Erwerbs-Obstbau
https://doi.org/10.1007/s10341-022-00779-3

ORIGINAL ARTICLE/ORIGINALBEITRAG

Analysis of Investment and Insurance in Orange Production: A Case Study for Turkey

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Received: 1 July 2022 / Accepted: 24 October 2022

Abstract

In agricultural production, there are risks and uncertainties arising from production, market, financing, technology, policy and climate conditions. For this reason, it is of special importance to consider risk and uncertainty in future management decisions in agriculture. Orange is a perennial crop and is a continuous source of income generation to the farmers. Orange growing can have three basic destinations: processing industry, domestic market and external market. Turkey is one of the most important producers of oranges on an international level and consistently increases its production. Antalya is a province with significant orange production whose share in total Turkish orange production is steadily growing. On the other hand, there is not enough research related to economic feasibility of investments in the establishment of orange plantations as well as insurance of orange production in Turkey. Therefore, the purpose of this study is to determine the level of profitability of investments in orange plantations and to examine possibilities to introduce modern insurance concepts in this type of activity. The data of the Antalya province for 2018 were obtained from the Turkish Ministry of Agriculture and Forestry (TMAF), Antalya Provincial Directorate. In order to achieve that goal, net present value, internal rate of return and benefit/cost ratio are determined. It was found that investment in the establishment of orange plantation is economically feasible having positive net present value, internal rate of return of 15.04% and a benefit/cost ratio of 1.14. In addition, we demonstrate how the use of modern insurance approaches (such as Adjusted Gross Revenue type of insurance) could be beneficial to producers involved in orange production.

Keywords Orange growing · Agricultural investment analysis · Agricultural risks · Risk management · Insurance · Adjusted Gross Revenue

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Published online: 01 December 2022

Fig. 1 The area of study, Antalya province in Turkey

Introduction

Orange (*Citrus sinensis*) is cultivated all over the world. It is a very nutritious fruit which contains many vitamins such as B-complex vitamins, C vitamin and also minerals such as potassium and calcium. Orange is also used to produce pies, marmalade, juice and jam (Fidan 2009).

Countries with the largest orange production are respectively Brazil (22.14% out of total production), India (13.06%), Mexico (6.16%), Spain (4.43%) and Turkey (1.77%) (FAO 2020). Turkey is one of the most important orange producers, especially in Europe. During 2004–2018 periods, Turkey's orange production increased from 1.30 million tons to 1.90 million tons (TURKSTAT 2020).

Orange is grown in almost all southern regions of Turkey. It is an important source of increase of farmers profit and for rural development in Turkey. Turkey's provinces that are the most important orange producers are Adana, Mersin, Hatay, Antalya, Muğla and İzmir. In Antalya province (Fig. 1) orange is cultivated on more than 750,000 ha and therefore Antalya has an important potential in terms of orange production.

Antalya provides 27.67% of orange production in Turkey. Its volume of orange production (Table 1) increased from 333,275 tons in 2004 to 525,821 tons in 2018. In other words, during the observed period orange production in Antalya province increased 57.77%, while orange production in entire Turkey increased 46.15%. The participation of Antalya region in total orange production in Turkey is substantial and during the observed period rose from 25.64 to 27.67%.

This is the indicator of very fast development of orange production in Antalya province, so there is a need to analyze economic feasibility of this production. Although the technical aspects of orange production have been extensively studied, little information is available on economic aspects of orange production. Nevertheless, in recent years some studies have been conducted regarding the economics of orange production analyzing its costs and revenues (Subasi et al. 2016; Mahanta and Konwar 2014; Robert and Emmanuel 2012; Zenginoglu and Van Dijk 2006; Ropan et al. 2015). Oral and Akpinar (2016) studied orange marketing efficiency in Turkey at the level of producer (it is found to be low), while Fidan (2009) compared citrus sector competitiveness between Turkey and EU-15 Member Countries, determining that Greece, Spain, Italy and Portugal are Turkey's main competitors. A study has been carried out on energy requirements in citrus production (Ozkan et al. 2004), and some studies analyzed economic feasibility of investments in orange production (Karegaonkar et al. 2011; Sidramayya et al. 2017; Trejo-Pech et al. 2017). However, there is still a need for further research concerning investment evaluation in this operation, especially at the local and regional level.

