

# Identify Factors That Increased The Likelihood Of Farmers Purchasing Crop Insurance

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## ABSTRACT

The research set out to determine what criteria in the India are most important to farmers when deciding whether or not to purchase agricultural insurance or invest in a mutual fund to cover risks that cannot be insured against. One reason for doing this research was to find out whether and how government programs can help farmers of different sizes and types create sustainable plans for dealing with agricultural risks. This research, unlike others that have attempted to examine agricultural insurance in isolation, aimed instead to demonstrate the connection between farmers' choices to invest in a mutual fund and their choice of agricultural insurance.

**KEYWORDS** Agricultural Insurance, Farmer Purchase, Crop, Insurance.

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## INTRODUCTION

Despite the fact that agricultural insurance has been studied and implemented, the extent to which farmers prioritize it over other risk management strategies remains unclear. Large-scale, subsidized multi-peril indemnity-based crop insurance schemes have been an integral part of governments' risk reduction strategy because to the volume and high exposure to numerous hazards, particularly in developing countries, and the difficulty of measuring risk using index insurance. In many nations, demand has remained minimal even at costs well below what would be considered actuarially fair for such programs, and this is despite the fact that the government often subsidizes them heavily. There is not much evidence, even in developed countries, would imply that farmers have an extreme aversion to risk, which would justify using private actuarial premiums alone. Traditional indemnity-based insurance systems have major challenges due to information asymmetries in the forms of moral hazard, adverse selection, and ambiguity aversion. Evidence on determining values for specific elements of a crop insurance is scant, notwithstanding research into the risk factors that farmers face and ultimately use to choose which products to buy. The effectiveness of development initiatives and their overall acceptability among target groups may be diminished by this top-down approach that excludes local stakeholders, notably farmers, from the planning process.

Agricultural activity is particularly susceptible to the effect of external variables that are beyond the control of farmers due to high risk and uncertainty. As a result, agricultural results are less predictable than those of other economic activities. As a result of global warming, extreme weather events have become more often and severe. Farmers also have to worry

about market price swings, in addition to the possibility of a declining crop output. Under these conditions, crop insurance has become more vital as a risk management tool for farmers and agricultural policymakers alike.

## LITERATURE REVIEW

**Youngjune Kim et.al (2018)** Over the last two decades, the federal crop insurance program in the United States has expanded significantly. Although crop insurance schemes are becoming more important, little is understood about how they influence farmers' choices to sell or shut down. We use a farm-level panel dataset to identify and quantify the parametric and semi-parametric impacts of crop insurance on the probability of farm disinvestment and farm exits. The dynamic panel model and the Cox proportional hazard model with propensity score matching that we used for our estimations both show that a) crop insurance decreases the risk of farm disinvestment and b) decreases the likelihood of farm departures. Regardless of the parameters used, crop insurance consistently improves agricultural viability.

**Michał Soliwoda et.al (2017)** Agriculture has a high risk profile due to the industry's reliance on environmental conditions for economic success. In this work, we investigate how a nation's dominant "model of agriculture" affects its approach to risk management (and, in particular, its use of insurance). In terms of agricultural growth, post-socialist nations like the Czech Republic and Poland couldn't be more different from one another. Poland's farm sector is split down the middle between large corporate farms and smaller family operations, in contrast to the Czech Republic's centralized focus on industrial farming with vast farms. Policy differences regarding agriculture's place in the economies of the two nations are reflected in the crop and livestock insurance markets' demand and supply sides, as well as in the varying degrees of risk that insurers are willing to take on. Policy solutions for agricultural risk management in the Czech Republic and Poland should strike a compromise between fiscal pliability and efficiency (as seen by insurers).

**Xiaodong Du et.al (2016)** Several characteristics distinguish the U.S. crop insurance industry unique from others worldwide. In recent years, the average premium subsidy rate has been around 60%, with prices set and expenses for selling and servicing insurance policies covered entirely by the government. Furthermore, the law requires that premiums be established at actuarially reasonable rates. With these factors in mind, we check how well crop insurance decisions made by farmers follow economic theory. The costs and benefits of increased risk coverage and subsidy payments are calculated using a general anticipated utility maximization methodology. The expected utility is disentangled from the combined effects of insurance, premium loading, and subsidy transfer, we discover that if rates are actuarially fair, the loading effect vanishes. A cautious farmer, we find, would choose either the greatest possible level of coverage or the plan that delivers the largest premium subsidy, if the premium is actuarially sound. Data revealing odd insurance choices among a wide sample of insurance units contradicts the theoretical conclusion. Employing a novel method based on the mixed logit framework, we demonstrate that, contrary to intuition, larger levels of out-of-pocket premium expenditures do not indicate increased grower welfare, but rather a drop in the chance that an insurance plan is selected. The premium costs seem more important than the future

benefits they support. An example of our regression in action is the new crop insurance trend yield adjustment.

