# AN ANALYSIS OF POTENTIAL IMPACTS OF ALTERNATIVE INSTITUTIONAL ARRANGEMENTS ON DEVELOPMENT OF A SPECIALTY CROP INDUSTRY IN SOUTHEASTERN OKLAHOMA

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## INTRODUCTION

Southeastern Oklahoma has historically been plagued with the pervasive problems of high unemployment and low incomes. The economic development which has been achieved, in one form or another, in most of the state, has not been common place in southeastern Oklahoma.

In December of 1985 the unemployment rate for the state of Oklahoma was 7.1 percent. The unemployment rate for southeastern Oklahoma, at that same time, was 13 percent (Oklahoma Employment Security Commission). Per capita personal income in southeastern Oklahoma is typically well below per capita personal income for the state. In 1982, per capita personal income for the state of Oklahoma was $11,247. Per capita personal income in southeastern Oklahoma at that time was less than $8,000. In two counties in southeastern Oklahoma (Atoka and Pushmataha), per capita personal incomes were less than half the state level (U. S. Department of Commerce). Because of these problems, economic development of southeastern Oklahoma is a priority for many government officials and agencies at the local, state, and federal levels.

Over 60 percent of the business proprietors in southeastern Oklahoma are farm proprietors. Due to the large proportion of the existing infrastructure based in agriculture, the area's economy is very responsive to changes in the agricultural industry. However, agriculture in southeastern Oklahoma is characterized by small and generally low income farms (Walker, et al.). The average size farm in the area is 328 acres as opposed to 466 acres for the state average. Nearly one-third of the region's farms have less than 100 acres while only 16 percent of the state's farms have less than 100 acres. Sales per farm in southeastern Oklahoma averaged $17,385, while the state average was $34,886, and over 70 percent of the farms in the southeastern part of the state had sales of less than $5,000 (1982 Census of Agriculture).

Agriculturists have long recognized southeastern Oklahoma's potential for growing fruit and vegetables crops. However, most growers of such commodities have had difficulty marketing their produce. This problem is currently being addressed by a number of agricultural researchers at Oklahoma State University who have had considerable success in identifying potential markets for numerous vegetable products which can be grown in the area. Preliminary research indicates that there may be significant potential for producing and processing fresh vegetables on small plots in southeastern Oklahoma (Tilley, et al.; Sleper, et al.).

In southeastern Oklahoma many producers have experience growing specialty crops. However, most of this experience has been in growing crops on a "home garden" scale for household consumption or for local markets. Compared to garden production, commercial vegetable production requires more intensive use of capital, management, hired labor, and marketing skills. Also cultural practices may be different because of needed quality control. Agricultural economists and horticulturists at Oklahoma State University are involved in research which will aid specialty crop producers in commercial vegetable production and marketing. Although the developing years of the industry do hold a degree of risk, if successful, southeastern Oklahoma specialty crop production could provide substantial benefits to both producers and their communities.

Irrigation is essential for the commercial success of the specialty crop industry in southeastern Oklahoma. Though annual rainfall figures imply ample water for the area (approximately 40 inches), the rain cannot be relied upon to meet commercial specialty crop water requirements in a timely and sufficient manner. Also, there are very few places in southeastern Oklahoma where adequate quantities of ground water are available for irrigation. Consequently, it seems that surface water is the most reasonable alternative for irrigation of specialty crops. Development of surface water resources is necessary, however, before appreciable surface water irrigation can occur in the area.

Just as in any development project, cost may be an impediment to the development of surface water irrigation systems. Providing adequate water for irrigation on a representative plot size for the area (2.5-10.0 acres) requires an investment of approximately $10,000 to $15,000. This investment would provide the structure, distribution system, motor, and pump. In light of the potential for substantial benefits from development of a southeastern Oklahoma specialty crop industry and the large investment costs required, there is a need to consider the advisability of using public funds to subsidize the construction of water structures.

The overall objective of the study and the specific objectives of this paper are presented in the next section. Then procedures used to accomplish the paper's objectives are discussed, followed by brief comments about types of data used and sources from which these data were drawn. The last two sections of the paper include a presentation of analytical results and a discussion of the conclusions drawn from these results.

