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SMALL-SCALE APPLE FARMERS' WILLINGNESS TO INVEST – THE CASE OF KORÇA REGION FARMERS IN ALBANIA

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Abstract

In this study we aim at assessing the willingness to invest of small-apple farms in Korça region-Albania. Furthermore, we want to identify and assess what are major determinants, as percept by farmers', willingness to invest. To this purpose we used data collected through face-to-face interviews with apple farmers. We used descriptive statistics, as well as classical and multinomial logistic regression. Most of farmers are willing to invest in view of their positive expectations for investment climate. Other important factors of willingness to invest are access to loans, advisory extension services, market competition, willingness to cooperate and willingness to take loans, and farm income, while socio-demographic factors such as age, education, and farming experience do not have significant effect on willingness to invest. Large farms are generally more willing to invest. We present also a general framework of constraints and policy levers to improving the investment climate which is almost valid also for Albania. Improving farmers' access to private credit sources, policy stability, providing information and public advisory services to small farmers, support farmers to adopt new technology, support to the creation of farmers' formal and informal groups, and mitigate risks of various type are some but essential policy measures to motivate farmers to invest more in apple.

Keywords: willingness to invest, investment climate, risk, apple farm, cooperation, access to loans, socio-demographic factor, micro-economic factor, environmental factor, multinomial logistic model

INTRODUCTION

Agriculture and apple production in Korça region

Korça area is a very important agricultural area of Albania. About 11 % of the country's agricultural land is in Korça and 12 % of farms operate in Korça. This region is famous in Albania for its apple production, because it contributes to about 60–70 % of the national apple production. According to agricultural statistics, apple is also the major fruit in Korça area. As for year 2016, apple area occupied almost 69 % of the total land with fruits trees, and 83 % of the total fruit

production[1]. The apple production trend over years has been positive and very strong. This is because of positive and strong trends in both the area planted with apple and productivity. Thus, in year 2016 as compared to year 1995, the apple production increased by 15 times, while the productivity increased by about 3 times. Thus, apple production has comparative advantages not only over other fruit types but also other products. Albanian farms are small or even very small, and extremely fragmented, as a result of the land distribution legislation applied after the fall of communism in 1991. Of similar size are also Korça farms. The average farm size in Albania is about 1.3 hectares, whereas in Korça it is about 1.4 hectares.

Situation and research problem

As indicated above, apple farming in Korça region has been very dynamic, in both production and productivity. But developments in other related sectors, such as storing and other post-harvest activities, have shown to be not as much dynamic, mainly because of insufficient investment. There are no reliable official data about investment activities undertaken by apple farmers, but discussions with agricultural experts and farmers have revealed the need for larger investment because there exists much unused potential to developing the apple sector. These potentials are related not only with areas that might be put under apple exploitation, but also with new technology adoption, post-harvest technologies and storing.

Thus, on one side there is clear need for investment, but parallel with it there is a need to know how willing are the apple farmers, to invest more in apple production or related activities and services. And in relation with this, which are the major factors shaping their willingness to invest, *inter alia*, barriers to investment as per their perceptions. Thus, willingness to invest is a key indication, and critical for the investment to happen in practice, but it is unknown and needs careful assessment. It is important but unknown in terms of role and effects that small Korça apple farmer attribute to potential barriers to investment in the future.

Research goal

The purpose of this research is to assess the willingness to investment of small apple farmers in the area of Korça, and to identify which are the major factors that affect, positively or negatively, their willingness to invest. Our intent is also to draw some policy implications on how to enhance in the future the farmers' willingness to invest, and their investment in apple production or related activities.

Review of literature

Investment and related risks

According to the Oxford Dictionary of Business World, (1993), willingness to invest, or willing to invest means having the desire, intention, and determination to invest; or, being ready to invest. But willingness to invest is not the same as the ability to invest. The same source states that ability to invest means having the capacity or the power to invest. Referring to Nikolaev (2016), ability to invest has to do with wealth, human capital (age, education, experience), time horizon and expected benefit from investing, Thus, for example a younger farmer tend to invest in long-term assets. Willingness refers also to the degree of risk one can undertake.

Incentives to investment are at the core of the willing to invest. According to Geda (2014) there are three main theories or models about incentives to invest. According to the Neoclassical or User Cost Model (or the Jorgenson model), investment is positively dependent on marginal product of capital and negatively on real interest rate, because this latter raises the cost of capital. According to Tobin's model or theory, investment depends on current and future expected profits from installed capital; if marginal product of capital is greater than the cost of capital then capital is making profit. According to the third theory, the accelerator theory or model, which is used more for investment in inventory but also for other type of investment, investment is proportional to the firm's level of output: $\Delta (N) = \alpha \Delta (Y)$, where Y is the firm's output. Here $\Delta(Y)$ is the investment accelerator. The partial adjustment model is a form of this model. Alpha (α) is called coefficient of adjustment; it is positive and less than or equal to one.

Investment has also some psychological aspects. These might affect investment decision making. As Branch argues (1989), all humans are subject to errors or "biases inherent in their judgment". For example, people do accept new information but in

1 Agricultural Statistics of Korça Region, 2016

a more or less conservative way; selective recall is another bias (people remember some events but not others); people tend to see patterns when in fact there aren't; people tend to see causation when in fact it is spurious correlation; people respond differently to the same question if asked differently, etc. Sometimes, complex decisions are made step by step, but biases in previous steps can lead to substantial bias in the final step of decision making.

