**Agricultural Irrigation Water Use and Management Research Proposal**

**Title**: On-farm volumetric measurement of irrigation water use as a best management practice tool for water conservation in drip irrigated vegetables

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**Collaborators:** Bob Wiedenfeld, Ph.D. and Juan Enciso, Ph.D., TAES, Weslaco

**Problem Statement:** The Lower Rio Grande Valley (comprising Cameron, Maverick, Starr, Hidalgo, Webb, Jim Hogg, Willacy, and Zapata counties) is one of the most important agricultural regions in Texas with about 475,000 acres of land being irrigated using approximately 615,000 acre-ft of diverted water (Sparks et al., 2004). Reduced availability of irrigation water due to drought, urban growth etc, has increased the need for efficient on-farm water management practices to conserve water (Texas water Development Board, 2004). A majority of the crops grown in the valley are primarily furrow-irrigated, even though the adoption of newer water-saving technologies (e.g., subsurface drip) is increasing, primarily on high-value crops such as vegetables (e.g. muskmelons) which also tend to use large volumes of water. Information on how much water is actually saved by adopting these technologies is scarce due to lack of accurate information on on-farm water use. Regardless of the type of irrigation system used (drip, flood, sprinkler etc) flow metering is essential in order to document water use and to adjust future irrigations. Very few growers currently use sub-metering to monitor irrigation inputs. A drawback of using gates to monitor water use is that delivery times, rather than volume of water, are recorded and this compounds errors in calculating water use. Volumetric monitoring of on-farm water use provides the most accurate means of quantifying the success of water conservation when best management practices such as improved water delivery or improved irrigation scheduling are implemented. Volumetric sub-metering, when used in conjunction with other water conserving strategies, gives growers the financial incentive to repair leaks, install water saving devices, and reduce water usage. Growers will also likely adopt these water conservation best management practices if such devices are affordable and if a demonstrable cost benefit is anticipated.

**Objectives:** The aim of this project is to utilize affordable propeller-type totalizing water meters to precisely quantify water use in representative fields of cooperating vegetable growers. This information will permit accurate estimation of crop water use efficiency as well the potential water savings associated with subsurface drip irrigation. This project will complement ongoing research aimed at profitably improving on-farm water use efficiency through improved irrigation scheduling.

**Methods:** Experiments will be conducted in representative commercial vegetable production fields in the Mercedes, Harlingen and United Water Irrigation Districts and at the Texas A&M

University System Agricultural Research and Extension Center (TAMU-TAES) Weslaco during the 2005 growing season. The initial study will involve muskmelons (*Cucumis melo* L.); subsequent studies will include other leading high value vegetable crops grown in the Valley (onions and peppers). Muskmelons will be direct-seeded in 80-in wide raised beds with subsurface drip tape (T-Tape, T-Systems Int. Inc., San Diego, CA) installed at 6-in depth, and covered with plastic mulch. The drip tape has emitters spaced 12 inches apart and a flow rate of 0.45 gal/minute/100 ft. Multi-jet totalizing water meters (Model DLJ75, Daniel L. Jerman Co., Hackensack, NJ; ±1.5% accuracy) will be installed at the inlets of selected beds (at least 10 water meters per site) between the main irrigation line and drip tube. Water meter readings will be recorded once per week from planting until harvest. At final harvest, yield data will be collected from plots with meters and from the entire field for water use efficiency calculation. The amount of water used during the entire cropping cycle will be computed as the difference between the initial and final meter readings adjusted for rainfall. Weekly water supply and rainfall records will be compared with weekly evapotranspiration demands to determine if plots are over- or under irrigated. At the TAMU-TAES site, irrigation will be scheduled based on soil moisture depletion monitored at 15-cm and 45-cm depths using soil moisture sensors (model 200SS, Irrometer Co., Riverside, CA) connected to portable data loggers (Model 200, Spectrum Inc. Plainfield Ill.).

**Expected Results**: Accurate quantification of crop water demand and supply can conserve water, save time and labor, and minimize stress-related yield loss. Sub-metering gives growers the financial incentive to repair leaks, install water saving devices, and reduce overall water usage. Growers will consider adopting new irrigation technology and will likely play a proactive role in the conservation effort if technologies such as sub-metering are affordable and if a demonstrable cost benefit is anticipated. Close collaboration with the cooperating Irrigation Districts will facilitate grower adoption of these water conservation tools.

**References:**

Sparks, B., A. Sturdivant, R. Prewett, R. Lacewell, and J. Robinson. 2004. On-farm water applications: A White Paper presented at the 2004 Valley Water Summit. Feb. 17, 2004, Harlingen, TX.

Texas Water Development Board. 2004. Water Conservation Best Management Practices Guide. Report #362 of the Texas Water Development Board - Water Conservation Implementation Task Force. Texas Water Development Board, Austin, TX.

## BUDGET BREAKDOWN

**Project Title:** **On-farm volumetric measurement of irrigation water use as a best management practice tool for water conservation in drip irrigated vegetables**

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| Cost Category | Funds Requested | Cost Share | Total |
|---|---|---|---|
| **Salaries and Wages** | | | |
| Technical assistance (wage worker) | $0.00 | $6,090.00 | $6,090.00 |
| Fringe Benefits (@8.25%) | $0.00 | $502.43 | $502.43 |
| | | | |
| **Travel** (Domestic) | $2,000.00 | $0.00 | $2,000.00 |
| | | | |
| **Equipment & Supplies** | | | |
| Pressure gauges, couplers, valves | $500.00 | $0.00 | $500.00 |
| Plastic Mulch & drip tape | $1,500.00 | $0.00 | $1,500.00 |
| totalizing flow meters 1/2" | $6,000.00 | $0.00 | $6,000.00 |
| | | | |
| **Publication costs** | $0.00 | $3,600.00 | $3,600.00 |
| | | | |
| **Total Direct Costs** | $10,000.00 | $10,192.43 | $20,192.43 |
| | | | |
| **Indirect costs (@ 45.5% MTDC)** | $0.00 | $9,187.55 | $9,187.55 |
| | | | |
| **TOTAL*** | **$10,000.00** | **$19,379.98** | **$29,379.98** |

***Funds may need to be shifted among budget line items to complete the proposed project.**

# Budget Justification:

**Travel**: Travel to commercial farms of cooperating growers to install water meters and to collect readings on a weekly basis.

**Equipment & Supplies**: Funds are requested to purchase totalizing water meters (1/2" size; ~$85 each), soil moisture sensors and data loggers, soil sampling equipment, and microclimate sensors (air temperature, air relative humidity, soil temperature, solar radiation). For the research component to be completed at the TAES, Weslaco site, additional supplies (plastic mulch, drip tape, fertilizer, pesticides) will be purchased.