

AN ABSTRACT OF THE THESIS OF

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Restrictions of Proposed Amendments to the Reclamation
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The Reclamation Act of 1902, as amended, is the basic legislation governing the distribution of water from federal projects for irrigation purposes. In the three-quarters of a century since the passage of this Act, technological, economic, and legal developments have forced a reappraisal of the original intent of the Reclamation laws.

Several proposals have been made to amend these laws and enforce provisions that put the current distribution of the rights to public water and related land resources in jeopardy. This study attempts to evaluate these proposed amendments in terms of the irrigation rights that would be displaced if the amendments were rigidly enforced in three of Oregon's largest federal irrigation districts.

The method of analysis proceeds by combining secondary data on land ownership with primary survey data on leasing arrangements to generate a distribution of farm sizes for each district. Each farming unit as a whole is then evaluated for any excess acreage that would be displaced from applying the ownership, leasing, and residency provisions of each of the proposals. Excess acreage is summed and extrapolated over the irrigation district to provide an estimate of the effect of enforcing each proposal in each district.

The results of the analysis indicate that the various proposed restrictions will result in widely different sets of effects. Two of the proposals, that of the Department of Interior and that of National Land for People, are restrictive enough to cause 17,000 and 23,000 acres of excess land, respectively, across all three irrigation districts. The other two proposals analyzed, that of Senators Church/Hatfield, and that of Farm/Water Alliance, will result in little or no excess land in these districts.

Evaluation of the Ownership, Leasing,
and Residency Restrictions of Proposed
Amendments to the Reclamation Laws:
Three Federal Irrigation Districts in Oregon

by

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EVALUATION OF THE OWNERSHIP, LEASING,
AND RESIDENCY RESTRICTIONS OF PROPOSED
AMENDMENTS TO THE RECLAMATION LAWS:
THREE FEDERAL IRRIGATION DISTRICTS IN OREGON

I. INTRODUCTION

The Bureau of Reclamation, Department of the Interior, plans, constructs, and operates multi-purpose water resources projects, primarily to provide irrigation water to arid and semi-arid lands in the seventeen western states. The construction of the projects is financed with public funds, and most of the water from the projects is generally sold to irrigation districts -- organizations created under state law to contract with the Bureau of Reclamation for the purchase of water, and to distribute the water to farmers.

The Reclamation Act of 1902 (43 U.S. Code 391), as amended, is the basic legislation governing the sale of water from Bureau projects for irrigation purposes. Several laws were enacted by Congress prior to 1902 to promote the settlement and development of public lands. Each of these acts provided for the distribution of public land to qualified persons and limited the acreage of land that a person could acquire.

Section 5 of the Reclamation Act provided, among other things, that privately held land within a project area could not receive a right to use federal irrigation water for more than 160 acres in any one ownership. In return for the

publicly provided water, the landowner was obligated to pay his share of the project construction costs in interest-free annual installments over a period of ten years (later increased to forty years plus a ten-year development period -- 43 U.S.C. 485). This interest-free financing of project costs represented a governmental subsidy in favor of the private landowner. The 160-acre limitation provision confined the enjoyment of this subsidy to tracts of not more than 160 acres in a single ownership. The acreage limitation as applied to private lands was thus the quid pro quo for the financial assistance afforded by the freedom from an interest burden on the deferred installments of the repayment obligation. In effect, the government borrows the money and builds the project. The landowner receiving project water pays no interest on the deferred installments as he repays the government, (through his local irrigation district), for his share of the cost of the project. Thus, to the extent that the landowners do not reimburse the government for the full cost of the project, they receive a direct subsidy.

This federal assistance in the reclamation of the drylands of the West has historically been justified in substantial part by the desirability of fostering the family-farm and its way of life. The legislative history of the

Reclamation law indicates that Congress had as its objectives to:

- distribute the benefits of the subsidized irrigation program to the maximum number of farmers on the land;
- promote the family-sized owner-operated farm as a desirable form of rural life;
- preclude the accrual of speculative gains from the federal irrigation investments.

