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The Necessity to Calculate the Impact of Climate Risks on Determining the Cadastral Assessment of Agricultural Lands

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ABSTRACT

Armenia, with its entire territory, is considered the most sensitive country to climate change. The land tax rate for agricultural lands is determined at 15 percent of the estimated net income determined by their cadastral assessment. The cadastral assessment of agricultural lands in the Republic of Armenia was carried out in 2002-2004. During the assessment, the materials of land management, soil science, geobotanical, and other studies and research conducted in the 1970-1980s were taken as a basis. The article presents the results of research and analysis conducted by the authors during 2020-2023, on the impact of climate risks on the yield and quality of crops on agricultural lands in the Republic of Armenia. As a result of the research, it turns out that among climate risks, the greatest damage to agricultural lands in the Republic of Armenia is caused by frost, hail, and drought, which affects the quantity and quality of crops from agricultural lands, and consequently the income received, which, however, does not reduce the tax burden of the landowner. As a result of the research, to modernize the assessment methodology in the process of calculating net income, it is recommended to adopt the revised calculation method developed and proposed by the authors using risk reduction coefficients (climate risks).

Introduction

Armenia, with its entire territory, is considered the most sensitive country to climate change. The annual increase in air temperature, increase in the frequency and intensity of extreme weather conditions (droughts, frosts, hail, etc.), as well as a significant decrease in precipitation have an obvious negative impact on gross agricultural output.

The land tax rate for agricultural lands is determined at 15 percent of the estimated net income determined by their cadastral assessment (Land Code of the Republic of Armenia, 2001). The cadastral assessment, of agricultural lands in the Republic of Armenia was carried out in

2002-2004; during the assessment, the materials of land management, soil science, geobotanical, and other studies and research conducted in the 1970-1980s were taken as a basis. The Decision of the Government of the Republic of Armenia No. 29 of January 13, 2022, "On approval of the cadastral value of agricultural lands" adopted the cadastral values of agricultural lands based on net incomes and cadastral values that were adopted by the Decisions of the Government of the Republic of Armenia No. 237 of July 3, 1997, No. 1101 of July 25, 2002, and were determined by the Decision of the Government of the Republic of Armenia No. 898 September 2, 2016 (Ezekyan, 2014; Decision of the Government of the Republic of Armenia No. 237 of July 3, 1997; Decision of the Government of the Republic of Armenia No. 1101-N July 25, 2002; Decision of the Government of the Republic of Armenia No. 29 of January 13, 2022).

By the observations that we have carried out in recent years, it turns out that every year in the Republic of Armenia 30-35 thousand hectares of arable lands, and perennial plantings suffer from different climatic disasters: spring frosts, hail, and drought.

Every year, 10-15 % of the Republic's perennial plantings are damaged by hail; in some cases, crop losses in hail-damaged areas amount to 80-100 %. In addition, hail-damaged crops lose their marketability, which makes them difficult to sell, as a result, the incomes of land users decrease significantly (Recommendations for reducing the risks of natural and man-made disasters that damage agriculture in the Republic of Armenia, 2015).

All of the said disasters directly affect the quantity and quality of obtained crops per unit area, and therefore, the net incomes from the land.

Materials and methods

Over the past 30 years, along with the development of market relations, the natural properties of agricultural lands, productivity, costs of their cultivation, as well as the types of cultivated crops and geography have changed in the Republic of Armenia. Research and analysis, conducted in 2020-2023, to modernize the methodology of the cadastral assessment of agricultural lands, show that the climate risks have a significant impact on the yield and quality of crops in the Republic of Armenia, herewith especially crops are seriously damaged by spring frosts, hail, and drought. Analysis was carried out based both on the results of field works and by studying statistical data on agricultural insurance sold in the Republic of Armenia since 2020.

Agricultural insurance in Armenia was started in the fall of 2019 and began in 2020. In 2020, only 5 crops were insured: grapes, apricots, apples, peaches and grain crops. Since 2021, the number of insured crops has increased to 9: watermelon, melon, plum, and potato have been added. The insurance territories were expanded to all marzes (provinces) of the Republic of Armenia, and all communities of Armenia were allowed to insure perennial plantings and cultivated areas (www.insurebusiness.am).

In 2022, to the list of crops that were insured was added another one - cherry, and there was also added the insure of grains against the risk of drought. Insurance contracts in the Republic of Armenia are concluded against the risks of hail, spring frosts, and fires. The graphs below show the number of concluded insurance contracts by year, the number of contracts applied for compensation, and the total amount of compensation depending on the degree of damage.

Research shows that 15 insured contracts received compensation in the period 2020-2023 under an insurance contract concluded only for insured crops (grapes, apricots, apples, peaches, cherries, watermelons, melons, plums, potatoes, and agricultural grains) -20 %, and according to the analysis, the average degree of damage (depending on the risk and crop) of most compensations ranged from 40-50 %.

