste and income; (b) map state-wise adoption; and (c) evaluate the adoption rate of PMFBY across the states. This study used data from the 70th (2012–2013) and 77th rounds (2018–2019) of the agricultural household surveys conducted by the National Sample Survey Office (NSSO), and additional information was gathered from the Agricultural Insurance Company of India and the PMFBY dashboard. The findings are: (a) a meagre percentage of farmers opted for crop insurance even after five decades of its inception, that is, less than 10%; (b) as expected based on previous studies, a low adoption is observed among smallholders and marginalised farming communities; (c) between the two rounds, around one-third of states have shown an improvement in the rate of adoption; (d) the percentage of adoption among the smallholders marginally increased in a few states; (e) a high adoption of PMFBY was noted in seven states; and (f) a lack of institutional capacity to enhance the adoption rate. The following aspects should be looked into for enhancing the adoption rate: improving institutional capacity, incentive mechanisms and basis risks. Further, this study warrants additional studies to identify behavioural biases and policy suggestions.

JEL Codes: Q580, Q180, Q120

Keywords

Crop insurance, adoption, India, state wise, landholding, caste, income

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I. Introduction

Climate and weather-related events like cyclonic storms, floods, droughts, torrential rainfall, extreme temperature and so on have been flagged as significant factors for indicating uncertainty in the yield of agricultural crops, particularly in countries in South Asia (Shaw et al., 2022). Thus, agricultural income is more volatile due to production shocks (Bahinipati et al., 2021, 2024). This consequently places farmers' livelihoods, particularly those from low- and middle-income countries, at risk without insurance mechanisms (Kumar et al., 2023). Farmers from South Asia are likely to be vulnerable as the impacts of climate change have been projected to increase with time (Shaw et al., 2022). In addition, the other features in India, for instance, a large percentage of smallholder farmers and lack of income smoothening measures, make farmers' earnings further unpredictable (Nair, 2010a; Paul et al., 2023). While small and marginal farmers in India possess 85% of the total operational holding (Mishra & Singh, 2019; Paul et al., 2023), less than half of this agricultural land is irrigated (Shroff & Phadke, 2022).[1] Moreover, around half of the farmers in India are not interested in taking up farming as a livelihood opportunity (Agarwal & Agrawal, 2017).

Numerous studies in India have estimated the adverse effects of climate change on agriculture (Pattanayak & Kavi Kumar, 2014; Pattanayak et al., 2021; Shaw et al., 2022). A study by Pattanayak et al. (2021) calculates a reduction in agricultural productivity by 4.5% per every 1°C rise in temperature, and for the wheat crop, Gupta et al. (2017) estimate a decline in yield by 2%–4%. Further, on average, around 0.03% of the total net sown area was damaged every year by floods between 1953 and 2011; in monetary terms, the loss has been estimated at Indian ₹11.15 billion per year (Bahinipati & Patnaik, 2020). Studies have shown evidence of undertaking various adaptation measures by farmers in India to reduce the potential impacts of compounding risks, including climate change and extreme events (Bahinipati et al., 2021; Bahinipati & Patnaik, 2022; Viswanathan et al., 2020). Among them, crop insurance is found to be one of the climate-smart practices that can safeguard farmers' income from production risks (Thornton et al., 2019; Viswanathan et al., 2020), and more importantly, it assists farmers in both ex-ante and ex-post income and consumption smoothening (Biswal & Bahinipati, 2022, 2023; Bahinipati et al., 2021; Panda, 2021). It provides a 'triple dividend of resilience', for instance, by compensating loss and damages that may arise from disasters, managing future risks that are predicted in the event of disasters, and fostering several other benefits (e.g., supporting the adoption of other climate-smart agriculture practices) that could enhance farmers' well-being (Bahinipati et al., 2024; Surminski et al., 2019; Surminski & Tanner, 2016).

In India, crop insurance was first introduced in 1972, and several modifications and/or restructuring were implemented in the last five decades (see Biswal & Bahinipati, 2022; Raju & Chand, 2008). These include the Comprehensive Crop Insurance Scheme (1985), the National Agricultural Insurance Scheme (NAIS: 1999), the Modified National Agricultural Insurance Scheme (MNAIS: 2010–2011) and the Weather-based Crop Insurance Scheme (WBCIS: 2007) (Mukherjee & Pal, 2017). In 2016, the Government of India initiated the Pradhan Mantri Fasal Bima Yojana (PMFBY) and Restructured Weather-based Crop Insurance Scheme (RWBCIS) (Biswal & Bahinipati, 2022). Premium rates were low in both schemes,[2] and it has a provision to include sharecroppers and tenants (Rajeev & Nagendran, 2019; Shroff & Phadke, 2022). An increasing trend regarding financial allocation has been observed over the years. It jumped from ₹1,457.32 crore in 2015–2016 to ₹5,550 crore in 2016–2017 and to ₹15,695 crore in 2021–2022—it is almost three times higher than the allocation made in 2016–2017 (Shroff & Phadke, 2022). Additionally, the national and state governments have introduced several interventions through agricultural extension services, Krishi Vigyan Kendra, the media and so on, to enhance the rate of the adoption of crop insurance schemes. Thus, it is imperative to assess the extent to which these

interventions and modified, restructured, and newly-commenced schemes, particularly the PMFBY, have contributed to boosting the adoption rate of crop insurance across states in India when studies (e.g., Biswal & Bahinipati, 2023) have found that crop insurance improves farmers' well-being.

This study's specific objectives are: (a) to examine the status of crop insurance adoption in India, focusing on landholding size, caste and income; (b) to provide a state-wise mapping of crop insurance adoption and compare adoption rates among farmers of different landholding sizes; (c) to compare the adoption of the PMFBY across various states in India. The data for the above objectives were collected from different sources, and the details have been given in the next section. Such types of assessments could generate facts about the extent of the adoption across states and in India at large. These objectives are crucial from a policy perspective for many reasons. First, they provide a comprehensive picture of the disparities in crop insurance adoption across different social and economic categories. Second, mapping adoption rates at the state level helps policymakers better grasp regional trends, allowing them to target interventions more effectively. Finally, comparing PMFBY adoption across states will emphasise its breadth and efficacy, providing insights for future policy formulation and implementation. The structure of the article is organised as follows: Section II elaborates on the data and methods; Sections III and IV show the coverage of crop insurance in India and across the states; and Section V comprises the concluding remarks.

II. Data and Methods

This article has employed two rounds (70th and 77th) of farm household-level data collected by the National Sample Survey Office (NSSO), that is, the Situation Assessment Survey of Agricultural Households 2012–2013 and the Land and Livestock Holdings of Households and Situation Assessment of Agricultural Households 2018–2019. These data sets are the most appropriate source of disaggregated unit-level data that captures the agricultural landscape at the household level in India. These surveys were specific to agricultural households and are considered a representative sample of farmers in India; several studies have made inferences about the agrarian situation in India based on these data sets. Moreover, compared to other household-level data sets such as the India Human Development Survey, National Family Health Survey and District Level Household Facility Survey, these data sets provide a more comprehensive and representative sample of agricultural households, offering in-depth insights into various aspects of agriculture across the country. Additionally, the survey is conducted at regular intervals, making it reliable for assessing the agricultural scenario over time. For empirical assessment, this article considered data[3] of around 30,446 households during the kharif season in 2012–2013 (i.e., July–December 2012), 25,196 households during the rabi season in 2012–2013 (i.e., February–June 2013), 41,603 households during the kharif season in 2018–2019 (i.e., July–December 2018), and 31,778 households during the rabi season in 2018–2019 (i.e., February–June 2019). Since around 1% of landless farmers were interviewed in 2018–2019, we have not compared the findings of landless farmers[4] in 2012–2013 with those conducted in 2018–2019. In addition, state-level data was gathered from the Agricultural Insurance Company of India[5] and the PMFBY website (Ministry of Agriculture & Farmers Welfare, 2025a). We have estimated descriptive statistics and compounded annual growth rate (CAGR).

Development of Crop Insurance Programme in 2012–2019

Crop insurance programmes in India had a dynamic transition between 2012 and 2019 regarding insurance design, enrollment procedure and stakeholder participation, resulting in better accessibility,

coverage and efficiency. On the eve of 2013, three crop insurance programmes were operational in India: NAIS, MNAIS and WBCIS (Mukherjee & Pal, 2017). NIAS, established in 1999, had an area-based strategy, paying farmers based on the average yield losses in a specific region, whereas MNAIS was introduced in 2010 with localised risk coverage, covering events like hailstorms and landslides (Nair, 2010b). Due to high dependence on manual field assessments for crop loss, both NAIS and MNAIS resulted in delayed claim settlement. Additionally, WBCIS was launched in 2007 to improve the loss assessment procedure by linking payouts to deviations in specific weather parameters like rainfall, temperature and humidity, but the scheme was still limited by weather data availability and infrastructure (Ogra, 2018). The enrollment methods for these crop insurance programmes were primarily offline and manual. Although these schemes were mandatory for loanee farmers, non-loanee farmers had to join voluntarily, which required extensive paperwork and advance premium payments, complicating the scheme for marginal and small farmers (Dey & Maitra, 2017). Government agencies and public sector banks primarily lead these insurance schemes; for instance, the Agriculture Insurance Company of India (AIC) is the primary insurer.

Since 2016, PMFBY and RWBCIS have been initiated to offer comprehensive coverage for the entire crop cycle, including pre-sowing, post-harvest and mid-season losses, while addressing localised risks like pest attacks (Ministry of Agriculture & Farmers Welfare, 2025b). The scheme integrated advanced technology such as satellite imagery, drones and remote sensing to assess crop damage, improving the speed and accuracy of claim settlements. The enrollment process was modernised under PMFBY and RWBCIS, with offline and digital options available (Tiwari et al., 2020). While loanee farmers were still automatically enrolled, non-loanee farmers could voluntarily join through online platforms, such as the PMFBY portal and mobile apps. This digital integration significantly simplified enrollment, reducing the need for physical bank visits and allowing farmers to access their policy details, file claims and receive updates from their mobile devices (Murthy et al., 2022). There was a notable expansion in the involvement of stakeholders. Private insurance companies became critical players in implementing PMFBY and RWBCIS, competing alongside the AIC to provide insurance coverage (Ministry of Agriculture & Farmers Welfare, 2025b).

III. Findings and Discussion

Crop Insurance Coverage in India

Figure 1 compares the status of the adoption of crop insurance in 2012–2013 and 2018–2019. It shows that even 3 years after implementing the PMFBY and the RWBCIS, many farmers did not opt for crop insurance in 2018–2019. During the kharif season in 2012–2013, around 5.9% of the total number of surveyed farmers opted for crop insurance, which spiked to 9.25% during the kharif season in 2018–2019 (with the CAGR being 8%). In the case of the rabi season, the adoption rate increased from 3.66% in 2012–2013 to 7.61% in 2018–2019, with the CAGR being 13% (see Appendix A). This reveals that a marginally higher percentage of farmers opted for crop insurance in the kharif season than in the rabi season. Such a result can be attributed to crop production in the kharif season significantly relying on the monsoon, which is often unpredictable, leading to a higher risk of crop damage. Further, crop production in the kharif season is also affected by frequently occurring natural calamities like drought, flood and cyclonic storms during this period (Mukherjee & Pal, 2019). Also, crop production in the kharif season requires high upfront investment in seeds, fertilisers and pesticides because many of these crops are cultivated on a large scale. Five decades after the beginning of the crop insurance scheme in India, the adoption rate is below 10%, according to both rounds of the NSSO surveys.

