

Risky business: engaging farmers in innovative risk management tools through ICT.

Evidence from a randomized control trial

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Introduction

Risk management is a critical component of farming. As the agricultural sector continues to face numerous challenges, such as climate change, soil erosion, and a dwindling workforce, it is important for farmers to have access to risk management tools to help them manage their operations. However, in order for these tools to be effective, farmers must be informed about their availability and how to use them. This can be done through the use of different communication strategies, such as interpersonal communication, digital communication, and ICT technologies (Aker, 2011). These strategies can be used to effectively inform farmers about the risk management tools available to them, allowing them to make informed decisions about their operations. Extension services are at front-end in helping farmers to adopt new risk management tools and strategies, but they may struggle in outreaching farmers and change their behavior effectively (Larochelle *et al.*, 2019). In turn, this may slow down the adoption by farmers of newly proposed policies and risk management tool. Indeed, if on the one side there are many determinants of adoption of innovation and innovative systems related to the farm and farmers' characteristics, and the innovation characteristics itself, on the other side the type of information and the type of channels to reach out to farmers influence the adoption of such new policies and instruments (Aker, 2011). SMS, emails and online newsletter offer a low-cost service to disseminate information timely to agricultural producers both in developing and developed countries (Fu and Akter, 2016). In this study we want to test how different form of information communication technology nudge farmers in enrolling into an innovative risk management tool: the income stabilization tool. We developed a randomized control trial within the population of apple producers in Autonomous Province of Trento (PAT) in Italy. Randomized control trials (RCTs) are undoubtedly an appropriate tool for improving the design of the European Common Agricultural Policy (CAP) (Behaghel, Macours and Subervie, 2019), however, applications for this goal is scant and low (Colen *et al.*, 2016; Behaghel, Macours and Subervie, 2019). This paper thus would like to contribute to: i) the literature on the role of ICT on the adoption of innovation among farmers by adding empirical evidence about the impact of different information channel transmission, ii) the research regarding the acceptability of newly and innovative proposed risk management tool from the EU CAP risk management toolkit, iii) the literature regarding the use and the potential of RCT as a tool to predict and investigate EU farmers behavior.

Data and research methodology

Our RCT was implemented in the PAT in the North-East of Italy. The local defense consortium (Co.Di.Pr.A.) is the major defense consortium and represents almost 90% of the agricultural producers. Moreover, it works as extension service and brings together the majority of the local demand for insurance and other risk management tools (i.e. mutual funds). Indeed, the Co.Di.Pr.A. is the management entity of the Income Stabilization Tool developed for the apple-sector, which has been introduced in the PAT since 2019 and is the first and most developed IST scheme in the whole EU

(Rippo and Cerroni, 2023). The consortium usually advises farmers (for example about the beginning of the new insurance campaign) through SMS and a quarterly printed news-magazine. This has also been the case for spreading information and gathering participation in the apple-IST during its first three-years period of operation (i.e. 2019-2020-2021). For the new three-years period of functioning of the apple-IST two different forms of communication campaign were instead proposed. In our RCT, we involved 3.355 apple producers randomly allocated in two sample (see Table 1 for summary statistic): sample A, consisting of 1.493 apple producers that was informed about the beginning of the new three-years periods through the usual communication channels (SMS and paper communication); sample B, consisting of 1.862 apple producers who, in addition, received information through an official email from the defense consortium (see Table 2 for between group comparison). The 1.863 farmers were randomly chosen from the apple producer population by the Co.Di.Pr.A. communication and marketing office. The email contained a short 100 words text informing the farmers about the possibility to join the IST scheme and a link to a video posted on the official Youtube channel of the consortium explaining the functioning of the IST scheme (see Figure 1).

