Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 23, Issue 4, 2023
PRINT ISSN 2284-7995, E-ISSN 2285-3952

RISKS IN GRAPES PRODUCING AND ALTERNATIVE RISK MANAGEMENT FOR VITICULTURISTS: A STUDY CASE FROM AZERBAIJAN

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Abstract

Every activity and fruit production of viticulture farms always brings risks. It is therefore important to develop a risk management system that allows for the identification, assessment and minimization of threats to the production of grape products. The organization of such a system requires a detailed analysis and systematization of the risk factors affecting the viticulture-wine-making activity. Reducing and managing risks is possible by knowing the risk factors and the rules of behavior with the risks. Preventive measures taken to manage the risks that may arise, in addition to the protection of the grape plant, will also create the conditions for increasing the product quality and increasing the yield. The purpose of this study is to examine the different risk sources encountered in grape growing, to reveal different risk management strategies that can be carried out by growers, and to compare and evaluate these aspects of grape growing in Azerbaijan with examples from different countries. The main material of the study consists of the data obtained from FAO, The State Statistical Committee of the Republic of Azerbaijan, The Ministry of Agriculture of the Republic of Azerbaijan and the results obtained from previous researches on the subject. The collected statistical data were arranged in the form of tables and figures and interpreted by making percentage and index calculations. Risk management in grape production depends on the values, knowledge, past experience, financial obligations of the growers, and the magnitude of potential gains or losses associated with any particular risk.

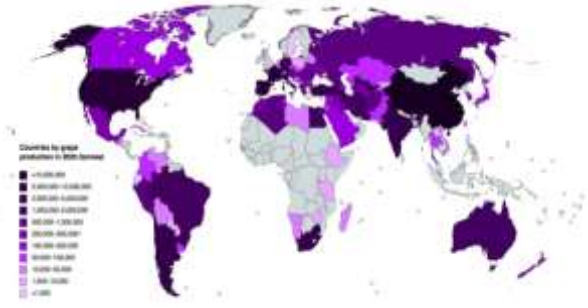
Key words**:** *grape producing, grape variety, risk analysis, risk strategies, viticulturists'behavior*

INTRODUCTION

Viticulture in the world is generally carried out between 20º-50º latitudes in the Northern Hemisphere and 20º-40º in the Southern Hemisphere. Temperature is the most important factor preventing viticulture from spreading to the north. The reasons such as the various evaluation methods of grapes, not being very selective in terms of climate and soil requirements, being perennial and easy reproduction methods are an important factor in the widespread cultivation [18].

Grapes, like all fruits, are a very important food source for humans. Grapes could be consumed like: fresh food, wine, dried fruit, fruit juice and other processed products [25]. Fresh grapes are an important source of energy and nutrients, as they have high levels of sugar and rich minerals. The vitamins, sugar and minerals that grapes have can also be beneficial to people with grape juice. For these reasons, grapes and their products are used in the treatment of kidney, liver and intestinal diseases and anemia. Wine, which is a low alcohol drink, is also a good source of nutrients because it is made from grapes.

According to FAO data, 73.5 million tons of grapes were produced on 6.7 million hectares of land in the world in 2021.



Map 1. Grape production by countries
Source: FAOSTAT, 2023 [10].

The most important countries in grape production are respectively; China, Italy, USA, Spain, France, Turkey, India, Argentina, Chile and Iran. In 2021 (Map 1), Azerbaijan has a share of 0.22% in the world with a production area of 15,100 hectares, and a share of 0.29% with a grape production of 209,843 tons [10].

Viticulture, which has an important place in Azerbaijan agriculture, is faced with many problems in the process from production to growing, from growing to marketing. Among these problems, the problems related to the amount of product taken from the unit area and low quality have an important place. Productivity in viticulture is closely related to the number and size of clusters and grains on the vine, as well as the number of vines per unit area. However, these characteristics are affected by many internal and external factors such as variety, rootstock, cultural practices and environmental conditions. One of the factors affecting productivity is the characteristics of the fertilization biology of the cultivars. On yield and quality; ecological factors, rootstock and variety, training, pruning, irrigation, fertilization, tillage, diseases and pests, use of growth regulators, etc. is effective.

