SBx7-7 Task A-1
Developing a methodology for quantifying the efficiency of agricultural water use.

Quantifying water use efficiency (WUE) can be approached from different perspectives. It can be an evaluation of crop production given a defined quantity of water. It can be the economic output of crop production compared to water supply inputs. It can be environmental benefits derived from irrigated agricultural practices that might not occur absent of agricultural operations. In a state as diverse as California, agricultural water use efficiency is all of these and more. Because the nature of California agriculture is so diverse, it is important to consider the many variables in selecting the appropriate quantification methodology for each alternative.

Any WUE strategy undertaken must look at the local conditions. One size does not fit all. For example, in areas where water use is causing problems (e.g.. water quality issues, water lost to a salt sink, etc.), increased on-farm efficiency could be evaluated as one means of addressing the problem. However, where conjunctive use is necessary to stabilize groundwater levels, and where that recharge is relied upon by others (downstream users) as a supply, increasing on-farm efficiency will not only cause a problem, it will require additional infrastructure be installed to make up for supply that is no longer recharged.

Insisting that advanced irrigation practices be implemented may increase water use, particularly in areas where flood irrigation is currently providing substantial groundwater recharge or where inadvertent deficit irrigation has been practiced. While implementing widespread drip/micro use could increase crop production/drop of applied water (crop/drop), - but will result in reduced recharge. Programs would need to be developed to compensate for the change in groundwater supply. Urban agencies would need to find another water supply. Dedicated recharge facilities could be built - taking land out of agricultural production. The costs for the efficiency analysis and on-farm improvements, as well as the recharge facilities and other infrastructure improvements, could be substantial.

A tiered or incremental approach might be the best strategy for quantifying water use efficiency. By evaluating WUE using scale-relevant criteria, opportunities to define efficiency relevant to scale centric constraints more closely accounts for opportunities and limiting conditions.

There are a limited number of options for growers to reduce applied water on the farm as a means of improving efficiency. Irrigating less farmland results in a direct reduction of applied water but consequences include loss of income from the sale of farms products, loss of on-farm and farm-related jobs and a reduction in economic activity in communities dependent on the farm economy. Reduced crop evapotranspiration can lead a reduction in applied water. Installing alternative irrigation systems or reducing the surface wetted area or changing crops also have the potential for reducing evapotranspiration but not all options are practicable in all farming situations. Economics, potential market for crops, the availability of labor, soil type, water quality,

weather conditions and environmental constraints are potential limiting factors to options discussed above.

Regional differences in water use and management must be taken into account. The Sacramento Valley is much different from the San Joaquin Valley and both are very different from the Salinas, Imperial and Coachella valleys so regional approaches that are affected by local conditions must also be considered. A number of vital criteria should be evaluated against both local and regional conditions to determine whether they are appropriate under specific conditions. What could be considered a viable strategy for quantification in one instance may be inappropriate in other situations. Developing a matrix or menu approach may be the best method to assist local water engineers and managers determine what water use efficiency methodology is appropriate for their situation.

In addition to regional differences, there are commodity-based factors that must be considered when evaluating any scale or temporal approaches to quantifying WUE.

Agricultural WUE should be approached as a means to an end, not an end in itself. In other words, the approach to efficiency should be objective-driven. General objectives may include: water conservation as defined by the reduction of applied water, energy conservation, environmental enhancement, water quality improvement.

Conversely, general quantitative efficiency targets or numerical standards are an inappropriate means of inducing efficiency improvements. They have the potential to impose unnecessary costs, not to take into account regional differences, to have unintended effects (e.g., reduce groundwater recharge, negative environmental, third party allocation and/or economic impacts, etc.), and to fail to meet desired objectives.

With regard to water conservation, the distinction between recoverable and irrecoverable flows presently institutionalized in statewide and regional planning practices should be carried forward.

The specific regional Targeted Benefits and Quantifiable Objectives developed pursuant to the CALFED Agricultural Water Use Efficiency Program should be regarded as a beginning point for defining efficiency goals.

The methodology for quantifying efficiency should recognize that efficiency can be calculated at different spatial and temporal scales, and that the appropriate scales depend on the specific objective being pursued. Therefore, the methodology should be accompanied by instructions to guide the application of the methodology and interpretation of results.

The methodology for quantifying efficiency should consider employing water balances as analytic tools to improve understanding of all potential effects of efficiency increases.

The economic and financial costs and environmental effects of increasing efficiency should be considered along with the benefits associated with identified objectives such as water conservation as defined by the reduction of applied water, energy conservation, environmental enhancement, water quality improvement. Water use efficiency could result in unintended consequences, and those should be well documented.