

Field Performance of Subsurface Drip Irrigation (SDI) in Kansas¹
by
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SUMMARY

A SDI survey was mailed to a list of 297 individuals thought to be owner/operators of an SDI system. The return rate of survey was 31% (returned 92) out of which 53% (49 responses) were from actual SDI users. The respondents had SDI acreage totaling 8,022 acres of the 323,260 acres irrigated by the respondents (about 2.5%). The survey results indicated that the producers were generally satisfied with their SDI systems. The survey responses indicated the majority of the SDI systems were installed by the joint efforts of producers and contractors (54%). Contractors installed systems account for 19% and the remainder (27%) were self-installed by the producers. The major concerns were rodent damage, filtration, clogging due to iron bacteria, initial cost of system, and wetting up of the top soil in dry years during germination.

INTRODUCTION

Drip irrigation has proven to be an effective irrigation method for water saving and better return for high dollar cash crops, however, as a surface drip system it does not lend to the field cropping system practiced in the Central Great Plains. Kansas State University's research on suitability of using drip method as subsurface drip irrigation (SDI) has shown that it is a feasible technology for irrigating field crops like corn (Lamm, Manges, Stone, Khan, & Rogers, 1995). More than 2 million acres out of 3 million irrigated in Kansas depends on groundwater from the Ogallala aquifer. The producers are experiencing decline in water level and the pumping cost is rising due to greater depth of pumping and increasing fuel cost. Economic comparison of systems indicated that a well managed SDI system with a promise of fifteen or more years of life is economically competitive (O'Brien, Rogers, Lamm, & Clark, 1998), although it requires a high investment at the start. Extension demonstration in producer field has helped a steady increase in the acreage irrigated by subsurface drip irrigation starting in 1997. Initially many of these systems were installed in small farms with limited water where a part of the water supply was diverted from existing flood or center pivot sprinkler irrigation systems. Lately, producers with large acreage under flood irrigation have started switching to SDI. The state wide SDI acreage is estimated at 20,000 acres, most of which is in western Kansas represents about 1% of irrigated crop land. Although no major concern regarding failure of system has surfaced, it was felt necessary to evaluate the present operational condition of these systems to provide field performance information to farmers intending to adopt SDI in their irrigation operation. The objective of the study was to assess the operational condition of the existing subsurface drip irrigation (SDI) systems and the level of satisfaction of the producers. Information would help address clientele needs and keep the service providers informed.

¹ This project receives support from the Ogallala Aquifer Project of the USDA-ARS Research Initiative.

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PROCEDURES

A survey questionnaire was sent out to producers using SDI system. The sample questionnaire is shown in Appendix A. The mailing list of producers was prepared from sign up lists of farmers attending educational meetings conducted by cooperative extension on use of SDI and a list obtained from Kansas State Division of Water Resources that show producers reporting use of microirrigation. The recipients of survey forms were requested to return the survey form even if they were not SDI users. Survey forms numbering 297 were mailed out. The survey requested information regarding acreage, installation, and performance satisfaction.

RESULTS AND DISCUSSION

A survey of SDI systems in Kansas indicated that the producers were generally satisfied with their SDI systems. The survey responses indicated the majority of the SDI systems were installed by the joint efforts of producers and contractors (54%). Contractors installed systems account for 19% and the remainder (27%) were self-installed by the producers.

When asked if the producers had received an “as-built” drawing or diagram of the system from the contractors, thirty-four positive responses were received and fourteen were negative. The response on receiving operational and maintenance instructions or operating procedures for the SDI system was similar; thirty-three received instructions and fifteen did not receive instructions on operational procedures.

Crops irrigated by SDI systems were corn (43 responses), soybeans (24 responses), cotton and alfalfa (5 responses each), and sorghum (3 responses). Other crops included wheat, oats, and sorghum silage.

The survey asked about the level of satisfaction with the SDI system, using a level of satisfaction scale of 1 to 5; where 1 indicates “very satisfied” and 5 being “unsatisfied”. The majority rated their level of satisfaction as “very satisfied” (17) or “satisfied” (19); other response options were “almost satisfied” (4), “somewhat satisfied” (4), and “unsatisfied” (2).

Survey response to a question on whether the SDI users are planning to expand acreage under SDI was that the majority plan to do so (30 responses), however nineteen indicated they did not plan to expand their SDI acreage at the present time.