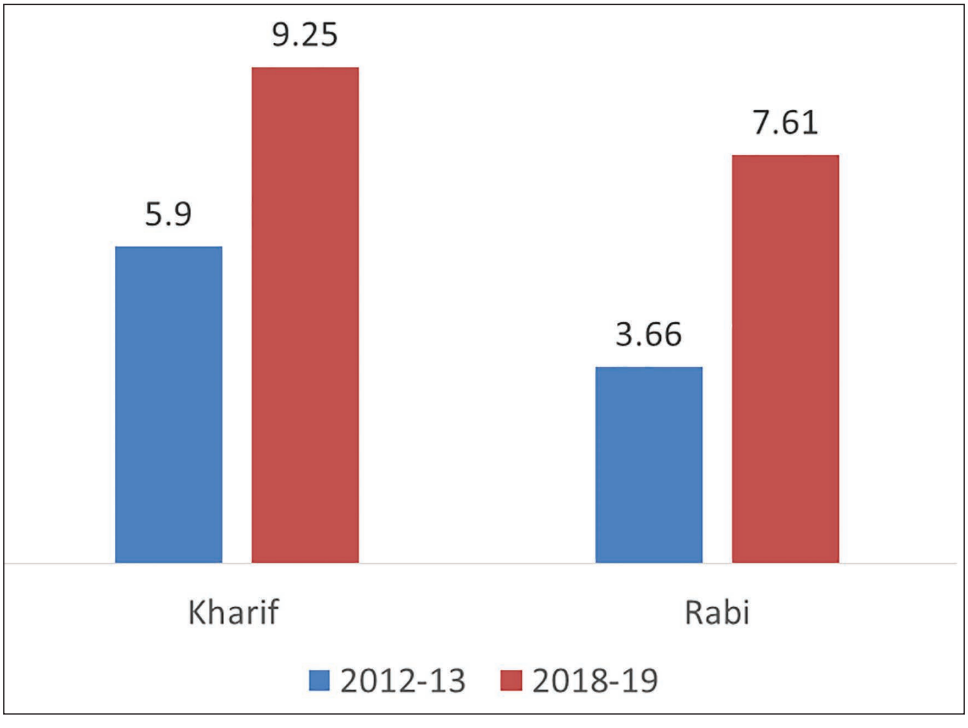

Figure 1. Percentage of Farm Households Insured Crops in India.

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

The landholding-wise (landless, marginal, small, medium and large) adoption of crop insurance schemes is presented in Figure 2. In line with previous studies (Cariappa et al., 2020), it can be observed that a higher percentage of large and medium farmers opted for crop insurance in 2012–2013 and 2018–2019. Among large farmers, adoption rates increased from 22.31% in 2012–2013 to 32.94% in 2018–2019 during the kharif season (reflecting a CAGR of 6.7%) and from 13.73% to 27.94% in the rabi season, with a CAGR of 12.57% (see Appendix B). With reference to medium farmers, around 14.26% opted for crop insurance during the kharif season of 2012–2013. This increased to 18.37% in the kharif season of 2018–2019 (CAGR is 4.31%). Similarly, during the rabi season, the adoption percentage grew from 8.16% (2012–2013) to 14.27% (2018–2019), with the CAGR being 9.76% (see Appendix B). Medium and large farmers are likely to purchase crop insurance due to the availability of financial resources, access to information and high-risk awareness. These farmers have invested considerably in agricultural inputs; thus, they are more likely to use risk-averse techniques like crop insurance to protect against future losses (Cariappa et al., 2020).

Approximately 4.22% of landless and marginal farmers chose crop insurance during the 2012–2013 kharif season. This number slightly raised to 5.16% in the kharif season in 2018–2019 (CAGR is 3.4%). However, the rabi season exhibits a slightly higher trend, with a marginal increase from 2.64% in 2012–2013 to 4.46% in 2018–2019, with a CAGR of 9.13% (see Appendix B). Similarly, small farmers' adoption rates improve marginally during the rabi and kharif seasons (see Figure 2). Among the small farmers, around 7.92% adopted crop insurance schemes in the kharif season of 2012–2013. This number increased

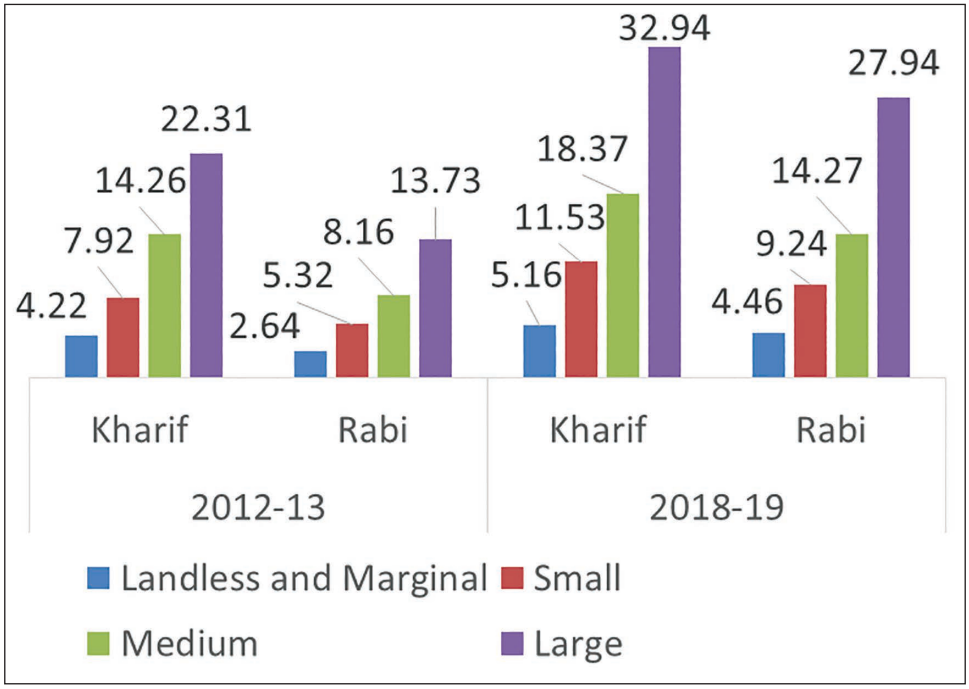

Figure 2. Crop Insurance Adoption by Landholding (%).

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

to 11.53% in 2018–2019, with the CAGR at 6.46% (see Appendix B). During the rabi season, around 5.32% of small farmers enrolled in crop insurance schemes in 2012–2013, and this figure almost doubled in 2018–2019, standing at 9.24%, with the CAGR being 9.64% (see Appendix B). Compared to medium and large farmers, landless and smallholders are the lowest adopters of crop insurance due to various barriers such as insufficient income, high opportunity costs, difficulties in obtaining credit, a lack of financial literacy and land ownership, as identified by Rajeev and Nagendran (2019) (see Biswal & Bahinipati, 2022).

The adoption of crop insurance schemes among the different caste categories, such as the scheduled caste (SC), the scheduled tribe (ST), other backward classes (OBC) and other castes, has been presented in Figure 3. During the kharif season (in 2012–2013), around 7% of OBC farmers opted for crop insurance, which was close to 4% during the rabi season. In 2018–2019, between 11% and 12% of the OBC farmers purchased crop insurance during the kharif season, and around 8% did so during the rabi season. As expected, the adoption rate among SC and ST farmers has been relatively low. Around 2%–4% of the SC and ST farmers obtained crop insurance for both seasons in 2012–2013. This figure varies from 4% to 6% in 2018–2019. There could be three reasons for the low adoption rate of crop insurance schemes among SC and ST farmers. First, these households have fewer resources and not enough income to be in a position to make such an investment (Aditya et al., 2018; Birthal et al., 2017). Second, these households have less chance of availing credit from formal sources (Birthal et al., 2017). Third, they are also not entirely aware of the benefits of crop insurance due to a lack of education and financial literacy (Cariappa et al., 2020; Mukherjee & Pal, 2019).

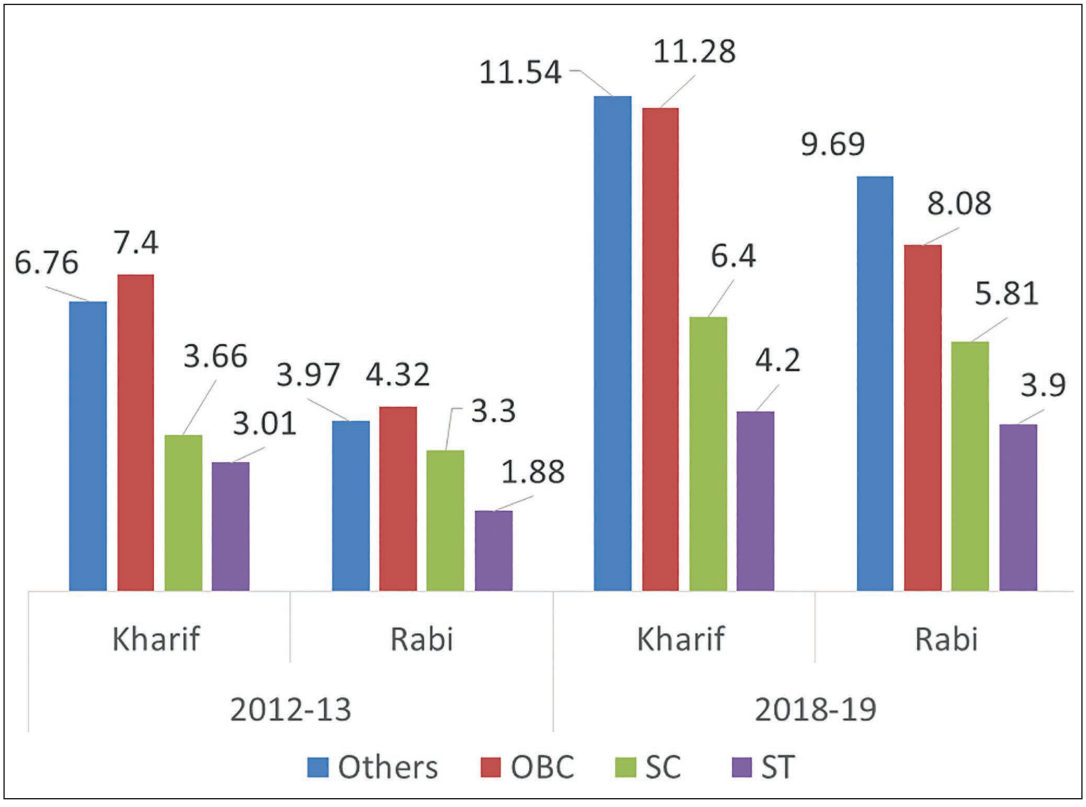

Figure 3. Crop Insurance Adoption by Caste Categories.

