PUBLIC POLICY AND A COMMUNITY

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INTRODUCTION

There are obvious contradictions in agricultural policies and programs as well as in other aspects of public policy. This is a brief report on the effects of one small program in a limited area.

Even very casual reading of newspapers or magazines will provide evidence of policy contradictions. Most people, however, remain unaware of the contradictions they support at the voting polls. Or perhaps people are unable to recognize conflicts inherent in progress administered by different agencies or different arms of one agency. At any rate the contradictions have always existed where there is progress and they will remain.

Most people are vaguely aware that the United States has in the past paid a price for sugar that was above the world market price while at the same time restricting the acreage of sugar beets in the United States. Many people will recall that a few years ago farmers were being paid for reducing cotton acreage while at the same time the United States was importing cotton textiles in increasing quantities.

The average man on the street is also probably aware that the research and educational services of public agencies such as the Extension Service and the United States Department of Agriculture have provided agriculture with a technology which results in the greatest per capita agricultural output of any nation in history. From their inception these programs have been dedicated to production.

The Soil Conservation Service (SCS) program and the Agriculture Conservation Program Service (ACPS) are two other public programs which contribute to agricultural production. These two programs cost the American taxpayer about $330 million annually; $250 million for (SCS) and $80 million for (ACPS).[1] Both programs are justifiable partly from a genuine conservation standpoint but are equally dependent on rationalizations of soil and water conservation. Drainage, irrigation, tillage and other pseudo-conservation practices make up a large part of each program.[2] The additions to farm output is incalculable because ACPS and SCS practices merge with other farming operations. However, SCS considers one-third of all farmland is involved in some phase of the service's program,[3] and one-third of all farmland is involved in ACPS practices.[4]

One of the most visible programs aimed at increased agricultural production, and to many the most desirable, is reclamation. Reclamation programs administered by the Department of Interior not only restore lands left after strip mining operations and replant burned over timberland, but also include extensive projects in drainage of lowlands and development of irrigation. Irrigation projects of the Bureau have been concentrated in the 17 western states of the nation. One of the largest projects undertaken by the Bureau of Reclamation is the Missouri River Basin Project involving drainage areas of seven states.

The annual contribution to total agricultural production of any two of the foregoing public programs is probably far greater than the five percent of annual farm output contributed by reclamation programs, which operates

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[1] John A. Schnittker, Kansas State University, Appraisal of Past and Present Programs and Impacts on Land Use Adjustments.

[2] E. O. Heady, "Redirecting Conservation Programs," National Farm Institute, Des Moines, Iowa, 1960.

[3] Hearings, House of Representatives, Subcommittee on Appropriations for the Department of Agriculture, 86th Congress, 1st Session, p. 568.

[4] Ibid., p. 663.

on only two percent of all cropland. If 12 percent of all corn is surplus then only six-tenths of one percent of that surplus is the result of reclamation projects.

Only two percent, or 6.6 million acres, of all harvested cropland in 1957 was irrigated from reclamation water sources. Only one-sixth of this acreage has been added since 1950 -- the modern surplus era. In 1957 reclamation land produced $928 million in crops; five percent of the value of all crops. A look at some minor statistics would show clearly the minimal extent to which reclamation projects are adding to the public liability of agricultural surplus. The following percentages of certain other crops were produced on reclamation land.[1]

Corn	.6%	Dry Beans	27.6%	Tomatoes	10.6%
Wheat	2.2%	Sugar Beets	40.6%	Apples	8.1%
Barley	7.9%	Carrots	23.2%	Peaches	7.9%
Upland Cotton	7.4%	Lettuce	20.9%	Grapes	26.2%

Many of these crops can be produced efficiently only under irrigation. Whether under private or public auspices it appears desirable to improve lands capable of producing fruits and vegetables. As population increases these lands must be developed to avert a serious shortage in the future. The man on the street considers many of these crops to be superior consumer goods resulting in his demand for them is increasing at a rate greater than that of his income.

Some of the aforementioned public programs not only have the effect of increasing total agricultural production but also reduce the total number of cultivated acres. The soil conservation practices have the effect of

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[1] Schnittker, op. cit., p. 2.

reducing total crop acreage. The soil bank programs under the Agriculture Stabilization and Conservation materially reduce total crop acreage. Annual retirement of land not eligible for crop price supports reduces total crop acreage. Land clearing and reforestration practices of the Reclamation Bureau have historically taken depleted land from crop production and returned it to nature. "An increase in agricultural production on a new reclamation project almost inevitably means that there is going to be less agricultural production somewhere else."[1]

It is apparent there are several public programs which have changed the land use but have not changed the aggregate amount of land in use. Likewise reclamation irrigation projects have changed the physical appearance of the area under development but have not increased the total acreage. The influence on total acreage, though small, would be in reducing acreage cultivated due to the area covered by water, the dam, ditches and access roads.

Reclamation has one of the lowest cost benefit ratios of any of our public programs. Since 1903 the entire program has cost only $4 billion in public funds. The cost of buying, storing and disposing of farm surpluses in a single year exceeds this amount. Reclamation's largest annual expenditures - $300 million in 1950 - would not pay for present annual storage costs of only one of the surplus crops - wheat.[2] "Federal tax revenues since the enactment of the Reclamation Act in 1902 until 1956 totaled $3 billion dollars from these projects. Reclamation expenditures during that period totaled

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[1] G. S. Tolley, "Reclamations Influence on the Rest of Agriculture," Land Economics, May, 1959, 35:177.

[2] Schnittker, *op. cit.*, p. 2.

$2.4 billion."[1]

> Even with the addition of interest costs for irrigation development to the federal investment, the federal taxes collected from the project areas still exceed the federal costs. These tax revenues are in addition to the obligation assumed by the water users for repayment of costs allocated to irrigation. They are also in addition to income from power and municipal water supplies.[2]

Reclamation now serves an irrigable area of more than 8 million acres consisting of 83 projects. Nearly one half million people comprise the 129 thousand farm families on these lands. The cumulative value of 54 years of crop production on reclamation projects now stands at more than 15.3 billion dollars. This is almost five times the federal cost of all plant, property and equipment in reclamation projects.[3]

In spite of the public clamour whether for or against such agricultural policies and practices these programs have become an accepted institutional undertaking in the modern American society. It would be difficult proposition trying to convince the man on the street that fields as green as his front lawn constitute a liability. The day in this nation where volume and bigness are the accepted criterions we would conclude that the nation is fortunate to have eight million more acres under irrigation with a resultant of 15 billion dollars more crop production. Past, present and future reclamation costs, in view of an increasing population with a rising income, may be one of our best public welfare investments.

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1 American Farm Bureau Newsletter reprinted in Market Growers Journal, December, 1954, p. 36.

2 Guy C. Jackson, Value of Reclamation To The West. Presented October 27, 1956. Arizona Reclamation Association, Phoenix, Arizona.

3 Bureau of Reclamation, 1959 Crop Report and Related Data, p. 1.

PURPOSE OF STUDY

The general purpose of this study is to examine the effect of one small segment of a controversial public policy upon the community in which it was undertaken. The controversy of the Bureau of Reclamation has been multiplied during the past 15 years, the modern surplus era. The Bureau's continued emphasis on increasing production during this era has been a focal point for much criticism.

Another point for much criticism of public policy programs, has been that such programs and projects do not benefit the communities in which the projects are constructed. It is upon this latter point that this report is cast. It is intended to examine the community's socio-economic costs and benefits of a reclamation project in Kansas.

In order to examine community benefits, or lack of benefits, it would be ideal to study a project which covered a political subdivision. In the absence of such a combination the next best alternative would be a project which layed wholly within a political subdivision. There are many projects of the latter type but only one of substantial size in Kansas. This is the Kansas Bostwick Irrigation Division in Republic County. The irrigated area of the Division lays 96 percent within the boundries of Republic County.[1]

The area represents a well established agricultural economy on which data was available for many years. These data were readily available from the Bureau of the Census and the State Board of Agriculture's annual publication, Kansas Farm Facts.[2] The latest data available from the Kansas Bostwick is the census

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1 Orwin Marquardt, Kansas Bostwick Superintendent, Personal Communication.

2 Kansas Farm Facts, State Board of Agriculture, Topeka, Kansas, 1954-55 and 1959-60.

of Republic County in 1959. The first water was delivered to the district in 1955. Considering this dichotomous situation, an input-output analysis was selected as the basis of the study utilizing the census of 1954 and 1959.

A comparative statics involving time partial equilibrium methodology was used for the analysis. The time period for the study was not suggested by any previous studies but was circumscribed by the available data. No studies could be found which had been completed as recent as ten years after introduction of irrigation. Several studies have been done on cummunities, or areas containing several communities, with mature irrigation projects, i.e. from 25 to 40 years duration.

The analysis of the study consisted of comparing the transactions of the community in 1954 with the transactions in 1959. By comparing the total change in inputs and outputs together with the changes in the product mix it was anticipated that the benefits, or lack of benefits accuring to the community, since the introduction of irrigation, could be elucidated.

Republic County represents a very homogeneous agriculture. Wheat is the primary cash crop with corn, milo, alfalfa hay and silages comprising the bulk of the remaining crops. There are a few soybeans and horticulture crops grown but their production varies widely and in some years constitutes less than one percent of the county's agricultural production. Livestock production in the area is limited to cattle, hogs and sheep with a minimum of poultry and dairy.

Only agriculture and agriculturally allied transactions were included in the transactions matrix. The economy of the area is predominently agricultural. Examination of the report by the Kansas Industrial Development Commission revealed that less than one percent of the businesses were allied with other than agricultural industries.

In addition there are benefits accuring to the community which are not allied with agriculture yet are dependent upon the agricultural economy. These would be the retail sales and service establishments in the community. It was assumed that anything directly or indirectly affecting the agriculture of the community would affect these establishments.