Farmer's investment decision making not only is very important, but it is part of a more general process, the decision–making process of the farmers for the realization of their objectives. Furthermore, as Kahan (2008) states, all types of on-farm decision, investment decision included, are not immune to risks. The risk is the chance or possibility of damage, loss or injury, is stated in the ODB (1993). Willingness to take risk depends on factors such as personality type, self-esteem, investing experience, financial security, inclination to independent thinking and resiliency (Nikolaev, 2016). For any investment decision making, risks are calculated against potential economic, social and environment benefits that farmers can reap from the investment. Thus, a trade-off between risks and potential benefits is established for any investment that farmers are able and willing to make.

There are five types of risks: production, marketing, financial, institutional, and human risk, as argued by Kahan (2008). Farmers are exposed to risks, related to weather uncertainties, fluctuation of market demand, supply, prices; interest rates and access to and repayment of loans, disease and change of government agriculture policy, which cause variability of revenue and productivity. The farm risk tends to increase as farmers become more and more commercial and as world becomes more globalized and liberalized. These risks are not under the control of farmers but farmers may develop ways to cope with and manage them. Risks may be higher when the farmers implement for the first time a new technology, seed or variety. However, different causes of risk are farmer-relative; it may depend on available and used farm resources, farm location, production process chosen, and farmer specific attitude to risk (whether they are risk-averse, risk-neutral or risk-taker). As Kahan (2008) argues, good risk management means anticipating risk-related problems not jus affronting them after they happen.

The agricultural sector faces significant weather, disease and price-related risks, effective risk management instruments can mitigate these risks, thus ensuring agricultural investors a more stable income and creating a predictable environment favorable to investment (provide insurance, enforcement of forward contracts, provide advice on co-operative arrangements among agricultural producers to help implement collective risk management strategies, government encourage diversification, including diversification in production, practices, marketing and income sources, as a risk management instrument).

Some but key aspects of how to help farmers manage the risk would be the dissemination of market, weather and technical information, information about government policies, as well as knowledge and skills, advice to farmers about production, technologies, field operations, use of inputs, planning, marketing, cooperation, and keeping farm records. Here the role of agricultural advisory services is important, if not critical. Some ways to cope with risks would be product diversification, use of quality inputs, risk-reducing technologies, low-risk activities, system flexibility, use different locations for same activity, share leases, custom farming, spreading sales during the year, direct sale, contract agreements; keeping liquid assets, leasing assets, phasing investment, insurance; social arrangements, producer (informal) groups, and cooperatives, producer groups and organizations (formal groups).

Agricultural development is supported by some major factors that are called drivers of development. For the agriculture to develop, Mosher (1996) argues that some essential factors are needed to be in place: markets for farm commodities, technologies continuously changing, disposal of materials and equipment, production stimuli for farm technologies, disposal of materials and equipment, production stimuli for farmers and transportation. In addition, some other factors are called accelerators are needed; education, production credit, cooperation among farmers, soil enlargement and improvement, national planning for agriculture development.

Investment climate in agriculture and constraints to it.

"*Private investment is essential if agriculture is to fulfill its vital function of contributing to economic development, poverty reduction and food security*", (FAO, 2012). But investment climate is essential for private investment in agriculture. Fiesta *et al.* (2011) found that the relevant literature at large affirms that between investment climate and investment there is a clear positive relationship. Thus, creating

possibilities for small-scale producers to save and invest is at the core of enabling environments for sustainable and inclusive agricultural growth (Karlson, 2014).

Some of the major constraints to agricultural investment that farmers often face in access to land, markets, inputs, credit, insurance and technology. In some cases, the government policies actively discriminate against them. This severely affects farmers' incentives and ability to invest in agriculture. In addition, smallholders are often more exposed to risk, which has implications for their investment initiatives and their ability to adopt investment strategies of possibly higher returns, which also involves higher risk. Some farms, in the developing countries, face other obstacles against regarding private investment, such as policy uncertainty, macroeconomic instability, and tax rate. Cost and access to finance, but also regulations and tax administration, as well skills are important constraints to investment climate in these countries (WB, 2005). The well-known elements of an enabling or stimulating environment for investment in general are equally relevant for agriculture too. Shortly, according to FAO (2012) they are: good governance, rule of law, political stability, low levels of corruption, and ease of doing business. Governments that want to stimulate agricultural investment must get these basics right.

According to Christy *et al.*(2009) there are three groups of factors (called enablers) of business climate: a-essential (such as land tenure and property rights, infrastructure, and domestic and foreign trade policy). b-important,(such as norms, standards, regulations and services relating to production, R and D, financial services); useful (such as ease of doing business, business services and effectiveness of horizontal and vertical business linkages between enterprises along the value chains).One major aspect of farm investment is farm technology. Barriers to technology adoption are: weak advisory service, farmers' poor education and management expertise, and not using new technologies for info dissemination. Inertia and resistance to change due to risk and uncertainty in this regard have to be managed by building public and industry awareness and support on the need for change. In the adoption of farm technologies, a role must be played by the government by providing support to agricultural research, extension and education, awareness, information dissemination, and engaging the public through consultations (OECD, 2000). At last, as Karlson, (2014) says, "Lack of adequate input and output markets are well-known disincentives for farmers in developing countries to make productive investment. Without access to adequate seeds, fertilizers, credits or knowledge it is difficult to invest. Without access to wholesale or retail markets, there is no point in producing marketable surpluses. Much more investments in bottlenecks in the input, processing, storage and retail segments of food systems are needed to enable and encourage on-farm investment"

Policies in support to private investment in agriculture

The quality of investment policies directly influences the decisions of farmers to invest. Investment is a key measure to enhance food security and reduce poverty, but for this the poor must be involved, or differently stated, as Karlson argues (2014), "the poor must be enabled and motivated to invest".

