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CLIMATE CHANGE IMPACT ON MOLDOVA'S AGRICULTURE AND RURAL DEVELOPMENT

OVERVIEW 2020

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1. INTRODUCTION

The Republic of Moldova is one of the most disadvantaged countries in Europe and Central Asia, with a high vulnerability to climate change. In Moldova, most of the rural population depends either directly or indirectly on agriculture for their livelihoods. As such, a potential decrease of food production because of extreme weather would lead to an increase in poverty, a backslide of the economic growth and increase the inequality between the urban and rural areas.

It is crucial to align the agriculture policies with climate change and learn alternative ways to mitigate the impact of climate change and adapt the agriculture to the extreme weather. Therefore, the farmers, small businesses, the government and the scholars have to work together to achieve viable results.

2. BRIEF DESCRIPTION OF THE PROCESS

The meeting took place on September 18, 2020. The meeting gathered experts and farmers from the Republic of Moldova to discuss the impact of climate change on the agriculture sector, water resources, biodiversity and rural development.

The experts discussed the importance of adapting agriculture to the new challenges created by climate change. The seminar aimed to collect good practices regarding adjusting agriculture to climate changes and find the problems that farmers and producers are encountering daily.

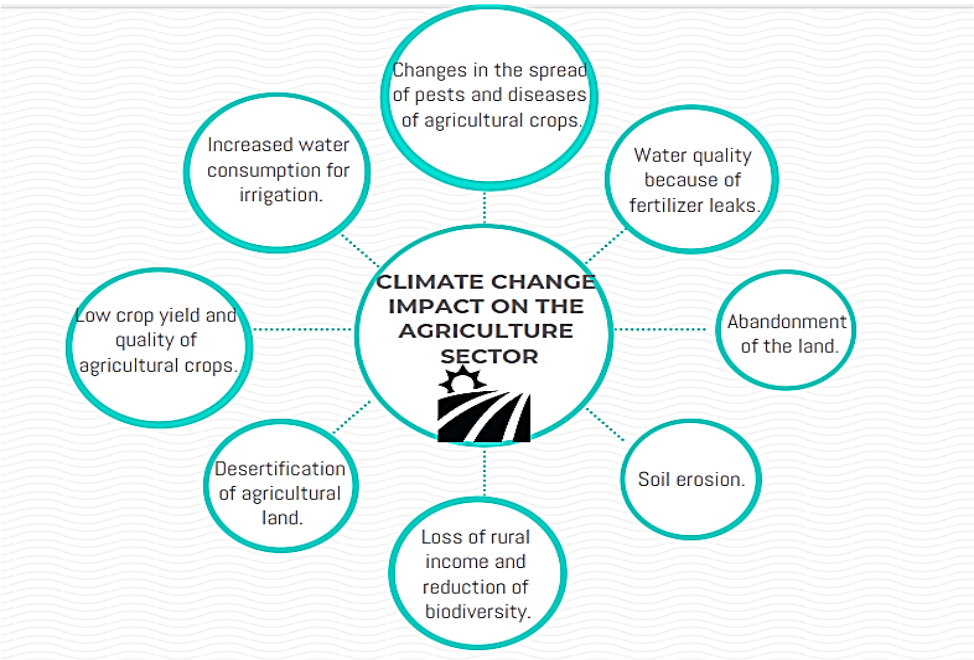
3. CONTEXT AND STATE OF PLAY

In the Republic of Moldova, agriculture is the backbone of the country's economy. However, the agricultural sector creates 20 percent of the overall emissions. Moldovan agriculture has to become more efficient and adjust to climate change. The country can adjust its agriculture to climate change issues by adjusting national laws and offering compensation to farmers affected by the extreme weather. In 2018, Moldova adopted a program for 2018-2020 to promote green economy, and ecological agriculture.

