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Agricultural Insurance and Intensification Investment: Case Study of Khorasan Razavi Province

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ABSTRACT

Theoretically and empirically, it has been often argued that production uncertainty affects the farmers' production efficiency. Insurance can play an impactful role in reducing the uncertainty and, consequently, increasing the investment. Using multilevel models, we examined the effect of agricultural insurance programs on investment in the agricultural sector of Khorasan Razavi Province. The cross sectional data was collected by using the two-stage cluster sampling method in 2012-2013. The results indicated that the insurance background, insured cultivation area, compensation payments, and all of the socio-economic variables as well as the county and climatic situations affected the farmers' willingness to invest. Hence, insurance policies should be based on climatic conditions and particularized for the local situations of the specific counties. In addition, the payments of the compensation should be on time to encourage the investments.

Keywords: Compensation payments, Indemnity payments, Multilevel model, Production uncertainty.

INTRODUCTION

In developing countries, livelihood of people in rural and suburban areas depends, directly or indirectly, on agricultural activities (Chantarat *et al.*, 2007). However, agriculture does not have any impact on development indices without any proper investment. In order to clarify agricultural investment, proper investment here means balance between agriculture and other sectors with respect to (1) direct state investment, (2) efficient budget allocation for education-extension programs, and (3) burden of taxation levied on different sectors (Johnston and Mellor, 1961). Investment is an important element of agricultural development and poverty reduction in rural areas. However, agricultural investment in these societies is typically influenced by different sources of risk and uncertainty, such as weather deviations, financial insecurity, and other external risk sources (Li and Miranda, 2015). These external phenomena alongside the inherent risks of the agricultural activities create an insecure situation preventing outside investors to invest in the agriculture sector. Moreover, inside investors employ a risk-avoidance behavior in their new investments and they may be unwilling for new risky investment (Gine, 2009; Li and Miranda, 2015).

Agricultural insurance can be considered as a strategy to bring a safer atmosphere for risky business. In other word, insurance schemes are potent tools to cope with income losses through indemnity payments and therefore stabilize the income and economic performance of the farms (Spörri *et al.*, 2012). As a matter of fact, insurance has potentials to transform the life of the poor in low-income settings by providing a market-based approach to alleviate the effects of catastrophic shocks (Toth *et al.*, 2014). Since income stabilization through insurance schemes can bring secure incomes

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for farmers, they might invest their resources in agriculture (Spörri *et al.*, 2012). Thus, insurance programs not only produce a safer income for poor farmers, but also they might give them ability to invest more in their business. In other word, agricultural insurance programs influence agricultural investment in two ways. First, they cause almost a certain situation for investment and bring more confidence for the inside and outside investors. Secondly, they can stabilize farmers' income and create enough courage among traditional farmers to invest in risky productive activities.

Khorasan Razavi is one of the most important, extensive, and populous provinces of Iran and the local agriculture sector of the province plays vital role in the local and national economy. However, in recent years, the province has been faced with drought, widespread crop and livestock diseases and pests as well as fluctuations in prices of both farm products and inputs that cause high volatility in farm-household income. Investigating the investment flow in different economic sectors of Khorasan Razavi, we find that only 11 percent of total investments are allocated in agriculture, which might be a reason for the modest sectorial growth and low investments. Hence, we analyze the impact of different indicators such as insurance index on agricultural investments. There are various studies on the impact of agricultural insurance on production efficiency, growth and etc. (Toth *et al.*, 2014). However, there is no study focused on the impact of agricultural insurance on agricultural investment, yet.

Epetimehin (2011) suggests that all the agricultural indexes (in Nigeria) such as growth, investment and financial markets are affected by risk and uncertainty. However, insurance programs modify the negative effect of uncertainty. Examining the effect of direct and indirect indices of insurance on maize producers in the central part of Serm, Markovic *et al.* (2013) concludes that indirect insurance index has a significant relation with risk reduction and production growth. Pocuca *et al.* (2013) suggest that the agricultural insurance could be considered as an important determinant of productivity growth. Thus, extension of insurance programs can be helpful in the countries like Serbia. Performing endogenous ex-ante analysis of the effects of insurance in China, Cai *et al.* (2010) exhibit empirical evidences where the formal insurance increases farmers' tendency to invest in risky production. Janzen *et al.* (2012) asserts that the farmers who use insurance strategies tend to invest more in risky activities, even at low levels; and this additional investment comes from the expected reduction in their vulnerability that insurance programs will offer in future.

