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Effect of Crop Insurance and Employment Support on Agricultural Households' Well-being: Evidence from India

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HIGHLIGHTS

- Indian farmers jointly follow farm risk management and livelihood diversification to augment their income for better well-being.
- Household and farm-related characteristics influence farmers' decision to participate in PMFBY and MNREGS.
- Involvement in both, PMFBY and MNREGS, have significant and positive impact on household usual consumption expenditure.

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ABSTRACT

Indian farmers jointly follow farm risk management and livelihood diversification to augment their income for better well-being. The uncertainties in climatic conditions and rural employment market pose dangers of income insecurity to already low-incomed farmers. Crop insurance is a promising production risk management technique, which, through Pradhan Mantri Fasal Bima Yojana (PMFBY), seems beneficial in improving Indian farmers' well-being by ensuring financial support during crop loss. Similarly, Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) provide income security by ensuring guaranteed regular employment. This paper strives to contribute to the knowledge related to PMFBY and MNREGS. The Binary Logit Regression results suggest that marginal and small farmers are less involved in both whereas socially marginalized farmers participate more in MNREGS but less in PMFBY. The possession of education, agricultural training and crop loss experience enhance their participation in both. Further, the Propensity Score Matching (PSM) results of all the three different matching methods suggest the positive impact of PMFBY and MNREGS on household usual consumption expenditure. The study suggests to enhance crop insurance adoption by boosting education, agricultural training, and membership in farmer organization. Further, ensuring diverse livelihood opportunities to farmers for their improved well-being.

INTRODUCTION

In climate-posed uncertain situation (Jatav, 2024b; Birthal, 2022), managing the production risks and exploring other livelihood diversification techniques seems most common attempt for the farmers' sustainability in farming (Srinivas & Giridhar, 2023; Vinaya & Tapan, 2023; Jatav, 2024c). Though farmers follow input advices and different crop management strategies to manage the production risks, the uncertain climate fluctuations and resultant losses affect the yield. The sector demands a robust mechanism targeted for long run to secure the farm incomes (Bharat et al., 2022). For augmenting income by livelihood diversification, farmers generally get involved in unskilled labour activities (Srinivas & Giridhar, 2023). The uncertainty in rural unorganised labour market puts them on the verge of income insecurity (Deininger & Liu, 2019).

Crop insurance is popular and one of the most cost-effective solutions for farm risk management (Nirmal & Babu, 2021). The latest launched crop insurance scheme, i.e. Pradhan Mantri Fasal

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Bima Yojana (PMFBY), seems beneficial for farmers due to its attracting features in terms of covering risks, capital and crops and having highly subsidized premium rates (Bharne & Yadav, 2022). For income security, Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) becomes the biggest support with the guaranteed regular employment for the rural people (Nayak, 2012). MGNREGS is a flagship social welfare program aiming at enhancing the livelihood security of rural households by providing at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work (Singh, 2013; Bose, 2017).

Both PMFBY and MNREGS, are among the most aspirational income security schemes of the Indian government. Considering MNREGS are the core for poverty eradication (Singh, 2013), and the continuous increase in budget allocation of PMFBY shows the governments' seriousness towards ensuring income security to the vulnerable population. As agriculture is predominantly a rural occupation in India, PMFBY largely overlaps the MNREGS target population, and thus, both schemes have targeted to improve the rural economy. The previous similar studies about crop insurance (Nain et al., 2017; Aditya et al., 2018; Birthal et al., 2020; Cariappa et al., 2020) and MNREGES (Bose, 2017; Deininger & Liu, 2019; Varman & Kumar, 2020) find that they significantly improve the different aspects of farmers' well-being.

Considering the above, this study aims to analyse the determinants and assess the impacts and the extents of the abovementioned governmental security schemes on farmer well-being in India. The variables for the study are selected after a robust literature review and are suggested and used by previous similar studies. The household Usual Consumption Expenditure is considered as an indicator for the respective purpose. Further, analysis of latest available nationwide information broadens the study's scope and makes it unique from the previous studies.

