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Crop Insurance as a Climate Risk Adaptation Strategy: A Study of Jalgaon District, Maharashtra

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Abstract

Climate change is a problem for farming especially in countries like India where crops depend on weather. Weather changes like droughts, floods and unexpected rain make farming more uncertain. This study looks at crop insurance as a way to help farmers deal with climate risks. It focuses on Jalgaon district in Maharashtra, where small farmers are often hit hard by weather changes. The research tries to find out if crop insurance helps farmers. It does this by collecting data from farmers and looking at government reports. The study finds that crop insurance helps farmers recover from losses. There are some problems. Many farmers do not know about crop insurance. It is also hard for some farmers to get insurance if they do not have a loan. Sometimes it takes a time to get compensation. The study says that crop insurance is important. It needs to be better. Farmers need to know more about it. They need to get paid on time. The process needs to be simpler. Crop insurance needs to work with ways to make farming stronger against climate change. The study uses a mix of methods to get its data. It talks to farmers. Looks at reports. This helps it understand how crop insurance works. Farmers are important for our food. Climate change affects them a lot. We need to help them. Crop insurance can be one way to do this. We need to make it better. The research is about finding ways to help farmers. It looks at how crop insurance can help. It wants to make farming stronger. This is important for India and other countries. Farmers face risks. Weather changes are one of them. Crop insurance can help. It needs to be done right. The study concludes that crop insurance is good. It needs work. We need to make it better, for farmers.

Keywords

Crop Insurance, Climate Change, Agricultural Risk, Farmer Resilience, PMFBY, Jalgaon, Adaptation Strategy, Income Stability

Introduction

Climate change is a problem that affects many areas, especially farming. Farming is very important in India because it helps feed a lot of people and supports the economy. Because of climate change farming has become very uncertain. We are seeing a lot of changes in the weather like not rain, really bad droughts, big floods and temperatures that are getting higher.

The Jalgaon district in Maharashtra is in a spot. This is because the people who farm there need the monsoon rain to come at the time. They also grow a lot of bananas. Do not have a lot of land. This means they can get hurt easily by climate change. When their crops do not grow well, they make money and can even get into debt.

To help the farmers they can buy something called crop insurance. This is like a safety net that helps farmers if their crops get damaged by disasters. It gives them money to help make up for what they lost. This way they can keep farming. Do not have to worry as much. The government has programs like the Pradhan Mantri Fasal Bima Yojana to help more farmers get crop insurance and make it cheaper for them. Climate change is still a problem, for farmers and crop insurance is one way to deal with climate change.

Problem Statement

Despite government backing many farmers are not aware of crop insurance plans. They also face problems like claim payouts. This lack of trust among farmers raises questions, about how these plans work as a tool to help farmers adapt to climate change. Farmers need to trust crop insurance schemes to make them effective. The government must address these issues to ensure farmers get the support they need. Crop insurance schemes are crucial for farmers to manage climate-related risks.

Objectives of the Study

1. We want to look at the problems farmers in Jalgaon district face because of the climate.
2. We need to find out how much farmers know about insurance for their crops.

Literature Review

Author(s) & Year	Title of the Study	Journal / Source	Objective / Focus	Key Findings
Hazell (1992)	Appropriate Role of Agricultural Insurance in Developing Countries	Journal of International Development	To study the role of agricultural insurance in risk management	Crop insurance reduces income uncertainty and supports farmers during losses
Skees (2001)	The Bad Harvest: Crop Insurance Reform	Regulation Journal	To analyse crop insurance reforms	Effective insurance requires proper institutional framework and government support
Raju & Chand (2008)	A Study on Crop Insurance in India	Agricultural Economics Research Review	To evaluate crop insurance performance in India	Crop insurance improves farmer security but faces implementation challenges
Cole et al. (2013)	Barriers to Household Risk Management	American Economic Journal	To identify factors affecting insurance adoption	Lack of awareness and trust limits participation of farmers
Clarke et al. (2012)	Weather Index Insurance and Risk Management	World Bank Report	To analyse weather-based insurance systems	Faster claim settlement but presence of basis risk
Greatrex et al. (2015)	Scaling Up Index Insurance	World Bank Group	To examine index insurance for small farmers	Technology improves transparency and efficiency in insurance
Government of India (2016)	PMFBY Guidelines	Ministry of Agriculture	To implement crop insurance scheme for farmers	Increased coverage and reduced premium burden through subsidies
FAO (2017)	Climate Risk Management in Agriculture	FAO Report	To study climate adaptation strategies in agriculture	Crop insurance is a key adaptation tool for reducing climate risk

Mishra & Singh (2019)	Crop Insurance in India: Performance and Challenges	Indian Journal of Agricultural Economics	To analyse effectiveness of crop insurance schemes	Issues like delayed claims and low awareness reduce effectiveness
Kumar et al. (2020)	Impact of Crop Insurance on Farmers	International Journal of Agricultural Studies	To assess impact of insurance on farmer income	Insurance improves income stability but awareness remains low