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

Figure 4 reports the percentage of farmers who opted for PMFBY based on NSSO data obtained in 2018–2019. Following this, Figure 5 represents the landholding-wise percentage of farm households that adopted PMFBY. Although a significant budgetary allocation was made for the PMFBY (Shroff & Phadke, 2022), a very low percentage of nearly 6% of farmers enrolled (see Figure 4). Figure 5 indicates that around 24% of the total number of large farmers opted for the PMFBY compared to around 3% of landless and marginal farmers, 7% of small farmers, and 13% of medium farmers.

Table 1 shows the adoption of crop insurance schemes by quintiles in per-capita consumption expenditure. Quintile one generally represents poor farmers, and the wealthiest farm households belong to quintile five. As observed in the cases of landholding and caste, the adoption percentage representing the farmers in quintile one is always lower compared to the other quintiles (Mukhopadhyay et al., 2018). In 2012–2013, no significant difference was noted across the quintiles; adoption rates of 5%–7% in the kharif season and 2%–4% in the rabi season were recorded. In the kharif season of 2018–2019, around 6% of the farmers in quintile one adopted crop insurance schemes, while it was around 10%–12% for quintiles three to five. Likewise, during the rabi season of 2018–2019, an adoption rate of less than 5% was recorded from quintile one, while rates were close to 8%–9% for quintiles three and four and more than 10% for quintile five.

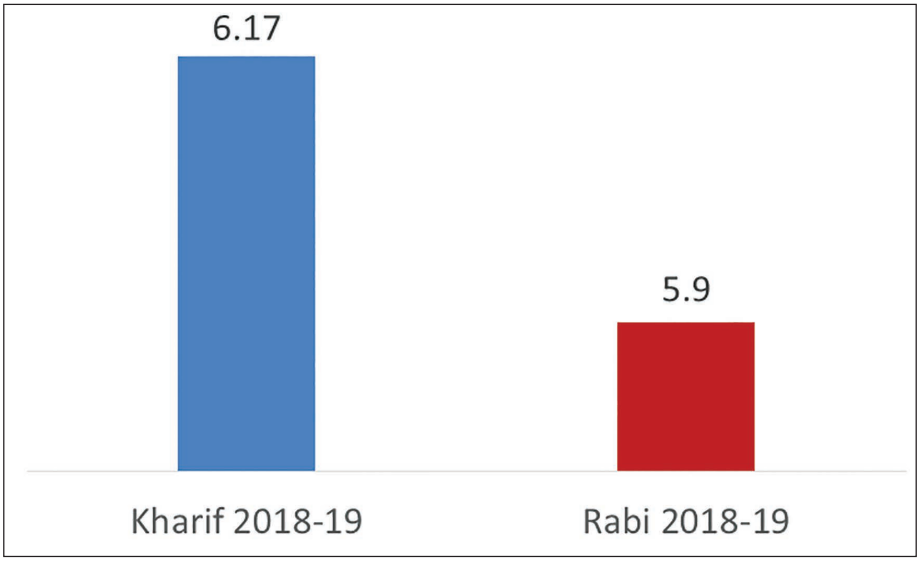

Figure 4. Percentage of Farmers Who Adopted Pradhan Mantri Fasal Bima Yojana (PMFBY) Based on National Sample Survey Office (NSSO) (2018–2019).

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

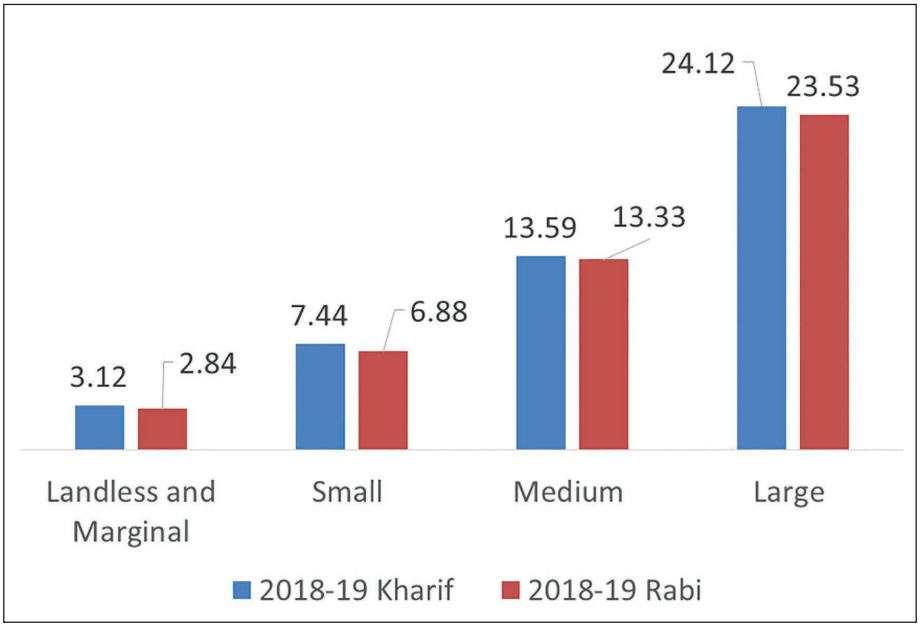

Figure 5. Percentage of Farm Households Opted for Pradhan Mantri Fasal Bima Yojana (PMFBY) by Landholding (2018–2019).

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

Table 1. Adoption of Crop Insurance by Per-capita Consumption Expenditure Quintile (%).

	2012–2013		2018–2019	
	Kharif	Rabi	Kharif	Rabi
Quintile 1	4.70	2.88	5.97	4.59
Quintile 2	6.49	3.55	7.31	6.32
Quintile 3	5.81	3.57	9.94	8.50
Quintile 4	6.53	4.19	11.15	8.56
Quintile 5	6.00	4.11	11.93	10.10

Source: Authors' calculation based on the data collected from National Sample Survey Office (NSSO).

Table 2. Number of Crops Insured by Farmers in India (%).

	2012–2013 (Kharif)				2018–2019 (Kharif)			
	Crop 1	Crop 2	Crop 3	Crop 4	Crop 1	Crop 2	Crop 3	Crop 4
Landless[6]	2.45	0.39	0.12	0.02	–	–	–	–
Marginal	4.61	1.1	0.24	0.14	4.49	0.7	0.12	0.1
Small	5.47	1.65	0.54	0.28	8.82	2.27	0.59	0.24
Medium	8.08	2.94	1.96	1.28	12.01	4.53	1.51	0.83
Large	10.74	4.96	2.48	4.13	17.18	6.75	4.29	4.91
Total	4.19	1.09	0.42	0.24	7.07	1.84	0.51	0.28

Source: Authors' calculation based on the data collected from National Sample Survey Office (NSSO).

Table 2 analyses the number of crops insured within each landholding category, helping to understand the extent of crop insurance coverage across different categories. This analysis can reveal patterns, such as whether smaller farmers insure fewer crops than larger farmers or if specific categories are more inclined to insure their crops. These insights could guide policy decisions or support farm groups with lower insurance coverage. In sum, about 4% of the households insured a single crop during 2012–2013, only 1% insured two crops, and less than 1% insured three and four crops, that is, 0.42% and 0.24%, respectively. About 7% of the total number of farmers insured a single crop in 2018–2019, and this rate significantly declined when it comes to insuring more than a single crop. For example, the adoption rate stood at around 2% for two crops and plummeted to 0.51% for insuring three crops and 0.28% for insuring four crops. Within the landholding categories, it has been found that less than 1% of the total number of marginal and small farmers insure three or four crops. This rate is between 1% and 2% for medium farmers and falls within the range of 2%–5% for large farmers. The findings indicate that medium and large farmers were more likely to insure more crops. Several factors could explain this trend. First, insuring multiple crops in a season adds a significant financial burden, particularly for landless, small and marginal farmers, who may already struggle to undertake cultivation activities with limited resources. For instance, Paul et al. (2023) report precarious conditions for these farmer categories, as there is hardly any significant difference between input expenditure and value of output. The cost of premiums, even with subsidies, can deter these farmers from insuring more than one crop (Dey & Maitra, 2017). Second, landholding size plays a crucial role in crop insurance decisions. Landless, small and marginal farmers typically operate on small plots, often cultivating one major crop alongside a few minor crops. Given this, they prioritise insuring the primary crop, representing the bulk of their income, while neglecting the minor crops. Medium and large

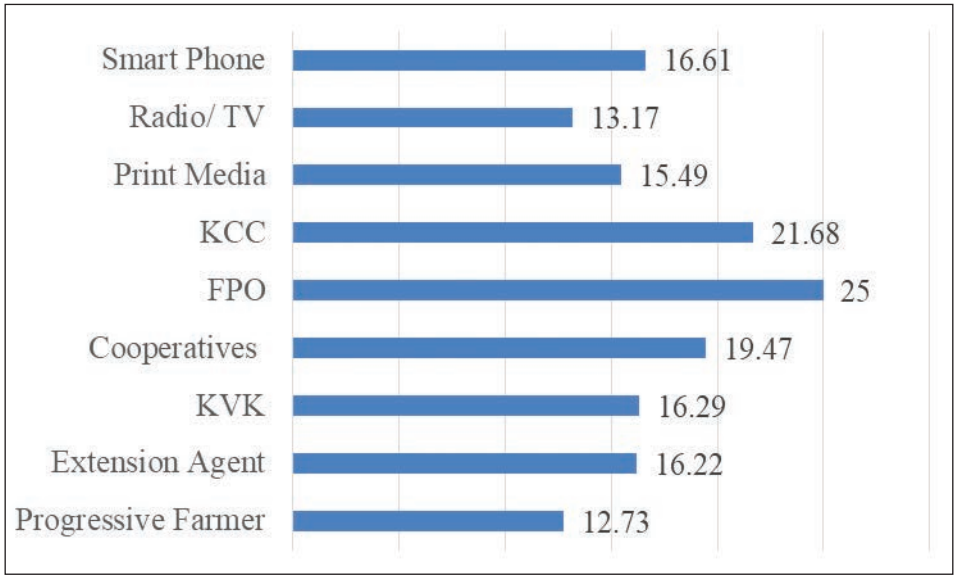

Figure 6. Adoption of Crop Insurance by Access to Institutions and Information Channels in Kharif 2018–2019 (%).

Source: Authors' figure based on the data collected from National Sample Survey Office (NSSO).

Notes: FPO: Farmer Producer Organisation; KCC: Kishan Credit Card; KVK: Krushi Vigyan Kendra; TV: Television.

farmers, with more extensive landholdings, are better positioned to insure multiple crops, as their larger scale of operations enables them to absorb the costs and spread risk across different crops.

Figure 6 exhibits the adoption of crop insurance by access to institutions and information channels in the kharif season of 2018–2019. The adoption rate is at its highest (i.e., 25%) among farmers with access to the Farmer Producer Organisation (FPO). Also, the adoption rate is about 22% for farmers with access to the Kishan Credit Card (KCC) enrolled in the crop insurance scheme. Similarly, the adoption rate is 20% for farmers with access to cooperative societies. It is evident that loanee farmers have, by default, purchased insurance before 2020 as crop insurance was a default option for crop loans, and now it is voluntary for both loanee and non-loanee farmers (Kulkarni et al., 2021). Information related to insurance is provided on various communication channels, such as radio, television and newspapers. Access to these could have motivated farmers to opt for crop insurance, and moreover, it is between 13% and 17%, as reported in Figure 6. Farmers should generally obtain agronomics, agrometeorology and crop insurance information through agricultural extension services and Krushi Vigyan Kendra (KVK). However, only 16% of farmers with access to KVK and extension services have opted for crop insurance (see Figure 6). This reveals the weak organisational capacities of the institutions associated with agriculture and allied activities (see Bahinipati et al., 2024; Ishtiaque et al., 2024).