As can be seen from Figure 1, after the implementation of the agricultural insurance system in 2023, compared to 2020, the number of concluded contracts increased by approximately 6.5 times (www.aina.am).

As can be seen from Figure 2, the degree of damage, caused to crops insured against frost, hail, and drought in the Republic of Armenia, was significant, and the cost of the insurance compensation received was about 1.9 billion drams, which is approximately 12.4 times more than the received amount of compensation of insured contracts in the Republic of Armenia during 2020.

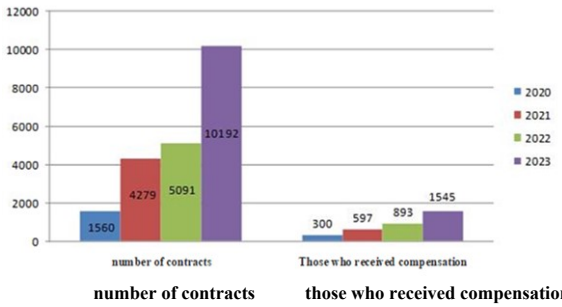

Figure 1. The number of contracts applied for compensation *(composed by the authors)*.

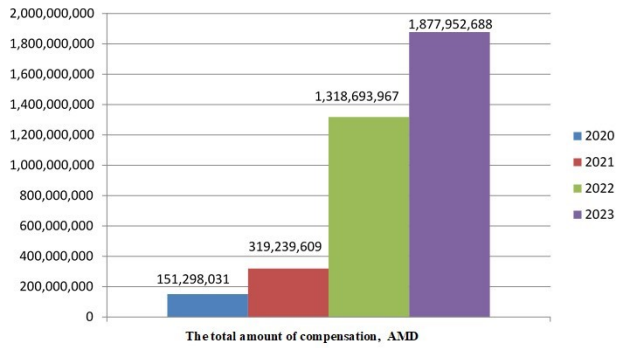

Figure 2. The total monetary value of contracts applied for compensation from concluded contracts in the Republic of Armenia, by years *(composed by the authors)*.

According to different predictions, if radical changes are not made before 2030, agricultural yields will decrease by 8-14%. The negative impact of climate changes on this indicator is mainly due to the direct impact of changes in temperature and precipitation, an increase in the need for irrigation water, and a reduction in irrigation water reserves in conditions of decreased precipitation and high evaporation, as well as an increase in the frequency, intensity, and duration of climate risks and expansion of spatial distribution.

According to predictions, by 2030, as a result of climate changes, the total area of pastures in Armenia will decrease (the area of pastures in the subalpine and alpine zones by 19-22 %), and the volume of harvest will decrease by 4-10 %. As a result of all this, feed production volumes will decrease, which in turn will hurt the livestock sector (www.e-draft.am/ru).

Figure 3 shows the research conducted by the Center for Hydrometeorology and Monitoring in 2022. As can be seen from Figure 3, severe and very severe droughts were observed in the Ararat Valley from the first and second decades of June until the end of September. At stations in the foothills, mountains, and highlands, severe and very severe drought began in the third decade of July and continued intermittently until the end of September at some stations, except Aparan, Tsakhkakhovt, and some northern regions, where drought conditions were weaker (www.meteomonitoring.am).

All of the above climate risks have and will have a significant impact on the productivity of agricultural lands in the Republic of Armenia.

Station	Height, m	May			June			July			August			September		
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Bagratashen	448	5	5	5	3	3	4	4	3	1	1	1	1	2	2	3
Meghri	661	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1
Ijevan	695	5	5	5	5	5	5	5	2	1	2	2	2	2	2	3
Ararat	819	1	4	2	1	1	1	1	1	1	1	1	1	1	1	1
Armavir	861	3	5	4	2	1	1	1	1	1	1	1	1	1	1	1
Yerevan-Agro	942	3	5	5	3	2	2	2	1	1	1	1	1	1	1	1
Urtsadzor	1064	4	5	5	2	2	2	2	2	1	1	1	1	1	1	1
Areni	1066	5	5	5	2	2	2	2	1	1	1	1	1	1	1	1
Dilijan	1256	5	5	5	5	5	5	5	5	1	3	3	2	3	3	5
Vanadzor	1376	5	5	5	5	5	5	5	5	1	3	3	2	3	3	5
Gyumri	1528	5	5	5	5	5	5	5	4	2	2	2	1	2	3	5
Sisian	1615	5	5	5	5	5	5	5	1	1	2	2	1	1	1	1
Fantan	1799	5	5	5	5	5	5	3	2	1	1	1	1	1	1	2
Aparan	1899	5	5	5	5	5	5	5	5	5	5	5	3	2	2	2
Martuni	1943	5	5	5	5	5	5	5	3	1	1	1	1	1	1	1
Gavar	1950	5	5	5	5	5	5	5	4	2	3	3	3	1	1	1
Amberd	2071	5	5	5	5	5	5	3	1	1	1	1	1	1	1	2
Tsaghkahovit	2101	5	5	5	5	5	5	5	5	2	5	5	3	3	3	5

1 - very severe drough, 2 - severe drough, 3 - medium drough, 4 - weak drough, 5 - absence of droughts

Figure 3. The zoning of the observing drought, 2022 *(composed by the authors)*.