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Figure 1. Example of the email sent to the farmers of sample B



Source: Co.Di.Pr.A. (2023)

We adopted a two-stage estimation approach with instrumental variable (IV) to identify the impact of the type of communication strategy. The two-stage least squares (2SLS) estimator with instrumental variables (IV) is a statistical technique used to estimate causal relationships between variables in econometric analysis. It is particularly useful when the relationship between the dependent and independent variables is complicated by the possible presence of endogeneity (i.e., when the independent variable is correlated with the error term in the regression equation). In our case, the 2SLS estimator uses one instrumental variable, which is uncorrelated with the error term and correlated with the

independent variable of interest, to estimate the effect of the independent variable on the dependent variable. This method provides more accurate estimates than standard regression models, which assume that the independent variable is exogenous, and can help to identify the causal relationships between variables that are necessary for making policy decisions. The 2SLS are reported in Equation 1 and Equation 2.

$$x_i = \beta_0 + \beta_1 z_i + \beta_2 X_i + \varepsilon_i \text{ (Eq. 1)}$$

$$y_i = \alpha_0 + \alpha_1 \hat{x}_i + \eta_i \text{ (Eq. 2)}$$

Where x_i is a dichotomous independent variable telling whether or not the farmer has opened the link embodied in the email ($Open_Link = 0.50$), which is treated as endogenous variable in Equation 2; z_i is our treatment variable ($Mail = 0.55$) informing if the subjects belongs to the control (Group A) or the treatment (Group B); X_i is a set of independents covariates like: gender (*Female*), age (*Age*), location of the farm within the PAT (*Area*), type of active risk protection strategies used on-farm (*Rp*), farm area (in hectares) (*Sup_ha*), a variable informing if the farmer has enrolled in the Income Stabilization Tool in 2021 (*IST_21*). It is important to notice that the error term ε_i has zero correlation with x_i and z_i does not affect y_i directly but only through x_i . In the second stage y_i describe the farmers' choice to enroll in the apple-IST in 2022 (*IST_22*); \hat{x}_i is the estimated value of the variable in stage one, and η_i is an error term with zero mean.

Table 1. Summary statistic of sample (n= 3.355)

Variable	Description	Mean	SD
IST_21	Farmers participating in the apple IST scheme in 2021 (= 1; =0 otherwise)	48%	0.49
IST_22	Farmers participating in the apple IST scheme in 2022 (= 1; =0 otherwise)	48%	0.49
Mail	Farmers who received the mail (i.e. the treatment)	55%	0.49
Age	Farmers' average age	56	14.76
Female	Farmers is female	4%	0.31444
Sup_ha	Farm size in ha	2.56	2.55
Rp_No	Farm using no on-farm protection (= 1; =0 otherwise)	68%	1.32
Rp_Nets	Farm using only anti-hails nets (= 1; =0 otherwise)	22.62%	0.16
Rp_Frost	Farm using only anti-frost system (= 1; =0 otherwise)	6.83%	0.03
Rp_Mix	Farm using nets with anti-frost system (= 1; =0 otherwise)	2%	0.26
Area_VSN	Farm located in Val di Non (= 1; =0 otherwise)	72.65%	0.99
Area_VAL	Farm located in Valsugana (= 1; =0 otherwise)	5.33%	0.05
Area_TSR	Farm located in Trento Sud – Rotaliana (= 1; =0 otherwise)	14.45%	0.14
Area_BVL	Farm located in Bleggio – Valle dei Laghi (= 1; =0 otherwise)	7.57%	0.07

Source: Co.Di.Pr.A. (2023)

Table 1. Summary statistic of Group A (control) and Group B (treatment)

Variable	Description	Group A	Group B
IST_21	Farmers participating in the apple IST scheme in 2021 (= 1; =0 otherwise)	47%	49%
IST_22	Farmers participating in the apple IST scheme in 2022 (= 1; =0 otherwise)	47%	50%
Open_Link	Farmers in treatment group B who received the mail and open the link to the video (= 1; =0 otherwise)	0%	50%
Age	Farmers' age	60	53
Female	Farmers is female	10%	11%
Sup_ha	Farm size in ha	2.30	2.76
Rp_No	Farm using no on-farm protection (= 1; =0 otherwise)	71,73%	66%
Rp_Nets	Farm using only anti-hails nets (= 1; =0 otherwise)	20,96%	23,95%
Rp_Frost	Farm using only anti-frost system (= 1; =0 otherwise)	5,89%	7,57%
Rp_Mix	Farm using nets with anti-frost system (= 1; =0 otherwise)	1,41%	2,47%
Area_VSN	Farm located in Val di Non (= 1; =0 otherwise)	79%	67%