IV. State-wise Crop Insurance Coverage in India

The state-wise adoption of crop insurance during the kharif and rabi seasons of 2012–2013 and 2018–2019 are shown in Figures 7 through 10 (see Appendices C through F). The states with low adoption

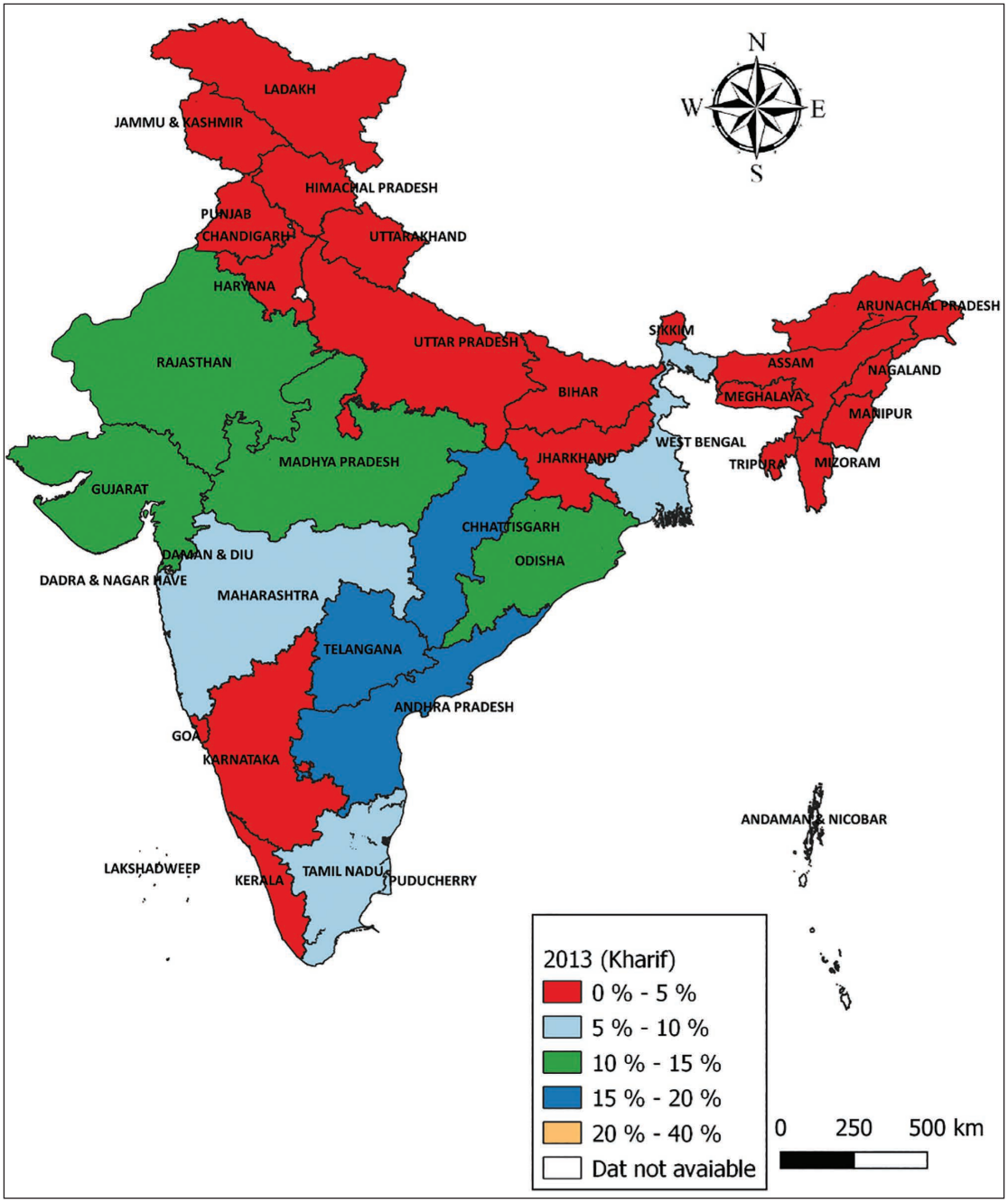

Figure 7. State-wise Crop Insurance Adoption During Kharif 2012–2013.

Source: Prepared by the author based on the maps collected from different sources and data gather from 70th round of National Sample Survey Office (NSSO) (2012–2013).

Note: This map is not to scale and does not depict authentic boundaries.

rates (i.e., less than 5%) during the kharif season of 2012–2013, as outlined in Figure 7 and Appendix C, were Jammu and Kashmir (0.15%), Punjab (1.63%), Haryana (0.44%), Himachal Pradesh (2.81%), Uttarakhand (0.74%), Uttar Pradesh (1.69%), Bihar (2.92%), Jharkhand (4.74%), Assam (0.39%), Meghalaya (0.2%), Manipur (1.15%), Nagaland (0.88%), Arunachal Pradesh (0.78%), Sikkim (0.33%), Karnataka (4.64%) and Kerala (3.43%). In the kharif season of 2018–2019, the adoption rate was again between 0% and 5% for these states, excluding only Haryana (28.69%) and Himachal Pradesh (6.72%), as seen in Figure 8 and Appendix D. Only three states, Chhattisgarh (19.07%), Andhra Pradesh (17.02%) and Telangana (16.48%), had adoption rates falling between 15% and 20% during the kharif season of 2012–2013, and these three states also had a higher percentage of crop insurance uptake in comparison to other states in India; the state like Chhattisgarh has occupied the highest position among the three (see Figure 7 and Appendix C). Moreover, the adoption rate crossed the 20% mark in three states: Andhra Pradesh (24.79%), Chhattisgarh (28.76%) and Haryana (28.69%); this was during the kharif season of 2018–2019 (see Figure 8 and Appendix D). Further, four states, namely Gujarat (13.78%), Rajasthan (14.32%), Madhya Pradesh (11.74%) and Odisha (12.53%), were situated in the 10%–15% bracket. The states with adoption rates between 5% and 10% included Maharashtra (6.21%), Tamil Nadu (5.76%) and West Bengal (5.94%), as seen during the kharif season of 2012–2013 (see Figure 7 and Appendix C). Adoption rates increased in Tamil Nadu (12.54%) and Maharashtra (19.54%) during the kharif season of 2018–2019 (see Appendix D). And five states recorded adoption rates falling in the 10%–15% range, as seen during the kharif season of 2018–2019. These included states like Gujarat (11.87%), Rajasthan (14.74%), Madhya Pradesh (11.91%), Tamil Nadu (12.54%) and Odisha (13.78%), corroborated in Figure 8 and Appendix D. Only two states saw adoption rates between 15% and 20% during this period: Maharashtra (19.54%) and Telangana (19.43%), as noted in Figure 8 and Appendix D.

Figure 9 shows that only the state of Chhattisgarh recorded the highest rate of crop insurance adoption (i.e., 16.39%) among all the states in India during the rabi season of 2012–2013 (see Appendix E). Around three states fell into the range of 10%–15%, that is, Rajasthan (13.68%), Madhya Pradesh (12.47%) and Telangana (14.35%), as noted in Figure 9 and Appendix E. Another three states recorded adoption rates between 5% and 10%, and these were Tamil Nadu (7.19%), Andhra Pradesh (6.45%) and West Bengal (5.13%). The remaining 13 states fell into the low adoption category during the rabi season of 2012–2013 (i.e., 0%–5%). These were Jammu and Kashmir (0.18%), Punjab (0.18%), Himachal Pradesh (1.39%), Uttar Pradesh (1.61%), Bihar (0.8%), Assam (0.41%), Meghalaya (0.62%), Manipur (0%), Nagaland (0.32%), Sikkim (0%), Haryana (0.44%), Uttarakhand (0%), Jharkhand (1.02%) and Arunachal Pradesh (0.99%), as noted in Figure 9 and Appendix E. During the rabi season of 2018–2019, around 12 states had low adoption, that is, 0%–5%. These were Jammu and Kashmir (0.96%), Punjab (1.35%), Himachal Pradesh (3.64%), Uttar Pradesh (2.3%), Bihar (2.5%), Assam (0.47%), Meghalaya (0.35%), Manipur (0%), Nagaland (0%), Mizoram (0%), Sikkim (3.98%) and Jharkhand (2.4%), as noted in Figure 10 and Appendix F. The adoption rate was highest in Haryana (i.e., 28.72%) as compared to the other states in India (see Figure 10 and Appendix F). Between 2012–2013 and 2018–2019, the states that shifted from the lower to the upper bracket for the adoption of crop insurance included Rajasthan, Madhya Pradesh, Telangana, Tamil Nadu, Andhra Pradesh, Chhattisgarh, West Bengal, Arunachal Pradesh, Maharashtra, Karnataka and Haryana.

Landholding and State-wise Adoption of Crop Insurance

Table 3 reports the state-wise adoption of crop insurance during the kharif seasons of 2012–2013 and 2018–2019 according to landholding categories, and Table 4 indicates the same for the rabi seasons of 2012–2013 and 2018–2019.[7] In general, it may be noted that a higher percentage of medium and large