Orange production is one of the most important livelihoods of farmers in the research region. In some years, as a result of the risks and uncertainties encountered in orange production, significant fluctuations may occur in the yield, price and income of the product. This may prevent the manufacturer from looking to the future with confidence and thus from making the right decisions in their plans for the future. Farmers who have agricultural insurance feel more secure. There is a significant contribution and support of the state in order to spread agricultural insurance and make it easier for farmers.

However, there is not enough research on the risks and uncertainties encountered in orange production in Turkey and the measures taken by the farmers against them. For this reason, it is important to examine the agricultural insurance practices in orange cultivation in the research region, in

Table 1 Developments in orange production of Turkey and Antalya Province

Year	Orange production in Turkey (t)	Index (2004 = 100)	Orange production in Antalya Province (t)	Index (2004 = 100)	Share of Antalya province in total orange production of Turkey (%)
2004	1,300,000	100.00	333,275	100.00	25.64
2005	1,445,000	111.15	366,244	109.89	25.35
2006	1,535,806	118.14	370,198	111.08	24.10
2007	1,426,965	109.77	279,203	83.78	19.57
2008	1,427,156	109.78	380,619	114.21	26.67
2009	1,689,921	129.99	401,486	120.47	23.76
2010	1,710,500	131.58	447,588	134.30	26.17
2011	1,730,146	133.09	470,761	141.25	27.21
2012	1,661,111	127.78	487,754	146.35	29.36
2013	1,781,258	137.02	506,588	152.00	28.44
2014	1,779,675	136.90	500,663	150.23	28.13
2015	1,816,798	139.75	496,487	148.97	27.33
2016	1,850,000	142.31	504,655	151.42	27.28
2017	1,950,000	150.00	549,681	164.93	28.19
2018	1,900,000	146.15	525,821	157.77	27.67

Source: TURKSTAT (2020) and authors' calculation

order to identify the problems encountered in practice and propose solutions.

Fluctuation of orange production in Antalya region (presented in Table 1) has been primarily caused by climate factors and high input cost. In order to mitigate the consequences of the negative impact of natural factors on the fluctuation of production value, the application of a suitable insurance model is recommended. In this particular case, the possibility of applying the Adjusted Gross Revenue (AGR) insurance model is analyzed, which represents the type of whole farm revenue insurance.

The insurance of crops and fruits, as a modern form of economic protection of production, is the best risk management instrument in plant production (Marković 2013). Rejda (2005) defines insurance as a community of individuals who are exposed to unforeseen risks and who transfer the risk to an insurance company, and the insurance company accepts to compensate insured persons if an accident occurs, provide other monetary compensation if they suffer loss or provide risk-related services. On the other hand, the insured is obliged to pay the insurance premium to the insurer as a compensation for the transfer of risk. Since 1996, various revenue insurance models have been developed, primarily in the United States of America and Canada. Crop Revenue Coverage (CRC) and Revenue Protection (IP) were launched in 1996. Revenue Insurance (RA) became available in 1997, and Group Risk Protection (GRIP) first appeared on the market in 1999. Until 1999, the only revenue insurance available for the whole farm (WFI) was the RA variant (Babcock and Hayes 1999). For that insurance, the actuarial fair premium was estimated using a similar procedure developed by Hennessy et al. (1997), giving it the form of an insurance portfolio that provides coverage against loss of revenue.

The emergence of modern risk management in agriculture is increasingly focused on ensuring the overall farm revenue (Turvey 2012). The aim of the WFI is to unify all the risks of a farm that can be insured under one policy. Since most of the crop risks are not perfectly covariate, WFI provides more effective coverage than an insurance of each crop or animal with a separate policy. In 2000, a new whole farm revenue insurance policy, AGR, was offered.

