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Farmer Crop Insurance Scheme Adoption process with application Theory of Planned Behavior (TPB)

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ABSTRACT

The study found that farmers' awareness of crop insurance schemes has a positive and insignificant influence on their attitude toward the scheme. However, a lack of awareness hurts farmers' attitudes. Social norms considerably impact behavioural intention, with a C.R. of 1.868. Perceived behaviour control (PBC) has an insignificant influence on behavioural intention, while risk awareness has less impact. Awareness about crop insurance schemes significantly affects farmer behavioural intentions, with a positive attitude (3.45/5.0) and a significant impact on crop insurance behaviour. Perceived behaviour control has less impact on farmer crop insurance behaviour. The analysis considers income, attitude towards crop insurance, behavioural intention, and insurance behaviour as dependent variables. Results show no significant difference in education, attitudes, or insurance behaviour among different groups. Low-income farmers showed significant differences from middle- and high-income farmers, as per Scheffe's post-hoc tests. crop insurance and risk awareness explained a 34% (R squared) variance in farmers' attitude toward crop insurance towards the scheme. Attitude, Perceived behaviour control, social norms, Awareness about crop insurance schemes, and Knowledge about crop insurance, variables explain 43% variance in the behavioural intention of the farmers.

Keyword: Perceived behaviour control, behavioural intention, crop insurance schemes

INTRODUCTION

Crop insurance protects farmers and cultivators, safeguarding them against financial losses resulting from anticipated crop failure caused by a range of uncontrollable natural factors. These factors include weather conditions, floods, pests, and diseases, among others. The actuarial aspect of crop insurance involves intricate calculations conducted by actuaries. This field is essentially a branch of statistics that deals with determining the probabilities of certain events occurring. A "catastrophe" refers to a sudden and severe disaster that strikes unexpectedly, leading to substantial losses. When a farmer faces a loss covered by the insurance policy, they can file a "claim" for indemnity, which is the payment made to them by the insurer. The "Sum Insured" is the specified amount mentioned in the policy, representing the maximum limit up to which the insurer will provide indemnity in the event of a covered peril resulting in a loss to the insured property. "Indemnity" is the compensation paid to insured farmers for their crop loss caused by insured perils. The amount is determined based on the extent to which the actual yield falls short of the coverage specified in the policy. The insurance policy includes a "Guaranteed Yield," which is the expected physical yield of the crop as stated in the policy. This guaranteed yield serves as a benchmark against which actual yields are compared when adjusting any losses.

Crop insurance has been essential in managing agricultural risk globally, with various systems developed to protect farmers from losses due to weather anomalies. In India, crop insurance has a long history and has evolved over time, particularly with the implementation of the Pradhan Mantri Fasal Bima Yojana (PMFBY) in 2016.

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This scheme primarily uses area-yield insurance mechanisms, which are designed to address crop yield losses across insured regions. Wang, Tack, and Coble(2019) To spur investments and innovations in agriculture, a robust crop risk transfer system is necessary. Because weather anomalies occur frequently and agricultural losses arise globally, agriculture insurance is a must to protect farmers. India has a long history of defending the farming community from a range of cultivation risks by putting in place several crop insurance systems that have undergone periodic modifications. India has a long history of defending the farming community from a range of cultivation risks by putting in place several crop insurance systems that have undergone periodic modifications. These insurance policies, which often cover plantation and horticultural crops, have grown in popularity.

Singh and Singh (2018) study focusses on improving crop loss assessment in area-yield crop insurance products, which cover horticulture and plantation crops by the way data-driven approaches in field. These insurance mechanisms address climate change effects, and studies require a stronger market presence. The basis risk in area-weather insurance has increased due to concerns about low-quality weather records and the disparate relationship between weather parameters and agricultural productivity. The basis risk in area-weather insurance has increased due to concerns about low-quality weather records and the disparate relationship between weather parameters and agricultural productivity. India's PMFBY, launched in 2016, is an area-yield crop insurance scheme, focusing on determining crop yields through manual measurements, making it difficult to obtain unbiased estimates (Ray, Hasan, and Goswami., 2018).