METHODOLGY

This study was carried out using latest nationwide information about Indian agricultural situation from 77th round of survey conducted by National Sample Survey Office (NSSO). A total 56894 sample rural households were selected by following reliable sampling techniques and most of them were visited twice in different halves of the agricultural year July 2018 – June, 2019. This study used data of households only who were reported on both visits. Subsequently, the metadata was filtered to extract the suitable data for fulfilling the purpose of the study. In this regard, the households who operated land for agricultural production during survey period and had crop insurance facility available under PMFBY, were selected. Further, the outliers were filtered out and 38,521 sample households were considered for final empirical analysis.

This study used two methods in the subsequent steps of statistical analysis. In the first step, the Binary Logistic Models was adopted for investigating the perceived determinants of PMFBY and MNREGS involvement in the sample farmers (Singh, 2020). The logistic regression is most appropriate when estimating the probability of adoption of specific policy is the purpose. The latent models are specified as:

$$PMFBY_i = \beta_0 + \beta_1 HHSIZE_i + \beta_2 ST\_SC_i + \beta_3 AGE_i + \beta_4 EDU_i + \beta_5 MARG\_SMAL_i + \beta_6 INCOME_i + \beta_7 AGTRNG_i + \beta_8 IRRIGAT_i + \beta_9 FOMBR_i + \beta_{10} INPUTS_i + \beta_{11} CROPLOSS_i + m_i \quad \ldots. (1)$$

$$MNREGS_i = \beta_0 + \beta_1 HHSIZE_i + \beta_2 ST\_SC_i + \beta_3 AGE_i + \beta_4 EDU_i + \beta_5 MARG\_SMAL_i + \beta_6 INCOME_i + \beta_7 AGTRNG_i + \beta_8 IRRIGAT_i + \beta_9 FOMBR_i + \beta_{10} INPUTS_i + \beta_{11} CROPLOSS_i + m_i \quad \ldots. (2)$$

The regressors in the models include households' socio-demographic and farm-related characteristics and their detailed description is provided in the Table 1. The explanatory variables for the study are selected after a robust literature review and are suggested and used by previous similar studies. The regressors shown in the equations are vectors of the individual independent variables. Some of the independent variables are continuous, whereas the rest are categorical. β_0 is a constant termand m_i infers the net effect of ignored variables.

In the subsequent step, the treatment effect of PMFBY and MNREGS on outcome variables representing farmer well-being was assessed. Income and consumption are generally considered for measuring poverty, while the absolute income hypothesis finds consumption as a function of income. Considering the fact that income influences farmers' taste and living conditions (Areef et al., 2021), reported household usual consumption expenditure as an indicator of farmers' well-being.

For this purpose, the Propensity Score Matching (PSM) technique was used. Because simply calculating the mean difference between adopted and non-adopter farmers will result in biased estimates, as the households' characteristics may affect their likelihood of adoption and, ultimately, the outcome results. PSM helped to pair adopters with non-adopter by aligning their distributions across the selected explanatory variables, which was crucial for maintaining the integrity of the comparison (Cariappa et al., 2020). Moreover, the Average Treatment Effects (ATT) were calculated using three distinct matching techniques: Nearest Neighbor (NNM), Radius (RM) and Kernel matching (KM). The ATT equation by assuming the absence of selection bias is specified as:

$$ATT = E[y_i^I - y_i^0] = E[y_i^I - y_i^0 | D = 1] = E[y_i^I | D = 1] - E[y_i^0 | D = 0] \quad \ldots(3)$$

Where y_i^I and y_i^0 denote household usual consumption expenditure when they are adopter and non-adopter of any of our considered policies, respectively. $E[y_i^I | D = 1]$ represents expected value of impact of participation and $E[y_i^0 | D = 0]$ represents counterfactual outcome. The ATT indicates the change in outcome of the farmers subject to their participation in PMFBY and MNREGS, separately.

