The Economics of Alternative Irrigation Techniques

Rising energy prices during the 1970's and the passage of the Groundwater Management Act in 1980 have focused increased attention on efficient water use in Arizona's agricultural sector. As a result, there is substantial interest by growers concerning how they can improve their irrigation techniques through better management and new technologies.

An ongoing research program in the Department of Agricultural Economics, in cooperation with the departments of Plant Sciences and Agricultural Engineering, is attempting to analyze the expected profitability of adopting these new irrigation technologies. Is the grower going to be better off economically by investing in and operating a new irrigation system? To date economic analyses have been conducted for laser leveling, drip, water harvesting and linear-move technologies. An economic analysis of surge-flow irrigation should be completed in 1987. Computerized models are used to evaluate the rate of return to these investments under alternative commodity price, yield, water savings and investment cost assumptions.

Several highlights from this research effort are worth noting. First, our analyses have shown that the existing management level is a key determinant in selecting an irrigation technology. It may not be economically justifiable to invest in a drip or linear-move irrigation system if the existing furrow system is well-managed.

A second highlight is the need to increase yields with the new technology over what they were in furrow irrigation. Water savings alone do not pay for the investment costs of most irrigation systems. More intensive management of fertilizers, insecticides, herbicides and water is required to obtain the necessary increments in yield. An economically significant yield differential may not be realized when converting from a well-managed furrow system to a linear- move or drip system.

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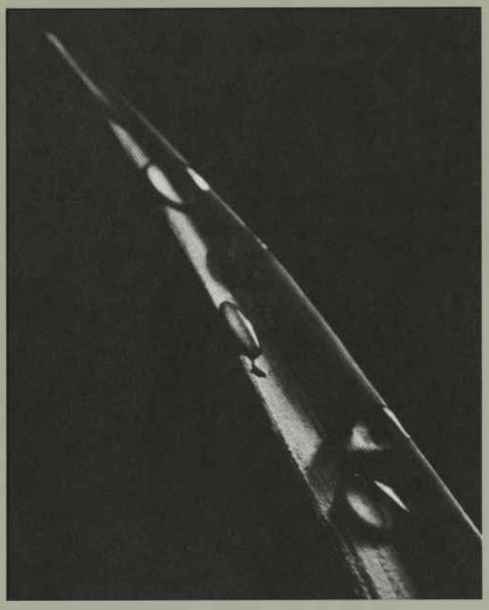

Financial considerations are a third highlight. Investment costs of $400-$1500 per acre for these alternative irrigation systems will have an impact on the financial status of the firm. Debt financing will increase the growers leverage position and may expose the farmer to increasing financial risks if higher yields do not materialize. Negative cash-flows attributable to these investments during the first two to three years must be covered by other enterprises in the farm business. The Tax Reform Act of 1986 will reduce the favorable after-tax impacts of these capital investments because investment tax credit has been repealed and depreciation schedules have been lengthened.

A final point is that although unskilled irrigation labor can be replaced by the capital investment, the increased level of technical management may require an increase in overall management costs. These increased management costs may be represented by the opportunity cost of the grower's time for the salary of an irrigation manager. The new irrigation system may reduce hassles with irrigation laborers but the actual out-of- pocket costs of irrigating may be higher with the new system.

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Transferring Water Rights

Historically, there was little reason for water markets because appropriation of unclaimed water and subsidized supply development provided low cost water for agriculture, industry and cities. However, surface water supplies have become fully appropriated in many areas and some states have limited new groundwater pumping so that it is no longer easy to appropriate water. The local costs of water development projects have risen since the federal government is no longer willing to subsidize project costs to the extent it did in the past. These changes, combined with a gradual shift in the economy of the West from agriculture and mining to municipal growth, industry and tourism have generated increasing pressure for transfers of water rights.

Water markets are distinguished from other property transfers in that water's value is recognized as distinct from the value of land and improvements. Both the public and the private sector participate in western water markets. Water buyers in the western states are often public entities such as cities, state agencies and public utilities.