Following several protests of the farmers in Moldova, the government increased the compensations offered for the losses caused by the drought. The government approved the comensations for one hectare of crop/ vegetables/orchards/vineyard. Subsequently, the farmers can receive 1,500 lei (74 euros) for one hectare of wheat, 1,530 lei (75 euros) for one hectare of autumn barley, 3,800 lei (188 euros) for one hectare of orchards, and 3,000 lei (148 euros) for one hectare of vineyards.

4.1. THE IMPACT OF CLIMATE CHANGE ON THE AGRICULTURE SECTOR

Directly depending on climatic conditions, agriculture is one of the most vulnerable sectors of the national economy. Climate change leads to less crops and livestocks. Subsequently, families in the rural areas are not able to maintain the number of animals they were growing. For example, this year's drought pushed small farmers in Moldova to sacrifice or sell the animals they were farming.



In August 2020, farmers from the center and the South of Moldova protested, asking the government for compensation to cover their losses caused by the drought[1]. Following the protests, the government increased the sums offered to the farmers, but the farmers claimed that almost two months from their protests, they didn't receive the compensations yet.

[1] A. Esanu, *The Drought Pushed the Farmers to Protests, Asking the Authorities to Support the Agriculture Sector*, Ziarul de Garda, 14.08.2020, https://www.zdg.md/en/?p=4643

4.2. CLIMATE CHANGE EFFECTS ON THE CROP YIELDS

Climate changes, mainly manifested through heat and water stress, is expected to reduce nearly all crop yields across the main agricultural areas in Moldova about 10–30 percent by 2050, relatively to 2013 yields - considering the current water shortages and irrigation infrastructure situation and lack of adaptation measures. The predicted increased rainfall variability, as well as overall drop in rainfall, will increase the chances of drought periods and most probably significantly reduce agricultural productivity.[2] For example, because of drought, in 2020, the farmers in Moldova harvested 630,000 tons of wheat, which is half in comparison to 2019 (1.1 million tons of wheat). According to several analyses, the farmers will harvest at least 800,000 tons of maize, and 400,000 tons of sunflower. These numbers are two and a half times smaller than they harvested in 2019 (1.7 million tons of maize and around 760,000 tons of sunflower). According to the Ministry of Agriculture, Regional Development and Environment, in the agricultural year 2019 - 2020, due to drought and spring frosts, 10.3 thousand hectares of wheat were affected, requiring their reseeding[3].

4.3. CLIMATE CHANGE EFFECTS ON THE VEGETABLES AND FRUITS PRODUCTION

Many plants' physiological, bio-chemical, and metabolic activities are temperature dependent. While floods can facilitate the spread of water-borne pathogens, droughts and heatwaves can predispose plants to infections. For example, high temperatures destroy the lycopene pigment in tomatoes and affect pollination.[4]

The climate conditions also affected the exports of fruits and vegetables. Farmers from the North of the country say that they cannot cover the quotas needed for exports because the fruits do not meet quality standards. Relevant example can be the Turcan family from the North of Moldova, which cultivated 12 varieties of apples on an area of 75 hectares. Usually, the fruits harvested from their orchards reach the markets of Poland, Belarus, the Russian Federation and Romania. This year, however, the extreme weather severely affected their harvest.

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[2] World Bank, CIAT, *Climate-smart agriculture in Moldova*. CSA Country Profiles for Africa, Asia, Europe and Latin America and the Caribbean Series, 2016.

[3] *MADRM prezintă rezultatele evaluării agricole realizată pe întreg teritoriul țării,* http://www.madrm.gov.md/ro/content/2568

[4] Putland Dave & Deuter Peter, *The effects of high temperatures on vegetable production and the rapid assessment of climate risk in agriculture*. 2011, https://www.researchgate.net/publication/273765816_The_effects_of_high_temperatures_on_vegetable_production_and_the_rapid_assessment_of_climate_risk_in_agriculture

4.4. THE IMPACT OF CLIMATE CHANGE ON BIODIVERSITY

Climate change leads to many birds and insects showing earlier onset of migration, egg-laying, and breeding. For example, Moldova's Agency for Food Safety[5] announced that the climatic conditions from May to June were favorable for the development of the first generation mulberry hairy caterpillar. The pest attacked 31.4 percent of Moldova's forest strip areas in districts in the South and North of the country.