Active Corp Insurance Scheme in Tamilnadu:

a) Modified National Agricultural Insurance Scheme (MNAIS) - The Department of Agriculture & Cooperation has selected several Agriculture Insurance Company of India Ltd., which have potentially provide insurance to agricultural sectors.

b) The Weather Based Crop Insurance Scheme (WBCIS) provide safe cuard to farmers especially from unfavorable weather events like excess rainfall, frost, heat, and humidity, affecting the crop's growth season.

c) The government-sponsored Pradhan Mantri Fasal Bima Yojana (PMFBY) is a crop insurance program that combined several stakeholders on a single platform..

d) The Coconut Palm Insurance Scheme provides risk management assistance to farmer and marketer of susceptible to natural disasters, pests, and illnesses, covering damage or losses to coconut palm and nut output during the 2011-12 fiscal year.

The four schemes are mostly used in insurance schemes in Tamilnadu (and the present research intent is to measure the acceptance and crop insurance behaviour of the farmers

Objective of the study

To study the farmer's attitudes of towards various crop insurance schemes

To study farmer awareness about crop insurance scheme

To explain the farmer crop insurance behaviour with application of The Theory of Planned Behaviour (TPB)

THEORETICAL BACKGROUND

The Theory of Planned Behaviour (TPB) is used to predict a person's intention to participate in a behaviour at a certain time and location. TPB is derived from the Theory of Reasoned Action (TRA). TRA originated in 1980; it was to provide an explanation for every behaviour that a person has control over. The TRB model's central idea is behavioural intent, which is influenced by attitudes towards the certain things that a behaviour will produce the desired result as well as subjective supports of the advantages and disadvantages of that result (Ajzen, 1991). The TPB is has five constructs that collectively explains a person's behavior. Rabiu et al., (2018) usethe TPB to explain the farmer adoption process of tactfulness in agricultural processes. Attitude is a major

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determinant of behaviour intention as TPB. Farmers' attitude toward crop insurance scheme is studies by various authors; Jamanal Natikar and Halakatti (2019) study was carried out in Karnataka state (India) former have positive attitude to crop insurance in general but they were unhappy delay settlement of claims. Dhande (2017) Samota, Dangi, Yadav and Yadav (2024) former have positive attitude towards crop insurance scheme and he suggest benefits derived the positive attitude. He also suggests attitude play major role in crop insurance schemes.

Adah, Chia, and Shaibu (2016) study on 240 rural Nigerian farmers reveals a negative perception of agricultural insurance schemes due to unclear communication about implementation procedures. Their reserach suggests enhancing communication and education could improve farmers' attitudes and participation in such programs. Johari, Saili, Ahmad and Azam (2024) study suggests that enhancing farmers' awareness of crop insurance can improve their perception of its reliability, leading to more positive attitudes towards insurance schemes, ultimately improving financial security and resilience. Mohamad Basir, Roslan, Zakaria, Nasron Ooi, and Anggraini (2024) reveals that smallholder farmers' awareness of crop insurance, risk attitudes, and farm size significantly influence their adoption of insurance schemes. further their work suggest that awareness programs and individual farmer characteristics.

H1) Awareness about crop insurance schemes significantly affects attitude towards a crop insurance scheme

H2) Risk awareness significantly affects attitude towards crop insurance schemes.

RESEARCH METHODOLOGY

The present research uses comes under category of behaviour studies and a questionnaire was adopted in various earlier studies in the field. Attitude and Social norms were adopted from Rabiu et al., (2018). Perceived behavioural control and behavioural intention adopted (Ajzen, 1991)and used with a slightly modified manner. Awareness about crop insurance and risk awareness were five and four items which were adopted Rabiu et al., (2018).

Sample determination: the present research collects schedules from 129 farmers on a simple random sampling method in the Thanjavur and Thiruvarur districts of Tamilnadu. The present study also uses MSEM to execute the research design framed on the basis theory of planned behavior. Mean is the arithmetical average of a group of scores, and standard deviation measures the variability of data about the mean score.