Area_VAL	Farm located in Valsugana (= 1; =0 otherwise)	4,29%	6,12%
Area_TSR	Farm located in Trento Sud – Rotaliana (= 1; =0 otherwise)	10,58%	17,56%
Area_BVL	Farm located in Bleggio – Valle dei Laghi (= 1; =0 otherwise)	5,96%	8,86%

Source: Co.Di.Pr.A. (2023)

Discussion of results

The results of the model are reported in Table 3. As it is shown by the variable *Open_Link* (2.99, p -value < 0.001) opening the link to the Youtube video contained in the email increases the likelihood of participating in the Income Stabilization Tool. This should signal that the informing the farmers with a targeted personal email with visual explanation regarding the functioning of the innovative risk management tool help increasing the acceptability of such tool. The control variables have heterogenous effects. The bigger the farm area ($Sup_ha = 0.06$, p -value < 0.001) the more the farmer adhere to the Income Stabilization Tool scheme. This is similar to what found previously in other study regarding adoption and use of the income stabilization tool (e.g., Rippo and Cerroni, 2023). Also, older farmers ($Age = -0.01$, p -value < 0.01) are less inclined in participating to the income stabilization, suggesting some resistance to innovation, (Santeramo, 2019).

Variable	Description	Estimates
Open_Link	Farmers in treatment group B who received the mail and open the link to the video (= 1; =0 otherwise)	2.99*** (0.61)
Sup_ha	Farm size in ha	0.061*** (0.16)
Rp_Nets	Farm using only anti-hails nets (= 1; =0 otherwise)	0.07 (0.13)
Rp_Frost	Farm using only anti-frost system (= 1; =0 otherwise)	0.27 (0.22)
Rp_Mix	Farm using nets with anti-frost system (= 1; =0 otherwise)	0.46 (0.32)
Area_VAL	Farm located in Valsugana (= 1; =0 otherwise)	-0.37 (0.25)
Area_TSR	Farm located in Trento Sud – Rotaliana (= 1; =0 otherwise)	-0.47* (0.20)
Area_BVL	Farm located in Bleggio – Valle dei Laghi (= 1; =0 otherwise)	-0.36 (0.23)
Age	Farmers' age	-0.01* (0.00)
Female	Farmers is female(= 1; =0 otherwise)	-0.39 (0.25)
Constant		-2.88*** (0.34)
N° obs		3.355
Wald chi2		69.52

Notes: Standard errors in parenthesis. ***p<0.001, ** p<0.05, *p<0.01

Main conclusions

This paper investigates the impact of different forms of information communication technology (ICT) on the adoption of innovative risk management tools by farmers. Specifically, the study tests how different communication strategies (interpersonal communication, digital communication, and ICT technologies) can effectively engage farmers in participation in an innovative risk management tool: the Income Stabilization Tool. The research was conducted through a randomized control trial (RCT) in the Autonomous Province of Trento (PAT), Italy, involving apple producers. The study compares the impact

of two different communication campaigns on farmers' enrollment in an income stabilization tool (IST) developed for the apple sector. One group was informed through usual communication channels (SMS and paper communication), while the other group received information through an official email in addition to the usual communication channels. The study employed a two-stage estimation approach with instrumental variable (IV) to identify the impact of the type of communication strategy. The findings suggest that email communication is more effective in engaging farmers to enroll in the IST scheme than the traditional communication channels of SMS and paper communication. The paper contributes to the literature on the role of ICT on the adoption of innovation among farmers and the acceptability of newly and innovative proposed risk management tools from the EU CAP risk management toolkit. Furthermore, the study highlights the potential of RCT as a tool to predict and investigate EU farmers' behavior.

Essential references

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