According to IIED and Oxfam, (2012), some major motivations to investment by small farmers are: i-encouraging producers' organizations (through laws and taxes to help smallholders to compete in the market, protection of autonomy of co-operatives and producer groups, and abort taxation of intra-co-operative trade). ii-support diversity of market outlets (through public support to upgrade traditional wholesale markets and informal sector, enable participation of private sector and co-operatives, infrastructure improvements, protection of traditional markets); iii-market coordination (investment in market fundamentals such as warehousing and storage, market information, and transparent commodity exchanges, effective market regulation to co-ordinate markets and manage producer risk, such as marketing boards); iv-competition policy (by break-up of cartels, and producing fair trading laws or codes); v-quotas and market preferences (procurement from smallholders, public procurement policies, smallholder access to export quotas); vi-public policy and private standards (enable smallholders to play, providing them with as training, subsidies); trade policy (treat small-scale sectors as an infant industry, phasing in market opening).

Limited access to financial services can severely constrain investment by small farmers. According to FAO, (2012) there is a clear evidence of access to and/or cost of credit as major factors conditioning on-farm investment. Another aspect of financial services is related to risk insurance. Governments may intervene to assist in the provision of

commodity price insurance because self-insurance strategies, such as crop and income diversification and consumption smoothing, may hinder investment and be inadequate to reduce income uncertainty. The land smallholders need also to build social capital if they are to take advantage of economic opportunities and incentives to invest and to overcome investment constraints. Social capital can allow smallholders to engage more effectively in markets and can help compensate for lack of other assets such as land or financial capital. Effective and inclusive producer organizations can play an important role in this regard. Rural producer organizations such as cooperatives can play a key role in strengthening the capacity of smallholders to invest in their agricultural activities. Producer organizations can also help smallholders articulate their concerns and interests and increase their market negotiation power and influence on policy-making processes.

Empirical research findings

Empirical research about private farm investment is extensive. Just to lip a little bit of it, Lefevre *et al.*(2014) based on survey data for 780 farmers in 6 EU countries and using the multivariate probit analysis the authors investigate EU farmers' willingness to invest in four asset classes (land, buildings, machinery, training). They found that these investments are complementary, that is the one willing to invest in land wills also to invest in machinery, etc. Larger farms are more likely to invest in machinery, older farmers are less likely to invest, also more educated farmers intent to invest more, and farmers in countries with higher economic growth intent to invest more. Campbell *et al.* (2018) investigates the effect of business risk management programs in the form of insurance (yield insurance, net margin insurance, etc.) on investment decision by Canadian farmers is investigated. It is found a significant correlation between business risk management programs and decisions to invest, and between level of financial risk and participation of farmers in business risk management programs. This has implications in relation with technology adoption by farmers and long-term increase of farm productivity. Martey *et al.*(2014) in a study for willingness of farmers to participate in innovation platforms is investigated. Innovation platforms are platforms established among various actors along the value chain, to communicate and collaborate for collective resource management and the adoption of new technologies. Using data from 250 rice producing farmers and the probit model they find that age, household size and income significantly affect the willingness to participate on the platform. Ulimwengu *et al.*(2011) using a multivariate probit approach, authors investigate the relationship between farmers' willingness to pay for agricultural services and some socio-demographic and farm factors. It is found that access to extension service reduces willingness to pay for agricultural services; farmers with available markets, with more land and higher income are more willing to pay, farmers more distant to markets are less willing to pay. Ihli *et al.* (2013) studied two investment options: the real options approach (new investment theory) and the classical investment theory, to predict farmers' investment behavior. The real options approach states that investors have two options, to make an investment immediately, or to wait (deferring thus investment for the future) even if making it now would have positive results (Net Present Value). Existence of a price floor for certain products on investment also is studied. Both theories do not enough explain farmers' investment behavior. Price floor also not significantly affects investments. Effect of socio-demographic characteristics such as gender, age, education, household size and socio-economic such as land size, annual per capita expenses, membership in cooperatives, access to credit, household size, is also investigated. Gender and age have no effect on willingness to invest; farm size, household size, if member of a cooperative and education have positive effect, while access to credit resulted of no effect. According to Filius, (1997) farmers' willingness to grow trees is affected by a number of factors. Increased productivity of staple crops, declining soil productivity, physical infrastructure and support to farmers to grow trees by the government, such as programs to protect soil from erosion, introduction of new tree growing practices, free supplied tree seedlings and of quick return cultivars, input and credit subsidies, have been factors of willingness to grow trees. McNulty *et al.*(2016) investigated willingness to invest in irrigation schemes, may be explained by a greater household labor endowment, a higher education level, a higher elevation, a stronger social network, and the perception that irrigation is important to yield.

World Bank (2007) highlights some key issues of the Albanian agriculture. Farm products are not competitive because of high production cost and low quality, and technology problems. Big problems are: low competitiveness of agriculture, business environment, public extension

services, low quantity and quality of inputs, small farm size, access to credit with smaller farms having less access; lack of post harvest storage/packing/grading facilities and services that seriously constrains expansion of production; and poor rural infrastructure. These problems are clearly underlined lately in the EU Instrument for pre-accession (IPA) adopted in 2014. Albanian agriculture is mainly subsistence oriented and characterized by low productivity of land and labor; farming is labor intensive its efficiency is low because of low level of technology and insufficient know-how. Investment in the agro-food sector is also limited. Advisory and extension services are weak, and agriculture-related information systems are not well developed. Agricultural funding is limited, if compared to the needs of the sector and to other countries in the region. National support measures provide production subsidies rather than promoting competitiveness and facilitating access to credit. Producers, including farmers, have not adequate knowledge about the environment and food safety standards.