Some of the questions considered were these:

1. In what manner and to what extent has the economic activity changed?

2. What allied industries and what volume of business have resulted from irrigation?

3. What problems and benefits have the agricultural businessmen encountered?

4. What problems and benefits have the farmers directly involved encountered?

5. What problems and benefits have the farmers not directly involved encountered?

6. Does the present generation go broke establishing irrigation but insuring future generations a high standard of living?

EARLY KANSAS IRRIGATION

The first known irrigation in Kansas was undertaken along Beaver Creek in Scott County, by the Taos Indians who came from Mexico in 1650. Little is known about irrigation in Kansas from that time until the early 19th Century when Kansas was referred to as part of the Great American Desert. This belief was widespread at the opening of the Kansas Territory for settlement in 1854. The earliest settlements in western Kansas were along the Cimarron, the Arkansas, the Smoky Hill and the Republican Rivers. It is understandable that these early settlers would devise some method of utilizing these waters for irrigation.[1]

The first major irrigation project in Kansas was undertaken by three men who formed the Garden City Irrigation Company in 1879. The company began building a canal eight feet wide and two feet deep in 1880 without the benefit of surveying. Their ingenuity was similiar to that used along the Tigris and Euphrates in the days before the birth of Christ; i.e. the ditch was excavated a few rods then the coffer-dam removed to see if the grade would permit the water to flow. This trial and error ditch had its beginning four miles west of Garden City, taking water from the south side of the Arkansas River, distributing it to 100 acres and terminating at Garden City. Even then the irrigated acres were devoted primarily to truck crops.[2]

The irrigation boom created immigration. The growth of irrigation was so rapid in Colorado that by 1902, 500,000 acres were being irrigated from the Arkansas River. This rapid expansion in Colorado seriously depleted the supply available in the Garden City area, especially during June, July and August. Thus the boom began to bust and by 1893 the cry became "Irrigate or emmigrate."[3]

Unfortunately the crying did not solve the manifold problems of such an extensive undertaking which proceeded without a central plan or systematic regulations and the boom was doomed to die the death of over expansion. Consequently the projects generally were dismal failures; financially as well

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1 Russell L. Herpich, _Kansas Farmer_, September 2, 1961, p. 18.

2 Richard Pfister, "Water Resources and Irrigation," _Bureau of Business Research_, University of Kansas, p. 48.

3 _Ibid._, p. 59.

as agronomically. However, seven of the early canals were later exhumed, extensively rehabilitated, after the waters of the Arkansas River were divided between Kansas and Colorado by legislation, and are in use today.[1]

Irrigation on the Republican River first began between 1880 and 1905. Records show that by 1908, eight irrigation canals has been constructed on the south fork of the Republican River in Cheyenne County. It was hoped that these canals would supply water to 10,000 acres.[2]

After the passage of the Reclamation Act in 1902, one of the Bureau's official duties in Kansas was to install pumping stations at 1,000 foot intervals along a four mile concrete conduit which paralleled the Arkansas River near Deerfield.[3]

Irrigation data in Kansas was first collected by the census in 1889. The census that year showed 20,818 acres under irrigation in the state by all methods. The following table shows the growth of irrigation during the last three-fourths of a century.[4]

1889	20,818
1899	23,620
1909	37,479
1919	47,312
1929	71,290
1939	99,980
1949	140,992
1959	1,010,000 [5]

[1] Herpich, *loc. cit.*

[2] *Ibid.*

[3] *Ibid.*

[4] Pfister, *op. cit.*, p. 63.

[5] Herpich, *op. cit.*, p. 19.

The first 20 years of the 20th Century saw irrigation practices in widespread areas of the state. In addition to the southwest and northwest areas previously mentioned, 1920 saw irrigation along the Ninnescah and Rattlesnake Rivers in south central Kansas; along the Smoky Hill, Solomon, Saline, Blue and Republican Rivers in north central Kansas and along the Kaw and Missouri Rivers in north east Kansas. The last 20 years of this 20th Century have seen the greatest expansion in irrigation from approximately one hundred thousand acres to over one million acres.[1]

A RECLAMATION PROJECT IN KANSAS

The Department of Interior, Bureau of Reclamation has designated the area of the Republican River Basin extending from Alma, Nebraska to Concordia, Kansas as the Bostwick Division of the Missouri River Basin. This Division had it's inception when in 1935, 110 lives were lost and $9 million worth of property was destroyed by a disastrous springtime flood.[2] The aftermath of this flood aroused the citizens of the community who took the first of a long series of steps to control, develop and improve the land and water resources of the area.

Ironically 1935 was one of the dryest years on record for this area of the state. Springtime floods are quite often followed by obfuscating dust storms as the fields dry out and the rich black loess soil (some of it 100 feet deep) is carried along by the prevailing winds. (Soil classification,

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[1] Loc. cit.

[2] Bureau of Reclamation, Missouri River Basin Region 7, Map No. 271-701-5293.

Crete, Hastings and Nucholls)[1] Although the average annual rainfall is 23 inches the rain may fall primarily in the spring and fall with long dry periods between. If rain does come during the growing season it often falls within a period of two or three hours and sometimes as much as nine inches in one hour, resulting in little infiltration and a high percentage of runoff.

The drouth, the depression and the flood of 1935 increased the problems of maintaining an economic and social order based almost entirely upon agriculture. An organization of farmers, bankers, businessmen and land owners took the first of the series of steps when they sent a four man delegation to Denver to appeal to the Federal Government for assistance. In response to this and numerous other appeals made through Congressmen and Representatives, the Departments of Interior, Agriculture and War made comprehensive studies and surveys of the area. In 1939 the Bureau of Reclamation began its work and as a result of the studies, organization of the Bostwick Division was authorized by an Act of Congress on December 22, 1944. This act also authorized the construction of Lovewell Dam and Reservoir. Construction was begun in 1948.[2]

The debate in Congress accompanying the passage of this act lacked the color and the presidental veto the superseding act of 1943 had. The subject of this colorful act was the division of the waters of the Republican River among Kansas, Nebraska and Colorado. Kansas emerged with a guarantee of 190,300 acre feet of water annually if needed.

As these steps were taken on the national level it was necessary to take a few steps on the state level.

It was found that the water laws of the state were inadequate to

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1 Major Soils in Kansas, Circular No. 336, July, 1956, KSU, p. 16.

2 USBR Map, loc. cit.

> permit construction, or provide protection to any irrigation district that might be formed in the state. In 1945 the state legislature was persuaded to revise, in fact, adopt a whole new theory in water rights, which gave the Chief Engineer of Water Resources the power to appropriate the stream and ground water of the state for benefical consumptive use.[1]

The state irrigation laws were also amended allowing the incorporation of a district which could use this water and contract with the Federal Government for it's use. The passage of this law paved the way for the circulation of petitions and formation of the Kansas Bostwick Irrigation District on April 26, 1948. A repayment contract No. I 1r-1584 with the Department of Interior Bureau of Reclamation was executed April 20, 1951.[2]

Twenty years after the disastrous flood in 1935 (and only three years after the devastating one in 1952) almost to the day, in the spring of 1955, the first water was delivered to some cooperators through facilities constructed by the Bureau of Reclamation. The turning of the valve allowing the waters of the Republican River to flow to the thirsty crops via the 122 mile Courtland Canal marked the last step of the journey of the four men sent to Denver some two decades earlier. The 8,707 acres irrigated that year was the culmination of the efforts of the delegation.

The development of irrigation in this area of North Central Kansas has been in many ways unlike those conditions generally found in newly irrigated areas in states west of Kansas. There was scattered settlement in this area prior to 1860. The enactment of the Homestead Act in 1862 and the Civil War stimulated settlement of the public domain. Development of irrigation therefore has been superimposed upon established farming patterns. For this

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1 Ward Douglas, Lovewell Dam Dedication, June 5, 1958.

2 Bureau of Reclamation Region 7 Annual Operating Plan, February, 1961, p. 14.

reason, the development problems which are being encountered are somewhat different from those faced in the more arid regions where settlement often is established with or following irrigation.[1]

According to the repayment contract for construction between the Federal Government and the Kansas Bostwick Irrigation District payments are to begin after a five year development period. These payments will be made by blocks in the order that the blocks received their first water from the district. Block one now has had water five crop years and the first payment on $5,781,000 will be due in 1962. The repayment period is 40 years, however, Secretary of Interior Fred Seaton has deferred the payments two additional years leaving the $5 3/4 million to be paid out in 33 years. There is pending in Congress, legislation which will permit the Secretary of Interior to extend the development period beyond the five years provided by the repayment contract. In the event this legislation becomes law it may be possible to extend the deferred payments beyond the 40 year contract limit allowing 47 years of payment of which seven years count as development years.[2]

The Kansas Bostwick Irrigation Division is located principally in Republic County on the northern border of Kansas, and is bordered on the south by Cloud County. The western border of the county is the north-south axis of the state. Republic County is bisected north and south by U.S. Highway 81 and east and west by Highway 36. At their intersection is the county seat Belleville. The resulting segments are four nearly equal-sized quadrants. The District lays principally in the valley of the Republican River which enters the county in

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[1] Bureau of Reclamation, 1960 Annual Report, Kansas River Projects, p. 1.

[2] A. D. Sodenberg, Acting Project Manager, personal communication.

the northwest corner, flows in a south southeasternly direction into Cloud County where it leaves Republic County near the center of the southwest quadrant.

Water for the Kansas District is provided by the Kansas-Nebraska Irrigation District whose principle supply is Harlan County Reservoir on the Republican River near Alma, Nebraska. The river flows in a easterly direction from the dam just north of and almost parallel to the Kansas-Nebraska line for a distance of approximately 55 miles before entering Republic County.

Approximately five miles west of the northwest quadrant of Republic County, in Jewell County is located one of the unusual water reservoirs in the United States and the only one of it's kind in the State of Kansas used for irrigation. The reservoir is created by Lovewell Dam on the White Rock Creek. This creek is an intermitten stream often flooding in the spring and fall with long dry spells during the interm growing season. It is necessary therefore for the reservoir to have a supplemental source of water in order to adequately supply the irrigable land.