Based on the previous studies, we can conclude that the insurance programs can increase the agricultural investment and growth and reduce the poverty in rural area. However, the studies mentioned above do not include heteroskedasticity aroused from the hierarchal structure of data. Ignoring the hierarchal structure, if the true model suggests to include them is a misspecification problem. The study of Baronchelli *et al.* (2016) indicates that the relationship between the investment and socio-economic variables includes interaction between the explanatory variables. By increasing the number of explanatory variables, the multi-colinearity between the variables is not negligible any more. On the other hand, omitting the variables, if the true model suggests to keep them, cause misspecification bias. The problem is more serious when there are some omitted variables that interact with included variables. Some of these variables are unknown regional factors that affect the relationship between the dependent variables and explanatory variables. To avoid this hazard, we use a hierarchal (multi-level) model. As argued by Goldstein (2011), multi-level models correct the estimation of variance-covariance matrix by including the random effects and are more efficient than the ordinary least squares. For more details, the reader can refer to Goldstein (2011),

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however, necessary details are included in the section on Materials and Methods. Our results, support our previous discussion and as we predict the regional structure significantly affect the estimations. The multi-level structure of relations indicates the importance of regional planning. This is more applicable in terms of policy making. For the conclusion the reader can refer to section 4.

MATERIALS AND METHODS

There are many factors and characteristics that influence the willingness to invest of the farmers. For example, gender, education, work experience, field of activity, age, etc. Gender differences exist in most of rural communities; hence, the gender of the respondent is hypothesized to influence the agricultural investment. Since education can increase the knowledge about the available opportunities and funding sources (Anang *et al.*, 2015), it is hypothesized to influence the investment, too. Following Anang *et al.* (2015), land ownership and household incomes are the other factors which are hypothesized to influence the investment. Also, age and work experiences could be important determinants of farm investments, too, because it is predictable that the experienced farmers have better credit management skills. However, the effect of household size is ambiguous. On the one hand, larger families are less limited to provide the labor needed for production and, on the other hand, they are often too limited in the accumulation of capital because of higher family expenditures. Baronchelli *et al.* (2016) suggest that the effect of family size on domestic and foreign direct investment depends on the degree of family involvement in their decisions to invest.

The relationship between the investment and irrigation systems is a complicated story. Especially because the modernization of irrigation systems is considered as an investment expenditure. In order to the environmental changes, the majority of studies focused on the optimal investment for irrigation modernization (Mushtaq *et al.*, 2009; Crossman *et al.*, 2010; Hagos and Mamo, 2014). However, the effect of irrigation modernization on new investments is not clarified yet. By including the irrigation systems, we estimate the effect of irrigation system on agricultural investment.

The other factor affecting the investment expenditures is the membership in cooperatives. Members of cooperatives follow the policy line of their organizations and behave different than the other farmers. Although the members of a cooperative are heterogeneous in term of tendency, interests, and wealth (Bauwens, 2016), but this heterogeneity is negligible in terms of investment behavior (Höfer and Rommel, 2015). However, the members of an individual cooperative may be significantly different from the members of other cooperatives. This heterogeneity is not negligible and causes the average effect of membership to be ambiguous and differs from sample to sample.

As mentioned before, the effect of insurance on agricultural investment is less studied and has remained unclear yet. Our main hypothesis was the positive effect of insurance on agricultural investment in Khorasan Razavi Province.

The data used by the study were collected through the two-stage cluster sampling method, based on the climatic condition. Table 1 represents descriptive characteristics corresponding to the study's variables. The findings imply on the impressive differences between the investigation of the 30.75% of the farmers who used insurance services and the remaining 69.24% of the farmers who did not use. The average difference is 27.82% and implies the positive effect of insurance on investment. Using a regression model, the differences in investigation behavior of the farmers (likes Age, Education, Household Size and Etc.) could be broken down to some variables mentioned before.

$$Y_i = B_0 + XB + \epsilon_i \quad (1)$$

Where, the independent variable (Y_i) is the farmer's total investment and the explanatory variables (X) include various socio-economic

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Table 1. Variables and descriptive statistics.