The Azerbaijani government has published forecasts for production in various sectors of the agro-industrial complex for 2023. The production of grains will continue to grow, but the most noticeable will be the increase in the production of fruits and berries.One of the most important production branches in terms of the sustainability of agricultural production in Azerbaijan and the provision of international competition opportunities is fruit growing. One of the important fruits is grapes. Grape, which was one of the most important fruits in the 1980s, has started to increase its production areas again in recent years. In many studies, the economic importance of fruit growing and grape production for the country and the necessity of its development have been revealed [2, 22, 6, 7, 8, 13, 44, 40]. In Azerbaijan, most fruits are planted in privately owned orchards, mostly by family farms and households, on areas up to 2 hectares, and larger agricultural enterprises cultivate about 7% of the fruit area. In grape production, about 30% of the area is used by agricultural enterprises, and the share of larger companies producing grapes is increasing slightly over time. However, the average farm size in grape production is still quite small [41].

The different natural and economic conditions of the Republic of Azerbaijan, the diversity and complexity of the use of land resources even in small areas, the presence of 8 out of 11 climate types in the world create the need for theoretical and scientific studies. It will also enable growers to make definite decisions about the correct organization of viticulture and to conduct experimental studies to examine grape varieties ripening at different times, as well as to examine the risks encountered and develop strategies, to provide high returns in viticulture.

Many studies have been carried out on the morphological characteristics, genetic variation and breeding of grape varieties in Azerbaijan [9, 31, 32, 27, 14, 1, 20, 33, 22, 24, 15, 47, 34, 23, 45, 35, 30, 5]. Today, however, grape growers face technical, economic and environmental risks and try to find solutions for them. For this reason, there is a need to develop the risks in terms of developing grape production in the country and the researches on the management of these risks.

The purpose of this study is to examine the different risk sources encountered in grape growing, to reveal different risk management strategies that can be carried out by growers, and to compare and evaluate these aspects of grape growing in Azerbaijan with examples from different countries.

MATERIALS AND METHODS

In this study, the risks in grape growing are classified as risks encountered during the production phase, risks during sales, financial risks, human-induced risks and environmental risks [37, 4]. Then, the sources of these risks were evaluated by using the results of the studies conducted in Azerbaijan and other countries. In the study, some alternative measures that farmers can take against risks

have also been developed. The most important measure that farmers can take against risks is insurance. In the study, insurance practices for viticulture in Azerbaijan were also examined and concrete evaluations were made on the subject.

The main material of the study consists of the data obtained from FAO, The State Statistical Committee of the Republic of Azerbaijan, The Ministry of Agriculture of the Republic of Azerbaijan and the results obtained from previous researches on the subject. In the study, evaluations were made with the data of 2012-2021 period.

The collected statistical data were arranged in the form of tables and interpreted by making percentage and index calculations.

RESULTS AND DISCUSSIONS

Recent Development in Grape Production and Marketing in Azerbaijan

The "Viticulture and Winemaking Law" leigslated in Azerbaijan on January 20, 2022 is the most important legal basis in the field of viticulture. This law aims to develop viticulture under free market conditions.

Also important is the "2012-2020 State Program on the Development of Viticulture in the Republic of Azerbaijan". This Program, prepared by the Decree No. 1890 of the President of Azerbaijan dated 15 December 2011, later covered the years 2018-2025 with the Decree No. 38 dated 3 May 2018. The State Program for the Development of Winemaking in Azerbaijan has also been prepared. With this program, it is aimed to establish the scientific basis of viticulture, develop production and establish processing industrial enterprises. Within the framework of this program, it is planned to expand production areas [43].