One-way ANOVA is used to test the difference between the mean scores of more than two groups. In the study, ANOVA is used to test the hypotheses of difference in the level of impact by various socio-demographic variables age and income level on attitude towards crop insurance, behavioral intention, and insurance behaviour as dependent variables. ANOVA analysis was used to find a significant difference among the groups and Post Hoc (Scheffe) Tests were conducted to find which group differs from others.

The study used a Multi-Structural Equation Modeling (MSEM) approach to test hypotheses. Validity tests included Exploratory Factor Analysis (EFA), Discriminate Validity (DV), Convergent Validity, Average Variance Extracted (AVE), Cronbach's Alpha (R), and Confirmatory Factor Analysis (CFA). These tests ensure accurate and reliable measurement of constructs, providing a solid foundation for testing hypotheses using MSEM.

The data was analyzed using SPSS version 21, with most items loading onto their variables. Confirmatory Factor Analysis (CFA) was performed to assess convergent and discriminant validity. The Average Variance Extracted (AVE) value was above 0.7, indicating excellent variance capture. Cronbach's alpha was calculated, with all values exceeding the acceptable threshold of 0.70, confirming data reliability and internal consistency.

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Table 1 Master Validity Table

	CR	AVE	MSV	MaxR(H)	OD	PRO	CI	CU	RT	VC	MMP	PP
1	0.952	0.770	0.057	0.958	**0.877**							
2	0.943	0.780	0.057	0.993	0.238***	**0.883**						
3	0.930	0.730	0.041	1.002	0.169**	0.018	**0.855**					
4	0.923	0.752	0.008	0.973	-0.023	-0.089	-0.036	**0.867**				
5	0.850	0.586	0.070	0.855	0.052	0.065	0.004	0.048	**0.765**			
6	0.810	0.523	0.022	0.853	0.148*	0.106†	-0.007	-0.023	-0.001	**0.723**		
7	0.911	0.781	0.041	1.054	0.107†	0.114*	0.203***	0.061	0.096	0.015	**0.884**	
8	0.793	0.500	0.070	0.847	0.065	0.063	-0.005	0.084	0.264***	-0.034	0.107†	**0.707**

Source: primary data

Subjective Norms (SN) are beliefs about how others in a social circle approve or disapprove of a behavior, influencing an individual's decisions and actions. Rahman and Husin (2022) these norms are influenced by social context and expectations, shaping an individual's approach to specific behaviors; this norms affects farmer adoption of insurance schemes. Furthermore, the subjective norm describes how social pressure affects a person's perspective on how to behave an action, and relates on an individual's behaviour (Husin & Rahman, 2016).Suriansyah, Nurliza, Dolorosa, Rosyadi, Suswati (2024) suggest that subjective norms have significant influence of on the farmers' intention to considered insurance scheme as well s risk management systems.

H3) Social norms significantly affect the farmer's crop insurance intention.

Perceived behavioral control (PCB) is an individual's perception of how easy or difficult it is to perform a exact behavior, influenced by factors like resources, skills, and external obstacles. Behavioural intention: This refers to the influencing desire factors that influence a given behaviour, where the stronger the intention to perform the behaviour, the more likely the behaviour will be performed. Hossain (2024) Farmers' insurance purchase decisions were correlated with their experimental measures of risk aversion and perception behavioural control affects the crop insurance behaviour. Farmers who are risk-averse and have control over risk-taking have a significant impact on their behavioural intention.

H4) PCB of farmer shasa significant impact on farmer crop insurance intention

Johari, Saili, Ahmad, and Azam (2024)Crop insurance is crucial for rural farmers in developing countries, mitigating risks and providing shield against climate change and weather hazards. It enhances resilience,

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stabilizes income, and supports agricultural sustainability and food security in vulnerable regions. examines the factors that influence paddy farmers' intention to purchase agriculture crop insurance being affect awareness and risk management behavior. Karthik and Ramalingam (2014); and Nirmal and Babu (2021) stated that scheme availability and knowledge about policy affect the insurance intention of farmers.