(Federal Register 8/25/77, part 426.1)

Identification of the Problem

In the three-quarters of a century since the passage of the Act, the production and management techniques of agriculture have changed drastically, and it is often charged that the enforcement of the 160-acre limit would result in farms which would be too small to provide for the needs of a single family. A system of smaller family-sized farms, as envisioned by the legislative objectives, would arguably be more equitable, but the question arises under modern economic conditions: what is the optimal economic size of a farm that is irrigated with federal (i.e., public) water? This farm size will likely vary from region to region based on geographical as well as economic differences, and in many instances may be greater than the 160-acre limit proposed by the 1902 Act. The debate over Reclamation

policy thus revolves around the issues of farm-size efficiency and the equitable distribution of the publicly provided water subsidy.

In an economy based upon profit and freedom of enterprise, operators seeking to maximize net incomes have rationally adjusted farm unit size to meet changes in economic conditions. Under these circumstances, it is not surprising that the regulations of the 1902 Reclamation Act, and the issuance of rules interpreting the Act, as amended, have not resulted in preventing large landowner and farm operators from acquiring federally irrigated holdings in excess of the intent of the law, and thus excessively benefiting from the program.

Recent legal developments, however, have forced a return to, and reappraisal of, the original intent of the law. The focus for this legal action was the Bureau of Reclamation's Westland Water District in the Central Valley of California. An investigation was conducted by the Comptroller General of the United States, in 1972, of several irrigation districts served by the Central Valley Project. That investigation showed that the 160-acre limitation had not hindered the subsidization of large landholders and farm operators because they were being supplied with water from Central Valley Project for use on more than 160 acres by leasing other eligible lands, and were controlling eligible

lands through corporations, family partnerships, and trusts.^{1/}

As a result of these developments, National Land for People, Inc., a Fresno-based private research organization, filed suit against the Bureau of Reclamation questioning procedures used in allocating federal irrigation water. On August 13, 1976, the U.S. District Court for the District of Columbia, in the case of National Land for People, Inc., V. The Bureau of Reclamation, et. al., (civil action No. 76-928), ordered the Department of the Interior to "...forthwith initiate public rulemaking proceedings... respecting the criteria and procedures to be used by the Bureau of Reclamation, to approve excess land sales under the Federal Reclamation Laws." In response to the court order, the Department of Interior issued proposed changes in the regulations to be used in administering the acreage limitation provisions. These proposed regulations were made public in the Federal Register of August 25, 1977. Briefly summarized (later to be dealt with extensively), these proposals would:

^{1/} The amount of eligible land that a farmer leases from other landowners has not been restricted under the Reclamation laws. Thus, there has been no systematic recording of leasing arrangements in any of the irrigation districts, permitting the establishment of federally irrigated holdings exceeding the limits originally intended by the laws.

- establish a residency requirement for owners of eligible land to live within a radius of 50 miles of the tract receiving project water;
- restrict leasing to 160 acres per eligible owner and prevent a seller of excess land from leasing back the same parcel from the buyer;
- allow multiple-ownership only where a direct lineal family relationship exists;
- mandate recordable contracts requiring disposition of excess lands within five years, and the buyers are to be chosen by lottery;
- require the sale price of excess land to be approved by the Secretary of Interior, to guarantee that the price does not include the value of project benefits accruing to the land from irrigation.

In response to these Department of Interior proposals, public and private demand for investigative hearings and research arose to determine the potential economic impact of the enforced regulations. Public hearings were conducted in various cities throughout the West to gather testimony from farmers and other concerned citizens regarding reclamation in the West. Universities and government research organizations began conducting analyses of relevant problems concerning the effects of enforcement of the new regulations.

On the political front, there arose alternative proposals to those of the Department of Interior to amend the reclamation laws. These are currently in the form of bills pending before Congress. Among these, the most highly

publicized, and those which are of interest for this analysis are those by:

- National Land for People, Inc.
- Farm/Water Alliance (a private farm-interest lobby group)
- Senators Mark Hatfield and Frank Church

Statement of Objectives

These four alternative proposals to amend the reclamation laws will be evaluated on the basis of the impacts each might be expected to produce in selected irrigation districts in Oregon. The three districts chosen for the analysis are:

- 1) The North Unit Irrigation District in the Deschutes Project in Jefferson County, Oregon;
- 2) The Klamath Irrigation District in the Klamath Project in Klamath County, Oregon;
- 3) The North Board of Control Irrigation District in the Owyhee Project in Malheur County, Oregon.