RESULTS

Variable description and descriptive statistics

Table 1 depicts the low crop insurance penetration under PMFBY and decent participation in MNREGS. Only 11.06 per cent of total sample agricultural households who had availability of crop insurance under PMFBY insured their crops, while 25 per cent of them participated in MNREGS-related works. The significant differences in the most of the features of treated and control groups for both the treatment variables were reported and

explained by employing t-tests. The t-statistics suggest that PMFBY adopters had increased consumption expenditure than the non-adopters with a significant mean difference of Rs. 436. On the contrary, the mean difference in consumption expenditure between MNREGS participants and non-participants was found insignificant and very low.

The variations in the other features suggest that PMFBY adopters consist of older, more secondary and above educated and better-incomed farmers than the PMFBY non-adopters. Also, Farmers who had more irrigated land, membership of farmer organization, attended agriculture training, spent more on farm inputs and experienced crop loss were significantly more involved in crop insurance under PMFBY. Farmers belonging to socially marginalized categories, lower farmer categories and with larger households were less inclined towards crop insurance. In MNREGS, participation of farmers belonging to socially marginalized and lower farmer category, farmers having membership of farmer organization and agriculture training, were significantly found more in the considered sample. Less participation of farmers with more household members, age, income, irrigated land, and spending on farm inputs, along with educated and loss-experienced farmers, was noted with significant mean difference values. However, these results are estimated on full sample where the presence of selection bias might affect their reliability. To address the selection bias and get the true picture, PSM is employed.

Determinants of PMFBY and MNREGS and estimation of the propensity scores

The Binary Logistic Regression (BLR) results of the models help in analysing the perceived determinants of crop insurance (PMFBY) and MNREGS, respectively (Table 2). The BLR was employed using full sample data to understand the effects of household and farm-related characteristics on farmers participation in PMFBY and MNREGS, separately. The odds ratios and marginal effects for each explanatory variable were estimated in both the models to interpret the results. For the reliable empirical results, diagnosis of the econometric issues and inspection of goodness-of-fit (GOF) of models were conducted. The mean Variance Inflation Factor (VIF) value of 1.2 negated the presence of multicollinearity while significant p-values of Breusch-Pagan/Cook-Weisberg test indicate that heteroskedasticity exists in both the models. To address the issue, the logistic regression with robust standard errors were employed (Wooldridge, 2013). The significant p-values of Pearson's GOF test for both the models validate the fitness and specification of the considered models.

The results pertaining to determinants of PMFBY and MNREGS suggested that marginal and small farmers were less involved in both of the governmental security programs than their counterparts, while farmers' income status didn't show significant associations. Farmers from socially marginalized strata (ST and SC) were less inclined towards crop insurance but had more participation in MNREGS work with significantly good numbers. Secondary and above educated farmers were more attracted towards crop insurance under PMFBY and less towards unskilled works under MNREGS. Farmers who faced crop loss, insured more but worked less in MNREGS than who didn't. Among other determinants, agriculture training, membership of farmer organization and spendings on farm inputs showed positive, whereas household size showed negative associations in both the cases. Having more irrigated land significantly increased crop insurance adoption, but decreased participation in MNREGS work among the farmers.