According to the data of the State Statistical Committee of the Republic of Azerbaijan, while the area cultivated for grape in Azerbaijan was 16,327 hectares in 2012, it decreased to 15,962 hectares in 2021. On the other hand, it is seen that cultivated area formed by trees of fruiting age increased by 21% in 2012-2021 period. In 2021, cultivated area formed by trees of fruiting age consisted 95% of the total area cultivated**.** While 150,987 tons of grape was produced in Azerbaijan in 2012, grape production was 209,843 tons in 2021 (Table 1). While the grape yield in Azerbaijan was 12,134 kg/ha in 2012, it was 13,951 kg/ha in 2020 and 13,897 kg/ha in 2021.

In 2021, 19.4% of areas cultivated were located in Mountainous-Shirvan region, 13.7% in Gazakh-Tovuz region, 12.6% in Ganja-Dashkesan region. However, 31.7% of grape production was from Gazakh-Tovuz region, 11.5% from Lankaran-Astara region, 8.7% from Mountainous-Shirvan region (Table 2).

Viticulture is carried out in many regions of the country. However, the areas that are more suitable for viticulture are shown on Map 2. As the green color gets darker on the Map, the suitability for viticulture increases [17].

In Azerbaijan, grape varieties are similar in many characteristics and differ from others. Local grape varieties have a wide variety according to their morphological characteristics.

Therefore, Azerbaijan grape varieties are distinguished by the color, shape
and size of the fruits, ripening time, usage direction, processing and storage features [35].

The above statistics show that grape production has increased rapidly in recent years. Grapes can be grown in many regions of the country. Grapes are sold for the fresh market (about 60%) and for wine processing (40%) [41].

The fresh market with grapes to be processed for juices as well as seedless varieties is attractive as a growing market.

The consumption of table grapes is increasing steadily around the world. However, in Russia, consumption has decreased in recent years due to the economic recession of the country, which affects the demand for grapes more negatively than for other fruits. In the global perspective, China, Turkey, Brazil, Italy and Spain are the main producers of table grapes and this can be considered as a benchmark for Azerbaijani growers.

Table 1. Change of area cultivated and grape production in Azerbaijan

Years	Total area cultivated (ha)	Cultivated area formed by trees of fruiting age (ha)	Index (2012=100	Grape production (tons)	Index (2012=100)	Yield (kg/ha)
2012	16,327	12,443	100	150,987	100	12,134
2013	16,115	13,128	105	148,535	98	11,314
2014	15,904	13,491	108	147,701	98	10,948
2015	16,096	13,514	109	157,076	104	11,623
2016	16,004	13,941	112	136,499	90	9,791
2017	16,088	14,140	114	152,843	101	10,809
2017	16,064	14,371	115	167,591	111	11,662
2019	16,061	14,522	117	201,842	134	1,3899
2020	16,068	14,911	120	208,019	138	13,951
2021	15,962	15,100	121	209,843	139	13,897

Source: The State Statistical Committee of the Republic of Azerbaijan, 2023 [42].

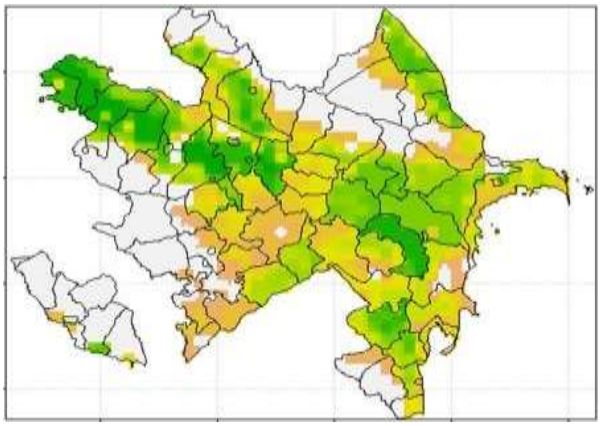
Table 2. Grape production in Azerbaijan according to regions (2021)