The impacts of the proposed regulations on these three irrigation districts will be measured in terms of the excess land that would result from the enforcement of various components of each proposal, specifically the ownership, leasing, and residency restrictions. (These will be detailed in the next chapter).

The specific objectives of this analysis are:

- 1) To examine economic concepts and empirical literature on the relationship between farm size and efficiency and attempt to draw conclusions about the economic consequences of acreage restrictions;
- 2) To develop a method for the collection of empirical data on the distribution of farm sizes (including owned and leased parcels of farm land) in the selected irrigation district study areas;
- 3) To evaluate and compare the ownership, leasing, and residency restrictions of four proposals to amend the Reclamation laws, by determining the excess land that would result from the enforcement of these proposed restrictions in the study areas.

In pursuit of these objectives, the analysis will rely on both primary and secondary sources of data. Insofar as farm operations are a non-homogeneous mixture of owned, leased, and custom-farmed land, an accurate distribution of farm sizes should reflect empirical information on each of these forms of agricultural land use. Secondary data on ownership of federally irrigated land is available for this study from irrigation district records. Some information on leased land is recorded by local tax assessors but is by no means systematic or complete, making it practically useless for any comprehensive analysis of the extent of leasing. Systematic data on custom farming is likewise not available. Therefore, for this study, primary data on leasing and custom farmed land is to be generated through a survey

questionnaire that will be mailed to owners of federally irrigated land. This primary data on leasing and custom farming will then be combined with the secondary data on ownership to derive the distribution of farm sizes for each district. The proposed amendments to the Reclamation laws can then be evaluated and compared on the basis of the excess land each would create through enforcement of its provisions in each irrigation district.

The general arrangement of the thesis will be as follows. The next chapter will describe the historical development of the Reclamation laws and present the various proposals to amend them. Chapter III will then describe the study areas and the reasons for their selection. Next, Chapter IV will examine the relationship between economic efficiency and farm size, followed in Chapter V by the analytical methodology employed in obtaining the results. Chapter VI presents the empirical results, an evaluation of bias in the survey data, and conclusions of the study.

II. DEVELOPMENT OF THE RECLAMATION LAWS

On June 17, 1902, Congress passed into law the Reclamation Act to encourage the settlement and development of the vast arid region between the Midwest and the Pacific Coast. This Act represented the culmination of over a century of Congressional land-settlement legislation designed to expand the productive capacity of agriculture in order to assure adequate food supplies and to improve the economic well-being of the rural population. The primary agricultural development tool in all these federal policies was the distribution and improvement of public lands.

The concept of a limitation on the acreage an individual can obtain through a federally-sponsored, publicly-provided land development program predates the Reclamation Act by over 100 years. As early as 1790, a plan was developed by then Secretary of the Treasury, Alexander Hamilton, for the disposition of the public domain in sections of 640 acres, at prices as low as two dollars per acre. Hamilton's plan was subsequently approved by Congress and thus became national land policy on May 8, 1790 (1 Stat. 464).

The first recorded reference to the concept of 160 acres as the limit in the disposition of public lands

occurred in 1796, during a Congressional debate over modifications of the 1790 Act. However, Congress did not formally adopt the 160-acre "family-farm" concept until the Preemption Act of 1841, which allowed up to 160 acres of dry public land to any individual homesteader (Act of September 4, 1841, 5 stat. 453). By this Act, Congress gave priority to the settler interested in developing a family-sized farm. At this point, however, Congress was still insisting that the public domain should be sold for revenue purposes, and that the objective of settlement and development of the public domain was secondary. Only with the passage of the Homestead Act of 1862 (Act of May 20, 1862, 12 stat. 392), after a great deal of debate and consideration, did Congress reject the policy of selling the public domain and decided instead to provide homesteads to actual settlers on the public lands (Renda, 1975).

Within a very few years, however, it became evident that this law was not suited to the arid lands of the West, which would require irrigation development to become productive. The drive for legislation to use the disposal of public lands as an incentive to irrigation development began, and produced concrete results with the passage of the Desert Land Act of 1877. By the terms of this law, a settler might purchase one section (640 acres) of land if he agreed to irrigate it himself within three years of

filing for ownership. Extensive use was made of this method of acquiring public lands, and close to a million acres per year were entered under the law.