## OBJECTIVES

The overall objective of the study is to evaluate the economics of vegetable production in southeastern Oklahoma with special consideration for costs of developing and using a surface water collection structure and the associated irrigation system. Specific objectives addressed in this paper are as follows:

1. Estimate the profit maximizing crop mix, for a representative southeastern Oklahoma vegetable producer, the potential net returns from the enterprises, and the size of the required water collection structure associated with this crop mix.
2. Estimate the potential value to a representative southeastern Oklahoma vegetable producer of a public program which might

be used to provide government cost-sharing to producers developing surface water vegetable irrigation systems.

## PROCEDURES

The primary tool of economic analysis used in the study reported herein was linear programming. A brief discussion of how the objectives were addressed follows.

Profit maximizing crop mixes and associated economic costs, net returns, and cash flows were estimated for a representative (five acres) vegetable producer in southeastern Oklahoma for two alternative irrigation technologies – handmoved sprinklers and furrow irrigation.

The potential value to the southeastern Oklahoma producer of a public program which might provide cost-sharing to farmers developing vegetable irrigation systems in southeastern Oklahoma was estimated by assuming the existence of such a program. The program analyzed was structured essentially the same as the current U. S. Department of Agriculture (USDA) Soil Conservation Service (SCS)/Agricultural Stabilization and Conservation Service (ASCS) joint program that provides cost-sharing for water retention structures for conservation and flood control.

SCS/ASCS cost-sharing is not currently authorized for irrigation structures. The authors are not suggesting that these agencies should implement such a cost-sharing program. The guidelines and parameters of the SCS/ASCS program were used to help evaluate the economic development value of a similar public program for irrigation development.

The potential economic value of such a program to a representative producer in southeastern Oklahoma was estimated by re-estimating costs, net returns, and cash flows for the profit maximizing vegetable crop mix for each of the two types of irrigation systems considered, assuming cost-sharing. The results are compared with estimates generated under the assumption that farmers would bear all costs.

## DATA

Information about the crop mixes considered ant the production practices for the individual crops was obtained from Oklahoma State University horticulturists. Capital and operating costs for production practices were estimated from information reported by Schatzer, et al. A five acre plot was considered available for vegetable crop production.

Technical information about small, onfarm water retention structures which could be used for irrigation was obtained from Oklahoma state specialists with the SCS, USDA. Cost information (costs of soil moved, cover establishment, necessary pipe requirements, etc.) for developing such structures were obtained from the Oklahoma state office of the ASCS, USDA. Costs for eight alternative structure sizes were used to develop a continuous function relating structure cost to structure size.

Non-structure related irrigation capital and operating costs were estimated by using the computerized O.S.U Irrigation Cost Generator (Kletke and Mapp). The model output provides detailed estimates of all cost, machinery complement, and engineering data for complete irrigation systems (from source to field).

## RESULTS

The estimated profit maximizing crop mix for both of the irrigation scenarios, no cost-share and cost-share, was a triple crop combination of spring spinach, summer cucumbers, and fall broccoli. Estimated results of these scenarios, as discussed below are shown in Table 1.

**TABLE 1.: Net returns, ending cash flow, operating capital needs and returns to the last acre of production for each scenario.**

| | SCENARIOS | | | |
|---|---|---|---|---|
| | HDMV-CS[a] | HDMV-NCS[b] | FUR-CS[c] | FUR-NCS[d] |
| | (dollars) | (dollars) | (dollars) | (dollars) |
| NET RETURNS | 13,276 | 13,153 | 13,528 | 13,406 |
| ENDING CASH FLOW | 11,387 | 11,069 | 11,882 | 11,564 |
| OPERATING CAPITAL | 1,139 | 1,139 | 1,136 | 1,136 |
| LAND SHADOW PRICE | 2,957 | 2,953 | 2,961 | 2,956 |

Key: a - Scenario assumes handmove irrigation system with cost-sharing.
b - Scenario assumes handmove irrigation system without cost-sharing.
c - Scenario assumes furrow irrigation system with cost-sharing.
d - Scenario assumes furrow irrigation system without cost-sharing.