Andoni *et al.*, (2017a) in a study for business climate in agriculture with reference to Korça region, as major factors of business climate are found to be political instability, unsecure property rights, unfair market competition, poor rural, irrigation and drainage infrastructure, as well lack of cooperation among farmers and along value chain. Andoni *et al.* (2017b) studying the business climate in the agricultural sector of Korça region, using descriptive statistics and econometric modeling, they find that in general farmers evaluate as less favorable the business climate for the agricultural sector in general. Specialized and larger farms, older farmers and more educated farmers made better evaluations of the business climate.

Research hypotheses

The research hypotheses are:

1. Willingness to invest by apple small-scale farmers is low, because of on-farm as well as environment constraints.
2. Potential constraints to private investment in small scale apple farming are the socio-demographic factors (education level, age and farming experience)
3. Potential constraints to investment are also some farm-related technical and economic factors (such as small apple farm size, low level of social capital, e.g., co-operation, low farmers' willing to take loans.
4. Another group of constraints to farm investment in apple are environmental factors such as lack of an investment climate, low or no access to various sources of loans, unfair and tough market competition.

MATERIALS AND METHOD

Korça region is of four communes. Korça and Devolli communes are typical areas of apple production, because these are the major areas of the regions' apple production; 85 % of the total apple area of the region is these two communes, while they have only 76 % of the regions total area. Comparing the two communes, Devolli is more typical for apple production, because it has 66 hectares with apple per 1000 hectares of the total agricultural land, while in Korça this Fig. is only 38 hectares.

After selecting these communes as typical apple area, within them we selected 10 villages as most typical sub-areas, as suggested also by apple production experts. From each village we accidentally selected 50 farmers, thus 500 in total. These farms are grouped according to size (dunums) and finally 150 farmers out of this number were interviewed, after randomly being selected based on the principle of proportionality referring to size. We believe this procedure guarantees a representative sample. 25 % of selected farmers have low education, 60 % middle education and the rest of 15 % have higher education. 70 % out of total were aged more than 40 years old. About 60 % of selected farmers used to grow apple on an area up to 15 dunums, and the rest are growing apple over 15 dunums. Data are collected for the variables shown in the Tab. I.

We used two study approaches: descriptive and econometric classical and multinomial econometric modeling approaches.

The general form of a simple classical regression model is:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_kX_k + e$$

Where Y is the dependent variable, X_i are factors or independent variables, a_0 is a free parameter which shows the expected value of Y when all factors are equall to zero. Parameters a_i for i = 1, 2, 3,...., k, are partial regression coefficients. For this model we can calculate the total variance SST of Y and residual, or unexplained variance as:

$$TSS = \sum_i (Y_i - \overline{Y})^2 \quad RSS = \sum_i e_i^2$$

I: *Variables and their operationalization*

Variable	Operationalization	Variable	Operationalization
Willingness to invest	0 = Not willing, 1 = Little willing, 2 = Willing, 3 = Very willing	Willingness to take loans	0 = Not willing, 1 = Little willing, 2 = Willing, 3 = Very willing
Education	0 = Low, 1 = Middle, 2 = High	Access to extension	Low, Average, High
Age	Years	Experience	Years in farming
Apple farm size	Dunums[2] planted with apple trees	(Expected) investment climate	0 = Worse, 1 = Not expected to change, 2 = Better
Market competition	Likert scale (1 to 5): 1 = No competition, 5 = Strong competition	Access to credit	0 = No access, 1 = Low access, 2 = Average access, 3 = High access
Willingness to cooperate	0 = Not willing, 1 = Little willing, 2 = Willing, 3 = Very willing		

They are used to calculate the coefficient of determination:

$$R^2 = 1 - \frac{RSS}{TSS}$$

This coefficient is the percentage of the total variance of Y explained by the variance of the factors included in the model.

We used also the (ordered) multinomial regression model. A multinomial model is one where the dependent variable is categorical, such as willingness to invest with four categories: "0 = not willing", "1 = little willing", "2 = willing" and "3 = Very willing". The general form of the ordered multinomial model with m categories of dependent variable, if the first category is set as a base category, is:

$$P_j = \frac{\exp(a_j - BX)}{1 + \exp(a_j - BX)} \text{ for } j = 1,2,3,...m$$

The left-hand side variables P_i are cumulative probabilities. They are probabilities of an individual being in the i^{th}or previous categories for given value of factors X. Regression coefficients are the same for each category but the free parameter is specific for each category.

We used also the multinomial logistic modeling technique. If the first category of the dependent variable is taken as a reference category, and it has J categories in total, then the general form of the k-factor multinomial model is:

$$P_j = \frac{\exp(a_j + b_{1j}X_1 + ...b_{kj}X_k)}{1 + \sum_{i=2}^{J} a_i + b_{1i}X_1 + ...b_{ki}X_k)}, \text{ for } j = 2,3,...J$$

This model gives the probability or the chance of being in the j category for given values of the k factors. Another form of the above model would be:

$$\frac{P_j}{P_1} = \exp(a_j + b_{1j}X_1 + ...b_{kj}X_k), \text{ for } j = 2,3,...J$$

This model gives the odds, relative chances, or the ratio of the probability of being in the category j with the probability of being in the base category. The exponentiated coefficients Exp (B) are multipliers of odds and indicate how many times increase the odds if a specific independent variable X is increased by one unit, the other X's remaining constant. Odds are or increasing if the regression coefficients are > 0, one (constant) if the coefficient is zero, and decreasing if the regression coefficients are < 0. A third form of the model could be:

$$\log(\frac{P_j}{P_1}) = a_j + b_{1j}X_1 + ...b_{kj}X_k, \text{ for } j = 2,3,...J$$

The coefficients of this model indicate the percentage by which change the odds if a specific X is increased by one and other factors remain constant.