By 1890, however, provisions in the Desert Land Act were modified by Congress. Serious questions had arisen regarding the reasons why a settler should be permitted to acquire 640 acres for farming under the Desert Land Act, when the Homestead Act allowed only 320 acres, notwithstanding the fact that provisions of the former required the landowner to irrigate the land. The result of this conflict was a change in the Desert Land Act restricting to 320 acres the limit for an individual landowner, and required (unspecified) improvements of one dollar per year for three years. However, there were numerous abuses of the Desert Land Act, despite the modifications of 1890, as various methods were devised to circumvent the restrictions, such as the 'improvements' clause. Subsequently, there arose strong political pressure for irrigation development to be taken over, and directly administered, by the government, preferably at the state level (Huffman, 1953).

In the Carey Act of 1894 (Act of August 18, 1894, 28 stat. 422), Congress attempted to achieve some of these irrigation development aims by agreeing to grant to each of the western states up to one million acres of land upon proof of reclamation. It is interesting to note that in

the Carey Act, Congress continued to rely on its 160-acre limit, in that the Act provided the states could not "sell or dispose of more than 160 acres to any one person." However, neither the Desert Land Act nor the Carey Act produced a satisfactory irrigation development program in the West, and by 1900 Congressional support was in favor of a program of reclamation by the federal government.

Congress passed the Reclamation laws by the Act of June 17, 1902. The Act was entitled:

"an Act appropriating the receipt from the sale and disposal of public lands in certain states and territories to the construction of irrigation works for the reclamation of arid lands."
(32 stat. 388)

Section 5 of the Act provides that,

"No right to the use of water for land in private ownership shall be sold for a tract exceeding 160 acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefor are made."

Thus, the basic pattern for federal reclamation projects was established; but Congress soon found the pattern wanting and began making refinements. In 1910, the Reclamation Act was amended to permit owners of lands receiving federal irrigation water to live up to 50 miles from their lands and still retain their eligibility qualifications.

In 1911, the Warren Act was passed, allowing the sale of excess federal irrigation water under the restrictions of the Reclamation Act. The Reclamation Extension Act of 1914 lengthened the ten-year repayment period, established under the 1902 Act, to twenty years. In addition, this Act further emphasized the objective of encouraging family farms on federal projects. Section 13 of this Act declared that the size of individual homesteads on public irrigation projects may be of any acreage determined (by the Department of Interior) to be sufficient for a farm unit, up to 160 acres.

One of the major amendments to the Reclamation laws came in the Omnibus Adjustment Act of 1926. In addition to further extending the project repayment period from twenty to forty years, it provided that,

- 1) no water would be delivered upon completion of a project until contracts had been entered into for payment of construction, operating, and maintenance costs;
- 2) any landowner holding irrigable land in excess of 160 acres was required, before receiving water for the excess land, to enter into a valid recordable contract with the Department of Interior, agreeing to sell his excess land under terms and conditions satisfactory to the Secretary; and,
- 3) excess lands should be appraised and evaluated without reference to the value attributable to the proposed irrigation project, and that sale prices should not exceed the appraised value.

(U.S.D.I. - Bureau of Reclamation, Federal Reclamation Laws Annotated, Washington, D.C. 1947, pp. 318-319).

The arrangements whereby irrigation water is priced and financed have been the object of much debate and complex legislation. The basic problem in repayment of public funds expended on federal irrigation projects is to devise a repayment plan which conforms to the farmer's ability to pay. To accomplish that, the plan would have to take into account both physical and economic variations. The Reclamation Project Act of 1939 set up a variable repayment plan, in effect separating repayment requirements from the actual cost of delivering the water. Charges to water users were converted from a cost basis to an ability to pay principle. (Federal Reclamation Laws Annotated. op cit., pp. 588-604).

Through all the legislative amending and political rhetoric, one clear and uncomplicated decision stands out, stated in Section 5 of the 1902 Reclamation Act:

"No right to the use of water for land in private ownership shall be sold for a tract exceeding 160 acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land . . . or in the neighborhood of said land."