Regions	**Area cultivated (ha)**	**Grape production (tons)**	**Yield (kg/ha)**
Baku city	1,308	14,419	11,024
Nakhichevan Autonomous Republic	1,402	17,098	12,195
Absheron-Khyzi	175	919	5,251
Mountainous -Shirvan	2,931	18,274	6,235
Ganja-Dashkesan	1,909	17,534	9,185
Karabakh	150	7,966	5,311
Gazakh-Tovuz	2,062	66,442	32,222
Guba-Khachmaz	778	7,511	9,654
Lankaran-Astara	1,546	24,210	15,660
Central Aran	441	6,250	14,172
Mil-Mugan	212	5,762	27,179
Sheki-Zagatala	950	11,834	12,457
East Zangazur	19	215	11,316
Shirvan-salyan	1,217	11,409	9,375
Total	15,100	209,843	13,897

Source: [42].

China's production is increasing rapidly, as is its export to neighboring countries. Not compatible with health-related fruits such as grapes, strawberries or pomegranates. Many exporting countries struggle to get prices that pay off in international markets [41].

Most of the fresh produce in the country is sold to local markets (open markets, street sale or grocery stores). Grape growers sell their products to shops themselves (family members) or through merchants.



Map 2. Suitable areas for grape producing in Azerbaijan
Source: [41].

Compared to other types of fruit, larger volumes are available from large companies and firms. Therefore, selling to larger supermarkets is possible when growers can comply with quality and stable supply requirements. To obtain more stable and profitable prices for their products, growers need to invest in marketing activities and chain links such as producer sales associations that will allow them to sell in larger volumes and exercise market power. This is extra important to compete in the market. Table 3 shows the development of grape prices received by growers. Compared to some grape producers in the world such as Turkey, Iran and Romania, it is seen that the prices

received by the growers in Azerbaijan are lower.

According to the data of the State Statistics Committee, grape prices received by growers have decreased in recent years. It has been determined that prices have decreased significantly especially after 2017 (Table 4).

Azerbaijan also exports fresh grapes and grape juice to different countries. The change in exports in the last ten years is presented in Table 5. The countries that sell the most fresh fruit and juice are Russia, Ukraine, Kazakhstan, Belarus and Germany, respectively.

Table 3. Grower prices for grape in Azerbaijan, Turkey, Iran and Romania

Year	Azerbaijan ($/ton)	Turkey ($/ton)	Iran ($/ton)	Romania ($/ton)
2012	751	700	592	872
2013	1,007	692	559	736
2014	940	555	439	879
2015	715	545	429	723
2016	450	492	327	714
2017	407	436	420	769
2018	382	414	696	652
2019	329	449	798	756
2020	329	427	1,104	814
2021	394	410	1,968	846

Source: [10].

Table 4. Level and dynamic of grower grape price in Azerbaijan

Years	Grower price (*)	Grower price (**)
2017	98.1	91.0
2018	100.9	91.9
2019	99.4	91.3
2020	99.1	90.5
2021	101.0	91.4

(*) Compared to the previous year, in percent
(**) 2015=100, in percent
Source: [42].

In 2017, Azerbaijani winemakers produced more than one million deciliters (or about 25,000 gallons) of wine, of which 375,000 deciliters were exported, generating approximately $6 million in revenue to the country. According to the data of the Azerbaijan Wine Producers and Exporters Association, wine exports are being expanded to Asia and Europe. The main importers of Azerbaijani wine include Russia (338,000 deciliters) and China (27,000 deciliters). With the opening of an Azerbaijan trading house specializing in wine in Shanghai, China, local producers and exporters will have the opportunity to distribute their products as one of the most competitive wines. It is aimed to increase wine exports five times by 2025 [16].

Table 5. Grape and grape juice export of Azerbaijan

Year	Grape (fresh) export		Grape juice export	
	Quantity (ton)	Value ($1,000)	Quantity (ton)	Value ($1,000)
2012	300	247	26	36
2013	1,180	864	51	67
2014	462	345	20	27
2015	2,026	1,531	18	21
2016	4,158	2,485	22	25
2017	2,444	1,742	42	48
2017	3,210	2,349	139	179
2019	4,168	3,028	63	81
2020	6,630	4,906	81	92
2021	10,398	7,144	103	83

Source: [10].