During the last five years nearly every western state legislature (and court system) has had to address policy issues involving water markets: how can third party and community impacts of transfers be mitigated; should interbasin transfers be restricted; what approval procedures and criteria need to be established to govern transfers; and should individuals profit from selling water?

While water markets can provide incentives for profitable water use and support regional economic development by providing water to new users, transfers may have impacts on neighboring water users, rural communities, water quality, riparian environments and water-based recreation. State policies seek to ensure that third party interests and public values are protected when market transfers occur.

Although market transfers have been occurring in Arizona for many years, the 1980 Groundwater Management Act created a new legal environment for water transfers and water rights sales now occur frequently. The City of Tucson and several Phoenix-area municipalities have purchased "water ranches", as have private development and investment firms. Some of these purchases are solely to acquire water rights and the buyer has no plans to develop the irrigated land that must be purchased, under Arizona law, in order to obtain appurtenant irrigation water rights.

In these situations the total price paid for the property gives a good indication of the value the buyer places on water rights. Purchase prices for water ranches calculated per acre foot of water rights transferable to the buyer have typically ranged between $400 and $1,200 dollars per acre foot (in constant 1986 dollars) over the years 1970 through 1986. At least 400,000 acre feet of irrigation water rights (including both groundwater and surface water rights) have been purchased for non-irrigation uses through "water ranch" purchases in the last 15 years.

A second type of water purchase is becoming common. Type II non- irrigation groundwater rights were created by the 1980 Groundwater Management Act to formally recognize rights to pump groundwater within Active Management Areas. Unlike irrigation rights, Type II rights can be bought and sold separately from land and transferred within their Active Management Area of origin.

In the Tucson and Phoenix area, Type II rights typically sell in small blocks of ten to three hundred acre feet per transaction for between $400 and $1,200 per acre foot (in 1986 constant dollars) though there have been a few sales at higher prices ($2,000 per acre foot).

Type II rights are being leased for $100-$200 per acre foot per year though state law is ambiguous about the permissibility of leasing Type II rights. Type II rights represent a small portion of Arizona's water resources but their location and transferability within active management areas make them an important part of the Arizona water market picture.

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The Japanese Beef Market: Trade Restrictions and Politics

Declining per capita beef consumption in the United States has caused dramatic readjustment in the U.S. beef production sector and evoked uncertainity about the future of the cattle industry. Arizona has been seriously affected.

In 1970, 860,000 fed cattle were marketed in Arizona. By 1985 that number had declined to 510,000 head. Market development, both domestic and international, has caught the attention of government officials, farm leaders and university researchers who are interested and concerned about the beef industry.

Japan presents an attractive export market. Per capita income is high and growing. Beef has only quite recently occupied an integral part of the Japanese diet and prospects for increased consumption levels appear good. However, if grey clouds have a silver lining, this silver cloud has two linings of grey.

First, beef imports into Japan are not subject to free trade— import quotas are set and strictly enforced in Japan by a semi- autonomous quasi-public agency, the Livestock Industry Promotion Corporation (LIPC). Second, Japanese beef quality standards, trading mechanism, and handling techniques are very different from those in the U.S.

Increased penetration of the Japanese beef market by the U.S. will involve the solution of a myriad of technical, political, and economic constraints. A new Department of Agricultural Economics project will evaluate the economic magnitude of Japanese beef trade barriers in conjunction with the policy formation process in Japan.

Because Japanese public policy presents the primary constraint to increased beef exports, it is important to have a clear understanding of the nature and causes of the policy. A report, currently in the preparation stage, delineates the Japanese beef production and consumption sector, trade policies and important components of the political system. Protection levels evaluated using effective protection and tariff equivalent rates suggest that beef producers in Japan benefit from an exceedingly high level of government support.

Research on the causes of policy is proceeding. It is frequently asserted that Japan provides such substantial protection to its beef production industry because of national food security concerns. However, preliminary evaluation of Japanese protection levels using an econometric model does not support this contention. In contrast, it appears that private interest group articulation and peculiarities associated with Japanese political institutions provide superior explanations for Japanese beef trade policy.

As this research project proceeds it is hoped that an improved understanding of the Japanese beef market and policy situation will emerge.

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