The supplemental source is provided by the Superior-Courtland Diversion Dam and Canal approximately 40 miles upstream from the confluence of White Rock Creek and the Republican River. Water is diverted into the Nebraska Bostwick Irrigation canals from the north end of this diversion dam and into the Courtland Canal of the Kansas Bostwick Irrigation Division on the south end. Courtland Canal empties into Lovewell Reservoir on the north side and continues on from the south side to become the longest canal of the system reaching 122 miles to the southern most tip of the irrigation district.

Lovewell Dam has a crest length of 8,500 feet, rises 91 feet above the White Rock Creek streambed. It required 3,190,000 cubic yards of earth materials and 12,250 yards of concrete in it's construction. The lake formed by the reservoir when the irrigation pool is full stores 44,100 acre feet of water, covers an area of 3,000 acres and has a shore line of 44 miles. The reservoir also has 50,100 acre feet of storage space for flood water. With total storage of 94,200 acre feet, the reservoir covers 4,850 acres.[1]

A diversion dam similar to the Superior-Courtland Dam in Nebraska, is planned downstream from the confluence near Scandia where Highway 36 crosses the Republican River in order to supply water to those irrigable lands lying on the eastern side of the river extending into Cloud County and terminating north of Concordia where Highway 81 crosses the river. This will irrigate an additional 13,000 acres.

Ironically the group of people opposing the extension of the District by the Scandia Diversion Dam is led by one of the men of the four man delegation making the journey to Denver to initiate the organization of the District. Understandably a man of this caliber would be a progressive farmer. This man has developed his irrigable land utilizing shallow well pumps and gated pipe. He originally was interested in the development of the District as a flood prevention measure. The basis for his opposition is the 160 acre holding limit of an individual imposed by the Bureau of Reclamation. This is the same individual limit as spelled out in the Homestead Act of 1862.

Most of the extensive land owners were able to circumvent this restriction by placing land in relatives names, most of them being children of the landowners. Only one other landowner has had to sell in order to stay under the 160 acre limit with an allowance of ten years to dispose of the excess.

But the progress of the District today was not attained without

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[1] USBR Map, loc. cit.

opposition. Characteristically some of the strongest opposition came from those who would benefit the most. The one main point of opposition was the land grading necessary on most of the irrigable acres. Almost two-thirds of the irrigable acres of the District had to be leveled at an average cost of $60.00 per acre.[1] Added to this cost, on the basis of 49,000 acres, was a repayment cost of $3.80 per acre annually and an estimated $4.50 per acre annual operation and maintenance charge.[2]

The age of the water user undoubtedly was a factor of opposition also. In 1954 the average age of all farmers in Republic County was 48.8 years. In 1959 this average age had increased to 50.2 years. These farmers were reluctant to change their method of farming in any way much less adopt a whole new method. The younger farmers were eager to have the opportunity to change their methods to a more intensive production technique and were willing to assume debt obligations in order to make the transition. However, many of the younger farmers were already heavily in debt and did not possess the assets with which to undertake such a technological change. From this thesis and antithesis the synthesis that emerged was in many cases the older farmers realizing their capital assets had been greatly increased, leased their farms to younger farmers and moved into the surrounding towns and villages.

METHODOLOGY

The study of the effects of a public policy program upon the community in which it was undertaken would involve the examination of the economic

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1 USBR, 1960 Annual Report, _op. cit._, p. 2.

2 Sodenberg, _loc. cit._

activity of the area. Such an investigation would entail the exposition of production - consumption relationships, inter-industry relationships and production functions all on the aggregate level. "Appropriate for such a study is the input-output model which permits us to use the method of activity analysis on the aggregate level."[1]

The Leontief Input-Output Model

Input-output analysis was developed in the days of the physiocrats by Quesnay. It was revived by Walras and extensively refined by Professor Leontief of Harvard in 1931. "Input-output analysis is the name given to the attempt to take account the general equilibrium phenomena in the empirical analysis of production."[2]

Input-output attempts to determine the interrelationships of the various sectors of an economy in it's production activity. The interrelationships arise from the fact that the various sectors of an economy employ the outputs of other sectors as their production factors. The investigation therefore is primarily concerned with technological processes.

Input-output analysis divides the economic unit and it's activity into three parts; inputs: intermediate flows and final demand and expresses them in a transactions matrix. All productive factors come under the input classification. Intermediate flows constitute the distribution of the inputs among their various uses by other sectors. Final demand denotes the output of the productive process and it's distribution among consumers.

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1 Ram, Petrez, "An Input-Output Analysis of a Small Homogeneous Agricultural Area," Journal of Farm Economics, p. 1909.

2 William J. Baumol, Economic Theory and Operations Analysis, p. 299.

The primary objective of the investigation, then, is what goes in, what is the disbribution of the inputs among it's various uses, what comes out and what is left over for final consumption. Basically then, the investigator could ask "What is the contribution of each sector during the productive process?"

Input-output analysis in this study is employed to illuminate the penumbral area of agricultural production of a more or less homogenous economic unit in one period of time (before irrigation) as compared to a later period (after irrigation) attempting to ascertain the economic consequences of a public policy program upon a community.

There are some basic assumptions in applying the Leontief input-output analysis to agriculture. The most prominent assumption is that of linear production functions. Since the Leontief System is essentially a physical activity analysis this becomes a very limiting assumption nullifying returns to scale and decreasing costs. This assumption, however, is time honored and classical in agricultural production research. Heady has this to say:

> Input-Output relationships are the partial basis for the majority of recommendations by agricultural economists. They include a wide range of coefficients or quantities and can be estimated for a single technical unit (an animal or an acre of land), for a farm as an economic unit or for an agricultural region or other aggregative unit. They can be derived on a purely physical basis or on a value basis.[1]

The second assumption of each sector having only one technological process and producing only one product with no joint products may be unrealistic in some instances but the determination of the exact amounts each infantismal production factor contributes to each joint product would, in

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[1] Earl O. Heady, "Use and Estimation of Input-output Relationships or Productivity Coefficients," Journal Farm Economics, 34:775.

the final analysis, be lost by the necessity of aggregation. A third assumption of no input substitutes has the same limiting effect upon product mix as crystallizing the technological process.

Input-Output Analysis Applied to Project

Mathematically the system can be expressed in a transaction matrix. A simplified transactions matrix expressing various sectors of the Bostwick Division's Economy and the various sectors employed is given in Table 1. The completed matrix for 1954 is shown in Table 2.; Table 3 is the completed matrix for 1959. Tables 2 and 3 also show the various functional relationships. These relationships, as expressed by equations 1, 2 and 3 below, appear as the first, second and third entry respectively, below the transactions entry in the matrix.

Production functions may be derived by dividing each entry in the transactions matrix by it's corresponding total output Xi. Where x_{ij}'s are the transaction matrix entries and X_i's are totals of outputs, the sum of the x_{ij}'s equals X_i.

Equation 1. $$a_{ij} = \frac{x_{ij}}{X_i} \qquad (i,\ j = 1,\ 2,\ 3....)$$

This expresses the fraction of a dollars worth of sector i required by sector j to produce one dollars worth of output of sector i. Additional relationships may be expressed by equations 2 and 3.

Equation 2. $$b_{ij} = \frac{x_{ij}}{x_j}$$

Equation 3. $$c_{ij} = \frac{x_{ij}}{Y_i}$$

Equation two expresses the relationship between each x_{ij} and the total inputs (X_j) of sector j. This relationship is the percentage each x_{ij} is of the total inputs (X_j) of sector j. Equation three expresses the relationship between each x_{ij} and the dollar value of final demand Y_i.

For the aggregation and compilation of each sector a common denominator must be found in order to equate the many and varied products and production factors. Some method must be devised to equate gallons of diesel fuel with pounds of pork. The dollar is the natural choice assuming free competition, we accept the dollar as the measure of value.

In the analysis of the Kansas Bostwick Division over a period of five years a common denominator for the change in the price level between 1954 and 1959 was needed. This was accomplished by using 1959 prices throughout. Prices of 1954 could have justifiably been used, so long as they were consistent.

EMPIRICAL ANALYSIS

The following section applies the Leontief input-output analysis to the Kansas Bostwick Irrigation Division. The first part of this section describes the economic activity of the county for 1954 in terms of aggregate inputs and outputs. The second part describes the economic activity of the county in aggregate terms for 1959. Functional relationships of the economy for 1954 are discussed in the fourth part and for 1959 in the fifth part. The fifth part of this section analyses the dichotomous economy by comparing the economic activity of 1954 with that of 1959. By comparing the economic activity of the county under dryland conditions in 1954 with the economic activity of 1959 after a community in the county had been irrigated five crop years it was anticipated that the effects of irrigation would be discernable.

Aggregate Inputs and Outputs 1954

Total sector outputs equalled total sector inputs (column 1, row 14) for the Kansas Bostwick Irrigation Division in 1954, as shown by Table 2, and amounted to $13,010,748. Final demand (column 15, row 14) totaled $13,738,758; $729,010 greater than inputs, which is an approximation of the net farm income for Republic County in 1954.

Sector 6 (small grains) showed a difference between inputs (column 6, row 14) and final demand (column 15, row 6) of $1,309,852. In only one other crop sector did inputs exceed final demand or production. This was the forage sector (number 9) with a difference between inputs and production of $241,935. This difference could have been the result of a large number of acres of corn and sorghums being harvested for silage which had been planted for grain. Many acres of forage were cut for silage in this area in 1954 due to the rainfall deficit late in the growing season. Sector 9 was also the only sector which had outputs (column 14) exceeding estimated production. This again could have been due to the large number of acres of corn and sorghum harvested for forage which was originally intended for grain production.