Increase in temperatures and the low level of humidity lead to more vegetation fires. For example, at the beginning of September this year, the firefighters in Moldova extinguished 67 vegetation fires in 24 hours[6]. In one region, the fire was spreading faster to the forest. Vegetation fires took place in the center of Moldova during the winter period, in the Anenii Noi and Straseni districts.

The Republic of Moldova approved in 2015 the Strategy on Biological Diversity for the period 2015-2020, engaging the country to develop technologies to improve adaptability of forestry ecosystems to climate change and planting 500 hectares of degraded areas. Among the actions stipulated in the plan of action for implementing the strategy are to extend the natural areas protected by the state to 8 percent of the country's territory until 2020, to create botanical gardens in Balti and Cahul, to open a training and consultancy center in the area of biodiversity, to publish the third edition of the Red Book of the Republic of Moldova, and to found the National Park "Lower Nistrul" and the Romania-Moldova-Ukraine Tripartite Biosphere Reserve "Danube Delta – Lower Prut".

[5] Agentia Nationala Pentru Siguranta Alimentara, http://www.ansa.gov.md/ro/serviciul-de-presa?page=6

[6] Comunicat de Presa, *Incendiu în apropierea căii ferate din Ungheni: Pompierii au stins 70 ha de stuf și vegetație uscată,* https://www.zdg.md/stiri/foto-video-incendiu-in-apropierea-caii-ferate-din-ungheni-pompierii-au-stins-70-ha-de-stuf-si-vegetatie-uscata/

5. CASE STUDIES: EXAMPLES & GOOD PRACTICES

Tatiana Marin, Head of the Stefan Voda Ecological Movement, Stefan Voda district, South of Moldova. The drought mostly affects the South of the country. The wells and the small rivers have dried up this summer. Fifteen to twenty meters in depth wells have run out of water in several districts in the South of Moldova. This summer, it rained only at the beginning of July. Since July, the South of the country has seen no more rains.

Elena Zubcov, member of Moldova's Academy of Sciences, Head of the Laboratory of Hydrobiology and Ecotoxicology. In August 2020, Elena and her colleagues tried to find the 50 streams of the Nistru river. They've found only four streams. Smaller rivers disappeared because the hydropower plants are keeping the water that has to flow in the Nistru river. Meanwhile, other small rivers dry up because people block the course of the river, building a reservoir for themselves, or the rivers are turning into landfills. In Moldova, surface water is the main irrigation source. However, sometimes farmers can also use groundwater, which is high-mineralized, and can deprive the soil of its fertility. Therefore, farmers need to consult the researchers before using the water. The government also has to support the researchers to carry out their studies and provide solutions to water scarcity issues.

Igor Luchianov, vineyard owner in the Crocmaz village, Stefan Voda district, South of Moldova. The 2020 year was one of the driest years since the end of World War II. The drought has affected the wheat, sunflower, maize, but also the grapes, apples, and plums. In the south of Moldova, over 30 percent of the ponds dried

up, leaving the residents with less water for irrigation. This year, Igor gathered 15 tons of grapes from one hectare because of the extreme weather. However, these grapes are not high-quality grapes. Therefore, if Igor would sort the 15 tons of grapes, he would get only eight tons from one hectare. For some types of grapes, the yield was even smaller, around four tons from one hectare. The most affected are the white grapes. This year he gathered 2.5 tons of Sauvignon Blanc from one hectare, which is two-and-a-half times less than last year when he harvested six tons; and three tons of Feteasca Neagra from one hectare, which is almost three times less compared to other normal years when he gathered eight tons. This year, Igor might lose 50 percent of his income because of the drought. Igor is expecting the 2021 winter to have snow so everything can come back to normal.