Estimated net returns for the furrow no cost-sharing scenario are $13,406 with an ending cash flow balance of $11,564. Net returns are to land, management, and non-irrigation related fixed costs of machinery. The ending cash flow value is the total annual cash available to the producer for living expenses and non-vegetable production related cash outflows. The estimated net returns for the cost-sharing scenario are $13,528 with an ending cash flow balance of $11,882. Under both scenarios, producers would find it necessary to borrow $1,136 of operating capital each year. Additional operating capital needs would be met by cash generated from produce sales during the course of the year. In the case of furrow no cost-sharing scenario, the estimated average net returns per acre are $2,681 while the land shadow price is $2,956. The land shadow price can be used as a measure of the lost returns if one less acre of land was used for vegetable production. The difference in average net returns per acre and the land shadow price suggests that there may be economies of size associated with larger structures to irrigate additional acres.

To provide the necessary water requirements, it would be necessary to build a collection structure with approximately 1.015 acres of surface area holding 8.125 acre feet of water. The total estimated investment cost of the entire irrigation system (structure, pump, motor, and distribution system) is $9,952 with cost-sharing and $11,018 without cost-sharing.

The profit maximizing crop mix for both of the handmove irrigation scenarios, no cost-share and cost-share, was identical to the mix for the furrow scenarios. The results for the handmove scenarios are also shown in Table 1. Estimated net returns for the handmove no cost-sharing scenario is $13,153 with an ending cash flow balance of $11,068. The estimated net returns for the cost-sharing scenario is $13,276 with an ending cash flow balance of $11,387. Both scenarios require a total of $1,139 in operating capital. The same structure built for furrow irrigation is required for the handmove system. The total estimated investment cost of the entire irrigation system is $11,544 with cost-sharing and $12,610 without cost-sharing.

## CONCLUSIONS

Surface water irrigated vegetable production in southeastern Oklahoma seems to hold the promise of rather large profits for the area's farmers. Such profits would clearly be an economic boon to the area.

Many vegetable crops can be grown in the area. The economically optimal crop mix, as estimated herein (spring spinach, summer cucumbers, and fall broccoli) is easily adaptable to southeastern Oklahoma's climate and topography. Profit levels from the mix are

substantial especially when compared to the profits from the more traditional enterprises common in the area (cow/calf and small grains). Though the irrigation system required for vegetable production is costly, the necessary water collection structure is of modest price and size.

Results reported above indicate that a public cost-sharing program to assist farmers in building small water collection structures for vegetable irrigation use would mean very little additional net revenue to farmers, as compared with farmers bearing all structure costs. However, the hypothetical cost-sharing program considered herein was modeled on the SCS/ASCS existing flood control/conservation program, so allowed for cost-sharing only for certain water collection structure costs. Irrigation system costs are significantly greater than collection structure costs. A program to cost- share both structure and system costs might be of much more value in bringing about the development of a southeastern Oklahoma specialty crop industry. This issue deserves further research.

Another issue deserving further research is that of economies of size which may exist n the development of water collection structures and irrigation systems. Such economies of size are indicated by the difference in average net returns and land shadow prices discussed in the results section of this paper.

Large irrigation facilities to serve multiple irrigators could be developed by irrigation districts. A possible advantage of developing irrigation in southeastern Oklahoma via irrigation districts, is that such districts may be eligible for low interest state guaranteed water development bond funds for capital investment.

The potential of the specialty crop industry in economically underdeveloped southeastern Oklahoma rest heavily on the ability of farmers, either on their own or with public assistance, being able to provide timely and cost efficient water application to high value crops. Researchers should continue to investigate all possible avenues for irrigation development in the area. The success of specialty crop production and marketing practices currently being considered for the area is dependent on irrigation development. Such irrigation development and accompanying agricultural development could result in a thriving agricultural industry which could generate economic activity long absent from southeastern Oklahoma.

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