Applied Water - Agricultural

In irrigated agriculture, water is applied over the land surface by various application techniques and allowed to infiltrate into the soil. The soil stores the water, and plants can extract water. Soil, however, is a "leaky" storage medium and water in excess of the storage capacity of the soil will move downward. When it is beyond the rooting depth of the crop it becomes unavailable to the crop. Further, not all of the water retained in the root zone is available for the crop. As the soil water content decreases, greater energy is required to extract the water and the water flow rate through soil decreases. When it is beyond the rooting depth of the crop it becomes unavailable to the crop. Further, not all of the water retained in the root zone is available for the crop. As the soil water content decreases, greater energy is required to extract the water and the water flow rate through soil decreases. The plant water demand rate to accommodate transpiration may exceed the rate at which water moves to the root, and when this occurs, plants may suffer from water deficiency.

Soils vary in infiltration rate, water holding capacity, water flow characteristics and energy of water retention, which all influence the supply of soil water available to the crop. These factors greatly depend on soil profile characteristics; and nature has provided soils with a wide range of these properties. Soil may be highly variable in a relatively small area. Supplying water for a crop is not, therefore, a simple straightforward process, but involves a number of complex dynamic processes that are intimately linked to highly variable soil properties. Water applied to a field in excess of that which can infiltrate during the application period will run off from the field. The run-off, does not represent a supply (not effective in supplying crop water demand) for the crop on the given field even though it was applied. Water infiltrated that exceeds the water holding capacity of the soil in the root zone moves down. This water, referred to as deep percolation, does not represent a supply (not effective in supplying crop water demand) for the crop. Only that portion of the applied water that infiltrates and is retained in the root zone can be considered available or a supply to the crop.

Water demand is largely controlled by climate and not very subject to management alternatives. Water supply, however, is subject to several management alternatives that entail different costs. The choice of irrigation technology influences both the rate and volume of water applications. Infiltration is a critical factor in determining the appropriate rate for applying irrigation water, and hence, in determining the size of pipes, sprinklers, etc. In other words, the choice of any irrigation water application system is partly dependent on the infiltration characteristics of the soil. The controlling factor of infiltration has significant implications on uniformity of water infiltration. In gravity flow systems (furrow, border, etc.) the uniformity of infiltration depends on uniformity of soil in a given field. Uniformity of infiltration for a pressurized irrigation system (sprinkler, drip, etc.) depends on uniformity of the delivery system, which, in part depends on system design, manufacturing specifications and maintenance. Soil properties may affect uniformity of infiltration for pressurized irrigation systems if the application rate exceeds the infiltration rate. Infiltration uniformity, therefore, is an important factor determining the amount of water supplied to crops through irrigation. All of the above require that the amount of water applied to a field exceed the need of the crop, due to inefficiencies of water application.

Precipitation is a valuable source of water for crops and reduces the requirement for irrigation water. Effective precipitation means precipitation that contributes to the crop-water need.

To summarize, the applied water requirement is the depth of water per unit area required to be delivered to a field head gate for a specific crop over 100% of the crop area to meet the water needs of the crop. This value under normal conditions will be higher than the Evapotranspiration of Applied Water (ETAW) and usually plant ET due to the inefficiencies described above.

Applied Water - Urban

Urban water use varies enormously from landscape irrigation to serving drinking water in restaurants. Urban applied water includes the water produced for all urban needs — residential, commercial (restaurants, auto repair shops), industrial (manufacturing, processing), institutional and governmental. Domestic water use is water used for indoor and outdoor household purposes — all the things you do at
home: drinking, preparing food, bathing, washing clothes and dishes, brushing your teeth, watering the yard and garden, and even washing the dog. Although most urban water use occurs in developed urban metropolitan areas and is delivered by a private water company or municipality. It also occurs in outlying rural-area residences, commercial facilities, manufacturing plants, and governmental facilities, which often rely on individual groundwater wells.

Many factors affect water use and include climate factors (temp, precipitation, solar radiation, humidity, etc.), evaporative demand, and evapotranspiration, water cost, density (households per acre, building footprint), physical (square feet of household, outdoor vegetation) and sociodemographics (income, age).

The variation in seasonal water use in any water year is directly related to the variation in the climatic and meteorological factors. Although most of the residential seasonal water use is due to landscape irrigation, the seasonal variation in commercial, industrial, and government includes water used as the result of space cooling, process cooling and other seasonal water-use processes in addition to landscape irrigation.

The quantity of water introduced into a water supplier's system for delivery (water production) and/or produced from private wells, which equals the amount of water delivered to all customers plus water unaccounted (lost) in an area is defined as urban applied water. Seasonal Use: An aggregate of end uses of water (e.g., lawn watering, cooling) that varies from month to month in response to weather conditions and other seasonal influences. Non-seasonal Use: An aggregate of end uses of water (e.g., toilet flushing, washing machine use) that remains fairly constant from month to month because these end uses are not sensitive to weather conditions and other seasonal influences. Water conservation efforts are often targeted at these uses through new technologies, designs, and behavior-management.

Pricing can influence seasonal and non-seasonal uses.

Climatological factors help explain much of the water use in different regions. Other factors affecting water use range from economic to esthetic factors and cover a wide range of activities (income, water price, water meters, community make-up, residential density, etc.).

In the San Joaquin Valley, most indoor uses of urban water do not result in the loss of the water. Indoor uses of water (kitchen, bath, etc.) result in the capture of the utilized water, ultimately this water is treated and reused (septic systems percolate the used water back into the groundwater). This water is either recharged into local groundwater or piped and re-used for non-potable purposes (usually landscape or crop irrigation).

Water that runs off into the gutter from overspray in landscaping or washing the family car is usually captured and directed to local residential ponds and allowed to recharge the local groundwater.

The primary loss or depletion of water in the urban sector occurs as a result irrigation (seasonal use) through plant water use of turf and other landscaped greenery and the evaporation of water from overspray on hard surfaces/runoff. However, due to the concentration of agricultural and the associated processing facilities in the San Joaquin Valley, a significant amount of water is also lost in the processing of various commodities from cooling, washing, etc. as well as in other industrial and commercial ventures requiring cooling, washing, and in the case of the Kern County, the petroleum industry. Many of these industrial and commercial (car washes) uses of water have been reduced by technological advances through on-site water recycling. Landscape irrigation accounts for as much as 90% of the residential sector’s and as much as 84% of the non-residential sector’s annual outdoor water use and is the dominant use during the summer and seasonal water use in the San Joaquin Valley accounts for as much as 60% of the total urban water use for the year.