

Project Narrative

Name of the Project: Sub-Surface Drip-Irrigation for Forage-Livestock Systems

Is This a New Project or Request for Continuation?: New

Geographic Area of the Project: Hill Country and Rio Grande Plain

Name of Principal Investigator(s): T.D.A. Forbes, H. Lippke

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Amount of Funding Requested: \$13,380

Project Need, Description and Expected Outcomes

Situation and Need: The availability of water for agricultural irrigation in the Texas Hill Country and Rio Grande Plain is likely to decrease further in the future due to the demands from urban and suburban users, whether from Austin, San Antonio or from smaller urban centers located in the region. A part of this increased water use is due to changes in land use from ranching to suburbanized “ranchettes” surrounding many of the major urban areas in Texas. Many of these land owners wish to raise sheep or goats, primarily for 4-H or recreational purposes. These individuals generally have relatively small acreage but, while often having sufficient capital and interest to invest in newer irrigation technologies, do not have the time or labor to manage conventional sprinkler systems. In addition to our duty to satisfy the needs of these clientele, it is also important for Texas Agricultural Experiment Station scientists involved in Forage-Livestock systems research to fulfill our mission of providing timely and useful information to our traditional clientele. It is, therefore, incumbent on us to develop alternative forage production systems that reduce water usage overall while maintaining profitable yields per acre. While it is currently both economically and technically feasible to grow cool-season forages under conventional overhead irrigation systems, recent advances in drip-tape technology now allow for the use of sub-surface drip irrigation systems in annual forage systems as well as for permanent, warm-season, forages. A very few private individuals in the Rio Grande Plains area have started to embrace sub-surface drip irrigation technology for forage production, but there is almost no independent research to assist the clientele in decision-making processes. By initiating this project at this time, we intend to become leaders in the field of drip-tape irrigation for forages and thus have a major impact in the development of information for our traditional as well as a non-traditional clientele.

Hypotheses and Approach We have laid a sub-surface drip-irrigation system within a 2 acre block which has subsequently been planted with Tifton 85 bermudagrass. The area is divided into eight, 0.25 acre, plots, with drip tape laid 9-inches deep on 24-inch centers with a metered, central main water supply. Within each plot, water can be supplied to each line or to alternate

lines thus supplying water on either 24 or 48 inch centers. By watering each plot separately, water usage can be measured. Water supply is serviced by a central filtration facility, but requires an enhanced means of supplying fertilizer and pesticide injection. Fertilizer will be applied according to soil test recommendations and level of N in the forage. Timing of water application will be based on soil moisture content data supplied by a Delta-T Profile Probe. Grass growth rate and forage quality under varying irrigation schedules and animal stocking rates will be determined using conventional

techniques in a series of studies over the next three years. Comparisons between drip-irrigation and sprinkler irrigation will be made, using an adjoining area of bermudagrass for the sprinkler irrigated area to avoid problems associated with sprinkler irrigation of relatively small plots. Forage will be harvested for yield and quality determination at intervals that approximate industry standards for hay production. Initially, animals will be set-stocked at 8, 12, and 16 animals per acre. Animal intakes and performance will be measured using conventional fecal-marker based techniques. During periods of grazing, plots will be separated using temporary electric fencing.

Expected Outcomes: There are several major outcomes to this project, in addition to numerous specific hypotheses that can be tested. Most important is the determination of the water savings obtained from using the drip-tape compared to sprinkler irrigation for the production of a standardized quantity and quality of forage. Secondary outcomes include: 1) development of potential evapotranspiration (PET) indices. 2) development of grazing systems for small ruminants using sub-irrigated forages under intensive management to help the growing number of individuals who keep goats or sheep for largely recreational motives. These individuals generally have relatively small acreage but, while often having sufficient capital to invest in newer irrigation technologies, do not have the time or labor to manage conventional sprinkler systems. This information will be applicable to areas far beyond south central Texas..

Specific Issues Addressed

This proposal addresses the following concerns:

1. **Water management and conservation.** We will compare forage yields under drip vs sprinkler irrigation, comparing relative costs of production as well as initial establishment costs.
2. **Irrigation efficiency.** We will measure forage production under a variety of watering schedules, application rates and seasons, and relate that information to subsequent animal performance.
3. **Cropping systems and rotations.** We will compare forage and livestock production under cool- and warm-season conditions, with varying forage species.
4. **Urban agricultural interface.** This project will supply information of great relevance to many of the TAES/TCE clientele who own and run livestock on small “ranchettes” around many of Texas’s urban centers.

Collaboration

T-Systems International supplied the drip tape necessary to irrigate the initial 2 acres, and Rio Grande Initiative Funds to the amount of \$2,500 were used to defray some of the initial costs. This project will work closely with Dr. Piccinni in validating PET indices from his grass lysimeter. Members of TCE and the local County Agent will be encouraged to lead the educational effort. Efforts will be made to secure funds from SAWS and the Edwards Aquifer Authority to establish a larger area.

Submitted by _____
(P.I. signature)

Approved for submission _____
(Unit Head signature)

Collaborators

TAES

Dr. Giovanni Piccinni, TAES-Uvalde, is setting up lysimeters, including a grass lysimeter, for the development of potential evapotranspiration (PET) indices. This project will work closely with Dr. Piccinni in validating PET indices from the grass lysimeter.

TCE Specialists

R.V. Machen, Livestock Specialist. Dr. Machen will assist in aspects of livestock management, and lead the animal aspects of the educational effort.

J.G. Pena, Farm Management Specialist. Mr Pena will direct economic aspects of the educational effort.

C.R. Stichler, Agronomist. Mr Stichler will advise on agronomic issues and will lead the agronomic aspects of the educational effort.

TCE County Agents

K.G. White - Uvalde County Agent will assist in educational programs.