Sign	Description	Measurement	Insured 30.76%	Non-insured 69.24%	Standard deviation
Y	Investigation	Dummy variable 1: Investigate and 0: Do not investigate	0: 42.02% 1: 57.92%	0: 69.90% 1: 30.10%	-
X_1	Age	Years	48.72	51.26	13.8
X_2	Education	Years of schooling	5.58	4.7	4.18
X_3	Household size	Persons present family	4.81	4.73	1.92
X_4	Cooperation in family	Persons involved in farming	1.79	1.65	1.26
X_5	Main vocation	Dummy variable 1: Agriculture and 0: Non-agricultural	0: 10.93% 1: 89.07%	0: 11.89% 1: 88.11%	-
X_6	Entry	Dummy variable 1: Ancestral and 0: Selective	0: 9.83% 1: 90.16%	0: 7.52% 1: 92.47%	-
X_7	Farm type	Dummy variable 1: Sparse and 0: Lump	0: 25.14% 1: 74.86%	0: 21.84% 1: 78.16%	-
X_8	Irrigation system	Dummy variable 1: Modern and 0: Traditional	0: 83.60% 1: 16.40%	0: 98.30% 1: 1.70%	-
X_9	Water resource	Dummy variable 1: Well and 0: others	0: 19.67% 1: 80.32%	0: 34.46% 1: 65.53%	-
X_{10}	Membership in cooperatives				
X_{11}	Borrowing	Dummy variable: borrowing from banks 1: Borrowed and 0: Do not borrowed	0: 63.93% 1: 36.06%	0: 85.68% 1: 14.23%	-
X_{12}	Insurance background	Dummy variable 1: Longer than 5 years and 0: Shorter than 5 years	0: 37.16% 1: 62.84%	-	-
X_{13}	Cultivated Land	Dummy variable 1: Larger than 5 hectares and 0: Shorter than 5 hectares	0: 28.96% 1: 71.04%	0: 36.40% 1: 63.60%	-
X_{14}	Compensation payments	Dummy variable 1: Receive and 0: Do not receive	0: 37.16% 1: 62.84%	-	-
X_{15}	Assets	Ownership of land, water resource and/or tractors Number of private assets: 0 to 3	Water: 81.96% Tractor: 56.28%	Water: 63.83% Tractor: 15.78%	-
X_{16}	Farm income				

Source: research findings

characteristics of the farm-households and technical characteristics of the farms. However, the above model is too simplified because it is ignoring the group effect corresponding to the hierarchal structure of data (Naderi and Mace, 2003). Particularly, it is believed that the social and other characteristics have a hierarchical organization in which units at one level are grouped and clustered within units at the higher levels (Goldstein, 1995).

Multi-level structure of the present study includes three levels. First, the farmers were clustered in two groups: those who were using insurance services and others who did not use . Secondly, these two groups were clustered in different cities. And third, cities were clustered in different climatic areas. It is believed that each group characteristics have a different effect on investment and they could influence each other. In other words, observations at the lower level are not independent of the higher levels variables and, therefore, a conventional statistical approach like the Equation (1) could lead to underestimation of standard errors (Jiang *et al.*, 2012). Ignoring the hierarchal structure and analyzing the aggregate data can only give a realization of variables in macro level, and analyzing aggregate data with hierarchical structure result in gross error (Jones and Duncan, 1995). Especially, aggregate analysis cannot be used anymore to draw real visualization of lower level behaviors (Overmars and Verburg, 2006). On the other hand, ignoring the hierarchal structure and continuing to use conventional methods leads to misspecification that might cause heterogeneity in the error term. In this condition, the correlation between two farmers is:

$$\rho = \sigma_{u0}^2/(\sigma_{e0}^2 + \sigma_{u0}^2) \quad (2)$$

Where, σ_{e0}^2 and σ_{u0}^2 are the variances in levels 1 and 2, respectively. Equation (2) measures the correlation between different levels. If the correlation parameter ρ is significantly non-zero, then the ordinary least squares estimations are not more efficient, and the hierarchical structure is not incurable and multilevel models should be used (Goldstein, 1995). Design effect which is calculated based on ρ can be another index for diagnosing the significance of the hierarchical structure.

$$DE = 1+(n_c\text{-}1)\rho \quad (3)$$

Where, n_c is the size of the first level. If the design effect index becomes more than 2, then, applying the multilevel analysis of the data is more efficient than traditional OLS; else, using the multilevel estimation is not significantly more efficient than the traditional least squares and the selected model for investigation of the relationship between variables is ordinary least squares.