Main Sources of Risk in Grape Growing

Since viticulture is a risky area like other agricultural areas, these risks that may occur during the production process should be taken into account and appropriate preventive measures should be taken. For this reason, growers should think about the risks in advance and be aware of the possible risks and how they will cause harm. Because the risk may arise as a result of the wrong decisions of the grower. For this reason, the lack of knowledge of some farm owners in the field of grape development, cultivation and protection can lead to difficulties and mistakes in product production and may endanger the farms.

Risk refers to factors that may occur and damage the farm. As a grower manager, he is constantly faced with various risks. However, the grower should be aware that ways to deal with risks are a risk reduction strategy.

Although risks are defined as undesirable events and causes of loss, it is a multi-factor process. In the study, it was determined that the risks were concentrated in two groups according to the source and scope of the risk factors;

- External factors unrelated to the activities of the farm. They are difficult to influence and almost impossible to control;

- Internal factors occurring in farm activities. Such factors should be controlled and influenced by management.

The main risks sources in viticulture can be listed as follows [37, 4];

Risks in the production phase

Changes in the production process that are not taken into account due to violation of production technology, poor quality of production tools, non-use of suitable planting material in terms of biological, genetic and phytosanitary, ignorance of growers about agroecology, agrobiology and farm-technological properties of introduced grape varieties, etc. are matters.

It should also be noted that the vineyards planted from poor quality, unknown origin and non-standard vine saplings have a short life span, and the product yield and quality are very low. In addition, due to the lack of domestic production of planting material and the preference of foreign varieties for grape planting, the local grape gene pool in Azerbaijan is shrinking and disappearing [29].

Globally, grapes are the fruit crop with the largest area and highest economic value. Grapes have a variety of pests and pathogens that cause economic damage and require control interventions. As a result, the use of chemicals in grapes is one of the highest among agricultural products [26].

Growers can benefit from meteorological data and disease and pest prediction information in order to combat diseases and pests and develop strategies against risks. While developing strategies against risks, growers should also take into account their local and economic impacts and apply them after obtaining the necessary information on this subject. Availability of information influences growers' strategies. To this end, an empirical analysis of the impact of improved disease prediction information on grape growers' behavior and the environment was conducted. Temporal and spatial data on powdery mildew treatments in California were used to estimate growers' disease management procedural patterns [19].

Risks during the sale: lack of market research, lack of determination of sales channels, poor organization of marketing services, lack of contractual management, etc are matters. Market risks for grape growers include reduced demand for grapes, lower grape prices, and increased competition with foreign or other domestic growers.

Grape growers may face production and market risks. Market risk is evaluated as price fluctuations as a result of changes in market supply and demand. In a study conducted in the USA, a simulation model was carried out to include both types of risks simultaneously, taking into account the combination of bud mortality and weather effects on yields, as well as production costs and prices [11].

Financial risks: the inefficiency of the structure of material resources, debts exceeding the acceptable level, the inability of farms to pay, a decrease in product profitability, etc. are matters.

Financial risks include restricted access to capital, fluctuating interest rates, and slow payment or non-payment from customers. It is also possible to count government risks such as poorly designed, intrusive, destructive and costly policies and regulations.

Human-induced risks: lack of highly qualified scientists and specialists in the field of viticulture and winemaking, insufficient professionalism of staff, incorrect assessment of the time required for training and retraining of personnel, incorrect setting of goals and lack of clear definition of duties, duties and responsibilities for employees, etc. are matters.

Environmental risks: recently, the change of the ecological system has been clearly felt. From this point of view, it is of great scientific and practical importance to determine the changes in the phenological stages of the grape plant, which are mostly related to environmental conditions. Thus, changes in environmental factors during the ontogenesis of grapes have a significant effect on the course of grape phenophases and the resulting environmental stress factors do not affect the life of the grape. It has been determined that the change of environmental conditions in the grape plant is accompanied by the change of phenological phases [3].