The socio-demographic characteristics were primary determinants of crop insurance adoption, as well as participation in MNREGS. The calculated marginal effects indicated that an increase in number of family members decreases the probability of farmers participation in crop insurance (PMFBY) and MNREGS by 0.6 per cent (for both). Further, if a farmer belongs to ST or SC category, she/he has 4.4 per cent less probability of adopting crop insurance but 15.5 per cent more probability of participation in

Table 1. Variations in household features by involvement status in PMFBY and MNREGS

Variable	Description	PMFBY participation (1 = Yes, 0 = No)			MNREGS participation (1 = Yes, 0 = No)		
		Yes (4,263)	No (34,258)	t-test	Yes (10,019)	No (28,502)	t-test
Outcome Variable							
Consumption Expenditure	Continuous	8615.40	8179.34	436.06***	8241.66	8222.66	18.99
Explanatory Variable							
Household Size	continuous	4.53	4.727	-0.199***	4.60	4.74	-0.144***
Social Category	SC/ST = 1; otherwise = 0	0.22	0.36	-0.147***	0.51	0.29	0.216***
Age	continuous	51.68	50.19	1.489***	49.49	50.65	-1.16***
Education	Above from secondary = 1; otherwise = 0	0.30	0.24	0.063***	0.18	0.267	-0.091***
Farmer Category	Marginal/small farms = 1; otherwise = 0	0.30	0.580	-0.277***	0.57	0.54	0.030***
Income	continuous	13014.22	10387.66	2626.56***	9952.12	10933.61	-981.49***
Agriculture Training	1 = Yes, otherwise = 0	0.04	0.017	0.021***	0.02	0.02	0.003**
Irrigation	Continuous	2.15	1.067	1.08***	0.77	1.33	-0.569***
Farmer Org. Member	1 = Yes, otherwise = 0	0.08	0.038	0.041***	0.06	0.04	0.024***
Farm Input	Continuous	5507.60	2494.94	3012.66***	2293.16	3016.47	-723.31***
Crop Loss Experience	1 = Yes, otherwise = 0	0.62	0.48	0.14***	0.46	0.51	-0.048***

Source: Authors' calculation based on NSSO 77th round survey data.
Note: ***, ** and * denote 1%, 5% and 10% level of significance of p-values, respectively.

Table 2. Determinants of PMFBY and MNREGS

Variable	PMFBY			MNREGS		
	Coefficient (Robust S.E.)	Odds Ratio (Robust S.E.)	Marginal Effects (Robust S.E.)	Coefficient (Robust S.E.)	Odds Ratio (Robust S.E)	Marginal Effects (Robust S.E.)
HH Size	-0.067***	0.935***	-0.006***	-0.035***	0.965***	-0.006***
	(0.008)	(0.008)	(0.001)	(0.006)	(0.006)	(0.001)
Social Category	-0.516***	0.597***	-0.044***	0.801***	2.228***	0.155***
	(0.041)	(0.025)	(0.003)	(0.025)	(0.056)	(0.005)
Age	0.001	1.001	0.000	-0.005***	0.995***	-0.001***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Education Level	0.075*	1.078*	0.007*	-0.433***	0.649***	-0.074***
	(0.039)	(0.042)	(0.004)	(0.031)	(0.020)	(0.005)
Farmer Category	-0.883***	0.414***	-0.080***	-0.146***	0.864***	-0.026***
	(0.04)	(0.017)	(0.004)	(0.027)	(0.023)	(0.005)
HH Income	0.000	1.000	0.000	0.000	1.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Agriculture Training	0.488***	1.630***	0.052***	0.181**	1.199**	0.034**
	(0.1)	(0.162)	(0.012)	(0.090)	(0.107)	(0.017)
Irrigation	0.039***	1.040***	0.004***	-0.188***	0.829***	-0.034***
	(0.009)	(0.010)	(0.001)	(0.012)	(0.010)	(0.002)
Farmer Org. Member	0.461***	1.585***	0.049***	0.718***	2.050***	0.146***
	(0.071)	(0.113)	(0.009)	(0.055)	(0.113)	(0.012)
Farm Inputs	0.000***	1.000***	0.000***	0.000***	1.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Crop Loss	0.498***	1.645***	0.045***	-0.170***	0.844***	-0.031***
	(0.035)	(0.057)	(0.003)	(0.024)	(0.020)	(0.004)
Constant	-1.798***	0.166***		-0.612***	0.542***	
	(0.088)	(0.015)		(0.063)	(0.034)	
Wald chi^2	1856.7	1856.7		2156.58	2156.58	
Prob> chi^2	0.000	0.000		0.00	0.00	
Pseudo R^2	0.0829	0.0829		0.0542	0.0542	
Observations	38,521	38,521		38,521	38,521	
Diagnostic Statistics						
Mean VIF	1.20			1.20		
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	0.00			0.00		
Pearson GOF test	0.00			0.00		