Both logistic models (unordered and ordered) are estimated using the Maximum Likelihood Estimator (MLE). After the estimation one should

2 dunum = 0.1 hectares

perform the statistical inference. This is a complex process which includes a number of tests:

Testing the IIA hypothesis. IIA means the hypothesis on independency of irrelevant alternatives (IIA) for the multinomial logistic model. This is based on the assumption that the error terms are independent across alternatives of the dependent variables. Model is valid and can be used only this hypothesis is valid.

The procedure begins with the formulation of two hypotheses: $H_{0:}$ IIA is valid (Odds ratios are independent of adding or removing other alternatives of the dependent variable). $H_{1:}$ IIA is invalid.

To test the IIA hypothesis we can use the Hausman test:

$$H_{HA} = (B_r - B_f)'[VarCov(B_r) - VarCov(B_f)]^{-1}(B_r - B_f)$$

Here B_f is the vector of coefficients of the full model, Br is the vector of the coefficients of the reduced model (model resulting after the removal of one or more categories of the dependent variable). VarCov(B_r) and VarCov(B_f) are the variance-covariance matrix of the model coefficients, Br and Bf respectively. Statistics HHA is distributed as chi-square χ^2 with degrees of freedom p equal to the rows of matrix Br. If $P(\chi^2 > H_{HA}) < 0.05$), or less rigorously if $P(\chi^2 > HHA) < 0.1$), then H_0 is not valid.

Testing the coefficients of the logistic model. Each coefficient is tested using the Wald test W:

$$W = (B/S_B)^2$$

In thus formula, B are the regression coefficients and S_B are the corresponding standard errors. *Testing the significance of adding new variables in the model*. While looking for better models It is usual to add new variables in the model and to test their (joint or one by one) significance. This could be done using the LR test:

$$LR = -2(L_r - L_u) = -2L_r - (-2L_u)$$

Here L_r is the LogLik (Log-likelihood) for the restricted or reduced model, which is the model with fewer variables; L_u is the unrestricted model, or the model with variables added to the reduced model. The first reduced model is the one with the intercept only.

Some statistical packages like SPSS report directly the chi-square statistic is the difference in –2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting a variable from the final model. The null hypothesis is that all parameters of that effect are 0.

LR follows a chi-square distribution with p degrees of freedom equal to the number of variables added. If $P(\chi^2 > LR) < 0.05$), or less rigorously if $P(\chi^2 > LR) < 0.1$), then variables added in the model are jointly significant.

Testing the overall significance of the model. To test if the model is significant, we use again LR test in the same way as above, comparing the unrestricted model and the model with the intercept only.

Estimate the fitting capacity of the model. The fitting capacity of the model is related with its ability to predict accurately the actual position of farmers against their willing to invest. Two (of many others) indicators that could be used for this purpose are the pseudo Mcfadden R^2 and the percentage of cases (individuals or observations) predicted accurately. A pseudo Mcfadden R^2 between 0.2 and 0.5 tells that the model is a very good predictor. Alternatively we can calculate the percentage of individuals that model predicts correctly. Figures about 75 % or more tell that the model is a good predictor. Also the magnitude of –2Loglikelihood tells how well the model fits the data. Smaller –2Log-lik are telling the model fits well the data. Perfect fits is achieved when –2Loglikelihood = 0.

Testing the collinearity among independent variables in the model. This can be done in a variety of ways. One way which is rather common is using Variance Inflation Factors (VIF for short):

$$VIF = \frac{1}{1 - R^2_{X/X_i}}$$

Values of VIF greater than 10 indicate high collinearity but even smaller collinearity may impact estimation results. In case of collinearity one or some variables could be removed from the model otherwise we can have problems with both the magnitude and sign of the model parameters.

Econometric software like STATA, SPSS, GRETL and other can report this figure. Other fitting ways, such as Pearson chi-square test could also be used.

For more about classical descriptive statistics, regression models and multinomial modeling refer to Gujarati (2003), Wooldridge (2013) and Verbeek (2004).

RESULTS

Just to have a preliminary assessment of the investment situation and some of its potential factors in the apple sector we present some descriptive statistics. Data show that roughly 70 % of farmers are willing or very willing to invest in

apple. In terms of type, investment might be mainly for apple production, but also for post-harvest storing and technologies, as well as advisory services. However, the negative side of this result is that about 30 % of farmers are not willing or little willing to invest, that means that some serious constraints to investment may exist.

Data also show that 69 % of apple farmers are willing or very willing to cooperate among themselves; only a minority of 15 % are not willing at all to cooperate. This situation may appeal for measures and support programs to initiate cooperative farmers' actions. As indicated by data about 65 % of farmers estimate that possibility for a loan is almost inexistent; only 2 % of farmers consider high the access to loans what practically is a null. Therefore, access to loans seems to be a very serious obstacle to future investment by apple farmers. Furthermore, about 60 % of farmers expect that in the near future the overall investment climate in the sector of agriculture will be more favorable for investments in apple. The above result on investment climate reveals that some of its determinants have been estimated positively.

Next, we use multinomial econometric modeling to identify most important factors of willingness to invest. Independent variables or potential factors are taken: expected business climate, access to loans, apple farm size, market competition, farmers' education and age.

We estimated two types of multinomial models, ordered models and unordered logistic models. The ordered model assumes that farmers are ordered according to the categories of willingness to invest. This assumption is more realistic, because the categories of the dependent variable present increasing levels of willingness to invest. The unordered model assumes that farmers are not ordered by their level of willingness to invest, and adjacent categories of willingness to invest are equidistant. Use of both types provides specific information, permitting thus to perform a more complex and detailed analysis.