AGR represents the type of whole farm revenue insurance (Johnson et al. 2008). This insurance model covers revenue losses that are expected from most cultivated crops on farms, domestic animals and unprocessed animal products such as milk and wool. AGR provides protection against revenue loss caused by a lower level of production or a fall in market prices. Namely, the aim is to provide protection against small revenue due to production losses attributable to unavoidable natural disasters and market fluctuations that affect the farm revenue in the insured year (Johnson et al. 2008).

Many studies have been conducted to determine agricultural insurance practices and farmer tendencies in Turkey (Birinci and Tümer 2006; Tümer 2011; Terin and Aksoy 2015; Aydin et al. 2016; Tekin et al. 2017; Kiziloglu 2017; Tümer et al. 2019; Hayran et al. 2020; Oguz and Diyanah 2021; Kutlar and Akcaöz 2022). On the other hand, it is observed that some studies have been conducted to analyze the insurance practices of farmers in orchards in Turkey (Cukur et al. 2008; Kiraci et al. 2014; Yilmaz 2014; Siray et al. 2015; Yilmaz et al. 2017; Kabaoglu and Birinci 2019;

Tekin and Karli 2021). However, the practises in orange growing need to be closely examined over time.

The purpose of this study is to analyze economic feasibility of investments in orange plantations in Antalya province of Turkey. Besides, the aim of this paper is to analyze the possibility of using AGR as a type of whole farm revenue insurance in orange production.

Materials and Methods

In the study, statistical data for the 2004–2018 period from the Turkish Statistical Institute (TURKSTAT) was used in order to reveal the developments in Turkey and Antalya province. Yield, price, cost and net profit data for orange production in Antalya are for 2018 year. The data of the Antalya province for 2018 were obtained from the Turkish Ministry of Agriculture and Forestry (TMAF), Antalya Provincial Directorate.

Monthly meteorological data were taken from Turkish State Meteorological Service (TSMS) for Antalya (Longitude: 30° 42′ E, Latitude: 36° 53′ N). Antalya province is located in the Mediterranean Region of Turkey and has climate conditions typical of that area. In summer, the weather is very hot, while it is rainy during winter. Average temperatures in the Antalya region during the period 1930–2018 ranged from –4.30 °C in January to +44.60 °C in July, while average monthly rainfall ranged from 4.50 mm in July to 262.10 mm in December.

Within this research, economic indicators such as gross production value, gross margin and net profit are calculated for orange production. Gross margin is obtained by deducting the total variable costs from gross production value, while net profit is calculated by deducting the total costs from gross production value (Kiral et al. 1999). US Dollars was used as the currency in the study; 1 USD was equal to 4.81 Turkish Lira in 2018.

Net present value (NPV), internal rate of return (IRR), and benefit/cost ratio (BCR) are used to determine economic feasibility of investments in orange plantation. These are standard methods used for evaluation of such investments and they have also been applied by other authors in the field. Sensitivity analysis of NPV is applied to analyze riskiness of the investment.

The NPV and IRR are found using equations suggested by Brigham and Houston (2009).

$$\mathrm{NPV} = \sum_{t=0}^{N} \frac{\mathrm{CFt}}{(1+\mathrm{r})^{t}} \tag{1}$$

Here CFt is the expected net cash flow at time t, r is the project's cost of capital (discount rate), and N is its life.

$$\mathrm{NPV} = \sum_{t=0}^{N} \frac{\mathrm{CFt}}{(1+\mathrm{IRR})^{t}} = 0 \tag{2}$$

where IRR is the Internal Rate of Return.

Present value of benefits (cash inflows) divided by present value of costs (cash outflows) is called BCR (or profitability index) and shows the relative profitability of the investment.

To discuss the possibility of applying the AGR insurance model, data from one representative farm from the Antalya region, involved exclusively in orange production, were used. When concluding the insurance policy with the AGR model, the farmer first defines the percentage coverage level and the rate of payment. In order for the farmer to qualify for the highest levels of coverage and rate of payment, it is necessary that the sowing structure consists of at least three different crops.

The AGR allows the possibility of coverage of at least 65%, and at most 80% of the planned and expected farm revenue. The percentage level of coverage is higher when there is greater diversification of production. In practical terms, this means that the producer who wants to obtain the highest level of coverage must have at least three crops in his portfolio, with each individually contributing significantly to the total revenue. In the analyzed case, since the farm produces only one crop, specifically orange, only the lowest percentage coverage level of 65% is available.