Source: Authors' calculation based on NSSO 77th round survey data.
Note: Robust Standard errors are in parenthesis, ***, ** and * denote 1%, 5% and 10% level of significance of p-values, respectively.

unskilled work under MNREGS. The variable representing age shows significant association only for MNREGS and suggest that an additional year of farmers age decrease the participation in MNREGS by 1 per cent. Education is a critical influencer of farmers' decision making in adopting farm risk management, as well as livelihood diversification strategy. The results indicated that possession of secondary and above education significantly increases probability of farmers' involvement in PMFBY by 7 per cent, but decreased the probability of their involvement in MNREGS by 7.4 per cent. Subsequently, the calculated marginal effects regarding farmer category indicate that there is an 8 and 2.6 per cent less probability of participation of marginal and small farmers in crop insurance (PMFBY) and MNREGS, respectively.

Table 2 depicts the significant association between farm-related characteristics and outcome variables (PMFBY and MNREGS). The results show that the probabilities of farmers' participation in PMFBY and MNREGS increase by 5.2 and 3.4 per cent if they have attended any formal training in agriculture. Further, having more irrigated land increased probability of crop insurance adoption by 4 per cent but decreases the probability to participate in MNREGS by 3.4 per cent. The membership of farmer organization increases the likelihood of farmers' involvement in both, PMFBY and MNREGS. The marginal effect results suggest that farmers who were members of any registered farmer organization had 4.9 and 14.6 per cent more probability of involvement in PMFBY and MNREGS, respectively. However, variable representing farm inputs show negligible but significant association and indicate that farmers who spend more for farm inputs have slight better chances of participation in PMFBY and MNREGS. Lastly, the crop loss possesses positive marginal values for PMFBY but negative for MNREGS. The marginal values of crop loss indicated that the farmer who have experienced crop loss had higher probability to insure their crops under PMFBY by 4.5 per cent but 3.1 less probability to perform unskilled work under MNREGS.

Table 3. Treatment effect of PMFBY and MNREGS on household usual consumption expenditure

Outcome Variable	Matching Method	Treatment Variable	Participants	Non-Participants	ATT (S.E.)
Household Usual Consumption Expenditure (CONSEXP)	Nearest-Neighbor (k = 1)	PMFBY	8615.40	8410.28	205.12*** (78.8)
		MNREGS	8241.66	7747.58	494.07*** (52.88)
	Radius (caliper = 0.05)	PMFBY	8615.40	8464.08	151.32** (56.03)
		MNREGS	8241.66	7792.38	449.28*** (39.03)
	Kernel (b width = 0.06)	PMFBY	8615.40	8469.44	145.97** (56.08)
		MNREGS	8241.66	7787.54	454.11*** (39.05)

Source: Authors' calculation based on NSSO 77th round survey data.
Note: Standard errors are in parenthesis, ***, ** and * denote 1%, 5% and 10% level of significance of p-values, respectively.

Impact of PMFBY and MNREGS on household usual consumption expenditure

The Propensity Score Matching (PSM) was utilized to address the selection bias and estimate the accurate impacts of involvement in PMFBY and MNREGS on farmer households' usual consumption expenditure. The PSM addressed the selection bias by making pairs of a treated and an untreated farmer using the similarities in their observed household characteristics. It then measured the mean difference of usual consumption expenditure between treated and untreated groups. To check the robustness of the findings, the Average Treatment Effects on the treated (ATT) were calculated using three distinct matching techniques: Nearest Neighbour (NNM), Radius (RM) and Kernel matching (KM). The ATT values laid out in Table 3 show the consistency of estimators with statistically significant p-values.

