10 RUSSIA – DZHANYBEK: DRIP IRRIGATION

The “Dzhanybek” study area is situated on the territory of Pallasovsky District, Volgograd Region, which is a dry steppe area situated at the left bank of lower part of Volga River valley. The climate of has a number of negative characteristics (drought, dry hot winds, dust whirls etc.) but also positive factors as warm summers and high radiation allows the valuable agricultural cultivation (horticulture, vegetables, cereals, fodder).

The irrigation of crops in this region (situated at about 100 km from Volga River and very scarce local resources of fresh water) was stopped in early 2000 due to increasing of costs for water delivering strongly linked to high price for energy. Working equipment was sold, the old units finally broke down. Water storage capacities at the territory were absolutely dry for already 4 years from beginning of project activities. Before, they were used to be filled with snowmelt waters. Unprofessional vegetable farming for domestic use is also under threat. High evaporation and shallow groundwater lead to salinization of the soil. This and declining water resources affects people's income by decreasing food production. Nowadays the main income of the stakeholders is agricultural production from their garden plots (fruits and vegetables), growing cattle (sheep and cows). There is a big agricultural conglomeration – farm “Romashkovsky”. A number of people are working in this farm and their salary depends on its production.

The young generation is leaving rural areas due to level of life and possibilities to find more income in the urban area. Lack of information about sustainable land management, climate instabilities and weak institutional support with low financial support from the governmental organization making life of people in this region difficult.

The experiment focusses on testing drip irrigation as a water conservation practice while generating a viable crop yield.

THE EXPERIMENT: DRIP IRRIGATION OF TOMATOES TO CONSERVE WATER

Field trials were carried out aiming to test drip irrigation technologies in different field conditions and sources of irrigation water. The groundwater in this region is the receiver of surface water (in general after snow melting) and the depth and concentration is determined by the micro-relief. Under micro-depressions the surface of groundwater is convex with depth about 2 - 5 m and mineralization about 0,3-1,4 g/l. Under micro-elevations the surface of ground water is concave with depth about 3 - 9 m and mineralization about 4-17 g/l. It has to be used with care.

The setup was to have (1) experimental plots at micro depressions within agricultural fields with the use a fresh ground water stored in between soil surface and salty ground waters, (2) experimental plots at garden of householders at villages with the use of municipal water delivery system and (3) experimental plots within natural pasture near location of temporary summer habitation of shepherds with water transported in tank or cistern.

Installing drip irrigation lines in Tomato plots

At each experimental site a drop irrigation networks were assembled of hose pipes of drop irrigation (produced by “Rosinka”) for each rank with the distance 0.3 m between the droppers, a output from tank/cistern was installed on about 1 meter height to water distribution system.

The experimental plots irrigated by drip irrigation technology were established and monitored during growing seasons from 2007 till 2011 at the same time and at the same fields in parallel with experiments with furrow irrigations. They were equipped with 4 boreholes providing access to capacitance soil moisture sensors measuring soil moisture till 40 cm. During all five experimental seasons a continuous drip irrigation applications were proceeded and data on soil moisture were recorded as well as meteorological parameters were recorded by automatic weather station located near these plots.

