

## Drought conditions and management strategies in the Republic of Moldova

V. Ia. Cazac, M. I. Daradur

State Hydrometeorological Service, Chisinau, Republic of Moldova

(valeriucazac@hotmail.com)

**Background.** The Republic of Moldova is located in the south-eastern part of Europe with a sub-humid and semi-arid climate and high frequency of drought. In the most part of the country the average return period of drought varies from 3 to 5 years (Daradur et al., 2007). For the period spanning from 2000 to 2012 the Republic of Moldova has already experienced 4 years (2000, 2003, 2007, and 2012) with the devastating droughts (*Tab.1*).

*Table 1. Impact area, duration and economical losses from droughts, 2000-2012 (Republic of Moldova) \**

Drought of year	Affected area,%	Duration, seasons	Economical losses	
			Million Moldavian Lei (MDL)	Million \$ USA
2000	75	spring-autumn	2098, 1	169,7
2003**	86	summer-autumn	-	-
2007	78	summer-autumn	11970,0	987,0
2012	80	summer-autumn	2500,0	200,5

*\*Adapted from: Ministerul Agriculturii și Industriei Alimentare, 2007; Ministerul Agriculturii și Industriei Alimentare, 2012; Daradur et al., 2007; UN, 2012; World Bank & FAO, 2007.*

*\*\* No data*

The frequency of recent droughts is uncertain because many values of meteorological indicators (temperature, precipitation, soil moisture) were exceptional in the climate history of Moldova (State Hydrometeorological Service, 2012). Some experts consider that the recurrence time of the severe drought has become shorter during the last decades and climate change is likely to increase extreme drought risk in Moldova (Daradur et al., 2007; Ministerul Mediului & Programul Națiunilor Unite pentru Dezvoltare, 2012).

Droughts have a wide range of impacts across all sectors of development in the Republic of Moldova. In some years drought impact acquires the scales of a nationwide environmental and socioeconomic catastrophe. As in 2007, the estimated losses caused by drought reached 23% of the gross domestic product (GDP) of Moldova (UN, 2012). Particularly profound droughts impact on agricultural sector and water resources, which are essential to human and economic development in Moldova. With the majority of the rural population both poor and dependent on the agricultural sector for their livelihood, the drought impact in the Republic of Moldova is of particular concern among the poorest rural households in the Central and South regions, where intensity of droughts usually more severe and poverty rates is still very high (WFP, 2012).

**Monitoring and early warning systems.** The State Hydrometeorological Service (SHS) of the Ministry of Environment (ME) is the main institution that carries out monitoring and provides most of the early warning services for drought risk management in Moldova. Currently the

monitoring of key meteorological parameters for drought assessment (precipitation, temperature, soil moisture, etc.) is carried out on 17 weather stations and 20 agrometeorological posts.

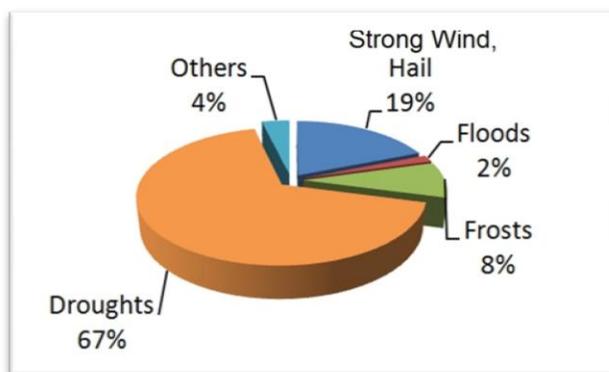
Several drought indices are applied in the Republic of Moldova: Hydrothermal Coefficient (HTC), Standardized Precipitation Index (SPI), SI Index representing difference the standardized anomalies of the temperatures and precipitation, and Z Aridity Index (ZAI) that inter alia identifies and assesses drought taking into account temporal distribution of the precipitation. *However, lack a consistent statistical basis to assess drought conditions, as well as a comparability of the drought categories among the indices make challenging to achieve the desired drought management goals* (Daradur et al., 2007).

