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Practical tools for improving the efficiency of surface irrigation systems

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Surface or flood irrigation systems such as furrow, basin or border irrigation are the primary methods of irrigation for alfalfa and field crops in California. Surface irrigation uses the soil surface to flow water from the upper end of the field to the lower end. The majority of water losses through these systems are either by surface runoff or deep percolation or a combination of both. Improvements in surface irrigation efficiency can be achieved by minimizing water losses associated with surface irrigation systems. Various practices could be used to improve irrigation efficiency. Determining the time of irrigation to reduce surface runoff and increase irrigation efficiency could be achieved by automating surface irrigation systems. Surface irrigation automation involves the use of wetting front advance sensors, flumes and electronic timing control gates to determine the irrigation cutoff time. Automation of surface irrigation systems increases irrigation efficiency and reduces the cost of labor and water. In addition to water conservation, reduced surface runoff and deep percolation reduce erosion, off-site movement of pesticides/phosphorous and nitrate leaching. In addition to automation, we discuss here some of the efficiency measures that are commonly used to evaluate surface irrigation systems and traditional and new methods for improving irrigation efficiency.

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Achievement of sustainable groundwater exploitation through the introduction of water-efficient usage techniques in fish farms

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Due to high quality, the artesian groundwater is the main source of water supply for the fisheries in Ararat Valley, Armenia. From 1.6 billion m3 abstracted groundwater in 2016, half was used by fish farms. Yet, the inefficient water use, typical for low-intensity aquaculture systems in Ararat Valley has become a key environmental issue in Armenia. In addition to excessive pure groundwater exploitation, which along with other sectors of groundwater use in this area resulted in the reduction of artesian zone by approximately 67% during last 20 years, the negative environmental impact of these productions is magnified by the discharge of large volumes of wastewater into receiving water bodies. In turn, unsustainable use of artesian groundwater in Ararat Valley along with increasingly strict policy measures on water use had a devastating impact on small and/or medium scale aquaculture: Over the last two years approximately 100 fish farms have permanently seized their operations. The current project aims at the introduction of efficient and environmentally friendly fish farming practices (e.g., Recirculating Aquaculture Systems) in Ararat Valley fisheries in order to support current levels of fish production and simultaneously reduce the negative environmental pressure of aquaculture facilities in Armenia. Economic and environmental analysis of current small and medium scale operational systems and subsequently developed environmentally friendly and economically sustainable system configurations will be presented.

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