First, we estimated the ordered logistic model including all potential variables of willingness to invest as listed in Tab. I.

From the initial estimation of the ordered logistic model (not shown here), it resulted that 7 out of 10 variables included resulted significant (extension, farm apple size, investment climate, willingness to cooperate, competition, access to loans and willingness to take loans). Variables age, education and experience, resulted with insignificant effect.

Now, including only significant variables in the models, the estimated ordered multinomial logistic model is as shown in Tab. 2.

The chi-square statistics calculated using –2Log Likelihood for the model with intercept only and the final model resulted 91.531. Using 7 degrees of freedom because the final model has 7 variables more, this model resulted highly significant. We also calculated the McFadden pseudo R^2 equal to 0.368 and the percent of cases predicted correctly equal to 768.4 %, which confirm that the ordered model has very good predictive power.

Now, Tab. II reveals that better extension service, access to loans and investment climate, more willingness to cooperate and take loans can increase farmers' willing to invest; larger farms also are more willing to invest, while tough competition makes farmers more reluctant to invest.

Based on the value of the regression coefficients in front of the independent variables we can write the expression:

II: *The ordered multinomial logistic model, dependent variable "willingness to invest", base category "0 = not willing"*

	Coefficient	Standard Error	Wald	df	p-value	Sign.
Extension (EX)	0.312	0.153	4.346	1	.037	**
Access to loans (AL)	1.585	0.341	21.386	1	.000	***
Willingness to cooperate (WC)	0.397	0.210	3.500	1	.061	*
Competition (CO)	–0.283	0.131	5.080	1	.024	**
Investment climate (IC)	1.369	0.312	19.565	1	.000	***
Farm apple size (FS)	0.110	0.037	10.451	1	.001	***
Willingness to take loans (WL)	0.725	0.293	6.659	1	.010	***
Cut point 1	1.345	1.252	1.154	1	.283	
Cut point 2	4.487	1.382	10.539	1	.001	***
Cut point 3	8.379	1.553	29.099	1	.000	***

$$BX = 0.312*EX + 1.585*AL + 0.397*WC - 0.283*CO + 1.369*IC + 0.11*FS + 0.725*WL$$

We can use this expression to identify and classify farmers by their expected willingness to invest, for given or desired values of the seven independent variables. If the result is lower that cut point 1 then the farmer with these characteristics is expected to be "not willing" to invest. If the result is between cut point 1 and cut point 2 then the farmer with these characteristics is expected to be "little willing" to invest. If the result is between cut point 2 and cut point 3 then the farmer with these characteristics is expected to be "willing" to invest. If the result is greater than cut point 3 then the farmer with these characteristics is expected to be "very willing" to invest.

The estimated unordered multinomial logistic model is as in Tab. III.

Before going deeper into the analysis and the inference process, one should make sure whether the IIA hypothesis holds true. To have a preliminary idea whether this hypothesis is valid or not, we could compare the coefficients of the full model (with all alternatives of the dependent variable included) and the model estimated after one or some alternative have been removed. The comparison of coefficients of the full model and the reduced model (after removing the third alternative, very willing) reveals very small differences between them, so a valid IIA hypothesis is very likely. Based on our calculations, the Hausman statistics results $H_{HA} = 0.82$, then $P(\chi^2 > 0.82)_{p=16} \approx 1 > 0.5$, thus H_0

III: *Unordered multinomial logistic model, dependent variable "willingness to invest", base category "0 = not willing"*

Willingness to invest	B	Std. Err.	Wald	df	p-value	Sign.	Exp(B)
1 = Little willing							
Intercept	–6.541	3.059	4.571	1	.033	**	
Extension (EX)	.960	.389	6.099	1	.014	**	2.612
Access to loans (AL)	.378	.732	.267	1	.606		1.460
Willingness to cooperate (WC)	.459	.514	.798	1	.372		1.582
Market competition (CO)	.457	.278	2.699	1	.100	*	1.579
Investment climate (IC)	1.521	.734	4.299	1	.038	**	4.577
Farm apple size (FS)	.011	.085	.016	1	.901		1.011
Willingness to take loans (WL)	–1.180	.788	2.242	1	.134		.307
2 = Willing							
Intercept	–7.123	3.050	5.454	1	.020	**	
Extension (EX)	1.046	.422	6.153	1	.013	**	2.845
Access to loans (AL)	1.497	.829	3.264	1	.071	*	4.468
Willingness to cooperate (WC)	.558	.530	1.111	1	.292		1.748
Market competition (CO)	–.095	.271	.123	1	.725		.909
Investment climate (IC)	2.563	.798	10.327	1	.001	***	12.981
Farm apple size (FS)	.140	.068	4.225	1	.040	**	1.151
Willingness to take loans (WL)	.011	.743	.000	1	.988		1.011
3 = Very willing							
Intercept	–21.389	6.730	10.102	1	.001	***	
Extension (EX)	1.269	.490	6.700	1	.010	***	3.556
Access to loans (AL)	5.612	1.675	11.220	1	.001	***	273.641
Willingness to cooperate (WC)	1.240	.720	2.965	1	.085	*	3.455
Market competition (CO)	–.181	.375	.231	1	.631		.835
Investment climate (IC)	3.527	1.129	9.757	1	.002	***	34.022
Farm apple size (FS)	.278	.102	7.441	1	.006	***	1.321
Willingness to take loans (WL)	1.222	.954	1.640	1	.200		3.394

results valid at 5 % an even lower significance level. This means that our multinomial logit model can be accepted and useful.