The multilevel model in this study is presented in a single complex regression equation as follows:

$$Y_{ij} = \beta_{00} + \beta_{10}X_{ij} + \beta_{01}Z_j + \beta_{11}Z_jX_{ij} + u_{1j}X_{ij} + u_{0j} + \epsilon_{ij} \quad (4)$$

Multilevel model has two major characteristics. First, coefficients of one or several explanatory variables are considered as a random variable. Secondly, this method has more than one residual that depends on the number of random coefficients (Goldstein, 1995). Thus, the first right-hand-side part of the Equation (4), $\beta_{00} + \beta_{10}X_{ij} + \beta_{01}Z_j + \beta_{11}Z_jX_{ij}$, that contains all of the fixed coefficients is called the deterministic part of the model. The second RHS part of the Equation (4), $u_{1j}X_{ij} + u_{0j} + e_{ij}$, contains all of the random error terms and for this reason this part is often called the stochastic part of the model (Hox, 1995). Also, the term Z_jX_{ij} contains the variables that are the interaction between the first and second level variables and effect of these variables on the dependent variable is called cross-level interactions (Hox, 1995).

Using the two-stage random sampling method, the survey data were collected from 620 wheat and barley farms of Khorasan Razavi Province. In the first stage, the province was divided into three climates, i.e. cold, moderate-cold, and moderate-warm; and in the second stage, particular counties were selected by experts of agricultural

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insurance fund of Khorasan Razavi Province. Because of incompleteness, 25 questionnaires were excluded and 595 questionnaires were used for the analysis.

RESULTS

The estimation results of four multilevel models and ordinary least squares are presented in Table 2. Model (1) only includes a constant term and the random part is considered only for the highest level. Significant random parts in all three levels imply the significant hierarchical structure of the data. Hence, the ordinary least squares estimator is inefficient. In the second model all of the socio-economic variables are included in the model. The fixed part of the second model shows that age, education, household size, entry, membership in cooperatives and compensation payments have a positive but maybe insignificant impact on farmers' investment decisions. However, main vocation, irrigation system, and water resource have a negative, but maybe insignificant impact on the investment. The third model is like the second model, however, the higher levels contain random coefficients, too. Based on the different statistical criteria such as variations in each region, a variety of insurance, deviance index and likelihood ratio test, the third model is known better than the second model. The fourth model is like the third model, however, the constant term of higher levels are excluded from the model. Significant intercepts of the third model indicate that the third model should be more efficient than the fourth model.

Estimated parameters of the third model show that the age has a negative, but an insignificant effect on investment decision. However, the corresponding elasticity indicates that a one percent increase in the farmer's age reduced the investment by 0.61%. So, older farmers are not as risk seeker as the young farmers. This finding is very similar to the results reported by Baronchelli *et al.* (2016). Our findings reject the hypothesis that the age affects the relationship between the investment and other explanatory variables. On the other hand, education has a positive, but an insignificant, effect on investment. A one percent increase in education increases the investment by 0.028%. This finding shows that education can bring a better knowledge of the farmers and they can decide better to invest. Also, well-educated farmers can increase investment productivity. This finding is similar to the results reported by Anang *et al.* (2015).

Both water resources and irrigation system have a negative effect on investment. In fact, sine the majority of farmers were using free underground water resources, they did not feel the need to invest in irrigation systems or water management facilities. Thus, irrigation adoption programs play an opposite role against the investment and policymakers should be cautious in policy implementation.