Results and discussions

As a result of analysis and research, we concluded that the cadastral value and net income of agricultural lands need to be updated and modernized no earlier than once every 3 years and no later than once every 5 years, and herewith there is also a necessity for implementation in existing land-cadastral zones and subzones of new modern works of zoning, after the completion of which the calculating of the impact of climate risks during the process of the cadastral assessment of agricultural lands will have national significance.

As already mentioned, frost, hail, and drought are the most destructive climatic disasters for the agricultural lands of the Republic of Armenia, directly affecting the quantity and quality of the harvest obtained from agricultural lands, and therefore the income, which, however, does not reduce the land owner's burden of the tax.

Table. Analysis of the reducing coefficients of climate risks

Climatic Disasters	Reducing Coefficients
Frost	0.1
Hail	0.1
Droughts	0.1

*Composed by the authors.

For example, according to the submitted proposal, the estimated net income value of irrigated arable land of the 1st class of the Urts-Kotayk-Shamiram land-cadastral zone is 145 900 AMD, and if the latter has been subjected to frost once during the period 3-5 years, then its net income will be:

$$145900*0.9=131310.$$

If the latter was subjected to each of the three above-mentioned disasters during the period under review, then the value of its net income will be:

$$145900*(1-(0.1f+0.1h+0.1d))=145900*0.7=102130,$$

where: 0.1f – coefficient that applied as a result of the impact of frosts, 0.1 h - coefficient that applied as a result of the impact of hails, 0.1d - coefficient that applied as a result of the impact of droughts.

If the region in question was subjected to hail annually during the period under review, then the value of the latter's net income will be:

$$145900*(1-(0.1h+0.1h+0.1h))=$$
$$=145900*0.7=102130.$$

Conclusion

The research and analysis conducted by us during 2020-2023 provide the basis to conclude that climatic disasters have a significant impact on the productivity and quality of crops in the Republic of Armenia, and the calculation of this impact in the process of calculating the net income of agricultural lands is necessary with to modernize the methodology of the cadastral assessment, adopt the proposed new calculation methodology by the reducing coefficients of climate risks.

References

1. Decision of the Government of the Republic of Armenia No. 1101-N dated July 25. (2002). On approval of the cadastral values of the agricultural unsuitable lands. https://www.arlis.am/DocumentView.aspx?docid=52078 (accessed on 04.02.2024) (in Armenian).
2. Decision of the Government of the Republic of Armenia No. 237, dated July 3. (1997). On approval of the data of the state land cadastre of agricultural lands and unsuitable lands of Republic of Armenia. https://www.arlis.am/DocumentView.aspx?docID=28610, (accessed on 04.02.2024) (in Armenian).
3. Decision of the Government of the Republic of Armenia No. 29 dated June 13. (2022). On approval of the cadastral values of the agricultural lands. https://www.irtek.am/views/act.aspx?aid=114266 (accessed on 04.02.2024) (in Armenian).
4. Land Code of the Republic of Armenia, adopted on May 2. (2001). https://cis-legislation.com/document.fwx?rgn=8657 (accessed on 04.02.2024).
5. Recommendations for reducing the risks of natural and man-made disasters that damage agriculture in the Republic of Armenia, (2015).
6. Yezekyan, A.S. (2014) The cadastral assessment of agricultural lands. Yerevan, ANAU,128.
7. http://old.minagro.am/public/uploads/2015/12/Աղետների-ռիսկերի-նվազեցման-ուղեցույց.pdf (accessed on 12.02.2024) (in Armenian).
8. https://insurebusiness.am/agro-2022. Your daily coverage of insurance news (accessed on 12.02.2024).

9. http://meteomonitoring.am/page/1290 "Hydrometeorology and Monitoring Center" SNCO of MoE of RA (accessed on 05.12.2023).
10. https://www.e-draft.am/projects/4888 Unified Webside for Poblication of Legal Acts' drafts (accessed on 05.12.2023).
11. http://aina.am. Agriculture Insurers National Agency (accessed on 04.02.2024) (in Armenian).

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Declarations of interest

The authors declare no conflict of interest concerning the research, authorship, and/or publication of this article.

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