Even in some cases, natural disasters cause complete destruction of vineyards or loss of crops. The factor causing natural (ecological) risk is the most dangerous risk for viticulture farms. It affects the yield of grapes, the technology of growing and the quality of agricultural work. The efficiency of the work of each farms depends on the hydrometeorological characteristics of the region [28]. It should be noted that the occurrence of undesirable climatic conditions (hail, drought, storm, diseases, excessive soil moisture, frost, etc.) is poorly controlled and these factors should be taken into account when managing risks. In general, the resistance of grape varieties to adverse environmental conditions is not the same. Therefore, the resistance of grape varieties to spring frosts depends on the late opening of buds and the replacement of shoots.

Viticulture in Peru is an important economic activity for the production and export of early table grapes or the production of wine and pisco. In a study, it was determined that climate change has negative effects on some grape varieties grown in the Ica region of Peru [46].

It is seen that the risks encountered in grape and wine production are also classified as climatic risks, growers' perception of risks, markets and prices risks, relevance of data and information availability in managing risk, risks and transaction costs [37].

In a study examining the behavior of growers under general risky conditions, growers' perceptions of climate risks and strategies to address them were evaluated. According to the research, climate change causes cost increases. The insurance rate of growers is low. The results showed that the behavior of growers is paradoxical because financial instruments are costly and very difficult to understand, although they have to face risks [36].

In a study conducted in Italy, the risk perceptions of producers regarding the risk of production losses caused by climate events were evaluated. The results showed that the long-term perceptions of the growers were significantly higher than the short-term, and that individual beliefs about climate change and personal experiences of past production damage played a role in this difference [21].

Risk Strategies for Growers in Grape Growing

Grape varieties with late budding and fertile replacement shoots should be planted especially in places where there is a danger of spring frost. Therefore, the following measures should be taken to manage the risks arising from winter and spring frosts [4]:

1. Variety selection,
2. Directly affecting the trunk itself by agrotechnical measures,
3. Influencing the environment surrounding the trunk with agrotechnical measures.

Depending on the frosty climatic regions, it should also be noted whether the grape plant is protected from frost with a special method in places with -15-16º C frost. Grape seedlings are buried in the ground where frosts fall below -15-16ºC. In places where frosts are below -35º C, the bushes are protected from frost with a special method [28].

Thanks to the development of the viticulture and processing industry, it is possible to significantly enrich the species composition of quality food products in order to adequately meet the demand for grapes and grape products of the world market and the population of the country. It is one of the most important scientific issues in viticulture in terms of examining the biochemical composition of individual varieties, obtaining a targeted and quality product during processing, evaluating the quality of the grains of grape varieties, determining their suitability for use and examining their biological nutritional value.

Knowing the weaknesses and strengths of the aforementioned internal and external risk-creating environment will enable the evaluation, development and implementation of methods to minimize and neutralize threats. Thus, the following measures should be taken to reduce the risks in viticulture;

1. It is necessary to determine the direction of production: technical or table viticulture;
2. The conditions under which technical varieties should be grown must be determined

in advance, that is, a contracted breeding system must be established.

Therefore, a farmer engaged in technical viticulture should operate on a contractual basis according to the conditions of the processing plant close to the field. Harvest content levels of grapes according to their intended use are shown in Table 6.

Table 6. Approximate harvest status of grapes depending on the direction of use

Uses of grapes	**Approximate harvest status of grapes**	
	Sugar (%)	Acidity (%)
Fresh use	16-20	6-8
Use in making white table wines	17-20	7-10
Use in making red table wines	17-21	6-9
Use in the production of champagne wine material	16-20	8-12
Use in the production of cognac wine material	16-19	8-12
Use in the production of wine material for dark wines	19-22	5.5-6.5
Use in the production of wine materials for dessert wines	≥22	5-6

Source: [28].

