ENVIRONMENTAL IMPACT OF IRRIGATION AND LAND IMPROVEMENT WORKS IN BIRDA LOCALITY, TIMIŞ COUNTY, ROMANIA

Pelea George Narcis, Costescu Ioana Alina, Man Teodor Eugen

Research group POLITEHNICA University of Timişoara, Construction Faculty,
Hydrotechnical Engineering Department,
e-mail: narcispelea@gmail.com

ABSTRACT

The paper aims to address environmental issues in land improvements area. Irrigation facilities are very important for the sustainable development of the western region of Romania considering that in Timis County, the area where the risk of desertification is moderate (R between 0.50 to 0.65), is located in the western and south-west and center of the county.
The territory under study is located outside of the Birda locality, north of the locality, along the river Voiteg (Valea Seaca and Valea Sculea). To increase agricultural productivity on the surveyed land are proposed 7 irrigation reservoirs to capture and storage of water required for irrigation. The water will be assured from rainfall, snowmelt, and additional by pumping from Bârzava River. Irrigation methods proposed are sprinkler irrigation using different modern irrigation equipements like: IADF, IATF, IAP

INTRODUCTION

Observations and measurements in the world and in Romania on climatic parameters and effects of climate change on water resources supports the hypothesis that show some signs of climate change. From signals produced in the Timis county, worthy of consideration, we note the following:
- the phenomenon of climate aridity and increased production to extremes temperature and precipitation;
- occurrence of extreme temperatures in Timis county since meteorological measurements are: on July 24, 2007 at Banloc station were recorded 42.0 ° C at station Jimbolia occurred 40.9 ° C, and at the State Theatre were recorded 41.1 ° C;
- very intense rain falling on the small areas that produce catastrophic effects, for example in 2005 exceeded the greatest amount of precipitation for April in Lugoj weather station (201.2 mm). Exceptional rainfall intensities occurred between 14.04 - 19.04. 2005 amounting to 110.2 l / m in Timisoara, 140.3 l / sq m Faget and 135.1 l / sq m Surduc.
- increased frequency of catastrophic floods: catastrophic floods occurred in Timis county in 2005 with a probability of occurrence between 1% and 0.5% / in April on the River Timis and Bega, the United Nations Convention to Combat Desertification, UNCCD, launched in Paris (1994) by desertification means land degradation in arid, semi-arid and dry sub-humid, resulting from various factors, including climatic variations and human activities. In danger of desertification are considered regions where the report precipitatation/evapotranspiration (also called R index) is between 0.05 and 0.659. In Timis county area where desertification risk is moderate (R between 0.50 to 0.65), is located in the western and south-western and central part of the county. A specific feature of this area is the low percentage of forest.

MATERIALS and METHODS

Geographically the area under study is located outside of Birda locality, in the north of the village, along the river Voiteg (Valea Seaca and Valea Sculea).
Administrative: the land on where the work are placed in the recipient lease are located outside of Birda locality. Access to the proposed scheme is done through an existing road that connects with Birda locality.

RESULTS

To increase agricultural productivity on the surveyed land are proposed 7 reservoirs of water required for irrigation. The water will be assured from rainfall, snowmelt, and additional by pumping from Bârzava River.
Irrigation works are proposed in the area under study totaling cca.1.650 ha. Maximum storage capacity storage tanks are proposed to be approximately 520,000 m^3.
Water storage tanks will be executed by excavating -1.50 ÷ -2.00 m below the current valley and earth pushing outwards making a smooth connection to the slope surrounding hills.
Irrigation system proposed for implementation will consist of four pumping thermal units that will take water from the storage tanks and underground pipelines will suppress that can be called the antenna by order of magnitude: primary and secondary.
From antennas through hydrants water is taken up by plants and distributed to irigat plants. Irrigation systems will be used: IATF (sprinkler irrigation systems and hose drum) IADF (sprinkler irrigation facilities displacement front) and IAP (cental pivot sprinkler irrigation). The entire surface will be only irrigated using sprinkler irrigation and watering systems depending on the terrain orography.
In general, spatial valleys must include the entire course and consider all the utilities required by local needs and spatial character is indicated by the prevailing economic branch. In a fair distribution of ponds over a valley, the runoff can be stored until canceled leaks. This will get a maximum increase of the volume of water and increasing the available volume (V), which can be used for multiple uses in the more favorable economic conditions.
When choosing the type of dam should pursue its security and savings in the volume of earthworks, the latter may be obtained by making a downhill slope limit. Adaptation of the slope is dependent on the type of the dam and the nature of the soil used in the construction. Slope susceptible to such adaptations is primarily the downstream slope and secondary the upstream slope.
By irrigating the crops is intended to ensure optimal soil moisture in the root zone development, for which purpose it is necessary to introduce additional water from those given naturally. Irrigation regime of a culture is a complex notion, which characterizes quantitatively and while the application of additional watering.
Terms of plant development differs from the irrigated lands irrigated by altering soil and air temperature variation by changing root development.
Irrigation regime of a culture is how the water is taken for irrigation in order to obtain stable harvest time with high values.
Knowledge of irrigation system allows sizing fair and well organized facilities for their use. Irrigation works will be carried out on the surface under study, totaling 1,650 ha. Crop rotation will be: about 500 ha wheat crop, about 500 ha maize crop, about 500 ha crop of sunflowers, about 150 ha of rape culture. The wathering time is the amount of irrigation water throughout the growing season of crops for distribution (m/ha).