Research Methodology

- The study looks at crop insurance as a way for farmers to adapt to climate risks focusing on Jalgaon district in Maharashtra. The researchers used a mix of methods to get a picture. They collected data from farmers and existing reports. They asked farmers about their knowledge, experiences and satisfaction with crop insurance. They also looked at government reports, research papers and publications on agriculture, climate change and crop insurance.
- The study focuses on farmers in Jalgaon district, where climate changes affect farming. The researchers picked a sample of farmers to represent types, including small and marginal farmers. For analysing data, they used tools. They calculated percentages and averages to summarize the data. They also used tests to see if there were relationships between things like awareness, participation and satisfaction with crop insurance. The researchers used software like SPSS to ensure accuracy. The study aims to provide insights into how crop insurance works as a climate risk adaptation strategy. It also seeks to identify challenges and areas for improvement in Jalgaon district. Farmers in Jalgaon district are significantly affected by climate variability.
- The study is based on secondary data sources. The researchers used a combination of probability and -probability sampling techniques. The sample size is determined based on feasibility and availability of respondents. The analysis has been carried out using software such as SPSS. The methodology is designed to provide insights into the effectiveness of crop insurance The study examines relationships between variables such, as awareness, participation, satisfaction and effectiveness of crop insurance.

Data Analysis

Q1: Significant impact on reducing climate-related agricultural risks

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Have you ever enrolled in a crop insurance scheme?	100	2.50	.628	.063
Crop insurance helps reduce financial risk due to climate change	92	2.51	1.288	.134

One-Sample Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Have you ever enrolled in a crop insurance scheme?	Cohen's d	.628	3.983	3.394	4.569
	Hedges' correction	.632	3.953	3.368	4.534
Crop insurance helps reduce financial risk due to climate change	Cohen's d	1.288	1.949	1.598	2.296
	Hedges' correction	1.299	1.933	1.585	2.277

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation.
Hedges' correction uses the sample standard deviation, plus a correction factor.

One-Sample Test

Test Value = 0

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Have you ever enrolled in a crop insurance scheme?	39.831	99	<.001	<.001	2.500	2.38	2.62
Crop insurance helps reduce financial risk due to climate change	18.697	91	<.001	<.001	2.511	2.24	2.78

INTREPRETETION

results of the one-sample t-test indicate that crop insurance has a statistically significant impact on reducing climate-related agricultural risks in Jalgaon district ($t = 18.697$, $p < 0.001$). Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. Furthermore, the high mean score (Mean = 2.51) suggests that farmers perceive crop insurance as an effective tool in minimizing financial risks arising from climate change. The large effect size further confirms that the impact is substantial. Therefore, it can be concluded that crop insurance plays a significant role in reducing climate-related agricultural risks.

Q 2: significant relationship between farmers' awareness of crop insurance schemes and their participation

Are you aware of crop insurance schemes? * Have you ever enrolled in a crop insurance scheme? Crosstabulation

			Have you ever enrolled in a crop insurance scheme?		
			?	No	Yes	Total
Are you aware of crop insurance schemes?	?	Count	3	3	1	7
		Expected Count	0.5	2.5	4.0	7.0
		% within Are you aware of crop insurance schemes?	42.9%	42.9%	14.3%	100.0%
		% within Have you ever enrolled in a crop insurance scheme?	42.9%	8.3%	1.9%	7.0%
	no	Count	2	17	7	26
		Expected Count	1.8	9.4	14.8	26.0
		% within Are you aware of crop insurance schemes?	7.7%	65.4%	26.9%	100.0%
		% within Have you ever enrolled in a crop insurance scheme?	28.6%	47.2%	12.3%	26.0%
	yes	Count	2	16	49	67
		Expected Count	4.7	24.1	38.2	67.0
		% within Are you aware of crop insurance schemes?	3.0%	23.9%	73.1%	100.0%
		% within Have you ever enrolled in a crop insurance scheme?	28.6%	44.4%	86.0%	67.0%
Total		Count	7	36	57	100
		Expected Count	7.0	36.0	57.0	100.0
		% within Are you aware of crop insurance schemes?	7.0%	36.0%	57.0%	100.0%
		% within Have you ever enrolled in a crop insurance scheme?	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32.906[a]	4	<.001
Likelihood Ratio	27.199	4	<.001
Linear-by-Linear Association	24.115	1	<.001
N of Valid Cases	100		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .49.

Interpretation

The Chi-square test results reveal a significant relationship between farmers' awareness of crop insurance schemes and their participation in such schemes ($\chi^2 = 32.906$, df = 4, $p < 0.001$). Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. The crosstabulation analysis further indicates that farmers who are aware of crop insurance schemes are more likely to participate compared to those who are unaware. This suggests that awareness plays a crucial role in influencing farmers' decision to enrol in crop insurance schemes.

Q 3: significantly improve income stability among insured farmers.