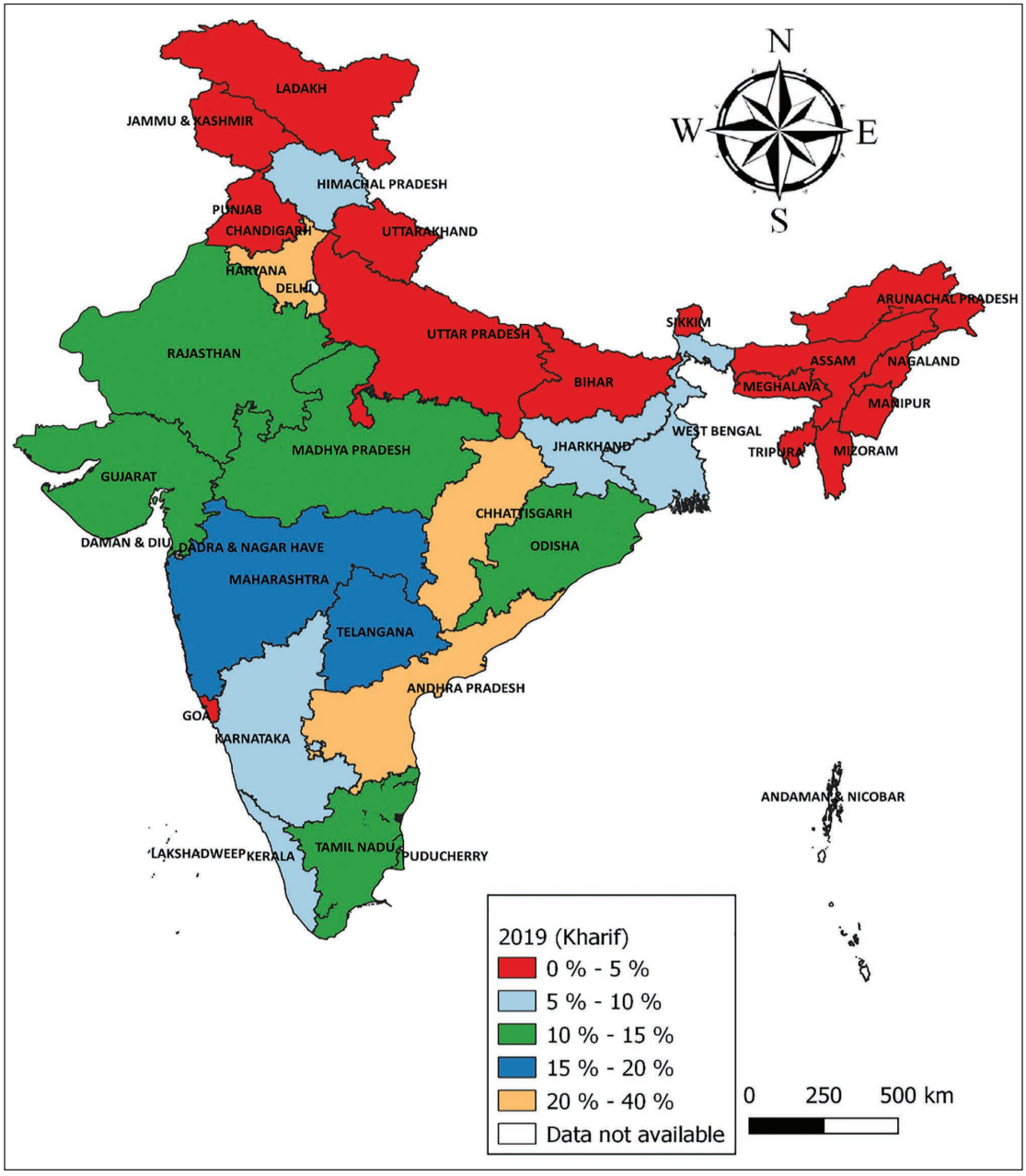

Figure 8. State-wise Crop Insurance Adoption During Kharif 2018–2019.

Source: Prepared by the author based on the maps collected from different sources and data gather from 77th round of National Sample Survey Office (NSSO) (2018–2019).

Note: This map is not to scale and does not depict authentic boundaries.

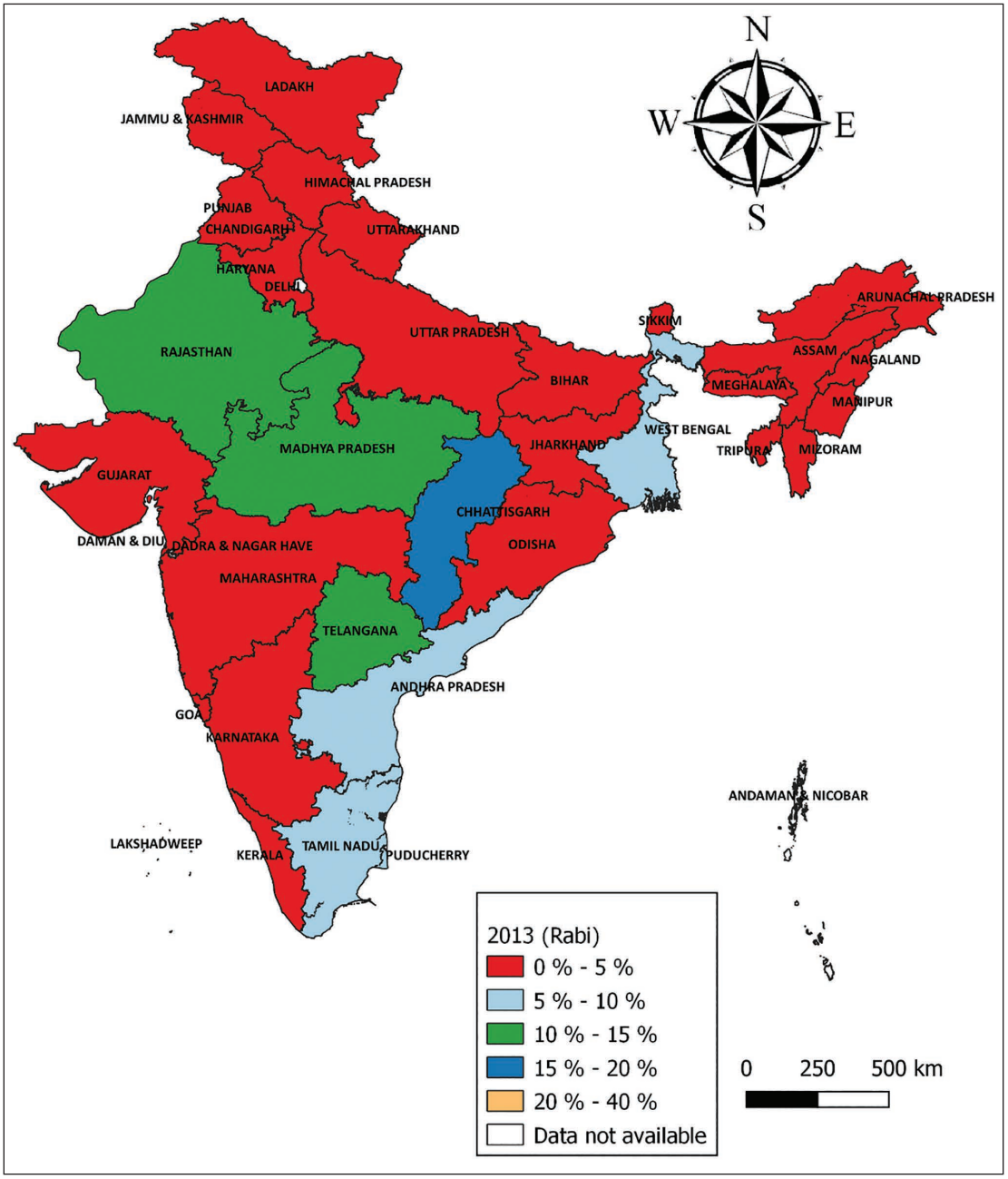

Figure 9. State-wise Crop Insurance Adoption During Rabi 2012–2013.

Source: Prepared by the author based on the maps collected from different sources and data gather from 70th round of National Sample Survey Office (NSSO) (2012–2013).

Note: This map is not to scale and does not depict authentic boundaries.

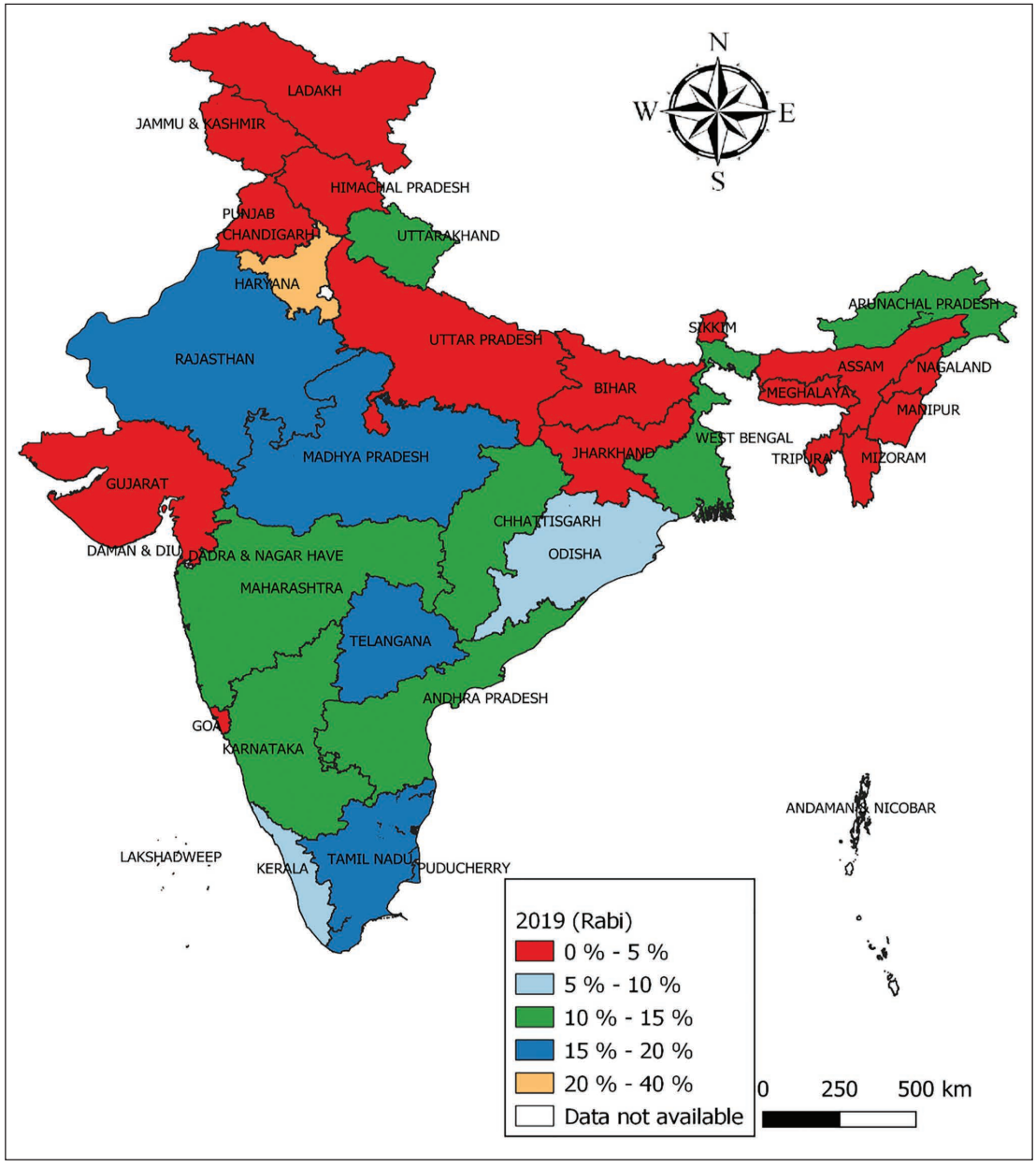

Figure 10. State-wise Crop Insurance Adoption During Rabi 2018–2019.

Source: Prepared by the author based on the maps collected from different sources and data gather from 77th round of National Sample Survey Office (NSSO) (2018–2019).