Also, when entering into an insurance contract, an agricultural producer has a payment rate of 75% or 90% at his disposal. The payment rate indicates how much the producer (the insured) will receive for each dollar of lost revenue in the insured year. In other words, the producer will be compensated for 75 or 90 dollars for every 100 dollars of lost revenue, depending on the chosen payment rate. If a lower payment rate is chosen (75%), it is possible to secure a higher amount of expected farm revenue, and vice versa. The expected farm revenue is determined based on the farm's achieved revenue over the previous 5 years. Assuming a lower final achieved revenue than the predefined strike level, a simulated application of the analyzed insurance system is performed, the following parameters are calculated, which, with some adjustments by the authors, were taken from Risk Management Agency (RMA) of the United States Department of Agriculture (USDA) (USDA 2020).

At the beginning of the year, based on data of achieved yields and prices in the preceding, e.g. last 5 years in the proposed period, the expected revenue for the insured year is formed. An insured event occurs if the achieved revenue

is below the agreed strike level at the end of the year calculated on the basis of the following:

$$S_l = E_r \cdot C_l \quad (3)$$

wherein:

S_l = strike level
E_r = expected revenue
C_l = coverage level

The insured sum in effect represents the amount of coverage (C) and it is calculated as the product of the strike level (E_r) and the payment rate (P_r):

$$C = E_r \cdot P_r \quad (4)$$

The insurance premium is based on the amount of the producer's coverage, where the coverage is calculated as a product of the expected revenue, the percentage level of coverage and payment rate. When determining the total amount of coverage, the amount of the total premium is calculated as the product of that value and the established premium rate. It is important to emphasize that the state provides 50, 60 and 66.6% of support premiums at varying rates depending on the branches of agriculture insurance and amounts of premium support to be provided by the government in terms of products, risks, regions and scale of enterprises (Tekin et al. 2017). In this way, if the state subsidizes the insurance premium in this production in the amount of 60%, the producers will pay only 40% of the total amount of the premium.

The amount of premium paid by a farmer to an insurance company as a risk transfer charge is calculated based on the following formula (state subsidy amounts 60%):

$$F_p = C \cdot p - 60\% \quad (5)$$

wherein:

F_p = producer's premium
C = amount of coverage
p = premium rate

The indemnity has to be paid to the agricultural producer (the insured) when the total achieved revenue is lower than the strike level for the insured year. The strike level indicates when the indemnity will be paid and is calculated as the product of the planned (expected) revenue and the percentage level of coverage.

At the end of the production year, any revenue deficiency due to either reduced yield or lower purchase prices is considered. Revenue deficiency (R_d) is calculated as the difference between the established strike level (S_l) and the achieved revenue (R_r).

$$R_d = S_l - R_r \quad (6)$$

Indemnity is calculated based on the following formula:

$$I = R_d \cdot P_r \quad (7)$$

wherein:

I = amount of indemnity
R_d = revenue deficiency
P_r = payment rate

Results and Discussion

Production costs in orange production consist of both variable and fixed costs. Total production cost is 7248.22 $/ha, variable cost dominates (80.88% of production costs), while fixed costs are relatively low (19.12% of production costs) (Table 2).

In orange production, the yield per hectare is 43 tons. A gross production value of $8819.73, a gross margin of $2957.18 and a net profit of $1571.51 are obtained from orange production per hectare (Table 3).