The wording of this section of the law is so unequivocal that there would seem to be little room for violation. In Oregon, at least, this seems to be the case. For example, in that portion of Oregon within the Pacific Northwest Region of the Bureau of Reclamation, (excludes Klamath River Basin), there were 313,400 irrigated acres in 1976. Of that total, 8,685 acres were excess lands, ineligible to receive federal water. Of those, only 6,267 acres received water in violation of the law (see Table I) (Federal Reclamation Projects Summary Report, 1976).

Thus, in most federal irrigation districts in Oregon, the letter of the law has been applied, and the acreage limitation on ownership has been enforced. However, it is in the interpretation of the intent of these laws that problems have arisen. The two fundamental issues, from which problems arise, and which are to be investigated in the empirical analysis of this study, are the leasing of federally irrigated land and the residency requirement.

Leasing Restrictions

It is difficult to over-emphasize the importance of leasing in modern agriculture. Leasing provides flexibility for a farmer to adjust his operational size to reflect changes in the economics of farming. Figures from the U.S. Department of Agriculture indicate that as much as 40 percent of all farmland in the nation is leased (Farm/Water

TABLE I. PACIFIC NORTHWEST REGION - EXCESS LAND SUMMARY BASED ON OWNERSHIP (excludes Klamath River Basin)

State	Total irrigable acres	Total excess acres	Percent of total in excess	Eligible acres ^{2/}	Ineligible acres served	Ineligible acres not served	Total ineligible
Oregon	313,400	11,458	3.7	2,862	6,267	2,419	8,685
Idaho	1,392,587	16,899	1.2	4,336	5,526	6,724	12,260
Washington	939,156	18,463	2.0	4,885	6,507	7,003	13,165
Montana	22,019	1,693	7.7	-	1,040	653	1,693
Region total	2,667,162	48,513	1.8	12,083	19,340	16,799	35,803

^{2/} Landowner signed recordable contract. See Glossary for definition of eligible acres.

Source: U.S.D.I., Bureau of Reclamation, Federal Reclamation Projects Report, 1976.

Report, December 29, 1978). It is important to note that leasing has never been restricted under the Reclamation laws. Partially for this reason, and partially reflecting the dynamic and complex nature of leasing arrangements, there has been no systematic recording of leasing in Oregon's federal irrigation districts. Currently, however, three of four leading proposals to amend the Reclamation laws, including the Department of Interior's, would restrict leasing. Thus, it has become one of the objectives of this study to evaluate the excess land that would result from the restriction of leasing under these proposals in three federal irrigation districts in Oregon.

Residency Requirement

The other issue of concern in amending the Reclamation laws is the residency requirement. It may be recalled that Section 5 of the 1902 Act specified that a landowner who receives federal water must reside "in the neighborhood of the land." This was interpreted by Congress in 1910 as living within a radius of fifty miles of the irrigated land. However, the Omnibus Adjustment Act of 1926, which consolidated some of the provisions in prior acts, failed to mention the residency requirement. The Bureau of Reclamation thus assumed that residency was no longer required, and from 1926 on no such requirement has been imposed upon

water users within a federal Reclamation project. Nevertheless, again, the interpretation of the intent of the law has produced a problematic issue. In 1972, a U.S. District Court judge in California held that contrary to the long established interpretation and practice of the Bureau of Reclamation, the residency requirement of Section 5 of the 1902 Act is an abiding restriction upon the right to receive federal project water, continuing in perpetuity until Congress changes the Reclamation laws by appropriate statutory enactment (Yellen v. Hickel, 352 F. Supp. 1300, (1972)). In response to this decision, and subsequently the decision in National Land for People, Inc., v. Bureau of Reclamation, the four proposals analyzed in this report all contain reference to the residency requirement, two retaining it and two abolishing it. Thus, another objective of this study is to evaluate the effect, in three of Oregon's federal irrigation districts, of applying the residency requirement, as outlined in the proposals to amend the Reclamation laws. The residency and leasing restrictions of these proposals will be briefly explained next.

Proposed Amendments

Department of Interior

Secretary of the Interior, Cecil Andrus, issued these rules and regulations in August, 1977. Their approval by

Congress and enforcement await a pending environmental impact statement, which is due for completion sometime in late 1980. At that time, final recommendations will be made on the leasing and residency restrictions. Currently, this set of proposed amendments would allow a resident adult to receive project water on 320 acres of owned land, with an additional allowance for 160 acres of leased land, for a total of 480 acres. However, multiple family ownerships, such as family corporations, joint tenancies, partnerships, or trusts, where owners are resident adults in an immediate family relation, could hold up to 960 acres, so long as no more than 480 acres is owned and leased on behalf of any one resident adult owner. Thus, the maximum allowable farm size would be 960 acres. In addition, the residency requirement stipulates the owner receiving water must live within fifty miles of the irrigated parcel.