Note: This map is not to scale and does not depict authentic boundaries.

farmers undertook crop insurance than marginal and small farmers in both years. During the kharif season of 2012–2013, an adoption rate of over 10% was seen among marginal farmers in seven states: Chhattisgarh (22.4%), Andhra Pradesh (19.13%), Gujarat (11.61%), Madhya Pradesh (11.49%), Odisha (15.13%), Rajasthan (11.94%) and Telangana (15.64%). However, adoption rates in the kharif season of 2018–2019 marginally declined in these seven states, though the figure was still higher than 10%. Additionally, states like Haryana, Maharashtra and Tamil Nadu observed an increase (of more than 10%) in the rate of crop insurance adoption in the marginal farmer category during the kharif season of 2018–2019. With regard to small farmers, an adoption rate of over 20% was seen in three states during the kharif season of 2012–2013. These were Andhra Pradesh (28.83%), Odisha (22.22%) and Telangana (21.55%). During the kharif season of 2018–2019, it marginally declines in Andhra Pradesh (27.07%), Odisha (17.01%) and Telangana (21.09%). A spike in percentage rate was observed for small farmers in three states during the kharif season of 2018–2019 as compared to the kharif season of 2012–2013. These states were Chhattisgarh (17.68%–31.56%), Haryana (0%–33.68%) and Maharashtra (8.27%–22.87%). The adoption percentage crossed the 10% mark for small farmers in 13 states: Andhra Pradesh (27.07%), Chhattisgarh (31.48%), Gujarat (14.6%), Haryana (33.68%), Karnataka (10.07%), Kerala (13.14%), Madhya Pradesh (13.04%), Maharashtra (22.87%), Odisha (17.01%), Rajasthan (17.45%), Tamil Nadu (14.30%), Telangana (21.09%) and West Bengal (11.13%). Although medium farmers in specific states reported an adoption rate of over 30% during the kharif season of 2012–2013, as in the cases of Chhattisgarh (37.88%), Gujarat (30.99%) and Odisha (33.72%), an improvement in the kharif season in the year 2018–2019 was observed only for the state of Chhattisgarh (46.86%), and the figure was seen to decline to well below 30% for Gujarat (20.75%) and Odisha (26.32%) during the same season in 2018–2019 (see Table 3). Three states also recorded an adoption rate of over 30% for medium farmers in the kharif season of 2018–2019: Andhra Pradesh (32.56%), Haryana (48.59%) and Maharashtra (30.29%).

Adoption rates of over 10% were recorded in the case of marginal farmers in the following states during the rabi season of 2012–2013: Chhattisgarh (19.18%), Madhya Pradesh (10.39%), Rajasthan (12.54%) and Telangana (14.39%), but except Telangana, these figures declined during the rabi season of 2018–2019 (see Table 4). In four states, an adoption rate of over 10% was noted among marginal farmers during the rabi season of 2018–2019, and these states were Haryana (10.14%) and Tamil Nadu (16.24%). In the case of small farmers, an adoption rate of over 15% was observed in four states (during the rabi season of 2012–2013): Chhattisgarh (15.79%), Madhya Pradesh (17.28%), Rajasthan (19.21%) and Telangana (16.03%). Growth in adoption rate was explicitly noted in the states of Chhattisgarh (18.35%) and Telangana (18.28%) during the rabi season of 2018–2019. There were only three states where an adoption rate of over 20% was observed for medium farmers during the rabi season of 2012–2013, and these were Madhya Pradesh (22.3%), Rajasthan (22.66%) and Telangana (26.19%). Adoption rates between 10% and 20% were seen in four states in the medium farmer category during the rabi season of 2012–2013, and these were Chhattisgarh (17.95%), Odisha (14.58%), Tamil Nadu (10.93%) and West Bengal (14.29%). Additionally, an adoption rate of over 40% was observed in Haryana (47.59%) during the rabi season of 2018–2019. An additional five states recorded adoption rate between 20% and 30%: Madhya Pradesh (23.69%), Rajasthan (25.68%), Telangana (23.81%), Tamil Nadu (25%), and Maharashtra (20.75%) (see Table 4).

State-wise Adoption of PMFBY

Table 5 indicates the state-wise distribution of the percentage of farmers insured and the area covered by the PMFBY during the kharif season from 2016 to 2021. The states like Chhattisgarh, Haryana, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Rajasthan have the highest percentage of farmer-insured crops

Table 3. State-wise Crop Insurance Adoption During the Kharif Season of 2012–2013 and 2018–2019 by Landholding (%).

	2012–2013 (Kharif)					2018–2019 (Kharif)				
State Name	Landless	Marginal	Small	Medium	Large	Landless	Marginal	Small	Medium	Large
Andhra Pradesh	10.45	19.13	28.83	25.88	100	NA	16.12	27.07	32.56	43.75
Arunachal Pradesh	0.00	3.28	0.00	0.00	NA	NA	2.15	4.73	0	NA
Assam	0.17	0.61	0.28	1.15	0	NA	0.30|	0.39	0.49	0
Bihar	2.33	3.70	2.89	5.3	0	NA	2.13	4.48	10.99	0.00
Chhattisgarh	9.84	22.40	17.68	37.88	100	NA	17.65	31.48	46.86	100
Goa	0	0	0	0	0	NA	2.56	8.33	0	0
Gujarat	7.34	11.61	12.97	30.99	28.57	NA	6.88	14.60	20.75	9.09
Haryana	0	0	0	1.16	20	NA	10.16	33.68	48.59	36.36
Himachal Pradesh	0.69	2.92	5.48	9.52	33.33	NA	4.94	6.31	15.71	0
Jammu & Kashmir	0.22	0	0	0	NA	NA	0.22	0.65	2.63	NA
Jharkhand	3.40	3.39	10.78	11.43	0	NA	5.94	9.69	15.60	0
Karnataka	3.03	3.31	5.38	8.29	16.67	NA	6.67	10.07	13.30	28.57
Kerala	1.05	6.65	7.02	6.25	0	NA	5.68	13.14	17.24	0.00
Madhya Pradesh	4.44	11.49	12.00	24.91	14.29	NA	6.05	13.04	21.55	36.36
Maharashtra	3.01	4.96	8.27	11.75	12.5	NA	11.16	22.87	30.29	64.71
Manipur	0.92	1.30	1.92	0	NA	NA	1.24	1.61	0	NA
Meghalaya	0	0	0.75	0	0	NA	0.74	1.69	0	0
Mizoram	0.81	0.00	0.00	0.00	NA	NA	0.47	0.84	0	NA
Nagaland	0.76	1.15 |	1.47	0	NA	NA	NA	NA	NA	NA
Odisha	6.87	15.13	22.22	33.72	100	NA	7.64	17.10	26.32	60
Punjab	0.66	0.00	2.70	2.92	11.11	NA	0	1.32	1.20	0
Rajasthan	5.49	11.94	17.96	28.52	30.77	NA	8.04	17.45	23.55	52.17
Sikkim	0.76	0.00	0.00	0.00	NA	NA	1.77	4.88	4.35	NA
Tamil Nadu	2.78	6.02	5.22	12.82	16.67	NA	10.07	14.30	14.38	37.5
Telengana	10.68	15.64	21.55	21.69	66.67	NA	12.93	21.09	26.64	20.00
Tripura	1.38	2.39	0.00	0.00	NA	NA	1.87	0.00	0.00	NA
Uttar Pradesh	0.98	1.24	1.82	6.08	0	NA	2.04	3.79	5.96	18.18
Uttarakhand	0	2.70	7.14	0	NA	NA	2.05	8.00	19.57	33.33
West Bengal	3.90	8.70	13.82	11.86	NA	NA	5.18	11.13	16.95	NA

Source: Authors' calculation based on the NSSO data.

Note: NA: Not available.

Table 4. State-wise Crop Insurance Adoption During the Rabi Season of 2012–2013 and 2018–2019 by Landholding (%).

	2012–2013 (Rabi)					2018–2019 (Rabi)				
State Name	Landless	Marginal	Small	Medium	Large	Landless	Marginal	Small	Medium	Large
Andhra Pradesh	5.42	9.09	5.38	7.81	33.33	NA	4.62	9.94	17.61	33.33
Arunachal Pradesh	0	4.00	0	0	NA	NA	8.14	16.88	5.41	NA
Assam	0.18	0.42	0.00	3.37	0	NA	0.43	0.74	0	0
Bihar	0.28	1.38	1.66	1.55	0	NA	1.33	3.81	7.05	0
Chhattisgarh	13.21	19.18	15.79	17.95	0	NA	7.75	18.35	18.68	50.00
Goa	2.04	0	0	0	NA	NA	0	0	0	0
Gujarat	0.94	0.44	0.00	0	0	NA	1.62	5.22	8.63	0
Haryana	0	0	0	1.14	20	NA	10.14	33.33	47.59	40
Himachal Pradesh	0	3.05	1.45	2.5	0	NA	2.49	4.40	7.69	0
Jammu & Kashmir	0.29	0	0	0	NA	NA	0	2.20	3.03	NA
Jharkhand	0	1.54	2.38	3.03	NA	NA	2.56	2.07	2.35	0
Karnataka	0.7	3.35	2.45	3.36	11.76	NA	6.29	15.21	18.49	16.67
Kerala	0.6	4.44	3.54	5.19	0	NA	5.65	12.23	14	0
Madhya Pradesh	5.29	10.39	17.28	22.3	28.57	NA	9.27	16.22	23.69	54.55
Maharashtra	2.26	4.14	3.30	3.83	0	NA	6.71	15.46	20.75	33.33
Manipur	NA	NA	NA	NA	NA	NA	0.00	0.00	0.00	NA
Meghalaya	0.63	0.58	0.78	0	0	NA	0.59	0	0	0
Mizoram	0.84	0.91	0.00	0	NA	NA	0	0	0	NA
Nagaland	0	0	1.54	0	NA	NA	0	0	0	0
Odisha	2.05	7.39	5.77	14.58	100	NA	3.65	6.96	10.93	50.00
Punjab	0.65	0	0	0	0	NA	1.42	0.97	1.70	0
Rajasthan	6.9	12.54	19.21	22.66	11.76	NA	8.85	18.73	25.68	33.33
Sikkim	NA	NA	NA	NA	NA	NA	1.93	6.17	10.26	NA
Tamil Nadu	5.45	5.39	9.76	10.93	16.67	NA	16.24	21.37	25.00	50.00
Telangana	8.09	14.39	16.03	26.19	100	NA	17.00	18.28	23.81	25.00
Tripura	NA	NA	NA	NA	NA	NA	1.72	4.08	3.70	NA
Uttar Pradesh	1.06	1.47	1.95	4.08	0	NA	1.19	2.71	4.90	31.25
Uttarakhand	NA	NA	NA	NA	NA	NA	5.82	13.64	38.30	100.00
West Bengal	2.92	7.17	14.60	14.29	NA	NA	9.55	15.20	13.48	NA

Source: Authors' calculation based on the National Sample Survey Office (NSSO) data.

Note: NA: Not available.

Table 5. State-wise Percentage of Farmers and Area Insured Under Pradhan Mantri Fasal Bima Yojana (PMFBY) During the Kharif Season from 2016 to 2021.