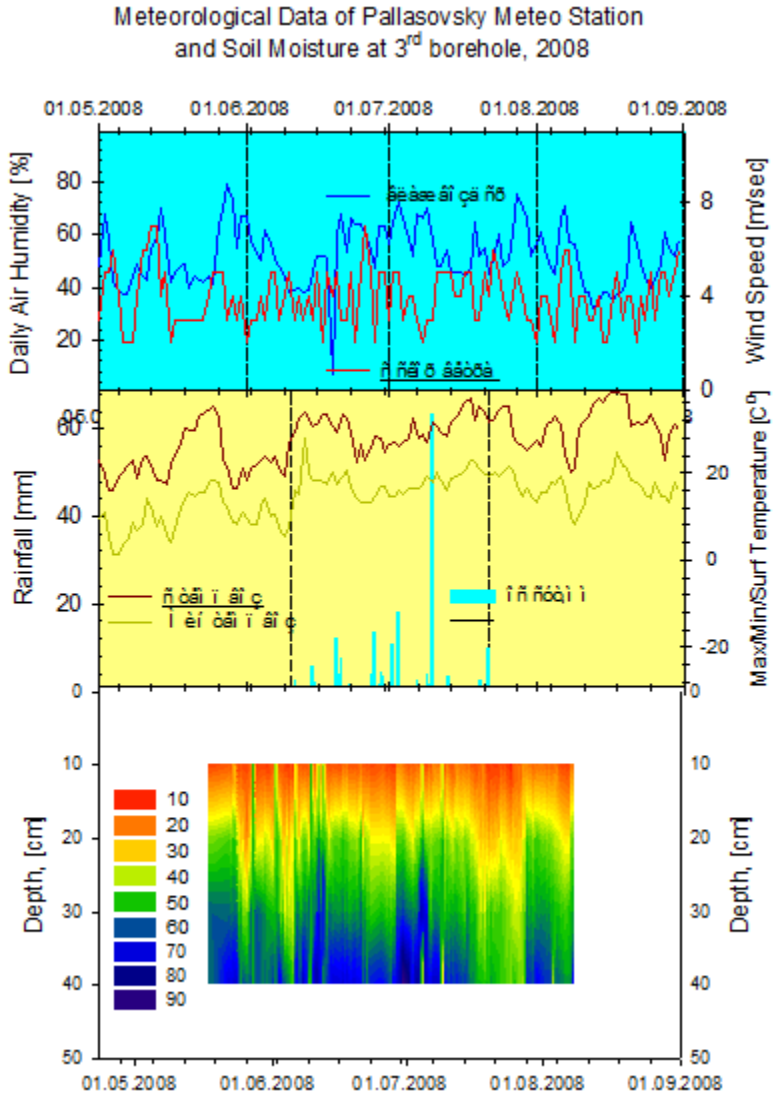
Underground storage tank of snowmelt water for drip irrigation. The meltwater forms a sweet water lens on top of the brakkish groundwater.

Variable	2007			2008			2009			2010		
	Vi	VII	VIII	Vi	VII	VII	VIII	VII	VIII	Vi	VII	VIII
Soil Moisture												
Electrical Conductivity												
Air Temperature												
Germination Rate												
Growth quality												
Soil chemical analysis												

RESULTS

During the monitoring period of 5 years a water regime under drip irrigation was recorded in total during 21 months. It was shown a positive water regime without development of preferential flow to deep soil layers and ground waters. Amounts and timing of furrow irrigation changed depending on weather conditions. Irrigation dozes during vegetation period was about 3600-4050 m^3/ha (May- 10 - 15 days with 400-500 m^3/ha, June- 20 - 25 days- 1000-1100 m3/ha, July- 20 - 25 days 1100 - 1200 m^3/ha; August – 15-20 days – 800-900 m^3/ha; September – 5 - 10 days – 300 - 350 m^3/ha). The actual use of irrigation water by drip irrigation was estimated at 2000 m^3/ha. At the same time this increases the water available for other uses (by roughly 30-50%). Effect on salinity was too early to tell.