The chi-square statistics calculated using –2Log Likelihood for this model with intercept only and the final model resulted 115.068. Using 21 degrees of freedom because the final model has 7 variables and three levels of the dependent variable, the model resulted highly significant (with $p<0.001$). We also calculated the McFadden pseudo R^2 equal to 0.462 and the percent of cases predicted correctly equal to 74.5 %, which confirm that the ordered model has very good predictive power.

Next, a test of collinearity among independent variables was performed. The largest VIF value resulted

1.09 referring to apple farm size, which means no collinearity. For this model we performed also the likelihood ratio tests for each of the independent variables; all variables are significant for the willingness to invest except for willingness to cooperate (Tab. IV).

To show how the model coefficients could be used in the analysis, we refer to the investment climate variable. For such an analysis we use Exp(B).

If farmers' expectations about investment climate are positive, then all farmer' categories are expected to be more willing to invest, but relative chances to invest increase drastically with increasing category of willingness to invest.

Thus, if expectations about investment climate increase by one unit, chances of a farmer being in category 3 of willing to invest increase about 34 times against chances of being the base (not willing) category, and about 7.42 times (34.0/4.577 = 7.42) against chances of being in category 1 (little willing), and 2.61 times against chances of being in category 2 (willing), other factors remaining constant.

Each equation of the above model could be used to estimate the expected probability of willing to invest for a given or desired set of farmer characteristics.

DISCUSSION

The main finding of this research is that small-scale apple farmers are willing to invest, but serious constraints exist to investment decisions. This finding reflects the need to invest more, and this is in full line with literature which highlights that investment is a key to farm revenue increase and poverty reduction. This result explains the current investment situation in the Albanian fruit sector where farmers' private investment is limited, government subsidies are scarce contribution from banks is almost inexistent.

One of the major positive determinants of the willingness to invest in apple production resulted to be the investment climate in the sector and outside it. This is in line with literature which highlights the positive role of the investment climate, *inter alia* ease of doing business on the willingness to invest and amount of investment (FAO, 2012; World Bank, 2007; Fiesta *et al.* 2011; Andoni *et al.,* 2017a). The investment climate is qualified as a key determinant of the farm investment, but in fact it is a composite determinant including a good number of contributing factors, such as well-functioning input and output markets, adequate taxes, good rural infrastructure, risk management services, etc. It is worth mentioning that farmers predict improvement of the investment climate over the coming tears.

Access to loans and financial services including cost of credits has resulted to be another positive key determinant of farmers' willingness to invest. This reflects the actual situation in the sector

IV: *Likelihood Ratio Tests for the unordered logistic multinomial model*

Variables	Model Fitting Criteria	Likelihood Ratio Tests			
	–2 Log Likelihood of Reduced Model	Chi-Square	df	p-value	Sign.
Intercept	152.890	20.341	3	.000	***
Extension	142.817	10.268	3	.016	**
Access to loans	158.922	26.373	3	.000	***
Willingness to cooperate	135.802	3.253	3	.354	
Market competition	140.963	8.414	3	.038	**
Investment Climate	152.482	19.933	3	.000	***
Farm Apple Size	143.165	10.617	3	.014	**
Willingness to take loans	145.380	12.831	3	.005	***

where farmer' private sources for investment are limited and access to off-farm sources is a scarce or difficult. Generally, the relevant literature (FAO, 2012; World Bank, 2007) highlights the positive role of this factor on farm investment, but in selected empirical research its role has resulted neutral (Ihli *et al.,* 2013). We assume this may happen but in cases where multiple and competitive money sources exist.

Fair competition including adequate markets and has been qualified by farmers as very influential on farmers' willingness to invest. As farmers themselves argue, they face serious difficulties in selling their apple. This happen because they have no competitive power in setting the sale price, they are price takers. One major reason of this could be the total lack of cooperation in the apple sector. Another factor could be the unfair competition from imports. Study of literature also reveals how important are fair competition and adequate markets for the farmers to make productive investment (Karlson, 2014; Andoni *et al,.* 2017a).

Cooperation seems to be another determinant of willingness to invest, as farmers who are more willing to cooperate are also more willing to invest. In fact, cooperation among farmers in Albania is almost inexistent. Albania has already a law on cooperation, but this situation of null cooperation reveals that support to farmers to cooperate has been inadequate or ineffective; otherwise, policy is not addressing in an effective way constraints to cooperation that may exist. Literature also reveals that cooperation and collaboration of farmers, both vertical and horizontal, is very influential on the willingness and decisions of farmers to invest (Martey *et al.,* 2014; FAO, 2012; Ihli *et al.,* 2013; Andoni *et al.,* 2017a)

Farmers have qualified advisory services as very important. Access to and quality of advisory services is an important determinant of private farm investment with a positive role is also strongly supported by international organizations. In the case of Albania, the advisory services are qualified as weak and inefficient (World Bank, 2007). In discussion with farmers, they affirm that public extension agents are almost inexistent, while the private ones are costly and sometimes in conflict of interest with their primary role as role as input traders.

The size of farms has resulted and important determinant of investment. The explanation of this is straightforward, as bigger farms generate more income, which is could also be verified based on our data for Korça apple sector. In a study about the competitiveness of the Albanian farm sector, the World Bank highlights the negative role of the small farm size (World Bank, 2007). However, data show that nothing or very little has changed in respect to the farm size since year 2007. Maybe measures to increase farm size so far have been ineffective or inappropriate.

The socio-demographic factors, such as age, experience and education are found not to affect significantly farmers' willingness to invest. Empirical evidence is not always in line with these findings. Age as a social factor, in some research cases has been found to have a negative effect on willingness to invest (Nikolaev, 2016); Lefevre *et al.* 2014); in other cases its effect has been found neutral to investment (Ihli *et al.,* 2013). In relation with education, empirical research highlights the positive role of education on farmers' willingness to invest (Lefevre *et al.,* 2014); Ihli *et al.,* 2013); Nikolaev, 2016); McNulty *et al.,* 2016). In relation with experience, literature highlights a positive effect of farmers' experience on investment (Nikolaev, 2016).