A large proportion of the livestock feed produced in the county is consumed in the county and not exported. In 1954, $2,097,838 of feed grains were produced (sector 7, column 15) of which only $412,505 were exported. Similarily $1,204,072 of hay (sector 8) was produced of which only $195,245 was exported.

Livestock production in Republic County is predominately cattle and hogs, as shown by rows 10 and 11, column 15. Cattle production was $4,401,959 and hogs, $1,369,788. Sheep and poultry productions amounted to only $72,571 and $216,990. (rows 12 and 13, column 15) However, poultry was the only livestock sector whose production exceeded its inputs as shown by row 14, column 12 as compared to row 13, column 15.

Machinery had the largest output of any sector with $5,265,934 (sector 1, column 14) followed by labor with $3,855,905. Machinery exceeded labor as an input of all sectors with the exception of cattle and sheep. (rows 1 and 4, columns 6 through 13) Machinery was an input amounting to $700,074 for cattle (row 1, column 10) compared to labors input of $1,820,571. (row 4, column 10).

Disposal of products to government (sector 16) was approximately one-half the disposal to sales. (row 14, column 16) Government disposal was comprised mainly of small grains and feed grains. Some disposal of livestock products in the form of wool subsidies could have appeared in sector 12 (sheep) providing sufficient data could have been found. However, the $27,269 difference between calculated production and sales could partially reflect the amount of government subsidies in the form of ASC incentive payments.

Aggregate Inputs and Outputs 1959

Total sector outputs equalled total sector inputs in 1959 and amounted to $13,145,132 as shown by Table 3. (row 14, column 14) Final demand (column 15, row 14) showed $15,041,771; $1,896,639 greater than inputs. This difference reflects an approximation of the net farm income for Republic County in 1959.

Final demand (or production, column 15) of small grains (sector 6) was $3,809,274 and inputs of this sector were $1,538,526 leaving a net of

$1,270,748. One other sector (feed grains, sector 7) had production exceeding inputs. Production of this sector was $2,881,891 and inputs were $2,054,160 leaving a net of $827,731.

Hay, forage, cattle, hogs, sheep and poultry (sectors 8 through 13) had inputs exceeding production and were considered to have been a liability to the productive process of the county by $211,840.

Livestock (sectors 10 through 13) consumed only $816,136 (column 14) of the $3,809,274 of small grain (sector 6) production (column 15), but $1,402,747 of the feed grain (sector 7) production of $2,881,891. Cattle ranked first with $695,853, hogs second with $545,160, poultry third with $112,354 and sheep last with $49,380 of this consumption.

Livestock did not consume all the hay but did consume more roughage in other forms than was produced in the county. Hay consumption equalled $514,739 (row 8, column 14) compared to the production of $745,200 (row 8, column 15). Cattle consumed $447,144 (column 10), hogs $63,625 and sheep $3,970. Forage (sector 9) consumption was $635,292 (row 9, column 14) and production was $306,109 (row 9, column 15) leaving a deficit of $329,183. This deficit may have been rectified by forage imports into the economy. On the other hand the deficit could reflect the value of roughage consumed in the form of pasture in the county.

The disposition of small grains (sector 6) compared to feed grains (sector 7) provided a contrast in 1959. Only $1,730,822 (column 16) of the $3,809,274 of small grains were delivered to Commodity Credit Corporation. Feed grains, on the other hand, had $2,710,866 of the $2,881,891 being delivered to the Commodity Credit Corporation. However, this data represent the actual amounts delivered to the Commodity Credit Corporation during 1959 and does not reflect precisely the amounts of the 1959 crop harvest that has been delivered to the Commodity Credit Corporation. In fact a quick check of the records in January, 1962 reveals that some of the 1959 crop under government seal has not yet been delivered.

Inputs to small grains (column 6, row 14) equalled $1,538,526 leaving a net of $2,270,748. Thus small grains was the largest income producing sector for the county in 1959. Feed grains on the other hand, had a net of only $827,731 (column 7, row 14 minus column 15, row 7).

Production of hay (sector 8) exceeded output and equalled $745,200; output equalled $514,739 (row 8, columns 15 and 14). Production and output were exceeded by inputs of the hay sector which equalled $1,089,302 (column 8, row 14).

Hay production of all types in the state of Kansas has an average per acre yield of 1.8 tons. Republic County has an average yield of two tons.

The "all forage" sector (number 9, primarily corn and sorghum silage) on the other hand had outputs equalling $635,292. Production equalled $306,109 (row 9, column 15). Thus $329,183 of forage were either imported into the economic unit to satisfy the automous demand or the $635,292 reflects the value of the pasture in Republic County which was unaccounted for in the formation of inputs. (Pasture acreage equalls 27 percent of the farm land in the county).

Cattle production equalled $5,229,099 (row 10, column 10) of which $4,471,166 (column 17) were exported from the economy in the form of sales, (column 17). Hogs (sector 12) produced $1,688,978 (column 15) of which $771,108 produced $1,688,978 (column 15) of which $771,108 were sold. Sheep produced $79,098 (row 13) of the economic units' income, but had sales equalling $189,645. This discrepancy may have arisen by including government incentive payments in the calculation of sales in final demand portion of the transactions matrix, but not including them in the estimation of intermediate flows. However, this also could have occurred by overestimating weights of the pelts and lambs when they were marketed.

The difference between total inputs of sheep; $132,976 (row 14, column 12), and production; $79,098 (row 12, column 15) left a deficit of $53,878 for the sheep productive efforts of the county in 1959.

Poultry production equalled $302,122 (row 13, column 15). Sales accounted for only $32,580 (column 17) of the disposal of the poultry production. Inputs of poultry equalled $653,403 (row 14, column 13) leaving a deficit of $351,281 for this productive effort of the county.

Of the sectors having their origin outside the economic unit (sectors 1 through 5) machinery and fuel (sector 1) had the largest outputs in 1959 as shown in Table 3. This machinery and fuel output, used by all other sectors as inputs, equalled $4,407,332 (row 1, column 14). Because the small grain sector (sector 6) contributed the most to the net output of the economic unit in 1959 it would follow that this sector (sector 6) consumed the most of the machinery and fuel outputs; $1,164,058, (row 1, column 6). The cattle sector (number 10) exceeded small grains as a contributor to the economic activity. However, the cattle sector consumed only $831,593 (row 1, column 10) of the machinery output. It was exceeded by small grains and feed grains as an automous consumer of sector 1. The feed grains (sector 7) automous consumption equalled $1,075,840 (row 1, column 7).

Sector 8 (hay) consumed more machinery and fuel than it had as either outputs or production. Hay consumed $586,224 of sector 1 with a resultant output of $514,739 (row 8, column 14) and production equal to $745,200 (row 8, column 15). This sector had total inputs of $1,089,302 (row 14, column 6).

The swine sector (number 11) followed the hay sector closely on the use of machinery and fuel as an input. Hogs recorded an autonomous demand of $571,832 of machinery and fuel as an intermediate flow (row 1, column 11). Sector 9, forage, utilized $108,714 of machinery and fuel as an intermediate flow; (row 1, column 9) this was over one-half of this sectors inputs of $156,492 (row 14, column 9).

Almost one-tenth of the total inputs of sector 13, poultry, were in the machinery and fuel sector. Poultry used $63,876 of sector 1 in it's total inputs of $653,403 (row 1 and 14, column 13). Sheep (sector 12) ran a poor last with $5,125 of it's total inputs of $132,976 being in machinery and fuel (sector 1).

Labor (sector 4) was a close second as an output sector with $3,996,497 (row 4, column 14). Of this amount $2,162,673 (row 4, column 10) went to cattle as an intermediate flow. Feed grains (column 7, row 4) with $752,016 exceeded small grains with $269,788 (column 6) as a consumer of labor. Hogs (column 11, row 4) utilization of labor equalled $169,302 which approximated the poultry sectors utilization which equalled $125,892, (column 14, row 4). Forage (sector 9) consumed $41,787 of labor and sheep (sector 12) consumed $3,695. Machinery and fuel (sector 1) exceed labor as an input to all sectors with the exceptions of cattle and poultry. Poultry used approximately twice the number of dollars of labor as it did of machinery and fuel. Cattle, on the other hand, used approximately three times the number of dollars of labor as it did the number of dollars of machinery and fuel.

Feed grains (sector 7) ranked a close third in dollars of output equalling $1,402,747, (column 14). Cattle and hogs (sectors 10 and 11) were the major consumers of feed grains. Their consumption equalled $695,853 and $545,160 respectively. Poultry (sector 13) consumed $112,354 and sheep consumed approximately one-half that amount or $49,380 (column 14 and 11).

Commercial feed and supply output almost equalled feed grains. Commercial feed output equalled $1,003,660 (column 14, row 2). This amount was arbitrarily apportioned among the four livestock sectors; 35 percent to hogs and poultry (sectors 11 and 13) 25 percent to cattle (sector 10) and five percent to sheep (sector 12).

Forage (sector 9) utilized as an intermediate flow of cattle equalled $618,076; sheep (sector 12) utilized $17,216 giving a total of $635,292 of output.

More soil additives (sector 3) were used on feed grains than on small grains in 1959. Fertilizers used on small grains equalled $104,680 (row 3, column 6) and that used on feed grains equalled $128,574 (row 3, column 7). The applications to hay equalled $30,726 (row 3, column 8) and that to forage equalled $3,976 (row 3, column 9) for a grand total of $267,956 (row 3, column 14).

The output of other costs (sector 5) comprised principally of water costs, equalled $100,773 (row 5, column 14). Feed grains (sector 7) received $97,750, hay received $1,008 (sector 8) and forage (sector 9) received $2,015 of this output.