For monitoring and data collection on groundwater levels the State Geological Agency (AGeoM) also of ME is responsible. The Institute of Ecology and Geography (IEG) of the Academy of Sciences of Moldova, which is under double subordination (ME and Academy of Sciences), undertakes integral monitoring of environment and elaborates GIS tools for extreme weather and climate risks assessment at high resolution.

Socioeconomic indicators that are used to assess drought and associated risks are under responsibility of the Ministry of Agriculture and Food industry (MAFI). Data is sent in from districts for compiling and analyzing by the Department of Crops of MAFI. MAFI is also promoting crop insurance against drought and other natural hazards (frost, hail), matching compensation by the insurance companies (World Bank & FAO, 2007).

With a positive assessment of the experience of the drought monitoring, nevertheless the existing network does not correspond to advanced requirements. Limited financial, scientific, technical, and human capacities do not allow providing comprehensive information based on the concept of risk management in a changing climate. Likewise, drought risk early warning is inadequate and the capacity to use advanced extreme climate prediction methodology and tools in management practice is insufficient.

**Vulnerability assessment.** The natural and socio-economic subsystems of the Republic of Moldova are highly vulnerable to drought owing to the high level physical exposure to water related climate extremes, as well as insufficient capacity to manage risks. *Accounting for 13% of the total number of hazards, droughts make up 67% of the economic losses from weather and climate related risks* (Fig.1).



**Figure 1.** Attribution (%) of the economic losses\* to weather and climate related hazards (Republic of Moldova, 1998-2005).

\*Adapted from Daradur et al., 2007; World Bank & FAO, 2007.

However, *the most vulnerable sector to drought is agriculture* which, in terms of human and economical development, is of vital importance to Moldova. The increase of frequency of severe drought, along with the expansive overexploitation of the land resources during the last decades and the poor adaptability of applied agricultural practices to water related extremes, have promoted a dramatic decline the resiliency of the agricultural sector. As a result, despite the high level of natural soil fertility and relatively favorable climate conditions, agricultural productivity in Moldova currently is very low (Daradur et al., 2007; UNDP, 2009).

Increasing vulnerability to drought and associated risks can be attributed also to a set of factors connected with distortions and imperfections in agricultural output and input markets, poor quality public services in agricultural education, research, and market information systems; a bias in public support programs against family farmers; delays in farm restructuring and undeveloped agricultural land markets; lack of access to finance; insufficient irrigation (World Bank, 2010).

Poorest households are the most vulnerable groups of population of Moldova. Poverty in Moldova still remains mainly a rural issue - 28.1% compared to 9.9% for urban areas (UNDP, 2011). *Drought impacts directly hit small holder farmers and agricultural workers whose income on 40-70 % is weather depended and comes from agriculture* (WFP, 2012). Droughts considerable reduce their savings and worsen their both the overall quantity and the composition of nutrition. In addition, in rural areas where 45% of the population relies on wells as their main source of drinking water, the negative social effects of drought are exacerbated by reducing an access to potable water.

**Emergency relief and drought response.** Recent droughts have been followed by emergency interventions supported by the FAO, such as the “Emergency Procurement and Distribution of Vegetable Seedlings and Maize Seeds to Drought Affected Farmers” (US\$337,000) in 2001 and the “Emergency Supply of Winter Wheat Seeds to Frost and Drought-Affected Farmers” (US\$374,000) to partly relieve the 2003 frost followed by drought (World Bank & FAO, 2007).

