Identifying effective techniques that reduce the inlet water to the farm and increase agriculture water productivity (in the Lake Urmia Basin)

The project "Contribution to restoration of Lake Urmia via modeling local community participation in sustainable agriculture and biodiversity" was considered as one of the activities of Lake Urmia restoration, in which the Department of Environmental of Iran in cooperation with the Ministry of Jihad Agriculture attempt to provide part of the payment for Urmia lake through the training and participation of regional farmers and transferring the technique to agriculture. In this plan, while paying attention to preserving the interests and income of farmers, changes have been made in traditional farming practices to reduce applied water at farm level and increase water productivity. Currently, most of the agricultural fields are irrigated by surface irrigation systems in the Urmia Basin. In order to achieve the objectives of the plan, improving and modifying surface irrigation methods, it is inevitable. Achievement of high efficiency and uniformity in surface irrigation management is complex, due to the large number of parameters affecting surface irrigation, as well as their temporal and spatial variations; hence improving irrigation performance based on variables with minimal operating cost, ease of use and practical at farm were noticed.

Various techniques have been applied in the fields such as tillage methods, correcting irrigation plots size, using winnowed seeds, using seeds with a shorter growth period, modifying the crop fertilizer management. The effectiveness of the techniques on 21 fields (treatment) in selected sites in East and West Azarbaijan provinces was compared with the current status (control). Selected fields in East Azarbaijan included wheat and barley farms in Bonab, canola farms in Ajbashir and Azarshahr and garlic farms in Azarshahr. One of the most effective methods for implementing proper management of surface irrigation is the use of computer software and numerical models. The WinSRFR software is a one-dimensional mathematical model for analyzing and simulating surface irrigation and selecting the right dimension of agricultural farms. The selected fields in Urmia were under cultivation of wheat, corn, pumpkin, tomatoes and sunflowers. The effectiveness of modifying farms dimensions size on reducing allocated water to the fields was investigated.

In the east of the lake, the applied water content for wheat, barley and rapeseed treatment farms was lower than that of the control farms, which is attributed to the application of recommended techniques. The applied water for treatment wheat was

6986 m3/ha e and its value was 10307 m3/ha for control, which was about 47% less. Similarly, for barely it was 4789 m3/ha and 5378 m3/ha. On average, 12% less water applied in the treatment farm. Rapeseed is an industrial crop that has entered the region's cultivation pattern in recent years. The optimization in dimensions of irrigation plots of rapeseed treatment in Ajbshir caused a 9% reduction in applied water. In most farms, increase in water productivity was recorded. High yield in wheat in Bonab has caused the average water productivity to be 1. 59 kg/m3, which was equal to 0.96 kg/m3 in the control farm. Barely water productivity in treatment and control farms in Bonab was 0.66 and 0.73 kg/m3, respectively. In other words, the water productivity as a result of the use of recommended techniques led to an increase in water productivity by 45%. Water productivity in rapeseed farm treatment in Ajbshir was 1.06 and in control farm was 0.8 kg/m3. In the area of Osco, the productivity of rapeseed was 1.44 in the treatment farm and 0.49 kg/m3 in the control farm. Low yield and productivity in the control farm are related to the salinity of the land, the high underground water level and poor management for soil washing. Garlic is a vegetable crop in Gogan region in Azarshahr, which has the highest cultivation area than other eastern cities. The total applied water was constant at all treatments and control which was 7333 m3/ha. The highest yield of garlic was obtained from vermicomposting fertilizer treatment with water productivity of 3.78 kg/m3.

In Urmia, the average of applied water in wheat farms was about 7132 m3/ha which by reducing the width of the irrigation strips by 60%, the water application rate is expecting to increased to 56% and the applied water reduced to 3219 m3/ha. Only by reducing irrigation strips width and land leveling 40% increase in water productivity for autumn crops is expected. Under existing conditions, the productivity of wheat was between 0.84 and 1.65 kg/m3, which increasing to about 1.6 to 4.5 kg/m3 by reducing in irrigation strip width. Also, the reduction in irrigation strip width in the farms of spring crops increases the water productivity by about 37 to 60%. Based on the WinSRFR software, the average irrigation application efficiency rate in 5 selected wheat farms can be increased from 23.5% to 52.7%. In selected fields for spring cropping including corn, pumpkin, sunflower and tomato, the average current water application efficiency was 34.7, 37.4, 41.6 and 57.6%, respectively, which could increase to 74.4, 78.1%, 68.3% and 79.9% respectively. In all fields, the width of the irrigation strips should be reduced.

The techniques used on the selected fields of the project "Contribution to restoration of Lake Urmia via modeling local community participation in sustainable agriculture

and biodiversity" have been effective on soil fertility, crops nutrition demand and soil water holding capacity and have positive impact on yield. Accordingly, although the techniques in some fields have not been able to specifically save water intake, it has increased the yield and water productivity in the selected fields. In the coming years, specific techniques for controlling and managing water application and use are needed.

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