TAILWATER RECOVERY ON IRRIGATED FIELDS FOR WATER AND NUTRIENT RECYCLING

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Description
A fraction of applied irrigation water is lost by subsurface or surface (runoff) flow, this fraction is called tailwater [3], that can be stored, transported and re-used for irrigation. Thus, water and dissolved nutrients would be recycled in agricultural irrigated soils.

Rationale, mechanism of action
Surface irrigation in non-flat plots can promote soil particles and dissolved nutrients loss from soils [1,2]. Losses of dissolved nutrients could be of particular concern after fertilizer application at a high rate, which may promote incidental losses of nutrients [3]. Water and nutrient that are lost can be re-used if an accurate system for storing and transportation is used. Design of these systems should be site-specific [4].

Applicability
Tailwater capture, storage, and re-use is possible on irrigated fields after installing accurate systems for conducting, capture, storage, pumping and irrigation. Depending on the field slope, high energy costs and an investment in powerful pumps could be required. It is thus important to study the management costs of the system accurately. In case a high energy input is necessary, it could be preferred to establish a strategy at farmer community scale to re-use the water in downslope, with a lower energy requirement for transporting water.

Effectiveness, including certainty
The measure could be effective for increasing water use efficiency and for decreasing nutrient losses. However, it may not be effective for decreasing erosion via overland flow and losses of particle bound nutrients. It is difficult to re-use sediments and the nutrients they contain, since they will be retained in the deposits where the water is stored. Thus, although these nutrients will not enter watercourses, they will not be recycled. Also, no effect on controlling erosion related to irrigation can be expected.

Time frame
In general terms, a decrease of N and P losses and less frequent incidental losses can be expected on short term.

Environmental side-effects / pollution swapping
Additional effects on loss of pesticides are expected. Also, water saving in dry regions is an additional and relevant potential benefit of this measure.

Relevance, potential for targeting, administrative handling, control
The option can be relevant for all irrigated fields, in particular where the soil P status is above optimal for crop growth and where large amounts of N and P fertilizers are applied. However, an accurate calculation of irrigation rates and an accurate selection of irrigation systems could be a (sometimes cheaper) alternative which could be even more effective in increasing the efficiency of irrigation water, that can also reduce losses of sediments and particle bound nutrients.

Costs: investment, labor

Estimated cost could be around 400 € per ha [3] if an accurate irrigation system is used. However, this could vary widely, depending on the local energy costs for pumping water. For this purpose it may be necessary to facilitate subsidies for covering costs of investment which should consider not only the reduction of non-point pollution (N, P, pesticides), but also soil conservation and water saving, which are important items in arid and semi-arid regions.

References

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