The results indicate that the farmers who were a member of cooperative(s) had more tendency to invest in their farms than the others. As mentioned before, this is an average of all cooperatives whose members were included in this study. Thus, it does not mean that all the members of all cooperatives invest more than non-member farmers. But, in total, cooperative members spend more investment expenditures. This case in interpretation is in agreement with the results reported by Höfer and Rommel (2015).

To analyze the effect of insurance on the investment, we studied the effect of the experience of previous insurances. These experiences were measured in three aspects: length of insurance time, farm area, and compensated losses. The results indicate that the insurance background and insured cultivation area had a positive effect on investment. Farmers who had used the insurance services for a long time and those who had insured larger fields tended to invest more than others. On the one hand, increases in insurance background and insured cultivation area cause the farmers to

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Table 2. Estimation results of four different methods.

Models	Model (1)		Model (2)		Model (3)			Model (4)		OLS	
Fix part											
Parameters	Coefficient	Sign	Coefficient	Sign	Coefficient	Sign	Elasticity	Coefficient	Sign	Coefficient	Sign
Intercept	137.92***	0.001	60.37	0.333	-56.95	0.307	-	-59.46	0.27	-120.59**	0.038
X_1			0.0826	0.907	-0.135	0.842	-0.619	-0.15	0.825	0.393	0.591
X_2			1.28	0.598	0.571	0.808	0.028	0.25	0.913	1.728	0.483
X_3			5.73	0.238	6.85	0.14	0.318	6.747	0.15	9.61	0.052
X_4			-0.0084	0.999	-2.083	0.763	-0.024	-1.44	0.835	0.0091	0.999
X_5			-38.41	0.129	-31.54	0.227	-0.272	-30.31	0.285	-6.49	0.802
X_6			31.40	0.265	31.78	0.242	0.025	33.801	0.214	32.32	0.274
X_7			20.38	0.269	20.072	0.258	0.044	18.5	0.298	17.21	0.369
X_8			-16.9	0.637	-3.55	0.919	-0.0021	-1.57	0.964	0.592	0.098
X_9			-52.008***	0.006	-46.34**	0.011	-0.316	-43.71**	0.016	-43.61**	0.023
X_{10}			10.9	0.518	11.74	0.463	0.043	10.60	0.507	27.98*	0.094
X_{11}			74.2***	0.000	76.44***	0.000	0.15	75.56***	0.000	86.59***	0.000
X_{12}			6.18***	0.023	3.99*	0.093	0.242	4.50*	0.079	4.44**	0.032
X_{13}			0.79***	0.005	0.47*	0.08	0.0523	0.482*	0.080	1.31***	0.000
X_{14}			0.62	0.45	0.96	0.229	0.0209	0.97	0.228	0.59	0.48
X_{15}			66.34***	0.000	63.75***	0.000	1.18	62.6***	0.000	54.64***	0.000
X_{16}			0.034***	0.000	0.0199	0.347	0.128	0.0235	0.206	0.297***	0.000
Random part											
Climate level											
Intercept variance	11611.66**		1804.23**		0.0874**			-			
Satisfy variance					626.07**			677.11**			
City level											
Intercept variancei	962.41***		1147.14***		809.77**						
Income variance					47.91***			47.91***			
Insurance level											
Intercept variance	16070***		3660.92***		0.00049**						
Job variance					2439.21***			3067.86***			
Residuals Variance	40418.6***		32277.32***		29747***			29923.3***			
ρ of Climate	0.0273		0.0464		0.0186			0.021			
ρ of City	0.0163		0.0295		0.0255			0.0014			
ρ of Insurance	0.2721		0.0941		0.072			0.091			
Deviance	8035.38		7889.35		7850.075			7850.87			
LR test	101.61	0.000	23.44	0.000	62.72		0.000	61.92	0.000		

Source: Research findings.***,**,*: Iindicate statistical significance at 1, 5 and 10 percent level of significance, respectively

absorb more services and facilities from the insurers; and on the other hand, that makes the farmer rely further on the insurers and increases the demands for the insurance services. Although the compensation payments have a positive effect on the willingness to invest, this effect is not statistically significant. A one percent increase in compensation payments increases the farmers' willingness to invest by 0.02 percent. Since using the insurance program creates more secure situation for the farmers and they can use their extra budget for investment in their farm. However, the insignificant coefficient of compensation payments indicates that the present insurance services do not significantly increase the investment.