	2016		2017		2018		2019		2020		2021	
State Name	Farmer	Area	Farmer	Area	Farmer	Area	Farmer	Area	Farmer	Area	Farmer	Area
Andhra Pradesh	5	4	4.7	4	10	9	16	19	NA	NA	NA	NA
Assam	NA	NA	0.54	0.003	1	1	14	8	21.88	19	21.01	10
Chhattisgarh	NA	NA	NA	NA	30	40	33	44	32.74	42	31.64	39
Gujarat	8	7	6.76	4	0	0	0	0	NA	NA	NA	NA
Haryana	NA	NA	NA	NA	40	27	43	32	39.55	28	32.64	23
Himachal pradesh	8	3	10.83	4	8	3	9	4	8.59	3	8.82	3
Jammu and kashmir	NA	NA	NA	NA	6	8	NA	NA	NA	NA	3.48	3
Jharkhand	30	11	NA	NA	34	19	32	20	NA	NA	NA	NA
Karnataka	NA	NA	2.88	2	24	0	16	0	15.49	0	NA	NA
Kerala	NA	NA	0.09	1	0.001	0.35	0.001	0.35	0.11	0.45	0.06	0.30
Madhya Pradesh	25	22	19.25	20	30	45	25	42	28.20	46	24.65	41
Maharashtra	NA	NA	20.51	8	30	28	31	33	27.98	28	23.60	24
Odisha	NA	NA	8.81	6	37	31	41	40	32.59	25	25.40	23
Rajasthan	NA	NA	32	12	27	23	29	27	39.77	35	40.39	32
Tamil nadu	0	0	0.66	1	2	3	2	3	2.40	3	0.60	1
Telangana	6	5	2.18	2	8	8	8	9	NA	NA	NA	NA
Uttar pradesh	NA	NA	NA	NA	12	16	8	11	7.84	10	7.51	9
Uttarakhand	15	11	7.46	6	10	7	9	7	5.01	2	5.13	2
West Bengal	18	11	19.52	11	26	19	NA	NA	NA	NA	NA	NA

Source: Authors' table based on the data collected from Pradhan Mantri Fasal Bima Yojana (PMFBY) and Agriculture Insurance Company of India (AIC) Website.

Note: NA: Not available.

and area-insured compared to other states. Jharkhand (30%) and Madhya Pradesh (25%) are the two states where 20%–30% of farmers are insured, and Madhya Pradesh has the highest number of areas insured in 2016. Further, in 2017, three states (e.g., Madhya Pradesh, Maharashtra and West Bengal) had around 20% of farmers insured, and Madhya Pradesh, Rajasthan and West Bengal had 10%–20% of the area insured. States like Chhattisgarh, Haryana, Madhya Pradesh, Odisha, Maharashtra and Rajasthan have 20%–50% of farmers and areas under crop insurance from 2018 to 2021. The rising trend in the rate of farmers insured and the percentage of area insured was observed from 2016 to 2019 in several states. However, after implementing the revamped PMFBY guidelines that made crop insurance voluntary for both loanee and non-loanee farmers, crop insurance adoption rates declined in 2020 compared to 2019 (Kulkarni et al., 2021). The same decline picture is also reflected in 2021 compared to 2020.

V. Concluding Observations

This study aims to highlight the status of the adoption of crop insurance in India and across the states based on the data collected from different sources, such as NSSO's two rounds of farmer's situation

assessment surveys, that is, 70th and 77th, and the dashboard of AIC and PMFBY. The adoption rate remains low in India despite the advent of new crop insurance schemes, namely PMFBY and RWBCIS, and a massive subsidy associated with all the crop insurance programmes (Biswal & Bahinipati, 2022). It is observed as a further low in the case of smallholders and farmers belonging to marginalised communities. This could be because of a lack of resources, land documentation, and lower and fragmented land holdings. Additionally, variations in crop insurance adoption are also noticed for seasons. Kharif season has seen a marginally higher adoption rate than the rabi season since the occurrence of frequent natural disasters and monsoon-dependent crops cultivated in the former season. The state-wise adoption of crop insurance shows that around three-fourths of the states in India had adoption rates of less than 10% in 2012–2013, while around three-fifths of the states had below 10% adoption rates in 2018–2019. Notable improvements in adoption rate between the two NSSO rounds were noticed in states like Rajasthan, Madhya Pradesh, Telangana, Tamil Nadu, Andhra Pradesh, Chhattisgarh, West Bengal, Arunachal Pradesh, Maharashtra, Karnataka and Haryana. Between 2016 and 2019, the PMFBY adoption rate reported positive growth in the number of insured farmers and the coverage area. However, this trend started to decline after 2020–2021, when the policy became optional for loanee farmers. Lack of institutional support could be the main reason for low adoption.

There is a pressing need for policy reforms to increase crop insurance adoption in India. First, crop insurance premiums should be tailored to the targeted farmers, prioritising smallholders and farmers from marginalised communities. For instance, different subsidy structures are adopted by national and state governments to enhance the adoption of micro-irrigation in India (see Bahinipati & Viswanathan, 2017), and indeed, studies observed that subsidies influence the adoption of micro-irrigation (Bahinipati & Viswanathan, 2019). In the case of crop Insurance, the Government of Andhra Pradesh has made universal coverage of notified crops through the e-crop registration platform, and the state government is paying all the premium amount on behalf of the farmers (PMFBY, 2023). Further, it can be attached to Pradhan Mantri Kishan Samman Nidhi [PM-KISAN (Ministry of Tribal Affairs, 2024)] so that the premium amount can be deducted from the farmers' entitled amount (₹6,000 per year), which may increase the adoption rate. Ishtiaque et al. (2024) advocate for the right kind of incentives for raising the adoption of climate-smart agriculture practices. Second, there is a need to strengthen institutions associated with agriculture to address the gap in knowledge, finance and claim settlement. For example, Ishtiaque et al. (2024) noticed that weak organisational capacity is the primary reason for observing low adoption of climate-smart agricultural practices in South Asia. Third, various pieces of evidence must be generated using behavioural economics principles to overcome potential behavioural biases. For example, the default enrolment option in crop insurance with pay later premium and opt-out provision can be implemented as Serfilippi et al. (2020) observed, that is, rebate frame crop insurance in Burkina Faso. Fourth, customised crop insurance focusing on state-specific factors like climate, crop type and local farming practices should be implemented to overcome the regional disparities in crop insurance adoption. For instance, making insurance premiums cheap with higher government subsidies for disaster-affected regions can boost the adoption rate. Further, introducing low-premium insurance for local and primary crops could improve the adoption. Fifth, to address the seasonal variation of crop insurance adoption, especially low adoption in the rabi season, boundling coverage of both seasons or offering low premium insurance in the rabi season could accelerate the adoption of crop insurance.

Declaration of Conflicting Interest

The authors declared no potential conflicts of interest regarding the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

Notes

1. This figure is lower across states, except Uttar Pradesh, Haryana and Punjab (Shroff & Phadke, 2022).
2. For instance, farmers are required to pay only 2%, 1.5% and 5% of the sum insured for kharif, rabi and commercial crops, respectively (Dey & Mitra, 2017; Mukherjee & Pal, 2017).
3. The final sample size was determined by merging various blocks relevant to our analysis. Since each block has a different number of samples, we only retained the matched sample sizes after merging the blocks.
4. In figures (Figures 2 and 5) and table (Appendix A) in this article, where we compare adoption rate landholding-wise for both rounds, we have merged landless and marginal farmers.
5. https://www.aicofindia.com/AICEng/Pages/BusinessProfileAllIndia.aspx.; accessed on November 11, 2022
6. Since less than 1% of landless farmers were surveyed during 2018–2019, we have not calculated the adoption rate as it may not represent landless farmers in India.
7. As indicated in the previous section, this study does not compare the results of 2018–2019 with 2012–2013 in the case of landless farmers due to the very low percentage of farmers in this category who were surveyed during 2018–2019.

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Appendix A. Percentage of Farm Households Insured Crops in India.

Year	2012–2013	2018–2019
Kharif	5.9	9.25 (7.78)
Rabi	3.66	7.61 (12.98)

Source: Authors' estimation based on the data collected from National Sample Survey Office (NSSO).

Note: Compounded annual growth rate (CAGR) figures are presented in the brackets.

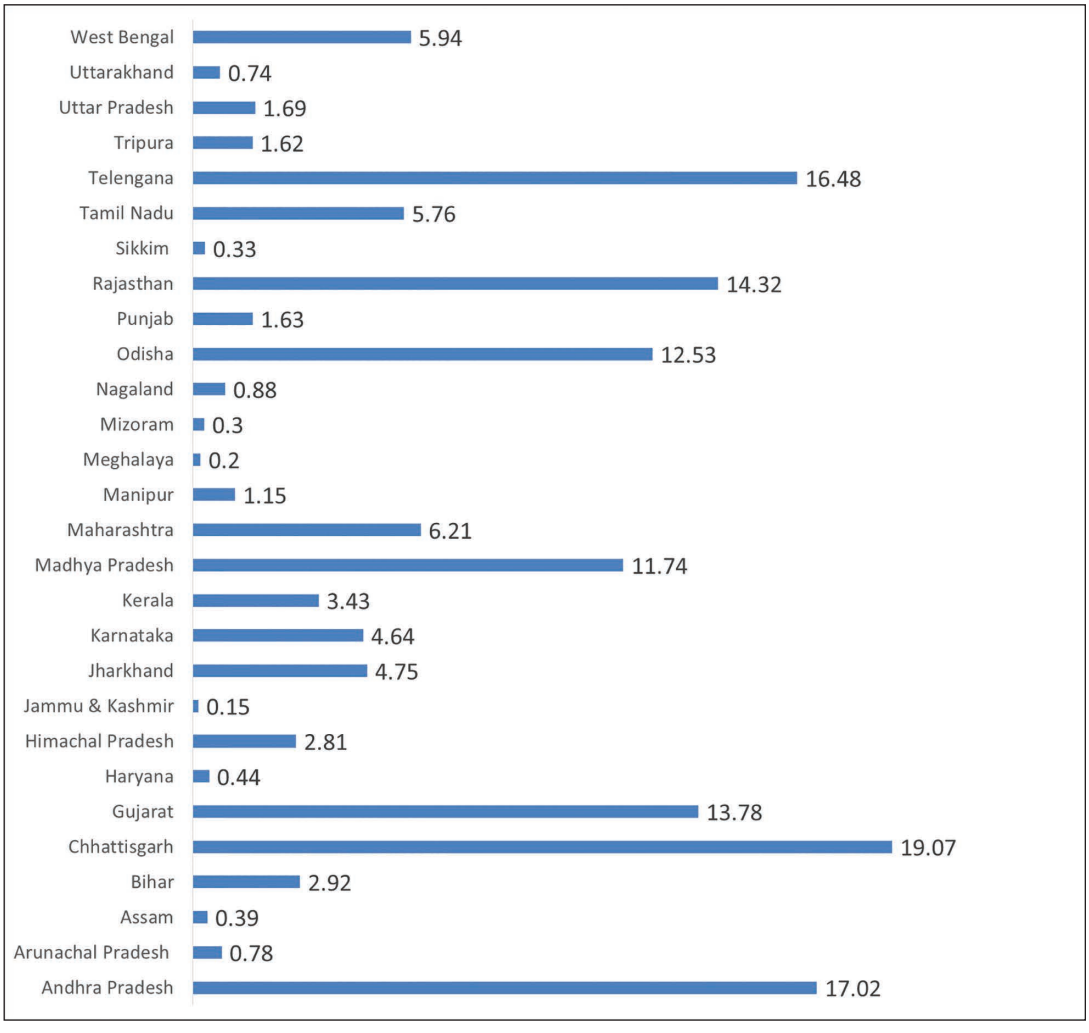
Appendix B. Landholding Wise Adoption of Crop Insurance.

	2012–2013		2018–2019	
Landholding	Kharif	Rabi	Kharif	Rabi
Landless and marginal	4.22	2.64	5.16 (3.4)	4.46 (9.13)
Small	7.92	5.32	11.53 (6.46)	9.24 (9.64)
Medium	14.26	8.16	18.37 (4.31)	14.27 (9.76)
Large	22.31	13.73	32.94 (6.71)	27.94 (12.57)

Source: Authors' calculation based on the data collected from National Sample Survey Office (NSSO).