The results depict that the farmers who adopted crop insurance under PMFBY and faced crop loss had an average of Rs. 205 more monthly household usual consumption expenditure than one who didn't adopt and faced crop loss. The results obtained from other matching methods have minor discrepancies only. Similarly, MNREGS significantly increases the monthly household usual consumption expenditure by an average of Rs. 494 among its participants. The other matching methods indicate similar ATT for MNREGS and validated the reliability of the calculated results. The ATT or mean differences pertaining to MNREGS are entirely different than the results obtained using t-test on usual consumption expenditure. It showed the adequacy of PSM in impact analysis of any treatment or policy.

DISCUSSION

Most of the variables used in the empirical analysis showed desired results by indicating significant associations. Though many of them match with the findings of previous studies, few differ in direction, for which suitable justifications were presented. The social and economic status of farmer were among the most important aspects which largely affect their involvement in governmental security programs. Households having larger farms have better risk-managerial capacity, thus, tend to insure more against small landowing farmers who, despite being more risk averse, tend not to insure (Champonnois & Erdlenbruch, 2021). The results of this study justify this argument by showing lesser likelihood of crop insurance adoption under PMFBY among marginal and small farmers than others. However, the results pertaining to MNREGS were against the popular premise that landless and smallholders are more engaged in MNREGS due to limited alternative livelihood options (Azam, 2012). A vast range of landholders attached with '0' values in binary variable 'farmer category' and corrupt practices leading to fake participation in MNREGS (Deshingkar et al., 2005) might be the reasons behind these opposite results.

The social category largely overlaps the farmers' economic status (Wu et al., 2023) and possess similar arguments that smallholders were generally less involved in PMFBY but more in MNREGS. The results followed the existing premises and suggest that the ST and SC farmers were less likely to cover with crop insurance their crops, but more likely to work under MNREGS. Further, education influences farmers' on-farm and employment choices (Jatav, 2024). Educated farmers were more attracted to crop insurance due to better financial understanding of crop insurance mechanisms (Senapati, 2020), whereas less-educated farmers participate more in MNREGS due to restricted employment opportunities in other sectors (Joshi et al., 2017). This study too, find that secondary and above educated farmers secure (crop insurance) their crops more but perform the unskilled works under MNREGS less than their counterparts. Our results are in line with the arguments that higher expenses to run bigger households decreases farmers chances of spending on insurance premiums (Hossain et al., 2022). These results have aligned with findings of our study

The farm related characteristics play important role in farmers' decision-making in the context of farm investments and livelihood strategies. Farmers having better access to agriculture extension services were more attracted towards crop insurance (Sadati et al., 2010). The findings suggest that the farmers with membership of any registered farmers organization tend more to participate in PMFBY and MNREGS. Such membership enhanced their exposure to knowledge and awareness about government policies, markets, and weather conditions, and help them to make better choices (Botzen et al., 2009).

Higher farm investments show farmers' positive attitude toward farming and concerns about possible capital losses (Wang et al., 2016). However this study finds that farmers who spend more on farm outputs execute better for securing their farm capital through PMFBY as well as diversify livelihood through MNREGS. The farmers who faced crop loss seem more interested to secure their crops and match the argument that the crop loss experiences contribute in making them more risk aversive (Aditya et al., 2018).

The results pertaining to PMFBY and MNREGS follow the findings of previous such studies and report significant and positive impact of PMFBY and MNREGS on agricultural households' well-being. The household usual consumption expenditure represents the household well-being as all the income generation efforts ultimately lead towards smoothening the overall consumption. Previous studies have reported crop insurance's positive impact on per capita consumption expenditure (Biswal & Bahinipati, 2023), income (Birthal et al., 2022) and negative impacts on outstanding debt (Cariappa et al., 2020). Similarly, MNREGS' role in enhancing expenditure on income (Deininger & Liu, 2019), nutritious food consumption (Bose, 2017) and durable goods (Varman & Kumar, 2020) was observed.