Functional Relationships 1954

The a, b, and c functional relationships as expressed by equations 1, 2, and 3 (page 20) are shown in Tables 2 and 3. These functions are: production, input and final demand. They appear as the first, second and third entry below the transaction matrix entry, i.e. in Table 2 the matrix entry of small grains (sector 6) supplied to cattle (sector 10) was $398,818. The output function was 5695, the input function was 0855 and the final demand (production) function was 1011. The decimal point has been eliminated and all relationships carried four places. The numerical expression of these relationships appear in column 6 through 13 and row 1 through 9. Columns 1 through 5 were eliminated from the transaction matrix because these sectors (machine and fuel, feed and supplies, fertilizers, and labor) have their origin outside the economic unit and were considered to have no autonomous demand. The "a" functional relationships add to 100 in each row. The "b" functions add to 100 in each column. The "c" functions do not add to equal 100.

The numbers in column 15 corresponding to the "a" function show the functional relationship of the entries in that column to the first entry appearing in succeeding columns. Thus for every dollar of small grains produced (column 15, row 6) 5617 cents were disposed of to the Commodity Credit Corporation in 1954. Similarily 1967 cents of every dollar of feed grains went to Commodity Credit Corporation.

The production function of small grains (sector 6) used as an input by the hog sector was 0723 (row 6, column 11), i.e. for every dollar of hog production small grains contributed 7.23 cents. The input function for small grains was 1644 used by sector 11, hogs, i.e. of the total inputs into the swine sector (1,734,129, row 14, column 11) 16.44 percent was the result of using small grains as hog feed. The output function of small grains was

4070, i.e. the total contribution in the productive processes of the economic unit by small grains was $700,356 (row 6, column 14) of which 40.70 percent was contributed by small grains as hog feed.

The output function of small grains utilized by sheep (sector 12) was 0236, the input function was 1324 and the production function was 0042.

The output functions of feed grains in the cattle, hog, sheep and poultry are very similar to small grains; the functions were 4971, 3889 and 0208 for the respective sectors. The input functions were considerably different; 1256, 2643, 1970 and 1889 for the respective livestock sectors.

The hay and forage functions present a contrast for 1954. The output function for hay consumed by cattle was 8716; for hogs it was 1239 and for sheep it was 0046, (rows 8 and 9, columns 10, 11 and 12). The input function for hay was 0807, 0308 and 0158 for cattle, hogs and sheep. The production function was 3126, 0444 and 0016 for the respective relationships. Output functions for forage were 9838 for cattle and 0162 for sheep. Input functions for forage were 1116 and 0687 for the respective sectors.

The production function for forage in the cattle sector was 1.2050. This function was larger than one because the forage consumption by cattle was larger than the production of the county. The possibility of cattle having a forage consumption larger than the counties production could have occurred due to imports of this commodity into the county. On the other hand this relationship could reflect the value of the pasture production of the county because the roughage value of pasture was not included in determining the feed requirements of the livestock sectors. All animals were considered dry lot fed.

Output functions of machinery (sector 1) were 2467 in the small grains sector (number 6) and 3093 in the feed grain sector (number 7). Machinery and fuel accounted for 74.89 percent of the cost of small grain production as reflected it's input function which equalled 7489. Feed grains also had sector one accounting for the major portion of it's production cost. Sector one accounted for 73.54 percent of feed grains total inputs as reflected by the input function 7354.

The functional relationships of hay and forage are quite similar for 1954 when considering machinery and fuel as inputs. The output functions were 1879 and 0271 respectively. The input functions were 5594 and 7517 for the two sectors.

Machinery and fuel (sector 1) output contributed to the total output of sector one an amount which yielded an output function of 1329 in the cattle sector (number 10). Machinery and fuel accounted for 15.02 percent of the total inputs of the cattle sector. Hogs (sector 11) had a smaller output function (0836) than cattle and a larger input function; 2539.

Input and output functions for sector one in the sheep and poultry sectors (sectors 11 and 12) were quite small. Output functions were 0005 and 0118 and input functions were 0208 and 1074 for the respective sectors.

The output functions for commercial feed and supplies (sector 2) were estimated to be 2500, 3500, 0500 and 3500 for cattle, hogs and sheep respectively. The input functions then became 0558, 2101, 4177 and 6267 for the cattle, hog, sheep and poultry sectors.

The output of sector 3, fertilizers, was allocated to sector 8, hay, thus the out function for this combination becomes 1000, the input function, however was only 0047. Therefore fertilizers were the smallest production cost for all crops in the county even when all fertilizer costs were allocated to one crop.

Labor (sector 4) was an important productive factor in the economy of Republic County in 1954. It had the second largest output and was the second most important input for most sectors. As a function of it's output it's input to small grains and feed grains (sectors 6 and 7) was 1130 and 1520. As a function of the inputs of small grains and feed grains it was 2511 and 2646.

Almost 20 percent of the labor of the county was employed in hay-making as shown by the output function of sector 8, hay. This function equalled 1999. The corresponding input function was 4358.

Forage was a much smaller sector having inputs about one-tenth that of hay, (row 14, columns 9 and 8). Forage therefore, used only .0122 of the labor outputs but it accounted for 24.83 percent of the inputs of sector 9.

The cattle and hog sectors have labor functions that differ greatly. The labor output function for cattle was 4722 while that for hogs was only 0344. The input function for cattle was 3867 and that for hogs was 0765.

Sheep and poultry, (sectors 11 and 12) were small utilizers of labor. Their respective output functions were 0344 and 0048. Their respective input functions were 0765 and 1475.

The functional relationships of the disposal in final demand of the livestock sectors have a wide range. Cattle production had 80.92 percent (row 10, column 15) of it's disposal accounted for in sales. The swine sector (number 11) had 47.33 percent of it's disposal accounted for in sales. The sales data available for sheep (sector 11) indicated that sales exceeded the output of sheep. In fact, the output was only 72.69 percent of the sales volume (row 12, column 17). The poultry presented a similar picture in that only 15.88 percent of it's disposal could be accounted for in sales (row 13, column 17).

Functional Relationships 1959

Machinery and fuel (sector 1) dominated as an output in 1959. The sector with the largest autonomous consumption of this sector was small grains (row 1, column 6), as shown by the output function 2641. Sector 1 also accounted for 75.66 percent of the small grain production costs as indicated by the input function. Feed grains (sector 7) consumed approximately the same amount of machinery and fuel resulting in an output function of 2441. However, the input function for feed grains, 5,237, was considerably smaller than that for small grains.

Hay and forage (sectors 8 and 9) had no functions which were similar. The output function for hay was 1330 and for forage it was 0247. The input functions were 5382 and 6947, thus machinery and fuel is a major cost of hay and forage production yet it is not a large consumer of this sector.

Compared to the crops sectors the livestock sectors were very small autonomous consumers of machinery and fuel. The cattle and hog sectors (sectors 10 and 11) had output coefficients equal to 1887 and 1297 respectively. Machinery and fuel was a much smaller portion of the cost of cattle production than it was for hogs, as indicated by the input functions; 1518 and 2803 respectively.

The poultry and sheep sectors (numbers 12 and 13) provided a very small autonomous demand for machinery and fuel. Their output functions were 0012 and 0145; their input functions were 0392 and 0978.

Commercial feed and supplies (sector 2) had autonomous demand arising only in the livestock sectors. The consumption of sector 2 was estimated to be 25 percent for cattle, 35 percent for hogs, five percent for sheep and 35 percent for poultry. This sector when viewed as an input to the livestock sectors gave input functions of 0458, 1722, 5783 and 5376.

Sector 3, fertilizers, ranked number 8 among the nine sectors in output. All other costs, primarily water, had an output smaller than fertilizer. Fertilizer was the counterpart of commercial feed and supplies insofar as commercial feed consumption was confined to the livestock sectors fertilizer was confined to sectors six through nine; field crops. According to census data, $267,956 of fertilizer were purchased by farmers in Republic County in 1959. As indicated by the output functions (row 3, column 6 through 9) .3907 was applied to small grains, 4798 applied to feed grains, 1147 applied to hay and 0148 applied to forage. As production costs of these crop sectors fertilizer was quite unimportant; 6.8 percent, 6.26 percent, 2.82 percent, 2.54 percent for the respective crops.

Labor (sector 4) followed machinery in the size of outputs and like machinery and fuel it appeared as an input of every sector. The output functions range from a high of 5411 for cattle (sector 10) to a low of 0009 for sheep (sector 12). The input functions for cattle and sheep were 3946 and 0278. Small grains (sector 7) had an output function of 1882, and an input function of 3661. Sector 8, hay, had an output function of 1179 accompanied by an input function of 4327. The output function of 0675 accompanied an input function of 1754 for small grains (sector 6). The swine sector (number 11) had an output function roughly equal to one-half the input function. They were 0424 and 0830. Sector 13, poultry, had a labor output function of 0315 and an input function of 1927. Hay, sector 9, the production of which is allied with backaches in the mind of every farmer, had an autonomous demand of 0105, yet it accounted for 26.7 percent of the inputs of the sector.

Water (sector 5) was scarcely a discernable production cost for the county in 1959. It was estimated from the data in the Bureau of Reclamation's Annual Report that 97 percent of the water was applied to feed grains, especially corn, one percent was applied to hay, and two percent applied to forage as shown by the respective output functions. The input function of water to the aforementioned crops was, 0476 for feed grains (sector 7); 0009 for hay (sector 8), 0129 for forage (sector 9).

Sales accounted for a large portion of the final demand for cattle (row 10, column 15). Sales were 85.51 percent of the bovine production in Republic County in 1959. The disappearance of swine, (row 11, column 15), in the form of sales was indicated by the output function of 4566. The sheep sales exceeded the estimated production in 1959. Production was 41.7 percent of the estimated sales as indicated in the only function appearing in column 17, row 12. Poultry sales (row 13, column 15) accounted for only 10.78 percent of the final demand of poultry.

Analysis of Dichotomous Economy

The purpose of this study was to examine the effects of irrigation upon the economy of the Kansas Bostwick community. The purpose of employing the Leontief input-output method of analysis was to facilitate the comparison of the economic activity of the community before and after the introduction of irrigation. The previous section examined the economy before and after the introduction of irrigation. This section compares the economies before and after in an attempt to answer the question in what manner and to what extent the economic activity has changed.