An average cash flow for this investment has been calculated for the period of 35 years. It is assumed that the discount rate for this investment is 7%. It is the real interest rate in 2018. The net present value of the investment is de-

Table 2 Orange production costs in Antalya Province ($/ha) (2018)

No.	Cost items	Total costs ($/ha)	Percentage (%)
1.	Fertilizer	671.00	9.26
2.	Pesticide	1255.41	17.32
3.	Labor	1506.49	20.78
4.	Harvesting	654.76	9.03
5.	Irrigation	86.58	1.19
6.	Other variable costs	1688.31	23.29
I	*Total variable costs*	5862.55	80.88
7.	Overhead costs	175.88	2.43
8.	Capital interest	293.13	4.04
9.	Land-rent	275.50	3.80
10.	Depreciation	348.03	4.80
11.	Other fixed costs	293.13	4.04
II	*Total fixed costs*	1385.67	19.12
III	*Production costs (I + II)*	7248.22	100.00

Source: TMAF (2020)

Table 3 Net profit and gross margin of orange production in Antalya Province ($/ha) (2018)

No.	Items	Values ($/ha)
1.	Orange production (tha^{-1})	43.00
2.	Orange price ($\$t^{-1}$)	205.11
3.	Gross production value ($\$ha^{-1}$) (1 × 2)	8819.73
4.	Variable costs ($\$ha^{-1}$)	5862.55
5.	Fixed costs ($\$ha^{-1}$)	1385.67
6.	Total costs ($\$ha^{-1}$)	7248.22
7.	Gross margin ($\$ha^{-1}$) (3–4)	2957.18
8.	*Net profit ($\$ha^{-1}$) (3–6)*	1571.51
9.	*Cash flow*[a]	2212.67

Source: Authors' calculation
[a]Cash flow = Net profit + Capital interest + Depreciation

Table 4 Cash flows in orange investment ($/ha)

Item	Value
Investment in fixed assets	12,181.20
Additional working capital	2436.24
Total investment	*14,617.44*
Useful life of the investment	35 years
Salvage value	2436.24
Cash flow	2212.67
Discount rate	7%
NPV ($)	14,259.82
BCR	1.14
IRR	15.04%

Source: Authors' calculation
NPV Net present value, *IRR* nternal rate of return, *BCR* Benefit/cost ratio

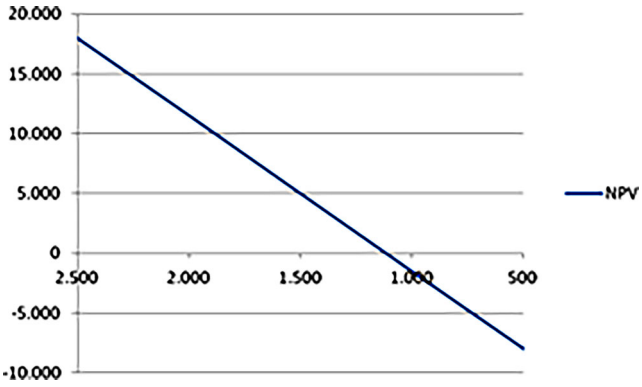

Fig. 2 Changes in net present value (*NPV*) depending on values of cash flow. (Source: authors' calculation)

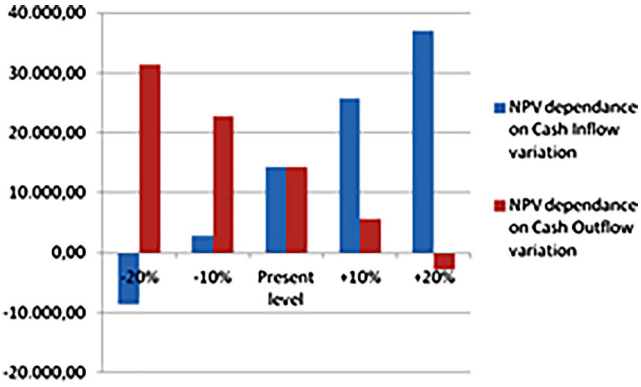

Fig. 3 Changes in net present value (*NPV*) depending on variations in cash inflow (*CIF*) and cash outflow (*COF*). (Source: authors' calculation)

termined to be $14,259.82 (Eq. 1). The BCR is 1.14, while the internal rate of return is 15.04% (Eq. 2; Table 4).