**Alexis Louaas et.al (2014)** We do a theoretical and practical analysis of the best insurance policy for high-severity, low-probability events. Catastrophic events occur when the financial impact of the associated risk exceeds an insignificant threshold, notwithstanding the low likelihood of such events occurring. We show that this is possible when the individual has a strong absolute risk aversion, as in the accident scenario. The perfect insurance coverage for an individual is first described, and then the same is done for a business that may be at fault for a widespread calamity. When the accident's likelihood approaches zero, the best indemnity schedule converges to a limit. This limit schedule refers to an indemnification of victims listed in order of priority based on the severity of their losses and is a straight deductible contract in the event of corporate civil responsibility. We also demonstrate that the cost of contingent risk capital necessary to support the indemnity payment in the event of an accident affects the amount of the deductible. The paper's empirical section is a nuclear accident-specific application of these broad ideas. Large-scale nuclear accidents are a common example of dangers with a high severity but low chance. To determine the best liability ceiling of a nuclear energy power producer, we calibrate a model using data from France. To demonstrate that the minimum corporate liability adopted in 2004 as part of the Paris Convention's revision is probably less than the level that would provide optimal risk coverage for the population as a whole, we use data from the catastrophe bond markets to calculate the cost of contingent capital for low-probability events.

**V. KARTHICK (2013)** Natural and human-caused disasters both have an impact on India's agricultural sector. It's making it impossible for farmers to grow their crops. As a result, taking precautions to safeguard the agricultural sector is essential. Crop insurance is one such precaution. This research looked at what consideration's farmers consider when deciding whether or not to get crop insurance. Age, access to finance, and level of education all had significant roles in the farmers' choices for crop insurance. Farmers' concerns about potential income drops and the inability to switch crops were other factors in the development of crop insurance.

## **METHODS**

The authors opted for quantitative research, utilizing questionnaire surveys using online data collecting as the primary data source, to get at the answers to the study questions. Both direct and indirect approaches were used to reach out to agricultural businesses. In the second part of 2021, we received 214 reliable replies. Standard deviation was 862 hectares, the middle quartile was 62 hectares, and the largest farms in the sample were 175 hectares in size. The mean farm size was 274 hectares. Both small farms with no land and huge farms, some as large as 10,000 acres, were included in the sample. In 2020, The Farm Accountancy Data Network (FADN CZ) estimates that there are 253 hectares of farmland per 1,000 Indians. This mean was quite near to the norm in the sample area. Sample made up of 81.8 percent humans and 18.1 percent corporations, paralleled the composition of agricultural holdings in India. The sample included both production-intensive farms and farms that only operated in naturally limited

regions, with the former accounting for an average of 55.7% of total agricultural acreage. All the major agricultural techniques were covered:

The sample was composed of 82.5 percent males and 17.5 percent females, reflecting the prevalence of males in positions of authority in the agricultural sector. The unfavorable age structure of workers in India agriculture is reflected in the sample population, with the biggest proportions of farmers being between the ages of 40 and 50 (32.5%) and 50 and 60 (28.3%). The majority of responders (76.7%) were highly experienced managers who had been in their current roles for more than 10 years. The composition of the sample was consistent with that of agricultural businesses.

## DATA ANALYSIS

Farmers were polled, and they identified dryness as the primary threat to crop production, followed by harvest rains, pests, diseases, and voles. The three biggest dangers to livestock output were identified as animal injuries, noninfectious diseases, and infectious diseases. The findings of a paired t-test showed that farmers placed varying importance on each hazard, with the exception of frost in grapevines, drought, and voles. Table 1 shows that farmers anticipated a rise in most hazards in the next years.