However, a study highlighted that written contracts for the supply of grapes are more reliable than informal agreements because of the risk associated with purchasing grapes of the required quality.

The unpredictable perishability of grapes due to both physiological and climatic events can make it difficult or uncertain to obtain the desired quality grapes. It can even make it costly at times. For this reason, vertical integration strategies should be implemented using detailed written contracts [12].

It is also beneficial for the growers to pay attention to the following points :

1. Where table varieties are produced, it should be determined whether they are used for transportation to regions where grapes are not grown or for storage in winter warehouses.
2. Product variety should be provided on the farm.

Therefore, if the climate (sum of active temperature) of the area where the farm is located allows, the field should be organized from the variety group, from the earliest maturing grape variety to the latest maturing grape variety (Table 7).

In addition to the protection of the grape plant, preventive measures applied to manage the risks that may arise create favorable conditions for the improvement of product quality and reproduction of the product.

Table 7. Active temperature sum and vegetation period of grape varieties ripening in different periods

Grape varieties	**Total active temperature from bud opening to full maturation of gills (°C)**	**Time from bud opening to full ripening of fruit (day)**
Ultra fast growing	2,000-2,200	100-110
Very early maturing	2,200-2,400	110-120
Fast growing	2,400-2,600	120-130
Moderately grown	2,600-2,800	130-145
Late grown	2,800-2,900	145-165
Very late maturing	≥ 3,000	165-175

Source: [38].

The main preventive measures to be taken in grape production are as follows;

- The area to be planted should be chosen from well-ventilated areas..
- It should be ensured that the clusters mature at the same time.
- The clusters and fruits should be protected from sunburn.
- Varieties suitable for agricultural climatic conditions should be chosen correctly.
- Planting scheme selection should be made according to the variety and the varieties should be placed correctly.
- Forms should be provided according to the variety.
- The strength of the variety should be taken into account when giving eye load to the trunk.

- Agrotechnical measures should be applied correctly and in a timely manner.

The effects of climatic changes have become more visible in recent years. One of these effects is the negative effects on agricultural productivity. Agricultural productivity decreases due to uncontrollable climatic events, which negatively affects profitability. Growers are trying different strategies and ways to reduce these effects of climate change and try to maintain their production levels and profitability. A study conducted in Italy found that growers suffered productivity and income losses due to climate change. In the study, it was suggested that the most appropriate strategy for climate change risks is insurance. The empirical results revealed that the age and education level of the growers are the variables that support access to insurance for quality grape production [39].

Insurance Applications for Vineyards in Azerbaijan

On June 27, 2019, it was issued a decree on the application of Law № 1617-VQ and the Establishment of the Agrarian Fund, on August 19, 2019, the decree on "Agrarian Insurance" number 809. In accordance with the decree, an Agricultural Insurance Fund was established to ensure the organization, development, and sustainability of the agricultural insurance system.

According to the Law of the Republic of Azerbaijan "On Agricultural insurance", the agricultural insurance system in the country is based on the principles of public-private cooperation. The Agricultural Insurance Fund is a non-profit legal entity established by the state and carries out insurance payments, bearing risks. The management company is a joint insurer established by insurance companies licensed for life insurance and organizes the conclusion of insurance contracts.

The agrarian insurance mechanism provided insurance for 14 types of plants and their products. Among them was the grape plant. Insurance premiums for vineyard insurance vary depending on the region and the productivity of the vineyard. In different regions, the rates for vineyard insurance at the base rate range from 1.95% to 6.38%. According to the rules, 3 insurance packages are offered for grape plant insurance within the framework of agricultural insurance. The first of them is the "basic package", which covers most of the risks, and the other packages cover additional risks. Insurance packages differ from each other both in the amounts of exemption, as well as the risks they cover.

In the first "basic package", the amount of exemption is 10%. This envelope insures the grape plant from hail, fire, earthquake, landslides, hurricanes, storms and actions of third parties.