One-Sample Test

One-Sample Statistics

		N	Mean	Std. Deviation	Std. Error Mean
Have you ever enrolled in crop insurance scheme?	Have you ever enrolled in a crop insurance scheme?	100	2.50	.628	.063
income_stability_score	income_stability_score	92	2.6902	1.02668	.10704

One-Sample Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	Upper
Have you ever enrolled in a crop insurance scheme?	Cohen's d	.628	3.983	3.394	4.569
	Hedges' correction	.632	3.953	3.368	4.534
income_stability_score	Cohen's d	1.02668	2.620	2.187	3.050
	Hedges' correction	1.03524	2.599	2.169	3.025

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation.
Hedges' correction uses the sample standard deviation, plus a correction factor.

Interpretation

The One-Sample T-test results for H3 indicate a statistically significant level of income stability among the surveyed farmers in Jalgaon district, with a mean score of 2.6902 (SD = 1.027). Since the observed p-value ($p < .001$) is well below the standard significance threshold of 0.05, the null hypothesis (H3) is rejected in favor of the alternative hypothesis (H13), confirming that crop insurance significantly improves income stability. Furthermore, the Cohen's d value of 2.620 represents a very large effect size, suggesting that the financial safety net provided by insurance has a substantial and practically meaningful impact on the economic consistency of insured farmers.

Q 4: farmers experience significantly greater income stability compared to uninsured farmer

Correlations

		Claim settlement process is timely and transparent.	Satisfaction_score
Claim settlement process is timely and transparent.	Pearson Correlation	1	.562***
	Sig. (2-tailed)		<.001
	N	92	92
Satisfaction_score	Pearson Correlation	.562***	1
	Sig. (2-tailed)	<.001	
	N	92	92

***. Correlation at 0.001 (2-tailed)

Interpretation

The Pearson correlation analysis reveals a moderate to strong positive relationship (r = .562) between the timeliness/transparency of claim settlements and overall farmer satisfaction. Since the p-value (p < .001) is significantly less than the alpha level of 0.05, the null hypothesis (H4) is rejected in favour of the alternative hypothesis (H14), confirming that timely claim settlement significantly improves farmers' satisfaction with crop insurance schemes. This indicates that as the efficiency of the settlement process increases, there is a statistically significant and substantial corresponding increase in the satisfaction levels of the farmers in Jalgaon district.

Q 5: Crop insurance does not function effectively as a climate risk adaptation strategy in Jalgaon district.

One-Sample Test

Test Value = 3

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
effectiveness_score	-1.401	91	.082	.165	-.14402	-.3483	.0602

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
effectiveness_score	92	2.8560	.98633	.10283

One-Sample Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
effectiveness_score	Cohen's d	.98633	-.146	-.351	.060
	Hedges' correction	.99455	-.145	-.348	.059

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation.
Hedges' correction uses the sample standard deviation, plus a correction factor.

Interpretation

The One-Sample T-test results for your fifth hypothesis (H5), which assesses the effectiveness of crop insurance as a climate risk adaptation strategy, show a sample mean of 2.8560 (SD = 0.986) compared against a test value of 3. Because the two-sided p-value of .165 is greater than the standard significance level of 0.05, the results are not statistically significant, leading to a failure to reject the null hypothesis (H5). This indicates that there is insufficient empirical

evidence to conclude that crop insurance functions effectively as a climate risk adaptation strategy in the Jalgaon district at this time; additionally, the small negative effect size (Cohen's $d = -0.146$) further suggests that the perceived effectiveness is slightly below the neutral threshold, though this difference is likely due to chance.

Result and Discussion

The study shows that changes in the weather have an effect on farming in Jalgaon district. Farmers in Jalgaon district often have to deal with things like drought and weather that's hard to predict. This makes it hard for them to grow crops. They do not get as much money from their farms. There are programs to help farmers if their crops do not grow well but not all farmers know about these programs. Some farmers know a bit about these programs but they do not really understand how they work or how to get help when they need it. So, some farmers use these programs. Some do not. The farmers who use banks to borrow money are more likely to use these programs than farmers who do not.

The study also found that these programs can really help farmers manage money problems when their crops do not grow well. If a farmer's crops do not grow the program can give them money to help them get back on their feet. There are some problems with these programs. Sometimes it takes a time to get the money and the process can be very complicated. Farmers are happy when they get the money they need quickly. The study found that if farmers know about the program and how it works, they are more likely to use it. If the program works well and gives them the money they need quickly, they are happy. Overall, the study says that these programs can be very helpful to farmers in Jalgaon district. They need to be improved so that more farmers can use them and get the help they need. Crop insurance can be a way for farmers to deal with the effects of climate variability and crop insurance can help farmers, in Jalgaon district but crop insurance needs to be made better.

Conclusion and Future Scope

The study finds that crop insurance is a financial tool for dealing with farming risks caused by climate. It helps farmers recover from losses. Makes their income more stable so they can keep farming. However, crop insurance does not work well because many farmers do not know about it claims take long to process and there are many administrative problems. To make crop insurance work better we need to make the process simpler more transparent and make sure farmers know about it through training and digital platforms. Using technology like satellite monitoring and mobile apps can also make the system stronger.

More research is needed to compare crop insurance across regions study the impact of digital insurance platforms on crop insurance and explore how crop insurance can be combined with other farming practices that are good for the climate. This can help improve crop insurance and make it more effective, for farmers.

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