Church/Hatfield Bill

Senators Frank Church of Idaho and Mark Hatfield of Oregon are the principal sponsors of this bill entitled "The Reclamation Reform Act of 1979." It has been introduced into the 96th Session of Congress where on September 14, 1979 the Senate passed the Bill (S.14) by a vote of 47 to 23. Briefly, the major amendments to the Reclamation laws which this bill proposes would allow an absolute

maximum federally irrigated farm size of 1,280 acres, owned or leased in any combination. The 1,280 acre limitation, as such, would not be based on the size of the family as it is under current law, but on the total amount of land owned and operated by a single person, family, or legal entity benefiting up to 25 persons. In addition, the residency requirement would be abolished.

National Land for People, Inc.

National Land for People is a private research organization, based in Fresno, California, whose primary concern is land reform. Its proposals to amend the Reclamation laws are the most restrictive of any of the proposals in terms of allowable farm size, reflecting the objective of a wide distribution of land and water benefits. Briefly, its proposals would allow privately owned parcels of land to receive up to 640 acres of federal irrigation water and would permit leasing of additional irrigated acreage only in emergencies (such as illness of the owner) or by lottery directly from the government. Furthermore, the residency requirement would force the owner of irrigated land to live within fifteen miles of the land.

Farm/Water Alliance

These amendments to the Reclamation laws represent the interests of a private pro-farming lobby group, which has introduced a bill into the 96th Congress (S.633) entitled "Farm Water Act of 1979." This Act would limit an individual farmer to 320 acres ownership of federally irrigated land and would allow unlimited leasing, i.e., there is no limitation on the size of farming operation. In fact, it is stated in the Bill that,

"This acreage limitation (on ownership) can only be acceptable with no limit on leasing. Any kind of ceiling on leasing must be considered with an increased ownership figure." (Statement of Senator McClure, Idaho, in presenting the Farm/Water Act to Congress, March 13, 1979).

Furthermore, this Bill would amend Section 5 of the 1902 Reclamation Act by completely eliminating the residency requirement.

TABLE II. OUTLINE OF MAJOR ELEMENTS OF PROPOSALS
TO AMEND THE RECLAMATION LAWS

Limitation proposal	Maximum owned eligible acreage per individual	Leasing restriction	Maximum size of farming operation	Residency requirement
1) Department of Interior	320 ac.	160 ac.	960 ac.	50 miles
2) Church/Hatfield	1,280 ac.	any combination of owned or leased	1,280 ac.	abolished
3) National Land for People	640 ac.	no leasing	640 ac.	15 miles
4) Farm/Water Alliance	320 ac.	unlimited	unlimited	abolished

III. SELECTION AND DESCRIPTION OF STUDY AREAS

This chapter has two purposes. The first is to explain the reasoning behind the choice of study areas used in this analysis. The second purpose is to describe the study areas, in terms of both physical and economic features.

One of the primary objectives of this project is to integrate secondary data on ownership with primary data on leasing. This information is then used to analyze the impact of restricting farm size. In so far as it was known that a survey would be used to generate leasing data, and in view of the potentially low rate of response to the survey, it was decided to examine a fewer number of districts more thoroughly rather than more, or perhaps all, districts only superficially. It was felt that this approach would provide more accurate information on the extent and distribution of leasing.

Site Selection

Since all of the major federal irrigation districts in Oregon are located East of the Cascade Mountain Range, only these needed to be considered for the analysis. The choices were narrowed down to these three, as aforementioned:

- 1) the North Unit District of the Deschutes Project in Jefferson County;

- 2) the Klamath District of the Klamth Project in Klamath County;
- 3) the North Board of the Owyhee Project in Malheur County.