DISCUSSION

Insurance is a valuable control implement of risk management in agricultural activities. After collecting the data through the two-stage cluster sampling method and using the multilevel modeling approach, we investigated the effect of agricultural insurance and some socio-economic characteristics on farmers' willingness to invest. The appropriate multilevel model contained both the intercept and the random coefficient in the random part, which indicated the insurance-investment relation was heterogeneous in respect to clustering variables (Climate condition, Insurance level, City) and so, the ordinary least squares estimations were not efficient.

The key variables that were entered into the model included insurance background, insured cultivation area, and compensation payments. In additional, use of the insurance services (dummy variable) was considered as a classifier in the hierarchical structure. The results showed that all of the variables which were related to the insurance, i.e. insurance background, insured cultivation area, and compensation payments, had positive effects on the farmers' willingness to invest. However, payment delays make the effect of compensation payments to be insignificant. Hence, it is predicted that timely payments can increase the investments. In additional, the results indicate that the effect of insurance background, insured cultivation area, compensation payments, and all of the socio-economic variables on the farmers' willingness to invest is affected by insurance, region, and climatic situation. Hence, insurance policies should be based on climatic situations and particularized for the local situations of the specific regions.

REFERENCES

1. Anang, B. T., Sipilainen, T., Backman, S. and Kola, J. 2015. Factors Influencing Smallholder Farmers' Access to Agricultural Microcredit in Northern Ghana. *Afri. J. Agric. Res.,* **20:** 2460-2469.
2. Baronchelli, G., Bettinelli, CA., Del Bosco, B. and Loane, S. 2016. The Impact of Family Involvement on the Investments of Italian Small-Medium Enterprises in Psychically Distant Countries. *Int. Bus. Rev*. **25(4)**: 960-970.
3. Bauwens, T. 2016. Explaining the Diversity of Motivations behind Community Renewable Energy. *Ener. Policy*, **93**: 278-290.
4. Cai, H., Chen, Y., Fang, H. and Zhou, L. 2010. Micro Insurance, Trust and Economic Development: Evidence from a Randomized Natural Field Experiment,' NBER Working Paper No. 15396.
5. Chantarat, S., Barrett, C. B., Mude, A. G. and Turvey, C. G. 2007. Using Weather Index Insurance to Improve Drought Response for Famine Prevention. *Amer. J. Agric. Econ.,* **89(5):** 1262–1268.
6. Crossman, N. D., Connor, J. D., Bryan, B. A., Summers, D. M. and Ginnivan, J. 2010. Reconfiguring an Irrigation Landscape to Improve Provision of Ecosystem Services. *Ecol. Econ.,* **69(5):** 1031-1042.
7. Epetimehin, F. M. 2011. Agricultural Insurance in Nigeria and Its Economic Impact. *Int. J. Curr. Res.,* **3(12):** 233-238.
8. Gine, X. 2009. Innovations in Insuring the Poor: Experience with Weather Index-based Insurance in India and Malawi. Brief 7,

[DOR: 20.1001.1.16807073.2017.19.1.18.3]