CONCLUSION

The socio-demographic and farm-related characteristics of households affect their participation in PMFBY and MNREGS. Giving farmers a strong way to deal with production risks in farming and making sure they have regular ways to make extra money and improve their health are important for increasing their income and happiness, and making farmers more aware of crop insurance and making the insurance environment stronger can help increase coverage. Helping farmers find other ways to make money based on their skills will definitely improve their well-being; Increasing education, agricultural training, and membership in farmer organizations has been suggested as a way to get more farmers covered by crop insurance; and making landowners more aware of PMFBY is important for getting more of them to sign up for it, which means better advertising and programs like door-to-door policies are also important to help landowners deal with the problems they're facing right now.

REFERENCES

Aditya, K. S., Khan, T., & Kishore, A. (2018). Adoption of crop insurance and impact: Insights from India. *Agricultural Economics Research Review*, *31*(2), 163–174. https://doi.org/10.5958/0974-0279.2018.00034.4

Azam, M. (2012). *The Impact of Indian Job Guarantee Scheme on Labor Market Outcomes: Evidence from a Natural Experiment* (6548). https://doi.org/10.2139/ssrn.1941959

Bharat, Chapke, R. R., & Kammar, S. (2022). Farmers' perception about climate change and response strategies. *Indian Journal of Extension Education*, *58*(1), 7–11. https://doi.org/10.48165/IJEE.2022.58102

Bharne, S., & Yadav, P. (2022). Stabilising farmers' income through pradhan mantri fasal bima yojana: An overview. In M. Singh, N. Tandon, V. Potdar, & P. Bhatt (Eds.), *Resilience and Transformation for Global Restructuring*. Ethics International Press.

Birthal, P. S., Hazrana, J., Negi, D. S., & Mishra, A. K. (2022). Assessing benefits of crop insurance vis-a-vis irrigation in Indian agriculture. *Food Policy*, *112*, 102348. https://doi.org/10.1016/j.foodpol.2022.102348

Biswal, D., & Bahinipati, C. S. (2023). Crop-insurance adoption and impact on farm households' well-being in India: evidence from a panel study. *Journal of the Asia Pacific Economy*. https://doi.org/10.1080/13547860.2023.2266204

Bose, N. (2017). raising consumption through India's national rural employment guarantee scheme. *World Development*, *96*, 245–263.

Botzen, W. J. W., Aerts, J. C. J. H., & van den Bergh, J. C. J. M. (2009). Willingness of homeowners to mitigate climate risk through insurance. *Ecological Economics*, *68*(8–9), 2265–2277. https://doi.org/10.1016/j.ecolecon.2009.02.019

Cariappa, A. G. A., Mahida, D. P., Lal, P., & Chandel, B. S. (2020). Correlates and impact of crop insurance in India: evidence from a nationally representative survey. *Agricultural Finance Review*, *81*(2), 204–221. https://doi.org/10.1108/AFR-03-2020-0034

Champonnois, V., & Erdlenbruch, K. (2021). Willingness of households to reduce flood risk in southern France. *Journal of Flood Risk Management*, *14*(2). https://doi.org/10.1111/jfr3.12696

Deininger, K., & Liu, Y. (2019). Heterogeneous welfare impacts of National Rural Employment Guarantee Scheme: Evidence from Andhra Pradesh, India. *World Development*, *117*, 98–111.