The specific reasons for choosing these were a) the geographical location and distribution, b) the size of the projects, and c) the benefits of past studies having been conducted in these districts.

a) Geographical location of districts -

These three irrigation districts are widely dispersed geographically across the drylands of Oregon, East of the Cascades, and represent a broad cross-section of economic, physical, and social characteristics. These characteristics include crop patterns, marketing conditions, climate, soil, and various institutional constraints such as credit availability, traditional farm practices, etc. This diverse distribution of factors, which are relevant to an analysis of farm size, allows for a wider applicability of the results, in that it eliminates some of the potential for bias inherent in an analysis of otherwise different areas, influenced by some similar conditions.

b) Size of districts -

The North Unit, Klamath, and Owyhee-North Board irrigation districts are among the largest in Oregon.

In 1977, Oregon had approximately 478,000 acres of federally irrigated land. These three districts represent over 32 percent of that total, or 154,000 acres (Bureau of Reclamation, 1977). The large size of these projects enables the evaluation of the greatest amount of federally irrigated acreage in Oregon, while still confining the survey and analysis to only three districts, thereby facilitating the collection and evaluation of data.

c) Past studies -

There have been some past studies (Wyckoff, et. al., 1977) analyzing various aspects of these three irrigation districts. These provided a familiarity between the staff of the irrigation districts in these areas and the Department of Agricultural and Resource Economics at Oregon State University. In view of the controversy surrounding the issues under analysis in this study, the knowledge of past objective research conducted by this Department enabled the irrigation district officials to more openly discuss conditions in their local areas.

Description of Study Areas

In this section, a brief description of each federal irrigation district is presented for the purpose of

evaluating similarities and differences in physical and economic conditions. These conditions include geography, climate, water sources and delivery systems, irrigated crops, and economic data pertaining to project construction, maintenance, and repayment.

Each irrigation district in this analysis represents part of a larger irrigation project. Each of these irrigation projects is located East of the Cascade Mountains in Oregon, and each receives water from a different watershed.

Deschutes Project -- North Unit Irrigation District

North Unit Irrigation District furnishes a full supply of irrigation water for approximately 50,000 acres in Jefferson County of Central Oregon, in the vicinity of the town of Madras. A map of the district is presented in Figure 1. Seventy percent of the irrigable acreage is suitable for intensive row crop cultivation. The frost-free growing season ranges from 110 to 120 days. Principal crops include wheat, barley, alfalfa, potatoes, grass seed, pasture and peppermint.

District water is obtained from natural stream flow of the Deschutes River and is stored in Wickiup Reservoir. Water released from Wickiup Reservoir utilizes the Deschutes River streambed as its channel for the first 45 miles of flow. At Bend, the water is diverted into the North Unit