H5) Risk awareness has a significant impact on farmer crop insurance intention

H6) Awareness about crop insurance schemes significantly affects farmer crop insurance intentions

H7) Attitude has a significant impact on farmer crop insurance intension

This study provides empirical insights into the various factors influencing farmers' intentions to purchase crop insurance, including knowledge, risk attitude, and social factors. These insights can help identify areas for improvement and strategic interventions. By shedding light on farmers' intentions to purchase crop insurance, this study can contribute to the enhancement of risk mitigation strategies in agriculture. Farmers will be better equipped to safeguard their investments and ensure their economic stability. Furthermore, policymakers will benefit from this study's findings, which can guide the development and implementation of crop insurance policies that are more attuned to the needs and preferences of farmers.

H8) The behavioural intention has a significant impact on farmer crop insurance behaviour

H9) Perceived behaviour control of farmers has a significant impact on farmer crop insurance behaviour

Table 2 Variable mean score and Slandered deviation

S.no		Mean score	Slandered deviation
1	Awareness about crop insurance,	3.51	0.78
2	Risk awareness	2.76	0.56
3	Social norms,	3.10	0.39
4	Attitude	3.45	0.56
5	Perceived behaviour control	2.35	0.34
6	Awareness about crop insurance schemes,	3.22	0.53
7	Risk awareness	3.09	0.71
8	behavioural intention	3.55	0.31
9	Perceived behavior control	2.35	0.45

Measured Structural Equation Model - The hypotheses tested in MSEM based on three exogenous (attitude, buying intent, and buyer behaviour variables) and five endogenous (awareness, Knowledge, PBC, and perceived behavioural control)

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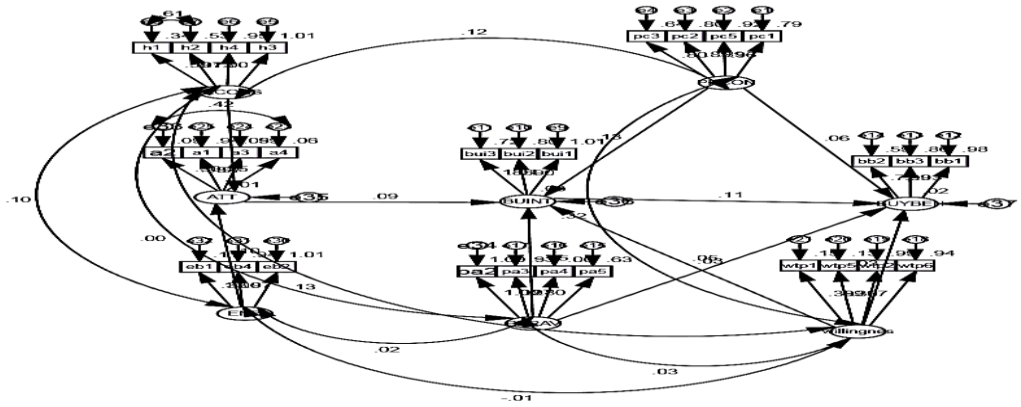

The model summary was prepared with the "Model Fit Measures", AMOS Plugin developed by Gaskin and Lim (2016) and the model has been an excellent fit for the analysis. Hu and Bentler (1999) suggested five important measures and threshold for this model (in table).The table shows that the model is an excellent fit for the analysis except one measurement such as RSMR which is inacceptable level.