The survey asked producers to list concerns regarding the SDI systems without providing any menu items for the respondents to select from. The overwhelming concern was about rodent damages and filtration. The major concerns were:

- Rodents, gophers, and other vermin damages requiring many hours of repair. (37)
- Filtration is a concern, but with a good system and maintenance there was no problem. Some asked if there were better filtration systems available or should one oversize to avoid frequent cleaning. (15)
- Clogging due to iron bacteria and calcium precipitation is a concern. Some reported clogging concern from drip oil used in pump. Clogging from drip oil is more evident in pumps with low capacity or fluctuating water levels. (15)
- Cost of the system, especially the life of the system kept some worried. (8)
- Wetting up of the top soil for germination. (3)
- Hard to visualize soil water condition, that is how to monitor soil water situation.

Finally, the survey asked producers to list information needs that Kansas State Research and Extension might be able to address. The responses from the producers were as follows:

- Rodent control – how and what to use.
- Fertilizer use through SDI including micronutrients.
- More educational meetings, seminars on management - both pre and post season included. Arrange field tour to visit systems and exchange information with other operators.
- Drip tape spacing for crops other than corn. More research for alternative crops under SDI.
- More information about planting alfalfa under SDI.
- How to germinate seed in dry soil or conserving moisture in surface soil for planting.
- How to unclog drip lines. How one may keep systems clean with different water supplies.
- System capacity, how much water to use, and limited water issues.
- Comparisons of crop yield advantage from SDI over sprinkler.
- Any improvement to cut down cost, better filtration, less maintenance requirement system for this area.
- Property Taxation classification for SDI needs to be developed to avoid over taxation where currently the producers are being penalized for conserving water.
- Why assistances are unavailable to conservation conscious farmers who want to install SDI, whereas it is available to non-conservative circle irrigation?

FOLLOW-UP

During the survey, producers were asked if they had interest in participating in an in-field analysis of their SDI systems. Approximately 30 individuals responded they would be willing to participate. Using criteria of system age and location, eight individuals were selected for the site visit. However, only three systems have been visited. Two of the systems appear to be performing near their original design specifications. The other was suffering from extensive rodent damage. Many large leaks were occurring in the system. Leakage was so extensive that no flow was occurring in the flush lines. Extensive rodent infestation and lack of timely maintenance has brought the system to the point that abandonment is being considered.

LITERATURE CITED

1. Lamm, F. R., Manges, H. L., Stone, L. R., Khan, A. H., & Rogers, D. H. (1995). Water requirement of subsurface drip-irrigated corn in northwest Kansas. *Transactions of the ASAE*. 38 (2): 441-448. ASAE, St. Joseph, MI 49085.
2. O'Brien, D., Rogers, D. H., Lamm, F. R., & Clark, G. A. (1998). An economic comparison of subsurface drip and center pivot sprinkler irrigation systems. *Applied Engineering in Agriculture*. 14 (4): 391-398. ASAE, St. Joseph, MI 49085.

Appendix A

Subsurface Drip Irrigation (SDI) Field Survey

The individual information collected will be kept confidential. The compiled information is for Kansas State University Research and Extension educational purposes only.

County _____

1. Do you have a buried subsurface drip irrigation (SDI) system? ____ Yes. ____ No. **Please return survey even if you do not have an SDI system.**
2. Number of acres in SDI. _____ Number of total irrigated acres. _____
3. Year of installation of oldest system. _____
4. Is the oldest system in use? ____ Yes ____ No
5. Who installed your SDI system? ____ Self-installed ____ Contractor ____ Both
6. Name of the contractor _____
7. If the contractor designed or installed your SDI system:
 - a. Did you receive an "as-built" drawing or diagram of your system? ____ Yes. ____ No.
 - b. Did you receive an operational and maintenance instructions or procedures for your SDI system? ____ Yes. ____ No.
8. Crops grown with SDI: corn ____ soybeans ____ cotton ____ other _____, please list.
9. Please indicate your level of satisfaction with the system performance in a scale of 1 to 5; where 1 indicates as very satisfied and 5 being unsatisfied.
Please circle a number: 1 2 3 4 5
10. Are you planning to expand SDI acreage? ____ Yes. ____ No.
11. What are your concerns about the system (such as filtration, clogging of drip lines, rodent damage, etc.)? Please list and comment.

12. What are information needs that Kansas State Research and Extension might be able to address? _____

If you would like to participate in an evaluation of your system (provided funding is available from the university) please indicate so by signing below.

If the system is operated by someone else on your behalf, please provide the name and address of that person below.

Name: _____ Phone Number: _____

Address: _____

City, State and ZIP _____

Thank you for your time and input. The survey is complete. Please return using the envelope provided. If you have any questions about this survey, please contact Dan Rogers at 785-532-5813 or drogers@ksu.edu. Or Mahbub Alam at 620-275-9164 or malam@ksu.edu SDI survey 2005-100a.