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Suggestions for Developing a Methodology for Quantification of Agricultural Water Use Efficiency

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Background

Over recent decades, a huge amount of work has been done pertaining to quantification of agricultural water use efficiency. Initially, this work concentrated primarily on the farm/field level, aimed at helping farmers understand how much water they were using in relation to crop water requirements and assessing opportunities to apply irrigation water more efficiently and uniformly, while maintaining and improving crop yields. Much of this work was centered in the San Joaquin Valley where water supplies were most limited relative to other regions of California, natural soil drainage is poor or water could be lost to salt sinks. One of the revelations stemming from this initial work was that the manner in which water is delivered by suppliers in some cases constrains efficiency improvements at the farm level. Consequently, attention has broadened to address the relationship between on-farm and delivery system operations, with the view of increasing efficiency at both levels. All kinds of water supplier and on-farm efficiency measures, in the form of both new equipment and technologies and improved management, have grown out of these efforts and have been widely adopted, though more needs to be done.

In the last decade or two, agricultural water use efficiency has come to the forefront as a critical component of balancing water demands and supplies at the regional level. In this context, water planners generally understand the importance of distinguishing between recoverable and irrecoverable irrigation losses. This is because in areas where irrigation return flows are truly lost to salt sinks or degraded water bodies, efficiency improvements can achieve real water savings, thereby helping to close the gap between water supplies and demands. In contrast, in areas where irrigation return flows are not lost but instead flow back to the hydrologic system as surface water flow or groundwater recharge, efficiency improvements will not increase additional supplies, but, importantly, may help address water quality, flow timing, energy consumption, and other issues. These understandings are institutionalized in the conventions adopted for statewide and regional water planning.

SBx7-7 and DWR's July 22, 2010 Draft Discussion Paper

Recently enacted SBx7-7 requires that the Department of Water Resources (DWR) develop a methodology for quantifying the efficiency of agricultural water use, working in consultation with the Agricultural Water Management Council, academic experts and other stakeholders. Furthermore, SBx7-7 requires that, on or before December 31, 2011, the department shall report to the Legislature on a proposed methodology and a plan for implementation.

DWR initiated work on the methodology in 2010 including preparation of *Discussion Paper 1: Initial Draft Methodology for Quantifying the Efficiency of Agricultural Water Use (Project A1),* September 22, 2010 (draft Discussion Paper). The draft Discussion Paper serves as a good starting point for further technical discourse among stakeholders for several reasons, chief among them being recognition of the following points concerning agricultural water use efficiency (WUE):

- WUE varies with spatial scale due to the potential for reuse of water among water users. DWR suggests that three spatial scales be included in the methodology: field, supplier and regional. These are appropriate because they generally align with the different levels at which water is managed.

- WUE cannot be described at all spatial scales and for all purposes with a single quantitative indicator; rather, different quantitative indicators are appropriate at the different spatial scales and for different analytic purposes.

- Quantifying WUE requires reliable data, the lack of which is presently a significant constraint to better understanding existing agricultural water use and advancing WUE improvements.

Implicitly, the draft Discussion Paper acknowledges that quantifying agricultural WUE is not an end in itself but is one water management tool, to be used among others, for achieving identified objectives. This view is strongly held by agricultural water managers in all regions of the state.

Suggestions for Moving Ahead

Building on the positive technical foundation put forth in the draft Discussion Paper, the following suggestions are offered for DWR's consideration.

1. Although the legislation does not define the purposes for which an efficiency quantification methodology might be used, and despite acknowledgement in the draft Discussion Paper of a variety of potential purposes, the methodology should link the anticipated various quantitative indicators with particular purposes to the extent possible. This is suggested to guide investments in agricultural WUE improvements, beginning with the necessary data collection. For example, if water quality improvement is the principal concern in a particular area, that would point to farm-scale quantitative indicators and associated data collection. Alternatively, if net water savings were the main concern, that would point to regional scale indicators and associated data collection, with investments in farm-scale data collection potentially carrying less importance. In short, the methodology should be accompanied by an objective-driven "user's guide" for applying the methodology. General objectives may

include: net water savings (to improve water supply reliability), water quality improvement, energy conservation, and environmental enhancement, among others.

2. With regard to improving water supply reliability, the distinction between recoverable and irrecoverable losses presently institutionalized in statewide and regional planning processes should be embodied in the methodology. Given the current and likely future emphasis on improving water supply reliability statewide, and the common misperception that increased efficiency translates to water savings in all locations and situations, maintaining this distinction is critically important to setting appropriate policies, establishing realistic expectations and identifying cost-effective WUE projects.

3. The regional Targeted Benefits and Quantifiable Objectives developed pursuant to the CALFED Agricultural WUE Program should be considered as a beginning point for defining regional WUE objectives and goals, although this level of detail might not be appropriate for incorporation directly into the quantification methodology.

4. The methodology for quantifying efficiency should be based on water balance techniques, which are useful for understanding the potential effects of efficiency changes. Water balances are applicable at different spatial and temporal scales and can be used to reveal potential consequences, intended and unintended, of contemplated efficiency changes.