1st Insurance package: In this package, risks such as hail, earthquake, fire, landslide, storm and hurricane are taken into account and covered.

2nd Insurance package: The deductible rate in this package is 30%. With this package, the grape plant is protected from diseases and pests, especially from the risk of spreading and attacking dangerous pests. The risks associated with this package are the risks of spread and attack by plant diseases and pests, especially dangerous pests.

3rd insurance package: The amount of exemption for the third insurance package is 10%. This package protects the Grape plant from the loss of quality caused by hail. Risks associated with the 3rd insurance package: guarantee of loss of product quality as a result of hail risk.

Simply put, the 3rd insurance package protects farmers from the deterioration of the appearance and quality of goods as a result of hail damage to the crop. The fact is that fruit damaged by hail becomes cheaper, and this circumstance causes financial damage to the farmer. The 3rd insurance package is also designed to replace this damage.

The choice of insurance package, depends on the decision of the farmer or vineyard owner. They can be satisfied with the first insurance package only, or they can choose the 2nd and 3rd packages in addition to it. That is, the 2nd and 3rd insurance packages cannot be selected without choosing the basic package.

Insurance rates and premiums required to insure grapes vary depending on the type of grapes, yield, price and selected insurance package, as well as the region of the country.In regions with a lower risk of natural disasters, insurance premiums are lower. However, in areas with a high risk of natural disasters, insurance rates and fees are relatively high.

CONCLUSIONS

In Azerbaijan, which is taking firm steps towards independent development, reforms are being expanded in the agricultural sector, as in other areas of the economy, new economic forms are being created, and new processing and industrial enterprises suitable for the market are created. However, recently, as a result of global climate change and direct human intervention, the flora has been exposed to serious adverse effects. This situation concerns growers closely and requires them to take more precautions.

One of the recent interests of researchers is to develop measures that can be taken against risks arising from different reasons. Most research, however, looks at the risks from climate change and the strategies that vineyard producers can adopt to address such risks. However, it is useful to evaluate the risks from multiple perspectives. Considering the studies done in the world, it will be useful to examine the same issues for Azerbaijan and to apply the same methodologies. In addition, it is useful to address the issues in terms of the wine industry. At the farming level, it is useful to examine producers' decisions at risk and their choices to handle different types of risk, taking into account costs and revenues, including cost-benefit analysis. Depending on the specificity of the country and region, breeders should take measures to address and manage varying risks. It is possible to manage the expected risks with the timely and correct implementation of the aforementioned measures.

Risk management in grape production depends on the values, knowledge, past experience, financial obligations of the growers, and the magnitude of potential gains or losses associated with any particular risk. Success in risk management in grape production depends on strategies to create adequate and effective personnel, control pests and diseases, optimize vineyard root zones, and regulate vine growth, canopy characteristics, and crop levels and quality. Reliable materials, equipment, labor and specialized machinery operations production necessary to minimize risks. Seeking sound know-how, encouraging grape production research, and further training reduce technical risks.

Growers need to carefully assess and manage risks for the economic management of agricultural enterprises. This is particularly important in agriculture, where climate change has led to lower productivity and profitability. Compared with agriculture, industrial sector, man cannot control the whole production process. Biological and climatic factors play a very important role. To mitigate the risks from climate change, insurance policies should be created and the state should intervene with aid to support some of the spending towards farmers' payments. However, despite the positive benefits of adopting insurance policies, growers may not choose to insure because of the cost. To improve the way growers adapt to increasing climate change, insurance contracts should be promoted and competition among insurance companies should be encouraged to guarantee policy cost reductions.

As market risk management strategies, it is possible to list sales and marketing research, creating a diverse customer base, participating in regional promotion efforts, choosing a diversified variety, and making a difference in the grape market with production techniques and methods. In terms of financial risk management, we can list well-designed contracts with various reliable grape customers, creating a certain amount of equity in business assets, using controlled debt, building cash and credit reserves, and establishing close relationships with the lender.

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