The most discernable change in the economic activity of Republic County from 1954 until 1959 was net income. Net income increased from an estimated $729,010 in 1954 to an estimated $2,896,639 in 1959 (rows 14, columns 15 minus column 14, tables 2 and 3). A great portion of this increase was the result of increased sales to the Commodity Credit Corporation. Delivery of small grain (sector 6) and feed grain (sector 7) crops to the Commodity Credit Corporation equalled $2,628,155 in 1954 and $4,441,688 in 1959 respectively for an increase of $1,813,533 (rows 14, column 16).

The increase in delivery to the Commodity Credit Corporation occurred in the feed grain sector (number 7) while delivery of small grains declined. In 1954 only 10.67 percent of feed grain production was delivered to Commodity Credit Corporation. In 1959 94.07 percent of feed grains were delivered. Small grain delivery declined from 56.27 percent in 1954 to 45.44 percent in 1959.

Production of small grains during this period dropped from $3,944,756 to $3,809,274. At the same time feed grains increased from $2,097,838 to $2,881,891. Output of small grains increased from $700,356 to $816,136 and feed grains increased from $1,178,465 to $1,402,747. Inputs (row 14, columns 6 and 7) for small grains decreased from $1,734,904 to $1,538,526 and feed grains dropped from $2,215,029 to $2,054,160.

Hay (sector 8) and forage (sector 9) production declined from 1954 to 1959. Hay dropped from $1,204,072 to $745,200. Forage dropped from $431,784 to $306,109.

The livestock sectors of Republic County increased production between 1954 and 1959. Cattle production (sector 10) increased from $4,401,959 to

$5,229,099. Hogs (sector 11) increased from $1,369,788 to $1,688,978. Sheep (sector 12) increased from $72,571 to $79,098 and poultry increased from $216,990 to $302,122. The decrease in inputs to crops, and the increase in livestock inputs and outputs could be the indication of a trend toward greater livestock production in the county.

The machinery and fuel output (row 1, column 14) declined from $5,265,934 to $4,407,332. This decline was shared by all sectors using machinery and fuel as inputs. The largest reduction in the use of this sector by another sector was in the feed grains sector. The output function declined from 3093 in 1954 to 2441 in 1959.

The output function of machinery and fuel for small grains increased from 2467 to 2641, and the input function increased from 7489 to 7566.

The input function of sector 1 for feed grains declined from 7354 to 5237. This reduction, in part, was due to the addition of fertilizer and water costs in 1959. Nevertheless inputs of the feed grain sector (number 7) in 1959 were smaller than inputs in 1954.

The machinery and fuel output utilized by hay (sector 8) declined as shown by output function which declined from 1879 in 1954 to 1330 in 1959. The input function also declined; from 5594 to 5382. The output function of forage (sector 9) declined from 0271 to 0247, and the input function was reduced from 7517 to 6947.

Machinery and fuel utilized by the livestock sectors (sectors 10 through 13) declined from 1954 to 1959. The output functions for cattle, hogs, sheep and poultry in 1954 were 1329, 0836, 0005 and 0118 respectively. The machinery and fuel input functions for these sectors declined with the exception of poultry. The functions in 1954 were 1502, 2539, 0208 and 1074. In 1959 these functions were 1518, 2803, 0392 and 0978.

The use of commercial feed and supplies (sector 2) was reduced from 1954 to 1959 by $37,315 (row 2, column 14). This reduction occurred in all livestock sectors (sectors 10 through 13). The output functions were estimated to be the same in each year and were 2500 for cattle, 3500 for hogs, 0500 for sheep and 3500 for poultry. Input functions for cattle decreased from 0558 to 0458 and hogs decreased from 2101 to 1722. The input function for sheep increased from 4177 to 5783. The input function for poultry decreased from 6267 to 5376.

All of the soil additives (sector 3) in 1959 were allocated to legumes and equalled $8,370. In 1959 the expenditure for fertilizer and lime increased to $267,956 and was consumed by all crops. The output functions for small grains (sector 6), feed grains (sector 7), hay (sector 8), and forage (sector 9) in 1959 were 3907, 4798, 1147 and 0148 respectively.

Labor (sector 4) output increased from $3,855,905 in 1954 to $3,996,497 in 1959. The output function for small grains decreased from 1130 to 0675, and the input function was reduced from 2511 to 1754. The output function of feed grains increased from 1520 to 1882; the input function from 2646 to 3661. The output function of hay decreased from 1179 to 1999; the input function from 4358 to 4327. Labor used by forage decreased slightly as expressed by the output function of 0122 in 1954 and 0105 in 1959.

Two sectors, cattle and sheep, in the livestock sectors utilized more labor in 1959 than in 1954. The output function for cattle in 1954 was 4722; in 1959 it was 5411. The input function in 1954 was 3867 and 3946 in 1959. The output function for hogs in 1954 was 0344 and in 1959 it increased to 0424. The input function decreased from 0765 to 0830 during the five year period. The output function for sheep in 1954 was 0048 and decreased to 0009 by 1959. The input function was reduced from 1475 in 1954 to 0278 in 1959. Poultry had an output function of 0116 in 1954 and it increased to 0315 in 1959. The input function increased from 0770 to 1927 during the five year period.

NON EMPIRICAL ANALYSIS

The quantification of some costs and benefits arising in the Kansas Bostwick Irrigation Division would entail more intensive studies than was undertaken here. The best that can be done here is to enumerate some of the relationships not described in the input-output analysis, without attempting to appraise their effect. An attempt to quantify nebulous relationships could result in obfuscation rather than illumination. Description of some of these nebulous relationships is the purpose of the following sections.

A-priori it would appear that a greater rate of progress might have been attained in the transition from dryland to irrigation farming. One of the following sections is devoted to this proposition.

Communal Activity

A new socio-economic class has emerged as a result of irrigation in Republic County. This class is comprised mainly of those landowners in their latter years who could not make the transition from dry land farming to irrigation. These people also seriously objected to the formation of the irrigation district. However, upon realizing that their capital assets had in many cases been increased by an estimated 200 percent they leased their farms to younger men and moved into the surrounding towns.

Evidence of this new leisure class can be found in Courtland, the town most centrally located in the Division. Sixteen new houses have been completed in Courtland since 1954 and an equal number are in the early stages of construction. This alone is remarkable for a central Kansas town with a population of less than 500, when most other villages of this size are annually losing families and houses. Courtland in 1954 had a population of 370. In 1959, after the introduction of irrigation, it has a population of 408.[1]

Courtland is favorably situated on Highway 36 where it makes a sharp turn for a short north and south direction and crosses the mainline of the Santa Fe Railroad. The citizenries faith in the continued growth of Courtland was recently shown by their voting to sell $102,000 of bonds to build a central water and sewer system. Courtland has gained two new businesses since the introduction of irrigation. One is an allied industry; that of ready mix concrete. The other new business is a Ford implement agency.

Implement dealers in the area report that there is a common belief among implement dealers outside the trade area that now that the Division's farmers have water they have disposable income when just the opposite is typically the case. Whereas the trend prior to irrigation was toward fewer and larger farms, the trend now is to smaller and more intensive crop farming because of the 160 acre limit. With the present trend there is an increase in livestock enterprises thereby reducing the size and use made of field machinery. None the less, dealers from two and three counties away in all directions can be found soliciting business in the community.

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[1] Agricultural Census, Department of Agriculture, Topeka, Kansas, 1960.

The financial strain placed on many of the farmers in the Division have caused them to repair their old machinery more and trade less than before irrigation was developed according to the implement dealers. Automobile dealers, on the other hand, report an increase in business which they contribute to the stability of expected farm incomes.

The ready mix concrete plant in Belleville reports that ten percent of their increased business is due to the development of irrigation in Republic County. The Co-op in Courtland has added a new office and feed mill since 1954. It was surmised that the feed mill would never have been built had irrigation not been initiated in the community. Commercial grain storage facilities in the county increased by 5,382,000 bushels whereas the three bordering Kansas counties have increased an average of only 1,133,000 bushels.[1] There has been some interest and action toward the development of a commercial feed yard in the area. Commercial livestock men are confident one will eventually be built if the present trend toward these large feed lots continues. The Bureau of Reclamation endorses any move which will increase the livestock numbers in an irrigated district in this part of the United States with the exception of dairy which has a limited local market.

The Bureau also highly recommends the development of horticulture crops on irrigated lands but this enterprise faces one of the same problems as dairying - no connection with marketing channels. In addition, according to the County Agent there is difficulty in getting a farmer to become a good irrigation farmer much less change him to a crop with which he is totally unfamiliar.

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1 Farm Facts, 1959-60, State Board of Agriculture, p. 8.

One of the common failures of a farmer changing from a dry land type of farming to irrigation is the failure to recognize the importance of proper fertilization. This is readily evident by a comparison of the fertilizer and lime usage in Republic County in 1954 and 1959.

Although the fertilizer business has not increased substantially since the introduction of irrigation, apparently other business has increased as indicated by railroad carloadings of towns in the Division. Courtland in 1954 has 53 cars in and 71 out compared to 41 in and 116 out in 1959. Kackley had nine cars in and 23 out in 1954 compared to zero in and 36 out in 1959. Seven cars came into Lovewell and 56 went out in 1954 with 11 in and 72 out in 1959. Webber although not the nearest freight depot to the dam has the most accessible roads to drive on leading to the dam. It was understood that the construction of the dam during 1954 explains why Webber received 73 cars and sent 24 while 14 were received and 31 sent in 1959.[1]

Tertiary Benefits

The empirical justification of a public project such as the Kansas Bostwick Irrigation District is difficult to determine. Nevertheless there are additional social benefits which defy empirical studies, particularly in the very early stages of development. For instance, the city officials in Courtland are convinced that the Courtland Canal, only a few hundred yards west of the city, will reduce the depth of the wells necessary to insure a plentiful supply of water to their new central water system. The civic leaders in Courtland, as in other towns and villages in the area,

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1 C. A. Walton, Division Freight Agent, Atchison Topeka and Santa Fe Railroad, Topeka, Kansas, personal communication.

are also cognizant of the increased payroll that is directly attributable to irrigation activity. More importantly the primary industry in the community - agriculture - is placed on a sound basis and a precarious economy is transformed into a stable and thriving activity. The new wealth created provides additional purchasing power which in turn increases markets for industrial products, goods, and services from outside the economic area. The community leaders know also that the school programs have expanded and improved as a result of the increased tax base.