International Research Institute for Climate and Society, Palisades, NY.
9. Goldstein, H. 1995. *Multilevel Statistical Models.* London Edward Arnold.
10. Goldstein, H. 2011. *Multilevel Statistical Models* (Vol. 922). John Wiley and Sons.
11. Hagos, F. and Mamo, K. 2014. Financial Viability of Groundwater Irrigation and Its Impact on Livelihoods of Smallholder Farmers: The Case of Eastern Ethiopia. *Water Resour. Econ.*, **7:** 55-65.
12. Hox, J.J. 1995. *Applied Multilevel Analysis*. TT-Publikaties, Amesterdam.
13. Höfer, H. H., and Rommel, J. 2015. Internal Governance and Member Investment Behavior in Energy Cooperatives: An Experimental Approach. *Utilities Policy*, **36:** 52-56.
14. Janzen, S. A., Carter, M. R., and Ikegami, M. 2012. Valuing Asset Insurance in the Presence of Poverty Traps: A Dynamic Approach. *Selected Paper Prepared for Presentation at the Agricultural and Applied Economics Association's 2012 AAEA Annual Meeting*, August 12-14, 2012, Seattle, Washington.
15. Jiang, L., Deng, X., and Seto, K. C. 2012. Multilevel Modeling of Urban Expansion and Cultivated Land Conversion for Urban Hotsopt Counties in China. *Landscape Urban Plann.*, **108(2012):** 131-139.
16. Johnston, B. F., and Mellor, J. W. 1961. The role of agriculture in economic development. *Amer. Econ. Rev.*, **51(4):** 566-593.
17. Jones, K., and Duncan, C. 1995. Individuals and Their Ecologies: Analysing the Geography of Chronic Illness within a Multilevel Modelling Framework. *Health Place*, **1(1):** 27-40
18. Li, Y. and Miranda, M. J. 2015. Mitigation Index Insurance for Developing countries: Insure the Loss or Insure the Signal. Selected Poster Prepared for Presentation at the 2015 Agricultural and Applied Economics Association and Western Agricultural Economics Association Joint Annual Meeting, July 26-28, San Francisco, CA,
19. Mushtaq, S., Maraseni, T. N., Maroulis, J., and Hafeez, M. 2009. Energy and Water Tradeoffs in Enhancing Food Security: A Selective International Assessment. *Ener. Policy*, **37(9):** 3635-3644.
20. Markovic, T., Ivanovic, S., and Todorovic, S. 2013. Reduction in Revenue Volatility in Maize Production Applying the Indirect-index Insurance. *Econ. Agric.*, **3.**
21. Naderi, A. and Mace, J. 2003. Education and Earnings: A Multilevel Analysis a Case Study of Manufacture Sector in Iran. *Econ. Edu. Rev.*, **22:** 143-156.
22. Overmars, K. P. and Verburg P. H. 2006. Multilevel Modelling of Land Use from Field to Village Level in the Philippines. *Agric. Syst.*, **89(2–3):** 435–456
23. Pocuca, M., Petrovic, Z. and Mrksic, D. 2013. Insurance in Agriculture. *Econ. Agric.*, **1.**
24. Toth, R., Barrett, C., Bernstein, R., Clark, p., Gomes, C., Mohamed, S., Mude, A. and Taddesse, B. 2014. Productive Spillovers of the Take-up of Index-based Livestock Insurance. Prepared for the 2014 AAEA Annual Meeting. July 27-29, 2014. Minneapolis, Minnesota.
25. Toth, R., Barrett, C., Bernstein, R., Clark, p., Gomes, C., Mohamed, S., Mude, A. and Taddesse, B. 2014. Productive Spillovers of the Take-up of Index-based Livestock Insurance. *Prepared for the 2014 AAEA Annual Meeting*.

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بیمه محصولات کشاورزی و افزایش سرمایه‌گذاری: مطالعه موردی استان خراسان رضوی

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چکیده

از لحاظ تئوری و تجربی پذیرفته شده است که عدم قطعیت در تولید محصولات کشاورزی بر کارایی تولید اثر میگذارد. بیمه می تواند نقش موثری در کاهش عدم اطمینان و در نتیجه افزایش سرمایه در بخش کشاورزی داشته باشد. در این مطالعه با استفاده از الگو چند سطحی، به بررسی اثر بیمه محصولات کشاورزی در سرمایه گذاری در بخش کشاورزی استان خراسان رضوی مورد بررسی قرار گرفت. داده-های مورد استفاده در این تحقیق با استفاده از روش نمونه گیری خوشه ای دو مرحله در سال ۹۳-۱۳۹۲ جمع‌آوری گردیده است. نتایج مطالعه نشان داد که سابقه بیمه، سطح زیرکشت بیمه شده، غرامت دریافتی، عوامل اقتصادی و اجتماعی، نوع اقلیم و شهرستان بر افزایش تمایل کشاورزان در سرمایه-گذاری تأثیرگذار است. از اینرو سیاست‌های بیمه‌ای باید بر اساس نوع اقلیم و شرایط هر منطقه باشد همچنین جبران خسارت‌ها باید در زمان مناسب صورت پذیرد تا موجب تشویق سرمایه‌گذاری گردد.

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