It could be concluded that according to the above mentioned indicators, investment in orange plantation is economically feasible. Similar results were obtained by Karegaonkar et al. (2011), who determined that the IRR for investment in orange production was 17.36% (it was greater than opportunity cost) while the BCR was 1.18. A study conducted by Sidramayya et al. (2017) determined much higher values of IRR and BCR (43.18% and 3.40 respectively). On the other hand, Trejo-Pech et al. (2017) determined that the modified internal rate of return (MIRR) for investment in orange production in Florida is equal to or higher than the 7.5% hurdle rate around 79% times the model is simulated using the Monte Carlo simulation.

In order to get better insight into riskiness of this investment sensitivity analysis could be applied as a useful tool. Results of sensitivity analysis showed that if cash flow during production period drops from 2212.67 $/ha to 1111.3 $/ha (decrease by 49.77%), NPV will become negative (Fig. 2). At the same time, NPV is more sensitive to changes in cash inflow compared to variation of cash outflow (Fig. 3).

While sensitivity analysis indicates riskiness of achieving negative NPV, insurance is an important instrument that helps orange producers to transfer risk to an insurance company. One of the comparatively new approaches to insurance in agriculture is AGR, which represents the type of whole farm revenue insurance. This insurance model covers revenue losses from crops, domestic animals and unprocessed animal products. AGR provides protection against revenue loss caused by a lower level of production or a fall in market prices. Bearing in mind that orange producers face numerous marketing challenges, such type of insurance would be very useful for them.

Table 5 shows the entire procedure for calculating indemnity using the AGR model. Based on data on average achieved yields and prices realized in the preceding 5 years, expected revenue was $8819.73. Given that the analyzed farm does not show the diversification of production, the agricultural producer is provided with an 65% coverage level, as well as a 90% payment rate, which is needed for the calculation of the strike level (based on Eq. 3) and cov-

Table 5 Procedure for calculating indemnity using the Adjusted Gross Revenue model of insurance

Contract elements	Units	Value
Expected revenue (E_r)	$/ha	8819.73
Coverage level (C_l)	%	65.00
Payment rate (P_r)	%	90.00
Strike level (S_l)	$	5732.83
Coverage (C)	$	*5159.54*
Premium rate (p)	%	4.10
Total premium (T_p)	$	211.54
Subsidy amount (S) (60%)	$	126.92
Producer's premium (F_p)	$	*84.62*
Achieved revenue (R_r)	$/ha	*4758.19*
Revenue Deficiency (R_d)	$	*974.64*
Indemnity (I)	$	*877.18*

Source: Authors' calculation

erage (insurance sum), according to Eq. 4. The payment rate essentially means how much a farmer (insured) will receive for each $ of lost revenue in the insured year. In other words, the producer will be compensated for $90 for every $100 of lost revenue. Below is the calculation of the insurance indemnity according to the AGR model. In the analyzed example, farm has achieved total revenue of $4758.19, which is $974.64 less than the strike level, and based on this, it can be concluded that the insured event occurred (Eq. 6). The insurance company is obliged to pay to the agricultural producer, the owner of the farm, an indemnity in the amount of $877.18, according to Eq. 7. The total payment from insurance is directly dependent on the yield level and the market price of the crop. With increasing yields or market prices, the payment is gradually reduced and at one point it is equal to zero, that is, there will be no payments from insurance if the total realized farm revenue reaches the strike level. Regardless of the achieved revenue, the insured has an obligation to the insurer amounting to $84.62, which represents the insurance premium when deducting the amount covered by the state through subsidies and it is calculated based on Eq. 5.

Beside highly diversified farms and farms selling in direct, specific, regional and local markets, and markets intended for traditional farms, including farms with specific crops (products), can have significant advantages over AGR (USDA 2020). Unlike traditional insurance, through this type of revenue coverage the withdrawal of funds is the choice of the farmers themselves, thus ensuring a smooth flow of revenue and better adaptation to the needs of farmers (Turvey et al. 1997). On the other hand, federally subsidized whole farm revenue coverage levels need to increase so as to beat least equivalent to other types of single-crop insurance products (Schahczenski 2012).