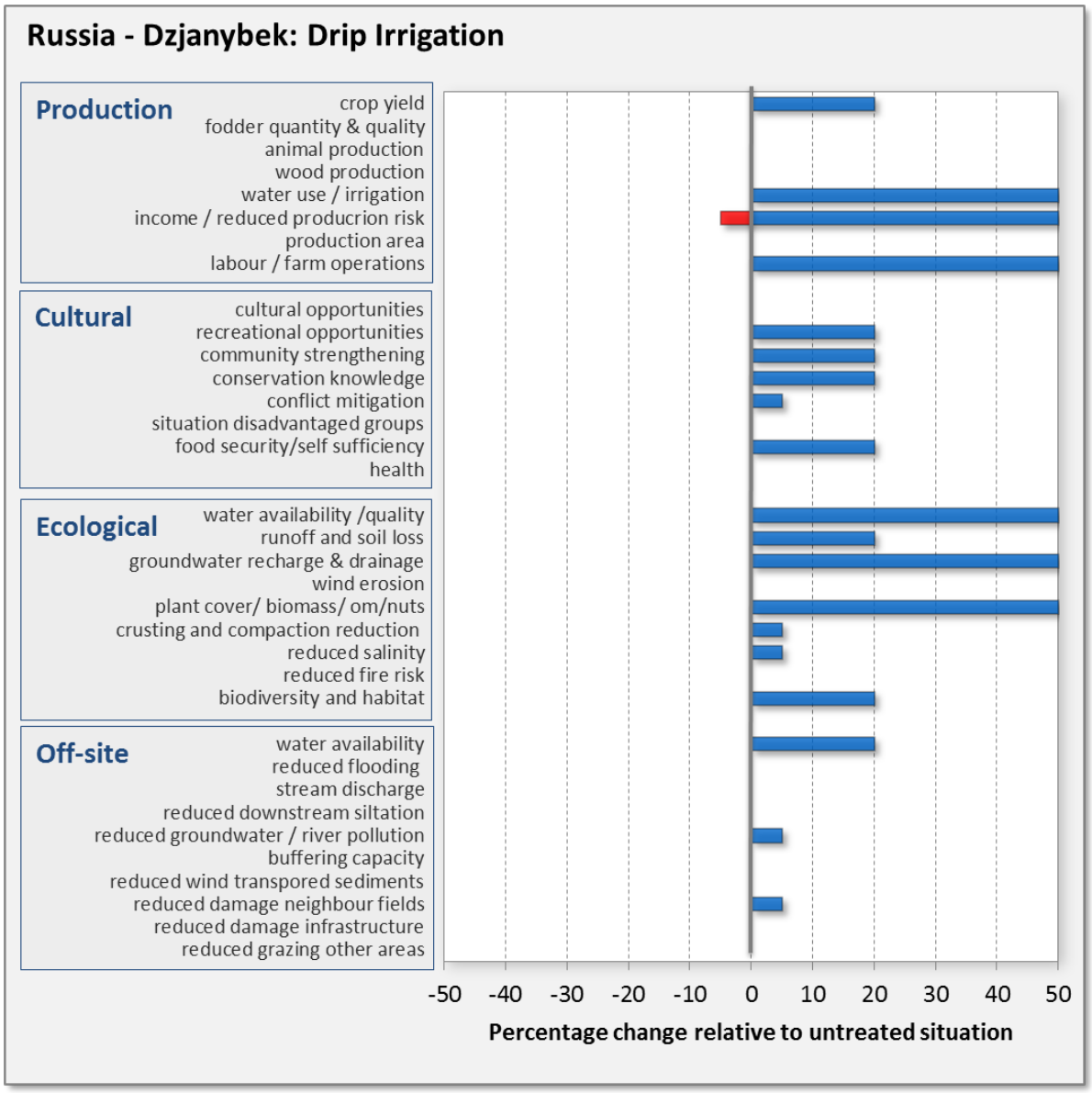
Consequently the drip irrigation has a very large effect because of the more precise application, shorter supply lines and decrease in evaporation. Vegetable yield increased form 4 to 6 tone/ha while the workload decreased from 2hours to 1 hour per day.



Measurements during growing season of 2008 year soil moisture in the root zone of the tomato plot of the Sobolev family (Romashky village of Pallasovsky District, Volgograd region, Russia)

HOW WELL DOES IT WORK?

The results are evaluated from a production, socio-cultural and economic point of view. The bars express the estimated or measured percentage of change with respect to the reference situation. This change can be positive (blue) or negative (red). Note that this evaluation is based on the experiments, on the long term experience of the coordinating team in this area and on consultations with the farmers.



STAKEHOLDER'S OPINIONS

A lot of farmers and experts and administrations shown interest in drip irrigation technologies using considerably small amount of water that is very important in this region with scarce fresh water resources. The stakeholders feel it should be more advertised in newspapers. The decrease water use for tomatoes is directly linked to the availability of consumption water for households. They would like this to be more controlled and introduction of drip irrigation would raise this awareness. Drip irrigation is a profitable irrigation practice since it provides opportunity to get fresh vegetables with a small amount of applied water and workload, but implementation and maintenance costs are high obstacles for large application of it.

However, the main bottleneck is the cost of installing drip irrigation systems. Without subsidy this technology will not be broadly used.

CONCLUSIONS

- In highly dry areas of Volgograd and Saratov Regions it is possible to cultivate tomatoes and other vegetables with drip irrigation method. The use of drip irrigation allows changing the cropping patterns that encourages land cultivation.
- Drip irrigation is very adaptable to the soil conditions and local sources of fresh water.
- System of drip irrigation can be successfully located and used as at the small holdings so at farms of different type of ownership.
- Using drip irrigation, more productive appeared to be tomato sorts that are grown in Volgograd Region, their productivity made up 50-60 t/ha.
- Vegetables of these sorts were also the best according to biochemical analysis. The sweetest (sugar contents - 3,74%) was the Dar Zavolgia.
- Drip irrigation is more conservative in water use and increases water availability for households.
- Initial Investments to install drip irrigation systems are the main bottleneck.

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