Table 3Results of the Model Fitness

Measure	Estimate	Threshold	Interpretation
CMIN	844.132	--	--
DF	458	--	--
CMIN/DF	1.843	Between 1 and 3	Excellent
CFI	0.969	>0.95	Excellent
SRMR	0.050	<0.08	Acceptable
RMSEA	0.044	<0.06	Excellent
P Close	0.984	>0.05	Excellent

(**Output generated by AMOS graphic 21version**)

Table 4Variance Explained

S.No	Dependent variable	Independent Variable	Variance Explained
1	Attitude	Awareness about crop insurance, Risk awareness	34%
2	Buying intent	Attitude, Perceived behaviour control, social norms, Awareness about crop insurance schemes, Knowledge about crop insurance	43%
3	Buyer behaviour	behavioural intention, Perceived behaviour control	37%

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Source: primary data

The dependent variables awareness about crop insurance and risk awareness explained 34% (R squared) variance in farmers attitude crop insurance towards scheme. Attitude, Perceived behaviour control, social norms, Awareness about crop insurance schemes, Knowledge about crop insurance, these variables explain 43% variance in the behavioural intention of the farmers. behavioural intention, Perceived behaviour control explains 37.5%variances in buyer behaviour

Table -5: Hypotheses Results (unstandardized Regression weights)

	Dependent Variables		**Independent Variable**	**Estimate**	**S.E.**	**C.R.**	**P**
H1	Attitude	<---	Awareness towards crop insurance,	0.031	.011	-.999	.318
H2	Attitude	<---	Risk awareness	.020	.011	1.970	.047
H3	Buying intent	<---	Social norms,	.389	.208	1.868	.062
H7	Buying intent	<---	Attitude	.144	.058	2.494	.011
H4	Buying intent	<---	Perceived behaviour control	.000	.023	.019	.985
H6	Buying intent		Awareness about crop insurance schemes,	.089	.039	2.257	.022
H5	Buying intent		Risk awareness	.017	.037	.440	.660
H8	Buyer behavior	<---	behavioural intention	.089	.039	2.257	.022
H9	Buyer behavior	<---	Perceived behavior control	.058	.050	1.149	.251

Source: primary data Output generated by AMOS graphic 23 version

Results and Interpretation:

H1 is rejected and it suggests that awareness about crop insurance schemes have a positive and insignificant influence on attitude towards a crop insurance scheme. H2) Attitude towards crop insurance schemes is significantly affected by the risk awareness of farmers in the study area. Farmers' awareness of the insurance scheme has an average score of 3.10 and a high deviation of 0.78. It suggests a lack of awareness about schemes has adverse effect on attitude of farmers.

H3 is approaching a significant level and it suggests that social norms have a considerable impact on the behavioral intention with C.R of 1.868.H4 is rejected and it suggest that Perceived behaviour control(PBC) has an insignificant influence on behavioural intention. This result is against Johari et al (2024) and we can suggest that the PBC average score is also 2.35 maximum of 5, farmers study PBC role in the study area has less impact on farmer behaviour.

H5 is rejected and it suggests that risk awareness has less impact on farmer crop insurance intention. it suggests that farmer risk does not pay considerable importance to risk awareness. H6 is accepted and it suggest that awareness about crop insurance schemes significantly affects farmer behavioural intensions.H7 is accepted with p value less than 0.05 and as per our bases theory of study attitude played major role in behavioural intention

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this finding is in line with earlier studies of Jamanal et al., (2019); Nirmal and Babu (2021). H7 the result also suggests that farmer in the study area have positive attitude (3.45/5.0) towards the crop insurance schemes.

H8 is accepted, and present research uses TPB, as per bases theory to study the farmer behaviour, and behavioural intentions significantly affects the crop insurance behaviour. The result supports earlier studies such as that behavioural intention has a significant impact on farmer crop insurance behaviour Hossain (2024); Rabiu et al., (2018). H9 is rejected and it suggests that perceived behaviour control has less impact on farmer crop insurance behaviour in the study area.

Age of the sample Respondents

Table -6: Respondent Age

Age level	Frequency	Percent	Valid Percent	Cumulative Percent
18-25	17	13.1	13.1	13.1
25-35	53	41.1	41.1	54.2
35-45	31	24.0	24.0	78.2
45-55	18	14.2	14.2	92.4
55-above	10	7.6	7.6	100.0
Total	129	100.0	100.0	

Source: Primary Data

The above table indicates that most of the respondents are middle-aged group people. The study avoids the minor respondents in their analysis. The age group above 55 is the minimum participant group 53% of the respondents come within the age of 35.