**Table 1: Scores for selected Risks in Farms now and In Future**

<b>Risk</b>	<b>Average</b>	<b>SD <sup>1</sup></b>	<b>SE <sup>2</sup></b>	<b>t</b>	<b>p-Value</b>
Hailstorm (present)	1.28	1.392	0.099	7.489	0.000
Hailstorm (future)	1.97	1.277	0.091		
Fire (present)	0.51	1.086	0.077	8.013	0.000
Fire (future)	1.22	1.217	0.087		
Windstorm (present)	1.09	1.236	0.088	6.758	0.000
Windstorm (future)	1.66	1.174	0.084		
Flood (present)	0.72	1.115	0.079	6.061	0.000
Flood (future)	1.13	1.226	0.087		
Soil flooding (present)	0.64	1.057	0.075	6.171	0.000
Soil flooding (future)	1.04	1.145	0.082		
Freezing out (present)	0.92	1.090	0.078	5.109	0.000
Freezing out (future)	1.30	1.123	0.080		
Spring frost (present)	1.29	1.247	0.089	4.809	0.000
Spring frost (future)	1.60	1.264	0.090		
Frost on the vine (present)	0.16	0.642	0.046	0.925	0.356
Frost on the vine (future)	0.19	0.717	0.051		
Drought (present)	2.95	1.218	0.087	0.706	0.481
Drought (future)	2.91	1.160	0.083		
Grain sprouting (present)	0.95	1.137	0.081	3.033	0.003
Grain sprouting (future)	1.14	1.141	0.081		
Harvest rainfall (present)	1.92	1.297	0.092	5.006	0.000
Harvest rainfall (future)	2.26	1.170	0.083		
Diseases and pests (present)	1.55	1.307	0.093	5.452	0.000
Diseases and pests (future)	1.87	1.305	0.093		
Voiles (present)	1.46	1.353	0.096	1.963	0.051
Voiles (future)	1.59	1.316	0.094		
Animal disease (present)	0.50	1.053	0.093	10.251	0.000
Animal disease (future)	1.58	1.218	0.108		
Acute poisoning (present)	0.37	0.855	0.077	7.439	0.000
Acute poisoning (future)	1.02	1.028	0.093		

Acute poisoning (future)	1.02	1.028	0.093		
Natural disaster—animals (present)	0.33	0.852	0.078	9.517	0.000
Natural disaster—animals (future)	1.28	1.154	0.105		
Overheating of animals (present)	0.41	0.860	0.079	5.100	0.000
Overheating of animals (future)	0.85	0.921	0.085		
Non-infectious disease (present)	0.72	1.052	0.094	7.144	0.000
Non-infectious disease (future)	1.38	1.083	0.097		
Animal injury (present)	1.02	1.015	0.088	4.606	0.000
Animal injury (future)	1.46	1.077	0.093		

Possibly because both drought and drought risk were already perceived as highly important by farmers, no discernible changes in the expected future importance of drought were detected. The threat posed by voles was likewise considered significant, and farmers saw it as becoming more so in the future. Difficult to insure against natural disasters, such as drought and voles, might be better managed with the aid of a mutual fund for non-insurable risks. The vine threat received the lowest average score, however this might be attributed to the low population concentration of winegrowers.

Livestock disease risk had the biggest impact size (Cohen's  $d = 0.91$ , 0.5 to 1.58 in the future) followed by livestock natural events (0.3 to 1.28 in the present, 0.869 to 0.91). In most cases, the impact sizes for agricultural output were below 0.571.

The growing significance of most agricultural dangers was a major source of worry for farmers. In order to keep public spending to a minimum, the Czech Republic needs an efficient system for managing both insured and uninsured risks.

### **Incentives Influencing the Individual Demand for Agricultural Insurance**

Seventy-five-point eight percent of farmers had crop insurance, while 54 percent of farmers had animal insurance. The majority of farmers that purchased crop insurance only covered themselves for the most basic of disasters, such as hail (97.2%), fire (55.6%), and windstorm (54.2%). Farmers seldom had protection from natural disasters like floods, freezes, and spring frosts. The most popular types of livestock insurance cover illness (94%), natural catastrophes (83.3%), and accidental poisoning (53.3%).

Most of the uninsured farmers (71%) said they had no plans to get coverage in the near future. However, 10.1% of currently uninsured farmers express future interest in purchasing coverage. Some farmers were thinking about buying insurance to protect themselves against dangers that aren't typically covered. However, the numbers were quite low when looking at the absolute frequencies for this sample of responders.

In Appendix E, we include all of the predictors that were utilized to kick off the stepwise logistic regression. We used a significance level of 0.05 and a forward likelihood ratio (LR) stepwise regression analysis, we input all theoretically viable factors into the model and subsequently

chose statistically significant uncorrelated predictors. Simultaneously, the farm area boundaries that most strongly impacted insurance coverage were calculated using the optimum binning method: interval (0) = 73 ha (reference category), interval (1) = 73 ha to 312 ha, and interval (2) = 312 ha or more. The completed model is shown in Table 2.