Table 1

Crop	wheat	sunflower	rape	maize
H (m)	0,5	0,75	0,70	0,75
Ni (mc/ha)	1500	2100	1500	2800

All data were taken from tables based on research conducted in several experimental fields stationary, representing monthly average daily consumption for the main plant during the growing season and irrigation water requirements about research and culture.
The wathering time is the amount of irrigation water supplied from surface soil moisture at a single watering, soil moisture rises to the actual value corresponding to the field capacity.

m –the wathering time (mc/ha)

$$m_{STAS} = \frac{Ni}{n}$$

N_i – the irrgiation time (mc/ha)

n – the number of wathering required

q_i – wathering module

$$q_i = \frac{m_{STAS}}{3,6 \cdot Ti \cdot ti}$$

Qi – the flow for the entire surface

$$Q_i = q_i \cdot Si \text{ [l/s]}$$

Calculus is made on table:

Table 2

Crop	wheat	sunflower	rape	maizeb
Si (ha)	500	500	150	500
q_i (l/s/ha)	0,69	0,97	0,69	0,97
Q_i (l/s)	345	485	103,5	485

The wathering module „ q_0” serves to calculate the total flow installed in the pressure station.

$$q_0 = \frac{\sum(ni \cdot mi)\ max \cdot ai}{3,6 \cdot T_i \cdot \tau_i} \text{(l/s/ha)}$$

$$Q_{SPP} = q_o \cdot S_{TOTAL} \text{ [l/s]}$$

The wathering module is calculated separately for each month:

Table 3

	month IV	month V	month VI	month VII	month VIII	month IX
q_0 (l/s/ha)	0,09	0,13	0,12 l	0,38	0,19	0,023

Total flow required to be installed in the pressure station in the maximum consumption month:

$$Q_{SPP} = 0,38 \cdot 1650 = 627\ l/s$$

The works proposed in this project does not lead to significant pollution of the area. It distinguishes one type of pollutants during construction, with local effects on short-term (temporary nature). During the operation does not stand any action polluting the environment.
Pollution sources during execution can be generated by:

- auto traffic by oil spills during operations due to power or poor technical condition of machinery and transport equipment and installation.

- storing waterproof construction land area.

Reducing the impact on soil and subsoil is achieved by using means of transport and assembly in good working order and landfill construction materials. During construction, soil and subsoil pollution is negligible.

CONCLUSIONS

Global warming will affect mainly steppe areas and afforestation where the forest percentage is very small. Most severe limiting factor for forest vegetation is represented here by the reduced amount of precipitation and their improper distribution during the growing season. To this is added the warm winds of the summer, whose effect are felt by enhancing soil moisture deficit and increased evapotranspiration. Along with low rainfall stands very high temperatures recorded on the ground.

The 7 irrigation water reservoirs will assure required water for 1650 ha which will be irrigated in Birda Locality from Timis County, Romania.

To prevent and control the risk of desertification in Romania need a broad set of measures such as:

- restoration of degraded lands (especially those eroded);
- programs for afforestation and water resources management;
- rehabilitation of irrigation systems that prove effectiveness;
- restoring the agricultural landscape;
- educating people for using judicious and economical water resources.

LIST OF REFERENCES

[1] Project 218/12.04.2013 I.N.C.D.I.F.– "Ispif" Bucureşti Banat Branch *"Landscaping irrigation and land improvement works at S.C. Exploataţia Agricolă Birda S.R.L."*, Birda locality, Timiş county.

[2] V. Blidaru, Blidaru TV, State I, State D, "Hydro complex along the Pan-European corridors and inland marine territorial development" Performantica Publishing, Iaşi, 2011 ISBN 978-973-730 - 856-6.

[3] V. Blidaru, State I., Blidaru TV, "Hydro for rural development through recoveries, protection of land and facilities complex (optimized solutions with examples of global technical and Romanian)" Performantica Publishing House, Iaşi, 2006 ISBN 973-730-171-4.

[4] Theodore Eugene Man, Nicu Cornel Sabau NC, CIMPAN Gabriela, Bodog Marinela "Hydrological", Vol I, II, Aprilia Print Timisoara, 2008.