The transformation of a land locked community in a semi-arid region is as much a page from the Wizard of Oz to the inhabitants of the community as the public policy contradictions are to the uninformed voter at the poles. The presence of a 3,000 acre body of water in the heart of a community that five years ago did not have one licensed boat now provides recreational facilities and social benefits that defy empirical enumeration. The fishing and boating facilities compare favorably with many of the nationally known recreational areas.

The Lovewell Reservoir is favorably situated in the central flyway of the migratory water fowl and provides untold hours of hunting to sportsmen for hundreds of miles in all directions. The dependable water supply in the ditches and canals has also stabilized the wildlife population of the community providing additional recreational opportunities during the autumn hunting season.

Limitations of Progress

Development in the county, either in the Irrigation District or the county as a whole has been hindered in three areas: Financing, Fertilizer and Feeding.

The development of irrigation has imposed upon the community a whole new concept in agricultural finance. Additional financing is needed for preparation of the land for irrigation; the additional machinery and feed handling equipment and also for the increased cost of crop production. The County Agent estimates it costs $75 per acre to produce 100 bushel corn under irrigation. If financing is to be available for an irrigation farmer for crops and livestock, in addition to the investment in land leveling a farmer could easily have an outstanding debt of $75,000 or $100,000.

The president of the largest bank in the immediate area with $4 3/4 million, capital and surplus sighted this example as being typical.

> A good farmer and steady customer from the irrigation district five years ago would look at the floor and sheepishly ask to borrow $20,000. That same farmer now walks in confidently and asks for $80,000, and with a little encouragement he would borrow another $20,000.

This banker related that they had gained several customers from the smaller banks in the area because of their small loan limit, but likewise he has had to send some of their customers on to larger banks because of their $35,000 loan limit. He also mentioned that many farmers were having to reduce livestock purchases in order to finance the land leveling.

It is inconceivable that much of the loanable funds have been spent for fertilizer. No fertilizer consumption was reported for the county in 1954 and only $267,956 worth in 1959. This was applied to less than one percent of the cultivatable land of Republic County and amounted to one dollar per acre of cultivated land in the county.

According to soil maps and soil test results the majority of the

267,857[1] cultivated acres in Republic County could use 40 or 50 pounds of phosphorus, 60 to 70 pounds of nitrogen and two tons of lime per acre. In the irrigated areas some potash could be economically employed especially in areas where "cuts" were made in the land leveling process. In these cut-over areas it is not uncommon to find one or two trace mineral deficiencies, especially zinc, sulphur and iron, in addition to the nitrogen, phosphorus and lime.

Assuming 45 percent P_2O_5 costs \$60 per ton; ammonium nitrate costs \$70 and lime \$6 per ton the fertilizer bill could easily amount to \$3 million as shown in Table 5; assuming also that the lime would have a life of ten years which is very liberal especially if a four year rotation including legumes is employed. No lime would be necessary on the irrigated lands, for the Republican River water contains an ample amount of dolamite to keep the PH near 7.

A recommended expenditure of \$3 million as compared to an existing expenditure of \$267,857 appears to leave a very large gap. However, conceivably the soil additive bill could be much larger if consideration were taken of the 16,370[2] irrigated acres in the county which could double the above amounts of fertilizers in addition to the trace elements.

Just as a balanced fertilizer program is essential to a balanced crop program a balanced crop program is essential to a balanced livestock program and a balanced livestock program is essential to the balanced farm program which in turn is essential for satisfactory returns on irrigation expenditures.

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1 Bureau of the Census, 1959.

2 Loc. cit.

The investment in such a complete farming program can easily run over $100,000 not including investment in land. If financial institutions existing in the area are not large enough to handle this type of financing then certainly the community is suffering a loss.

The large amounts of livestock feeds, particularly grains, being exported from the community suggests a lack in the livestock feeding development in the area. The reason livestock feeding development is not progressing may again be due to policies of the financial institutions in the area. The P.C.A. servicing the area (Concordia headquarters) had a very limiting livestock feeding policy in 1959 and 1960 based on the assumption that hog prices were going to 11 cents and cattle to 19 cents.

However, there is some increased interest in livestock feeding. One family corporation immediately north of Courtland has approximately 400 cattle on feed the year around and one young farmer south of Republic is custom feeding on a limited basis. No substantial increase in swine or sheep feeding is evident in the area.

SUMMARY AND CONCLUSIONS

All the benefits to a community arising from the development of irrigation can not be empirically expressed. All the costs to a community for such an increase in resource base can not be empirically ascertained. Similarly all the increase in net income between 1954 and 1959 can not be attributed to irrigation development.

The change in price levels was eliminated by using 1959 prices throughout. The elimination of the effects of weather was much more difficult. Considering the effects of weather it would be expected that net income would have declined from 1954 to 1959. However, as indicated by rainfall, Table 4, there were 22.93 inches of rainfall, only 1.64 below normal, in 1954 and 26.56 in 1959. The 9.29 inches of rainfall during July and August of 1954 were more favorable to crop production than the 2.22 inches in 1959. The abnormal rainfall of 8.11 inches in May 1959 delayed corn and milo planting until June thereby reducing the probability of normal yields. Planting was not delayed by the 5.05 inches of rainfall in May 1954.

The effects of weather were unfavorable to the farmer in 1959 and favorable to him in 1954, yet the input-output analysis showed a marked increase in net output in Republic County, Kansas from 1954 to 1959. This increase occurred at the same time the county sustained a decrease of 10,120 acres of "cropland not harvested and not in pasture" assumed to be government land retirement.

Allied industries also showed an increase in economic activity. Carloadings increased and commercial grain storage facilities in Republic County increased five times more than those in bordering counties. Implement dealers in the community report that their increase in business has been in livestock feeding equipment. Auto dealers report an increase in business. A ready mix concrete plant attributed a ten percent increase in business to irrigation development. A local co-operative has built a new feed formulation plant in anticipation of increasing livestock feeding. Other feed mills in the community report an increased interest in livestock finishing.

However, the agricultural businessmen in the community are encountering the increased competition of businesses from outside the community invading the trade territory in an effort to establish customers in an area of stable income. The farmers in the area outside the irrigation division are regularly confronted with drouth periods of four or five years duration. The farmers within the division enjoy a more stable income, the result of mitigating the effects of the drouth cycles.

The benefits derived from an undertaking as extensive and permanent as irrigation will be derived for an innumerable number of years. The cost of such an undertaking is usually assumed by one generation of people depending on the length of the repayment period. The assumption of the debt by one generation for the benefit of future generations is frequently the basis of objection of farmers in a community in which an irrigation development project is planned.

Under the original terms of repayment on Reclamation projects there is allowed a five year period after water is delivered before repayment begins. Through an act of Congress this period has been extended to ten years for the Kansas Bostwick Irrigation Division. Another bill is pending which would extend the repayment period from it's present 35 years to 40 years.

The economic growth of the community since the inception of irrigation has not been as rapid as would appear a-priori. The farmers in the Kansas Bostwick Division have been confronted with many problems in the transition from extensive dry land farming to intensive irrigation farming. There are two major problems, however, one financial, the other agronomic.

The intensive farming operations have increased capital needs. Borrowing for many farmers in the Division was necessary not only for the preparation of land for leveling but also to finance crops, livestock and machinery. The farmers have two primary sources of credit; the local banks and the Production Credit Association. In many cases the banks loan limits are too small to adequately handle their needs and the Production Credit Association has had a very conservative loan policy.

The agronomic problem that is a limitation to progress in part is also financial. Very little fertilizer was used prior to irrigation. With the increased costs of crop production fertilizer is frequently the input that farmers choose to ignore. However, fertilizer consumption increased five fold from 1954 to 1959 yet only one percent of the cropland of the county receives fertilizer.

The increased amount of feed grains exported from the community provides the physical resources for further livestock processing. In time financial barriers may be removed and livestock production will expand to meet the feed grains output.

In addition to the increased net farm income the community has received tertiary benefits. The increased land valuation has increased the tax base. As a result new schools have been planned in the community. Within the last year the town of Courtland, in the heart of the Kansas Bostwick Division, sold bonds to finance the building of a central water and sewage system. The water in the irrigation ditches also raises the water table thereby reducing the depth of the wells.

New paving is planned, especially for those streets having the 16 new houses. There is not a vacant house in town; while many surrounding towns are losing population, Courtland is gaining. The recreational benefits provided by Lovewell Lake inhances the social well-being of people in the community and for hundreds of miles in all directions.

Not all the increase in the economic activity of the community from 1954 to 1959 could be attributed to the development of irrigation but when all the factors are considered that could have resulted in decreased economic activity one would conclude that irrigation has had some very real and positive effects upon the community.

The exact empirical quantification of all the benefits derived by this community from this public policy program may be vague to some people outside the community and to many within. To the people in the surrounding communities outside the Bostwick Division it is a very real and tangible benefit. They cannot help but show regret in their eyes and voices. They regret that they too have not been favored by a reclamation development like the Kansas Bostwick.

With these positive effects in mind, and the realization of the man on the street that reclamation has one of the lowest cost benefit ratios of any public policy program and that the increased taxes (those collected by governmental agencies for purposes other than repayment) alone from one of these projects will more than pay its cost, it is inconceivable that anyone could object to a public policy whose program includes irrigation development under reclamation.