**Table 2. Logistic regression results.**

Model Variable	B	SE <sup>1</sup>	Wald	df	p-Value	Exp(B) <sup>2</sup>	95% CI <sup>3</sup> for Exp(B)	
Area of agricultural land (farm size)			29.411	2	0.000			
Area of agricultural land—interval (1)	2.064	0.518	15.904	1	0.000	7.876	2.856	21.717
Area of agricultural land—interval (2)	5.844	1.220	22.958	1	0.000	345.276	31.616	3770.723
Distrust of insurance companies	0.569	0.239	5.638	1	0.017	0.566	0.354	0.905
Probability of losses exceeding 20% of production	0.569	0.241	5.555	1	0.018	1.766	1.101	2.835
The price (premium) influences the probability of taking out an insurance policy	0.628	0.237	7.020	1	0.008	0.534	0.335	0.849
Risks are managed in the company according to a formal strategy	0.480	0.239	4.036	1	0.045	0.619	0.387	0.988
Intercept	1.903	1.181	2.596	1	0.107	6.704		

Both the propensity to acquire and the actual acquisition of agricultural insurance were accurately predicted by the model. The high area under the ROC curve (0.858) and reasonable Nagelkerke's R2 (0.603) both corroborated the high quality of the model.

A logistic regression analysis indicated that the size of the insured's farm and the cost of the premium had the greatest impact on whether or not they choose to get agricultural insurance, the likelihood that the insured would suffer a loss of more than 20% of their harvest, and the existence of a formal plan for managing risks. The model described in Table 2 allows us to infer the following.

Generally speaking, the larger the farm, the more likely it is that insurance will be purchased; When people have less faith in insurance providers, they are less likely to get crop insurance (everything else being equal). Agricultural insurance is more likely to be purchased (all else being equal) when the risk of a loss of more than 20% of output rises; The chance of purchasing agricultural insurance drops (all else being equal) as the degree to which one agrees with the assertion that price plays a role in the choice to purchase insurance falls.

### **Farmers' Views on Upcoming Fund for Non-Insurable Risks (the Fund)**

Less than a third of farmers (30.4%) have heard of the Fund via casual channels but lack in-depth understanding, while more than half (52.3%) are completely unfamiliar with it. When asked where they learned about the Fund, just 9.8% cited media sources, while only 7% cited the Chamber of Agriculture or professional groups. One responder only claimed to have had hands-on experience with the Fund's inception and early planning. As a result, the majority of respondents provided no useful information regarding the fund. Farmers had a voice in shaping the Fund's composition, whatever that may have been.

The majority of respondents (65%) believe that the Fund should be administered by the Paying Agency, with producer/breeder groups coming in a distant second (16.8% of the vote). The

remaining 9.3 percent of respondents suggested that the Fund be administered by a separate legal organization rather than the Chamber of Agriculture.

Overall, 92.6% of respondents favored making varied Fund contributions based on farm type. Farmers also favored speedy compensation, with 57.6% hoping for a response within three months and 35.1% anticipating a response within six months.

As shown in Table 3, there is a correlation between farmers who have insurance and those who wish to receive compensation from the Fund. Farmers who had not previously obtained agriculture insurance were shown to favor unconditional indemnity. The Fund's indemnity, insurance covering at least half of the year's harvest being obtained by the farmer is a must.

Agricultural insurance needs are less likely to be met (all else being equal) when there is greater consensus that hazards on the farm are managed under an established, written strategy.

**Table 3. Compensation for Agricultural Risks from the Pooled Fund for Uninsurable Events.**

<b>How Should the Indemnity Payment Be Tied to Commercial Agricultural Insurance?</b>		<b>No</b>	<b>Yes</b>	<b>Total</b>
No conditions (indemnity from the fund should not be linked to the purchase of commercial agricultural insurance)	Count	83	44	127
	%	65.4%	34.6%	100%
	Adjusted residual	4.1	4.1	
Agricultural insurance of at least 50% of annual production ( <u>otherwise</u> , no indemnity)	Count	12	27	39
	%	30.8%	69.2%	100%
	Adjusted residual	3.3	3.3	
Agricultural insurance of at least 50% of annual production ( <u>otherwise</u> , indemnity is halved)	Count	15	22	37
	%	40.5%	59.5%	100%
	Adjusted residual	1.8	1.8	
Total	Count	110	93	203
	%	54.2%	45.8%	100%

## CONCLUSION

Agricultural risk management in India has included state compensation for losses caused by weather and other output hazards. The system of regular ad hoc payments from the public coffers, however, can no longer be maintained. While ad hoc aid continues to put a strain on state finances, this reduces farmers' resilience in the face of risk and other repercussions. One

reason for doing this research was to find out whether and how government programs can help farmers of different sizes and types create sustainable plans for dealing with agricultural risks. The study's findings might reveal, for instance, which of the available external incentives really work.

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