The gender of the sample Respondents

Table -7: Respondent Gender Details

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	54	42.8	42.8	42.8
Male	75	57.2	57.2	100.0
Total		100.0	100.0	

Source: Primary Data

H10) There is no significant difference among different age groups and attitudes towards crop insurance

H11) There is no significant difference among different age groups and buying intention towards crop insurance

H12) There is no significant difference among different age groups and crop insurance buying behavior.

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Demographic variable role on farmer crop insurance behaviour

Kumari,Singh,Mishra,Sinha, and Ahmad (2017) study socio-economic variables' role in the adoption of crop insurance schemes and suggest that income and education play a major role in the crop insurance adoption process. The descriptive statistics show that Attitude towards crop insurance schemes is positive with a second high mean score (3.51) for this study. In this study, consumer age effects on attitude towards crop insurance, behavioural intention, and insurance behavior were tested. The result is illustrated in below table (**ANOVA with** Post Hoc test). Statistical analysis and results (Age and study variables) One-way ANOVA tells us whether there is any significant difference in the mean scores of the dependent variable across the groups. Post-hoc tests were done to find out where these differences lie‖ (Pallant, 2007). The present study consists of an unequal group in size, so the researcher goes with Scheffe's Post – hoc tests which are most suitable for unequal groups.

Table 8Independent Variable: Age

	dependent	Type III Sum of Squares	Df	Mean Square	F	Sig.	Observed Power[b]
H10	Attitude towards crop insurance schemes	1.267	4	.322	.480	.651	.165
H11	buying intention	12.65	3	4.152	6.52	.000	.971
H12	crop insurance behavior	3.45	4	.836	1.25	.277	.394

Source: Primary Data

First the researcher takes age as an independent variable and attitude towards crop insurance, behavioral intention, and insurance behaviour as dependent variables. The table illustratesthat H10 and H12 were accepted at @5% significance in different age group respondents and attitudes towards crop insurance schemes mean and crop insurance behaviour do not differ significantly. The study found that attitudes towards crop insurance and behaviour were not statistically significant, but buying intention was significantly influenced. Schaffer's post-hoc tests suggest that farmers aged 45-55 had higher buying intentions, highlighting the importance of age in evaluating factors influencing crop insurance adoption among farmers.

H13) There is no significant differences among different income groups and attitudes towards crop insurance.

H14) There is no significant difference among different income groups and buying intention towards crop insurance.

H15) There is no significant difference among different income groups and crop insurance buying behaviour.

Table - 9Independent Variable: Income

Source	Sum of Squares	Df	Mean square	F	Sig.	Observed Power[b]
H13 Attitude	5.471	4	1.368	1.186	.416	.374
H14 buying intention	8.357	3	2.786	2.429	.074	.606
H15crop insurance behavior	11.349	4	2.837	2.480	.033	.708

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In this analysis, (Table-9) the researcher takes First the researcher takes income as an independent variable and attitude towards crop insurance, behavioural intention, and insurance behavior as dependent variables and results are illustrated in the above table. H13 and H14 were accepted @5% significant which means that their no significant difference among various education and attitudes towards crop insurance schemes mean and crop insurance behaviour. The results reveals that education does not significantly impact crop insurance behaviour, while crop insurance behaviour has a significant impact. Low-income farmers showed significant differences in crop insurance behaviour compared to middle- and high-income farmers, emphasizing the need for tailored approaches to support low-income groups in accessing financial tools.

CONCLUSION

The intention to purchase crop insurance is a crucial aspect of the agricultural landscape. This study is motivated by the pressing need to better understand the factors influencing this intention, with the ultimate goal of enhancing risk management, economic resilience, and policy effectiveness in agriculture. The contributions of this study will be invaluable to farmers, policymakers, and the entire agricultural sector in achieving a more sustainable and secure future.

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