A good combination of investment and insurance presents protection against financial risks, but also protection from yield and price risks through revenue insurance. In this way, the AGR model of insurance can be very a useful element of new financial instruments, such as bancassurance. This integrates banking and insurance offers in the common financial market, and for farmers this product is a combination of loans and insurance that can stabilize its revenues, but also secure invested capital in the production (Marković and Kokot 2019; Marković et al. 2020). It is certain that in this way the Turkish farmer could provide relatively favorable funds for the successful realization of investment in orange production, while on the other hand he would have guaranteed protection against certain sources of risk.

However, agricultural insurance is seen as an unnecessary cost due to the fact that insurance awareness has not yet been grasped by the producers.

Agricultural insurance is neglected because the lands are fragmented and small.

At the same time, income problems among producers reduce the rate at which they take out agricultural insurance.

It was stated that the state support in agricultural insurance had a positive effect and should continue. In a study conducted in Turkey, 78.69% of hazelnut producers stated that government support was effective in obtaining insurance (Siray et al. 2015).

In a study conducted in Turkey, the result of the analyses showed that there is a statistically significant difference between insured and non-insured grape farms, considering educational level of farmer, household size, agricultural credit used, amount of produced grape, type of vineyard, the aim of growing grape, type of irrigation system, situation soil testing carried out by farmers, information sources about subsided crop insurance of farmers, the participation of farmers in any extension activities about grape production, agricultural advisory status of farmers and status of receiving an agricultural support of farmers variables (Yilmaz et al. 2017).

Moreover, in studies conducted in different regions of Turkey and in different years, income has a positive effect on the decision-making process and the desire to take out insurance (Tümer 2011; Kiraci et al. 2014; Kiziloglu 2017; Kabaoglu and Birinci 2019; Tekin and Karli 2021).

Conclusion

In Turkey, the proportion of those insured in agriculture was very low. This rate was 7.9% in total utilized agricultural area and 3% in animal numbers. Therefore, this is comparatively indicative of the enormous insurance potential that exists for addressing the needs of the farming community

and enhancing the overall efficiencies as well as the competitiveness of the agriculture sector. This also signifies the tremendous potential of agriculture insurance in the Turkey as a concept, which can mitigate the adverse impacts that such uncertainties would have on the individual farmers (Yilmaz 2014).

Bearing in mind the importance of Turkish orange production on a global level, as well as significant participation of Antalya province in this operation, it is necessary to analyze economic feasibility of investments in orange production as well as possibilities to provide proper insurance opportunities for this kind of agricultural production. It is determined that investments in the establishment of orange plantations in Antalya province are economically feasible. In addition, a sensitivity analysis provided additional insight in riskiness of investments in this enterprise.

AGR represents a modern type of whole farm revenue insurance. It provides protection against revenue loss caused by a lower level of production than expected (primarily caused by unfavourable weather conditions) or a fall in market prices (that could be caused by a number of factors). The example presented in the analysis provided insight in how AGR insurance works, and proved that this type of insurance could be a useful tool for risk management in orange production.

Structural features of farms and characteristics of the producer can play a negative role in the development of agricultural insurance in Turkey. Knowing more about the agricultural insurance system and transferring its benefits to the producers will be important for the development of this process. Agricultural insurance diversification and government support are expected to further increase the number of insurance applications and transaction volume in the agricultural sector in the coming years.

On the other hand, it is necessary to carry out more work and awareness-raising activities in order to raise awareness about the importance of agricultural insurance by the producers both in Turkey and in the province of Antalya. Awareness-raising meetings should also be held in addition to publication and promotion activities. Furthermore, agricultural insurance is a more technical, complex and specialized branch compared to other types of insurance. The training of agricultural insurers who can establish a good dialogue with the producer and understand their production conditions, opportunities and expectations as well as their presence in the insurance sector will also contribute to the development of the sector.

Risks in agricultural production and the measures taken against these risks may vary at the level of regions and countries. The results of this research are expected to set an example for other growing regions in the world and gain a different perspective.

Declarations

Conflict of interest K. Uçar, T. Marković, L. Nastić, Ž. Kokot, S. Engindeniz and M. Meseldžija declare that they have no competing interests.

Ethical standards Consent for publication: If the study is deemed appropriate, there is no objection to its publication. Ethics approval: An ethics document is not required for this research.

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