Irina Pomus, a farmer in the Teleseu village, Orhei district, center of Moldova. Irina owns a 0.5 hectares blackberry plantation. This year, her plantation suffered from the spring frosts and drought, but also from the dry weather last year. The drought from last year damaged the development of this year's fruit buds. To cope with the drought, Irina uses a dripping irrigation system and grassing between the rows. However, this year's drought was severe and neither the irrigation system nor the grassing could help keep the soil moisture. Every year, Irina was gathering around 15 tons of blackberries. This year she hardly gathered three tons. Compared to the two previous years, the income also decreased by 80 percent. And while last year Irina froze some blackberries, selling them later this year, she couldn't cover the demand for fresh blackberries.

The government offers a subvention of a little over 180 euros for one hectare of land to support the farmers. However, the sum is negligible, and some farmers chose not to take it because of the loads of paperwork. For example, they have to present and complete nine unique documents before getting the subvention. Irina might have to shrink her blackberry plantation to have enough water for irrigation. She plans to invest in a 7,000 euros shading net to protect her plantation against the heat and the sun.

Ion Tulei, a farmer in the Olanesti village, Stefan Voda district, South of Moldova. Ion Tulei farms apples, plums, cherries and peaches. He has different apples like Gala, Jonaold, Golden, Braeburn, and Granny Smith. Despite the spring

frosts and the drought, Ion farmed around 60 tons of apples from one hectare because he has an anti-hail net (the anti-hail net has around 11 years and can function at least eight more years), intelligent irrigation system, and modern harvesting techniques. However, this year, the pumping station had to work continuously because of the lack of water. These were additional expenses for the farmer. Ion also covers his cherry trees with protective foils when the fruits are in the ripening period to protect them from rains. And since 2014, he has a pre-cooling chamber with forced air for the cherries that allows the extension of the shelf life of the cherries. He mentions that in 2017, they tried to place the cherries in a special package that removes the oxygen, prolonging the shelf life of the cherries for up to two weeks, but they will lose from their taste.

Serghei Malcoci, a farmer in the Crocmaz village, Stefan Voda district, South of Moldova. Serghei farms plums, peaches and table grapes on around 80 hectares. He mentions that the spring frosts and the dry summer affected his peach orchard, cutting down his yield by around 50 percent. The table grape yields decreased by around 30 percent because of the spring frosts and the dry weather during the summer. He also lost over 50 percent of the yields because he didn't have an irrigation system to water the plum trees. The farmer claims that in the last few years there have been fewer rains in the country; the weather is dry and the water scarcity problem becomes more vivid, especially in the South of Moldova.

Ilie Gogu, a farmer in the Causeni district, South of Moldova. Ilie farms wine grapes on a 10 hectares land plot. From the harvested grapes, Ilie produces wine. He has different grapes such as Feteasca Alba, Feteasca Neagra, Cabernet Sauvignon, and Feteasca Regala. And although most of the grapes are resistant, the farmer told us that the frosts in late April or May will affect every grape. This year, he gathered the grapes only from two hectares, losing around 80 percent of the grape yield because of the severe drought during summer, the spring frost, and the low temperatures in May. The most affected were the white grapes. He used grassing between the rows to ensure the soil moisture. However, this year's drought was too severe and even the grass couldn't keep the soil moisture intact for too long. This year, Ilie had to buy the rest of the grapes from the local farmers to cover his yield losses. And the price of the grapes this year is ranging from 0.4 to 0.45 euros, which is almost twice bigger than last year 0.15 to 0.30 euros. And although there are grapes more resistant to the drought, they are wild types, which cannot be used in wine production.

Nicolae Sprinceana, farmer in Hirtopul Mic village, Criuleni district, the center of Moldova. In the spring of 2020, Nicolae mentioned[7] that the warm winter and the prolonged drought compromised the wheat. As a solution, Nicolae Sprincean cultivated drought-resistant plants, such as mustard or flax, to cover the losses he may have in some weather-sensitive crops.