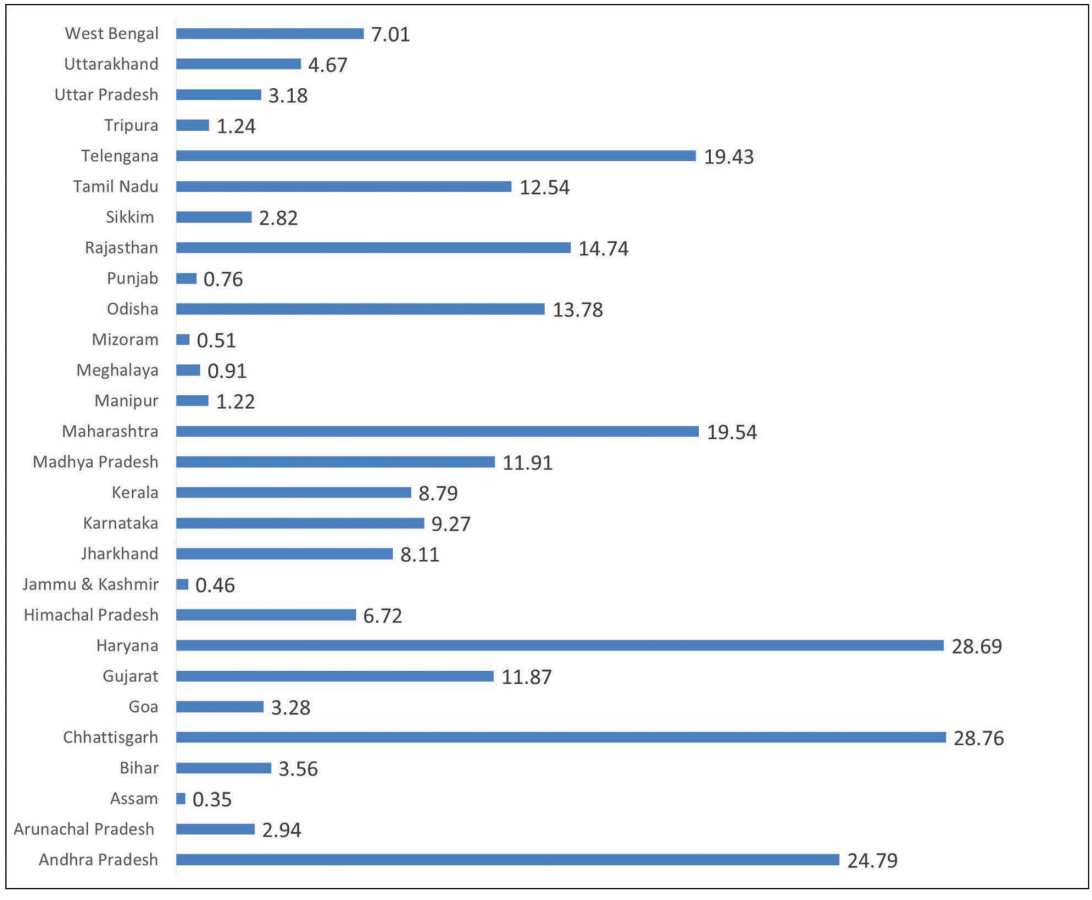
Note: Compounded annual growth rate (CAGR) figures are presented in the brackets.

Appendix C. State-wise Crop Insurance Adoption During Khari 2012–2013 (in %).



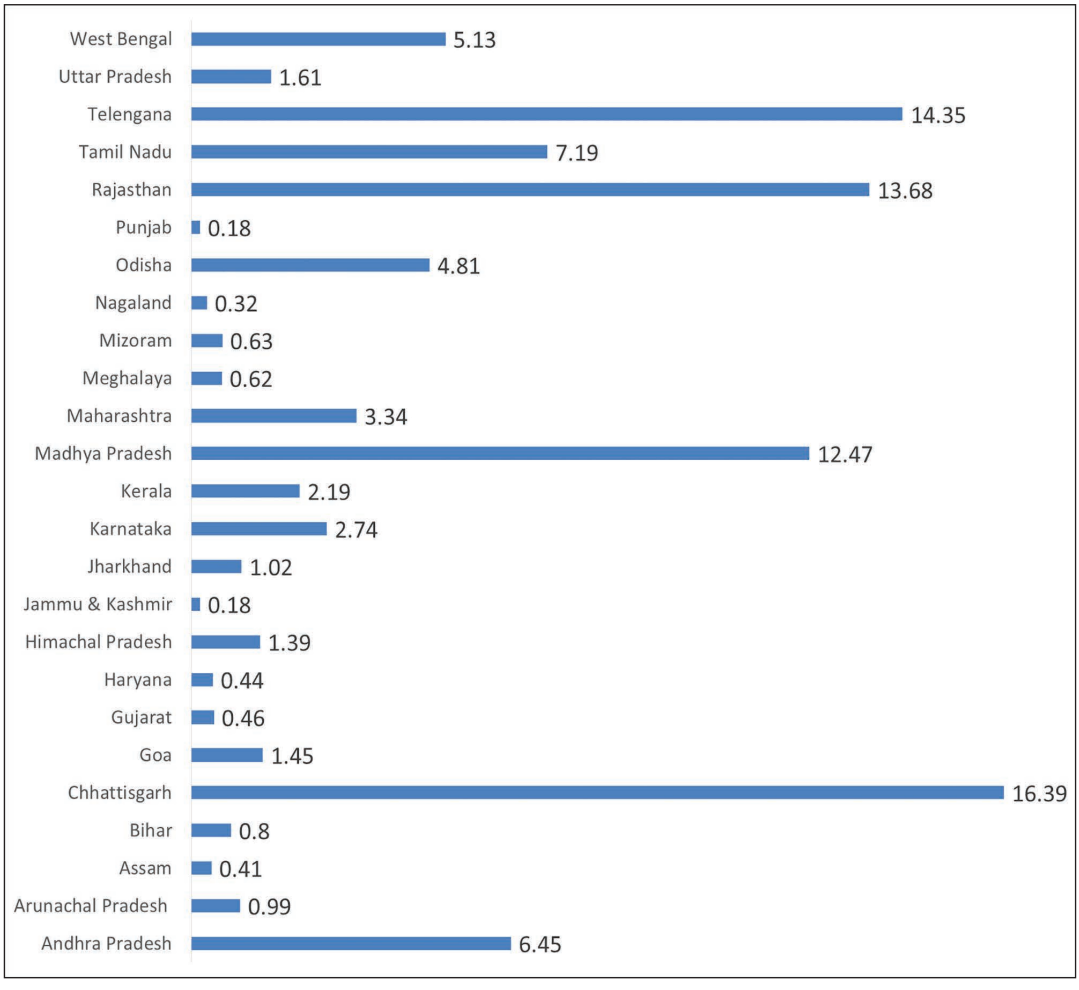
Source: Authors' calculation from National Sample Survey Office (NSSO) data.

Appendix D. State-wise Crop Insurance Adoption During Kharif 2018–2019 (in %).



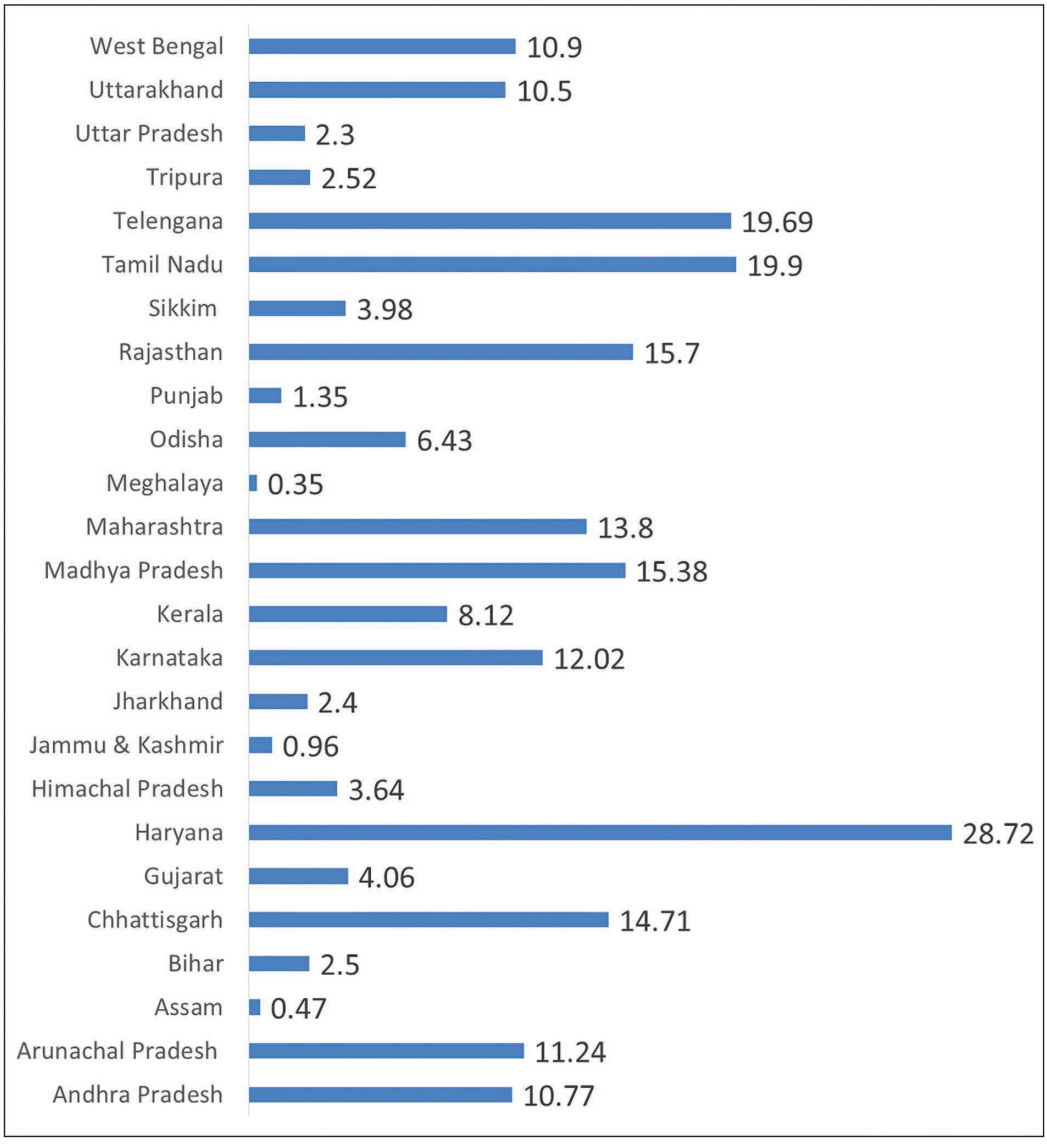
Source: Authors' calculation from National Sample Survey Office (NSSO) data.

Appendix E. State-wise Crop Insurance Adoption During Rabi 2012–2013 (in %).



Source: Authors' calculation from National Sample Survey Office (NSSO) data.

Appendix F. State-wise Crop Insurance Adoption During Rabi 2018–2019 (in %).



Source: Authors' calculation from National Sample Survey Office (NSSO) data.