These controversial results need some discussion. First, this result should be understood as farmers' behavior toward investment being enough similar regardless of their differences in education, experience and age. This might be so because of relative homogeneity of farmers in terms of age, education and experience, or because there are other powerful constraints that can offset the effect of these factors on willing to invest. Another explanation could be farmers living very close to each other and exchanging continuously and informally their knowledge, experiences and skills. This in fact contributes to narrowing differences between farmers in terms of education, experience and age. Of course, these are only assumptions which need to be tested carefully in another study.

Summarizing what discussed above, we can say that the research goal has been achieved; we now have an aggregate assessment of the willingness to invest by apple farmers in Korça region. In terms of hypotheses outlined in the introduction section, hypothesis one is not supported by data, because the level of willingness to invest resulted rather high. Hypothesis two is also not supported by data, because socio-demographic factors age, education and experience did not prove to significantly affect the willingness to invest. Hypotheses three and four are supported by data, as far as farm size, investment climate, willingness to cooperate, access to loans, willingness to take loans, extension services and market competition all are influencing farmers' behavior to invest.

What's new?

Discussing about what's new in this study, the first new is its uniqueness; similar studies do not exist for the Albanian fruit or other sectors. And major determinants factors of willingness to invest in agriculture are derived empirically here for the first time. The approach used is also innovative; ordered and unordered logistic approach is combined to produce more consistent results and to widen analytical dimension. In addition, we have been able to attach to any of factors a relative importance, as perceived by farmers, in terms of which is more important and who's less based on the magnitude of exponentiated coefficients. Moreover we were able to assess some new factors such as extension, willingness to take loans and market competition; these are new as far as were not able to trace empirical research dealing with these factors.

Some limitations of the research

The focus of the research is restricted to the Korça region; this means that results and conclusions may not hold true for other apple producing area. Also for Korça region, the results correspond better to areas where data have been sampled. It was not possible to take a representative sample the whole of region because of high costs and time constraints.

The analysis is based on farmers' perceptions-opinions. In this cases some bias in their responses and consequently in the study results is unavoidable.

The results correspond to one point in time and from them it is impossible to make inferences about them in other time periods and how farmers' willingness to investment has evolved over time.

Lack of secondary data on private farm investments in the apple producing sector is another limitation. This has reduced the possibility to analyse the farmers' willingness to invest in the context of both amount and trends of private investment.

CONCLUSION

The goal of this study is to assess the level of willingness to invest of small-scale apple producing farmers in Albania, and major determinants of this level. This study is highly relevant, because it is unique for Albania and the topic is very important, for a country with relatively low private investment, limited government spending and almost inexistent role of banks. Many institutions need to know why private investment is insufficient, and policies should take place to encourage this investment.

Based on farm-level data analysis, it is found that farmers' willing to invest is relatively high; most of farmers in the study area are willing to invest, but good part of them is not willing, indicating serious obstacles to investment in small apple farming in Albania. Better expected investment climate, higher access to loans, efficient advisory services to farmers, and willing to take loans, are important factors with positive effect on investment in apple farming. Strong and unfair market competition, lack of cooperation (among farmers or alongside the apple value chain) and small farm size seems to be among the major barriers to willingness to invest. Socio-demographic factors, such as age, experience and education are found not to affect significantly farmers' willingness to invest.

Policy implications

The achieved results call for immediate and effective and well-targeted interventions. First, there is a need to improve the investment climate in not just in the agriculture dimensions, but also in a wider socio-economic and political context. This is a task to be performed mainly by the central government but also by the local authorities in collaboration with the public and the farming community based on a participatory approach.

It is of extreme importance, to improve farmers' access to credit sources, such as private banks or government. Though recently the Albanian government launched a new support program in agriculture with its own and EU money, needs are far more than offered. In addition, some partnership of government with private banking sector must be developed to mitigate lending risks and thus stimulate banks to invest in agriculture by providing credit guarantees, relaxing loan regulations or offering farm development services.

Financial support should by priority support larger farms, because they most probably will make better use of support money. It is also important to improve the information system and advisory services, as well as banning unfair trade practices that reduce free trade would have strong effect on farmers' willingness to invest.

Among policies to supporting farmers willing to invest are according to literature which is relevant also for Albania, are access to water, well-functioning input and output markets and effective mechanisms to enforce contracts; access to information and communication technologies, open and predictable agricultural trade policies; empower market institutions and promote sound education.

Delivery of important public goods and services that are not adequately provided by the private sector such as research, development and extension, and market intelligence would be also an effective policy.

Government can also play a role in lifting up private-sector participation in value chain development to the benefit of small farmers. To alleviate high transaction costs of market participation, smallholders have to be encouraged to participate into formal and informal groupings.

Measures to collect farm level data, such as private investments, farm loans and credits from banks and other sources rather their own, and farm technologies are useful. This seems urgent as far as FADN system in Albania is still not in place.

Scope for further research

Analysing regional differences in farmers' willingness to invest would be useful for policy implications in a wider farming environment. The procedure followed here could also be replicated for other major fruits and crops to reveal what results are consistent across regions and crops. A farm policy analysis could also be useful to understand which is the policy's stake as far as the actual farmers' willingness to invest is concerned. Moreover, the actual study could be replicated later in another point in time to understand how the farmers' willingness to invest has evolved over time and possibly assess the impact of new policy measures if any.

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