Deshingkar, P., Johnson, C., & Farrington, J. (2005). State transfers to the poor and back: The case of the Food-for-Work program in India. *World Development*, *33*(4), 575–591. https://doi.org/10.1016/j.worlddev.2005.01.003

Hossain, Md. S., Alam, G. M. M., Fahad, S., Sarker, T., Moniruzzaman, M., & Rabbany, Md. G. (2022). Smallholder farmers' willingness to pay for flood insurance as climate change adaptation strategy in northern Bangladesh. *Journal of Cleaner Production*, *338*, 130584. https://doi.org/10.1016/j.jclepro.2022.130584

Jatav, S. S. (2024a). Factors affecting adoption of climate-smart agriculture practices: Evidence from Uttar Pradesh, India. *Indian Journal of Extension Education*, *60*(2), 27–32. https://doi.org/10.48165/IJEE.2024.60205

Jatav, S. S. (2024b). Farmers' perception of climate change and livelihood vulnerability: a comparative study of Bundelkhand and Central regions of Uttar Pradesh, India. *Discover Sustainability*, *5*(1), 11. https://doi.org/10.1007/s43621-024-00193-7

Jatav, S. S. (2024c). Livelihood diversification and rural household economic security in central and Bundelkhand regions of Uttar Pradesh, India. *Indian Journal of Extension Education*, *60*(3), 7–11. https://doi.org/10.48165/IJEE.2024.60302

Joshi, O., Desai, S., Vanneman, R., & Dubey, A. (2017). Who participates in MGNREGA? Analyses from longitudinal data. *Review of Development and Change*, *22*(1), 108–137. https://doi.org/10.1177/0972266120170105

Nain M.S., Singh R. and Mishra J. R. (2017). A study of farmers' awareness on agricultural insurance schemes in southern Haryana. *Indian Journal of Extension Education,* 53(4),75-79.

Nayak, S. (2012). What motivates to participate in an employment guarantee programme in India? A logit model analysis. *Economic Bulletin*, *32*(3), 2113–2127.

Nirmal, R., & Babu, S. C. (2021). *When implementation goes wrong: Lessons from crop insurance in India* (02012). https://doi.org/10.2499/p15738coll2.134336

Sadati, S. A., Ghobadi, F. R., Sadati, S. A., Mohamadi, Y., Sharifi, O., & Asakereh, A. (2010). Survey of effective factors on adoption

of crop insurance among farmers: A case study of Behbahan County. *African Journal of Agricultural Research*, *5*(16), 2237–2242.

Senapati, A. K. (2020). Insuring against climatic shocks: Evidence on farm households' willingness to pay for rainfall insurance product in rural India. *International Journal of Disaster Risk Reduction*, *42*, 101351. https://doi.org/10.1016/j.ijdrr.2019.101351

Singh, S. (2020). Farmers' perception of climate change and adaptation decisions: Micro-level evidence from Bundelkhand Region, India. *Ecological Indicators*, *116*. https://doi.org/10.1016/j.ecolind.2020.106475

Srinivas, K. J., & Giridhar, B. S. (2023). Mitigating risk and augmenting farmer's income through livelihood diversification framework. *Journal of Rural Development*, 155–170.

Varman, P. M., & Kumar, N. (2020). Impact of MGNREGA on consumption expenditure of households. *Economic & Political Weekly*, *39*, 49–54.

Vinaya K. Hebsale Mallappa and Tapan B. Pathak (2023). Climate smart agriculture technologies adoption among small-scale farmers: A case study from Gujarat, India. *Frontiers in Sustainable Food Systems*, *7*, 1202485. https://doi.org/10.3389/fsufs.2023.1202485

Wang, M., Ye, T., & Shi, P. (2016). Factors affecting farmers' crop insurance participation in China. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, *64*(3), 479–492. https://doi.org/10.1111/cjag.12088

Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach* (5th ed.). South-Western, Cengage Learning.

Wu, K., Liu, Y., Xu, Y., & Sun, H. (2023). It pays to have guanxi: How social capital affects household income in China. *International Studies of Economics*, *18*(3), 370–392. https://doi.org/10.1002/ise3.43