In 2007 Government of Moldova has approved the allocation of 16.5 million \$ USD (200 MDL) to cover the costs incurred by farmers to tillage and sowing of winter crops. In the fall of 2007, through the project “Relief and Technical Assistance Response to the Drought in Moldova” which was managed by the UNDP Moldova in partnership with FAO and the Government of the Republic of Moldova, as well as the NGO sector and local public authorities that were implementing partners, over 383,000 drought victims received wheat seeds, fertilizers, diesel fuel, fodder, corn seeds, and food packs (UN, 2008). Also through this project, 22 communities in districts that were severely affected by drought received cash assistance to carry out public works to rehabilitate various facilities in these communities.

To mitigate the impact of drought in 2010 the government subsidized the production factors for sowing winter crops in 2012 (fall campaign) to severely affected farmers (Ministerul Agriculturii și Industriei Alimentare, 2012). Also MAFI, through the contribution from FAO project distributed 161,5 tone of seeds of winter wheat to farmers severely affected by drought.

Moldova Red Cross, in cooperation with the Service of Civil Protection and Emergency Situations and Ministry of Labour, Social Protection and Family, also intervened in reducing the negative effects of drought 2012 and provided assistance to the affected population (5,800 beneficiaries) in eleven regions (International Federation of Red Cross and Red Crescent Societies, 2012).

*In the context of drought impacts the specific problem to Moldova is the lack of flexibility of the social assistance means tested social protection program in addressing the needs of rural households severely impacted by drought (WFP, 2012). As potential income from land holdings is part of the means testing formula and this is calculated based on pre-drought data, while drought-hit farmers and rural households leasing land may not have their actual situation and need for assistance correctly assessed.*

**Practices to alleviate drought impacts.** From a broad of primary response options for reducing drought impacts the practices applied in Moldova mainly focus on a “win-win” situations, when interested stakeholders implement a particular option for increasing current agriculture productivity (Daradur et al., 2007; World Bank, 2010). These measures are not considering effective medium and long-term perspective for the farming and livestock systems across the various natural and socioeconomic conditions of Moldova.

Currently the *agro-technical measures* that improve *soil moisture retention*, such as *minimum tillage and maintaining vegetative cover* are the most common practices to alleviate drought impact. They also include *introduction of drought-resistant crop varieties, optimization of sowing and planting times in according to agro-meteorological information, and elimination of weeds, which can reduce evaporation and promote to effective use of the soil moisture.*

Valuable option to mitigate drought risk in Moldova is *irrigation*. In normal years irrigation promotes to increasing yield by 25% - 50% while in drought conditions it considerable averts losses (World Bank, 2010). The most widespread irrigation systems in Moldova are irrigation by canals and sprinklers. Resent years *small-scale modern on-farm irrigation technologies* based on dripping method have introduced combining with fertilization. Although dripping method is considered being the most efficient system in view of a changing climate and reducing of the water resources, it is not widespread in Moldova.

**The need for knowledge and skills on drought management.** Drought management experience in the Republic of Moldova based mainly on a reactive, crisis management approach and traditional hierarchical and command-and-control management methods (Daradur et al, 2007). However drought impacts in the Republic of Moldova (UNEP & Ministry of Environment and Natural Resources, 2009; UNDP, 2009), as well as in other affected countries (WMO & GWP, 2011; UNCCD, 2013) illustrate that this approach, making individuals and societies more reliant on government programs and, often on external assistance from donor organizations, result in increased vulnerability to drought events in a changing climate. *Weak perception and underestimation of climate change and variability threats at all management levels and lack a grass-root activities in the knowledge management, dissemination and piloting advanced skills that moves drought management to more proactive principles based on an adaptive, resilience perspectives* are major gaps on the drought risk perception in the Republic of Moldova. Promotion proactive drought management principles assumes that decision makers involved in the process will expect to encounter a plurality of objectives, politics, and legacies where the facts are uncertain, values in dispute and decisions urgent. Therefore there exist a need in *a quick and effective, at the same time accessible and understandable for decision makers Drought Decision Support Tools (DDST) for designing the proactive drought response and maximum facilitating decision making process.*

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