Nicoleta and Andrei Basoc, farmers in the Hirtopul Mic village, Criuleni district, the center of Moldova. Nicoleta and Andrei are farming strawberries. This year, they set out to expand their cultivated land, but they had to cancel the seedlings delivery from March-April from Europe because of the COVID-19 traffic restrictions[8]. The closed markets during the pandemic pushed the two farmers to find virtual markets. They created a Facebook page, collect orders online and made strawberry deliveries at home.

Mihai Rotaru, an agronomic engineer in Gura Galbenii village, Cimislia district, the South of Moldova. He tries to minimize practices that cause moisture loss and soil drying in times of drought. Concomitantly, Mihai farms the soil along the surface and uses biological preparations that stress the plants less and makes them more easily manage the consequences of the drought[9].

Cimislia Town Hall, south of Moldova. Following a severe drought in 2012 that pushed 50 percent of the farmers in the region to abandon their land, the authorities in Cimislia[10] planted 470 hectares of forests to fight desertification and attract the rain. To preserve the groundwater and efficiently use water resources, the local authorities in Cimislia made a reservoir to irrigate the land in times of drought. The local authorities in Cimislia finished the project in 2019[11].

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[7] Seremet C., *Pandemia din agricultura: seceta, ingheturi, carantina și Facebook*, Ziarul de Garda, on 22.06.2020. https://www.zdg.md/reporter-special/reportaje/pandemia-din-agricultura-seceta-ingheturi-carantina-si-facebook/

[8] Seremet C. *Pandemia din agricultura: seceta, ingheturi, carantina și Facebook*, Ziarul de Garda, 22 July 2020. https://www.zdg.md/reporter-special/reportaje/pandemia-din-agricultura-seceta-ingheturi-carantina-si-facebook/

[9] Jentimir A. *La Gura Galbenei, din cauza coronavirusului și a secetei oamenii nu stiu ce-i mai asteapta*. (The COVID-19 and the Drought Drove People to their Limits at Gura Galbenei), Ziarul de Garda. 18 May 2020. https://www.zdg.md/stiri/stiri-sociale/la-gura-galbenei-din-cauza-coronavirusului-si-a-secetei-oamenii-nu-stiu-ce-i-mai-asteapta/

[10] Filimon C. *Agricultura in stare critica (The Agriculture sector in a Dire Situation)*, Ziarul de Garda. 12 July 2012. https://www.zdg.md/reporter-special/reportaje/agricultura-in-stare-critica/comment-page-1/

[11] Filimon C. *Agricultura in stare critica (The Agriculture sector in a Dire Situation)*, Ziarul de Garda. 12 July 2012. https://www.zdg.md/reporter-special/reportaje/agricultura-in-stare-critica/comment-page-1/

The Garden of Moldova[12], an NGO with an experimental garden. Despite the severe drought, the farmers from Moldova's Garden grew tomatoes resistant to the drought. The Douchova Pepper is a yellow fibber-type tomato, from Ukraine. Aside from its resistance to drought, this tomato is also very productive until very late.

5. CONCLUSIONS & RECOMENDATIONS

Moldovan producers are recommend to pay more attention and get informed about risk management tools and resource management, as well as, consider crop diversification and use of modern, drought-resistant crop varieties. Moreover, it is important to collaborate with the meteorological stations in order to predict, as much as possible, a potential future frost and act accordingly, isolating the crops and educate the farmers on how to prepare and act when faced with such harmful climate changes. Consequently, there is a urgent need for governmental support – both financial and legal.

Yet another practical and tangible solution to reduce the effects of drought on agriculture is to use drip irrigation and optimize the irrigation systems – while it is an expensive investment to make, in the long run, automated irrigation systems that release just the right quantity of water that the soil needs at a particular moment, would enable farmers to surpass droughts more easily and with less losses, what can be used for the period of drought, delivering water right to the roots of each plant.

[12] Gradina Moldovei, https://gradinamd.wordpress.com/