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APPENDIX

Table 1. Input-output model for Kansas Bostwick Irrigation District.

Producing Sectors \ Consuming Sectors	Machine and Fuel 1	Feed and Supplies 2	Fertilizers 3	Labor 4	Other Costs 5	Small Grains 6	Feed Grains 7	All Hay 8	All Forage 9	Cattle 10	Hogs 11	Sheep 12	Poultry 13	Totals 14	Production 15	Government 16	Sales 17	Other 18
1. Machine and Fuel	...	x_{12}	x_{13}	...	...	...	...	...	...	...	...	...	...	X_1	Y_1	y_{11}	y_{12}	y_{13}
2. Feed and Supplies	x_{21}	...	x_{23}	...	...	...	...	...	...	...	...	...	...	X_2	Y_2	y_{21}	y_{22}	y_{23}
3. Fertilizers	x_{31}	x_{32}	...	...	...	...	...	...	...	...	...	...	...	X_3	Y_3	y_{31}	y_{32}	y_{33}
4. Labor																		
5. Other Costs																		
6. Small Grains																		
7. Feed Grains																		
8. All Hay	x_{i1}	x_{i2}	x_{ij}	.	.	.								X_i	Y_i	y_{i1}	y_{i2}	y_{i3}
9. All Forage																		
10. Cattle																		
11. Hogs																		
12. Sheep																		
13. Poultry	x_{131}	x_{132}	x_{13j}	.	.	.								X_{13}				
14. Totals	X_{11}	X_{22}	X_{ij}	.	.	.								X	Y	y_1	y_2	y_3

Table 2. Input-output matrix for the Kansas Bostwick Irrigation Division 1954.

	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	1,299,272 2467 7489	1,628,985 3093 7354	989,481 1879 5594	142,716 0271 7517	700,074 1329 1502	440,382 0836 2539	2,594 0005 0208	62,430 0118 1074	5,265,934				
2.					260,244 2500 0558	364,341 3500 2101	52,049 0500 4177	364,341 3500 6267	1,040,975				
3.			8,370 1000 0047						8,370				
4.	435,632 1130 2511	586,044 1520 2646	770,832 1999 4358	47,133 0122 2483	1,820,571 4722 3867	132,576 0344 0765	18,379 0048 1475	44,738 0116 0770	3,855,905				
5.													
6.					398,818 5695 0855 1011	285,039 4070 1644 0723	16,499 0236 1324 0042		700,356	3,944,756 5617	2,215,650		1,729,106
7.					585,779 4971 1256 2792	458,303 3889 2643 2185	24,561 0208 1970 0117	109,822 0932 1889 0524	1,178,465	2,097,838 1967	412,505		1,685,333
8.					376,412 8716 0807 3126	53,488 1239 0308 0444	1,975 0046 0158 0016		431,875	1,204,072 1622		195,245	1,008,827
9.					520,305 9838 1116 1.2050		8,563 0162 0687 0198		528,868	431,784 1000			431,784
10.										4,401,959 8092		3,562,106	839,853
11.										1,369,788 4733		648,253	721,535
12.										72,577		99,840 7269	-27,269
13.										216,990 1588		34,454	182,536
14.	1,734,904	2,215,029	1,768,683	189,849	4,662,203	1,734,129	124,620	581,331	13,010,748	13,739,758	2,628,155	4,539,898	6,571,705

Table 3. Input-output matrix for the Kansas Bostwick Irrigation Division 1959.

	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	1,164,058	1,075,840	586,224	108,714	831,593	571,832	5,215	63,876	4,407,332				
	2641	2441	1330	0247	1887	1297	0012	0145					
	7566	5237	5382	6947	1518	2803	0392	0978					
2.					250,915	351,281	50,183	351,281	1,003,660				
					2500	3500	0500	3500					
					0458	1722	5783	5376					
3.	104,680	128,574	30,726	3,976					267,956				
	3907	4798	1147	0148									
	0680	0626	0282	0254									
4.	269,788	752,016	471,344	41,787	2,162,673	169,302	3,695	125,892	3,996,497				
	0675	1882	1179	0105	5411	0424	0009	0315					
	1754	3661	4327	2670	3946	0830	0278	1927					
5.		97,750	1,008	2,015					100,773				
		9700	0100	0200									
		0476	0009	0129									
6.					473,760	339,059	3,317		816,136	3,809,274	1,730,822		2,078,452
					5805	4154	0041			4544			
					0865	1662	0249						
					1244	0890	0009						
7.					695,853	545,160	49,380	112,354	1,402,747	2,881,891	2,710,866		171,025
					4961	3886	0352	0801		9407			
					1270	2672	3712	1720					
					2415	1892	0171	0390					
8.					447,144	63,625	3,970		514,739	745,200		74,107	671,093
					8687	1236	0077			0994			
					0816	0312	0298						
					6000	0854	0053						
9.					618,076		17,216		635,292	306,109		1,871	304,238
					9729		0271			0061			
					1128		1295						
					2.0191		0562						
10.										5,229,099		4,471,166	757,933
										8551			
11.										1,688,978		771,108	917,870
										4566			
12.										79,098		189,645	-110,547
												4171	
13.										302,122		32,580	269,542
										1078			
14.	1,538,526	2,054,160	1,089,302	156,492	5,480,014	2,040,259	132,976	653,403	13,145,132	15,041,771	4,441,688	5,540,477	5,059,606

Table 4. Rainfall Republic County, Kansas

	1954	1955	1956	1957	1958	1959	Normal
Jan.	.07	.65	.44	.17	0.21	0.48	.60
Feb.	.96	.85	.46	.29	1.47	0.38	.85
Mch.	.14	.20	Trace	2.41	2.68	2.27	1.26
April	2.13	.41	.83	3.47	2.08	1.56	2.21
May	5.05	2.24	1.84	5.74	2.95	8.11	3.60
June	1.72	6.81	5.54	7.49	3.50	2.59	4.82
July	2.39	2.46	1.37	1.40	7.99	1.15	2.81
Aug.	6.90	.20	1.25	5.81	3.02	1.07	2.68
Sept.	1.82	5.16	Trace	1.65	8.02	3.10	2.69
Oct.	1.42	.41	1.72	.89	0.54	5.64	1.45
Nov.	.0	.23	.56	1.15	0.68	0.03	1.03
Dec.	.33	.66	Trace	.37	0.10	0.18	0.77
Total	22.93	20.28	14.01	30.84	33.42	26.56	24.77

Source: Kansas State Physics Department collected at Scandia, Kansas Experimental Irrigation Field.

Table 5. Recommended fertilizer consumption for Republic County, Kansas.

Recommendation		Tons	Dollars
100# of 45% P_2O_5 /acre	=	13,393 Tons	
.05A ($60.00) = 3 A	=		803,572
200# of 33% N/acre	=	26,786 Tons	
.1 A ($70.00)	=		1,875,000
2 Tons lime/acre	=	535,714 Tons	
(10 year life) = .2 A ($6.00)	=		321,428
A = 267,857 acres		575,893	3,000,000

PUBLIC POLICY AND A COMMUNITY

by

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AN ABSTRACT OF A THESIS

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Today's agricultural surpluses have increased the criticism of government agencies dedicated to the technological advancement of agriculture. The criticism most often focused on irrigation development is based on the belief that it does not benefit the community in which it is developed.

The purpose of this study was to determine the benefits or lack of benefits accruing to a community in which irrigation had recently been developed. The Kansas Bostwick Division in Republic County was the project chosen to be studied. The first water was delivered to this project in 1955.

An input and output analysis was employed in this study to illuminate the penumbral area of agricultural production of a more or less homogeneous economic unit in one period of time (before irrigation, 1954) and compared to a later period (after irrigation, 1959) attempting to ascertain the economic consequences of a public policy program upon a community.

The agricultural economy of the area was divided into 13 sectors expressing inputs, outputs and intermediate flows. Four additional sectors expressed final demand and the disappearance of the counties' agricultural production. A transactions matrix of these sectors was constructed for the years 1954 and 1959.

Three functional relationships were derived for each matrix entry where appropriate. The comparison of the aggregate relationships and the determination of the changes in product mix constituted the empirical analysis.

Net income increased by an estimated $167,629 from 1954 to 1959. The government received 56 percent of small grains in 1954 but only 45 percent in 1959. It received 19 percent of the feed grain production in 1954 and 94 percent in 1959.

Two exegenous factors might have resulted in obfuscation of the effects of irrigation development on the community. These factors were changes in price level and changes in weather. The change in price level was eliminated by using 1959 prices throughout. The weather was more favorable to farming in 1954 than in 1959. Republic County during the same period sustained a 10,120 acre reduction in cropland.

Because all the benefits, or lack of benefits, cannot be empirically expressed, four trips were made to the area to interview some of the people in the community who have directly or indirectly been affected. Businessmen in the area report an increase in business but also have been confronted with increased competition from establishments outside the usual trade area. Grain storage facilities have increased five-fold in comparison to surrounding counties. Carloadings to all points in the community have increased whereas most other points in the area have been undergoing a reduction in rail traffic.

Sixteen new homes have been built in Courtland since 1954. This town is enjoying an increase in population while other towns in the area are decreasing; some into oblivion. The people of this town are confident of it's continued growth. Recently the citizenry approved the sale of $102,000 of bonds to finance a central water and sewage system. The irrigation ditches have raised the water table of the community thereby reducing the necessary depth of the wells. The recreational facilities provided by Lovewell Dam and Reservoir can be considered an important tertiary benefit to the community.

An attempt to weigh the increased economic activity of the Kansas Bostwick Division from 1954 to 1959 against the possibilities of decreased economic activity would swing the balance in favor of increased economic activity. To people living adjacent to the community it is apparent the community has received a very real and tangible benefit. It is possible, however, that time will bring to light the greatest benefit; that of stabilizing the communities' major industry, agriculture.