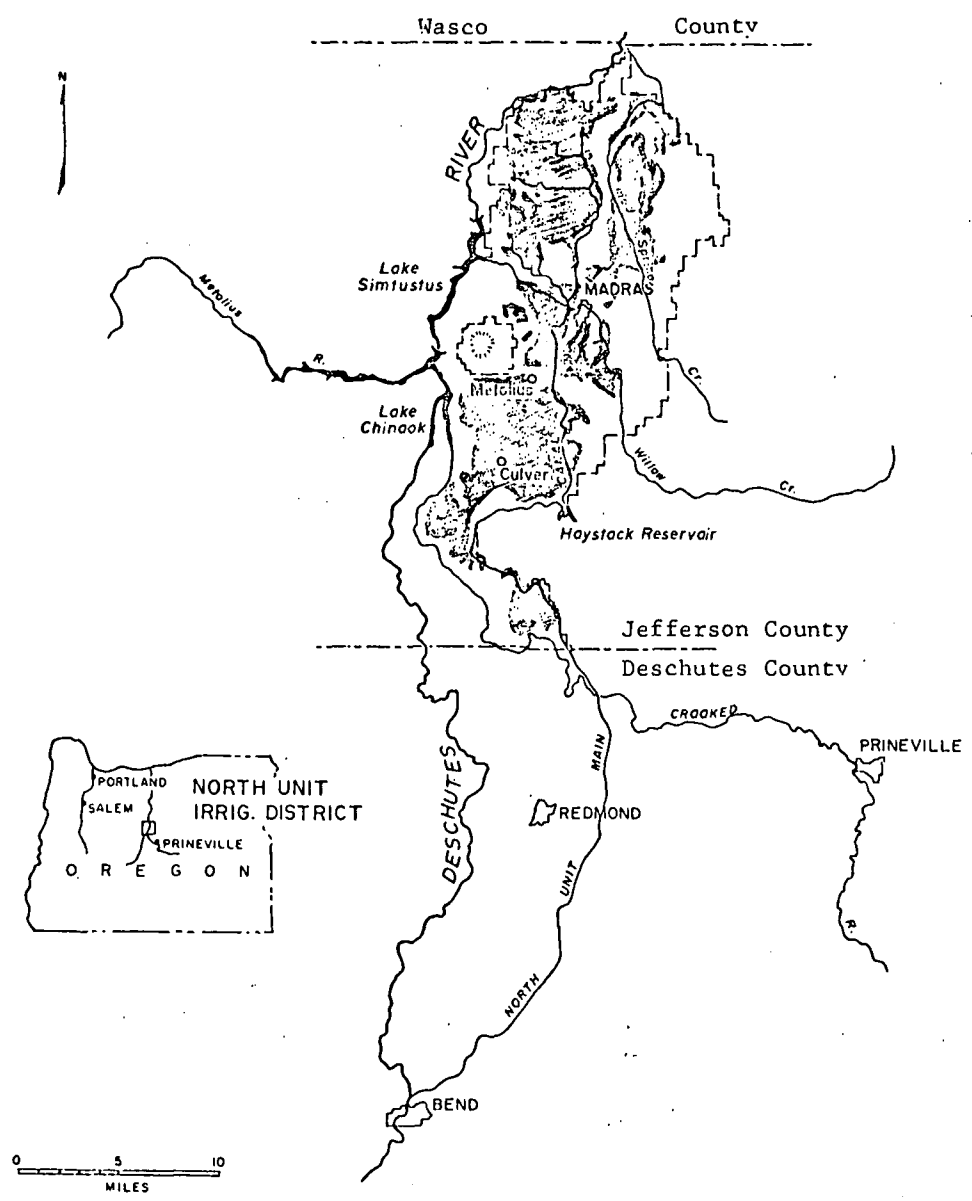


Figure 1: North Unit Irrigation District

Main Canal System. The Main Canal carries the water for 65 miles, through the Redmond area, to the farmlands of the North Unit Irrigation District. About 60 percent of the water supply released from Wickiup Reservoir is delivered to farms. Water loss is attributed to seepage and percolation in the Deschutes River and the open main land and laterals. Open laterals are replaced with underground delivery systems in cases where landowners pay for cost of pipe purchase and installation.

Project construction began in 1938 on the Main Canal and in 1939 on Wickiup Reservoir. The first year of irrigation was 1940. The entire Deschutes Project (97,000 acres) has produced a cumulative crop value through 1977 of over \$400 million. In 1977, over 125,000 ac./ft. of water were delivered to the North Unit district, (an average of 2.75 ac./ft. per irrigable acre), which produced a gross crop value for the year of over \$20 million (\$452 per irrigated acre).^{3/}

Farmers in the district pay an annual assessment per irrigable acre to cover operation and maintenance costs, and receive a base water allotment. This allotment is two ac./ft. per acre for most of the farmlands. For additional

^{3/} Source: U.S.D.I., Bureau of Reclamation, Federal Reclamation Projects Report, 1977.

water supplied, if available, farmers pay a graduated charge for each acre-foot.

Klamath Project -- Klamath Irrigation District

The Klamath Irrigation District provides water for 40,000 acres in Klamath County of southern Oregon, near the town of Klamath Falls. A map of the area is presented in Figure 2. The frost-free growing season ranges from 90-140 days; however, some frost can be expected at any time during most years. Annual precipitation varies from 9 to 23 inches in the agricultural areas, with an average of about 12 inches. Only 25 percent of the precipitation occurs during the June through September period, and these dry summers render irrigation necessary for most crops. The principal crops grown in the district are cereal grains, alfalfa hay, potatoes, irrigated pastures, onions, and grass seed.

Irrigation water for the Klamath Irrigation District is delivered from storage in Upper Klamath Lake into the "A" canal, and then distributed through 200 miles of canals and laterals extending from Klamath Falls in the North to the California border. The water is used on croplands and runs off through a system of drainage ditches into Lost River.

Project construction began in 1906 with irrigation water first being delivered in 1907. The entire Klamath

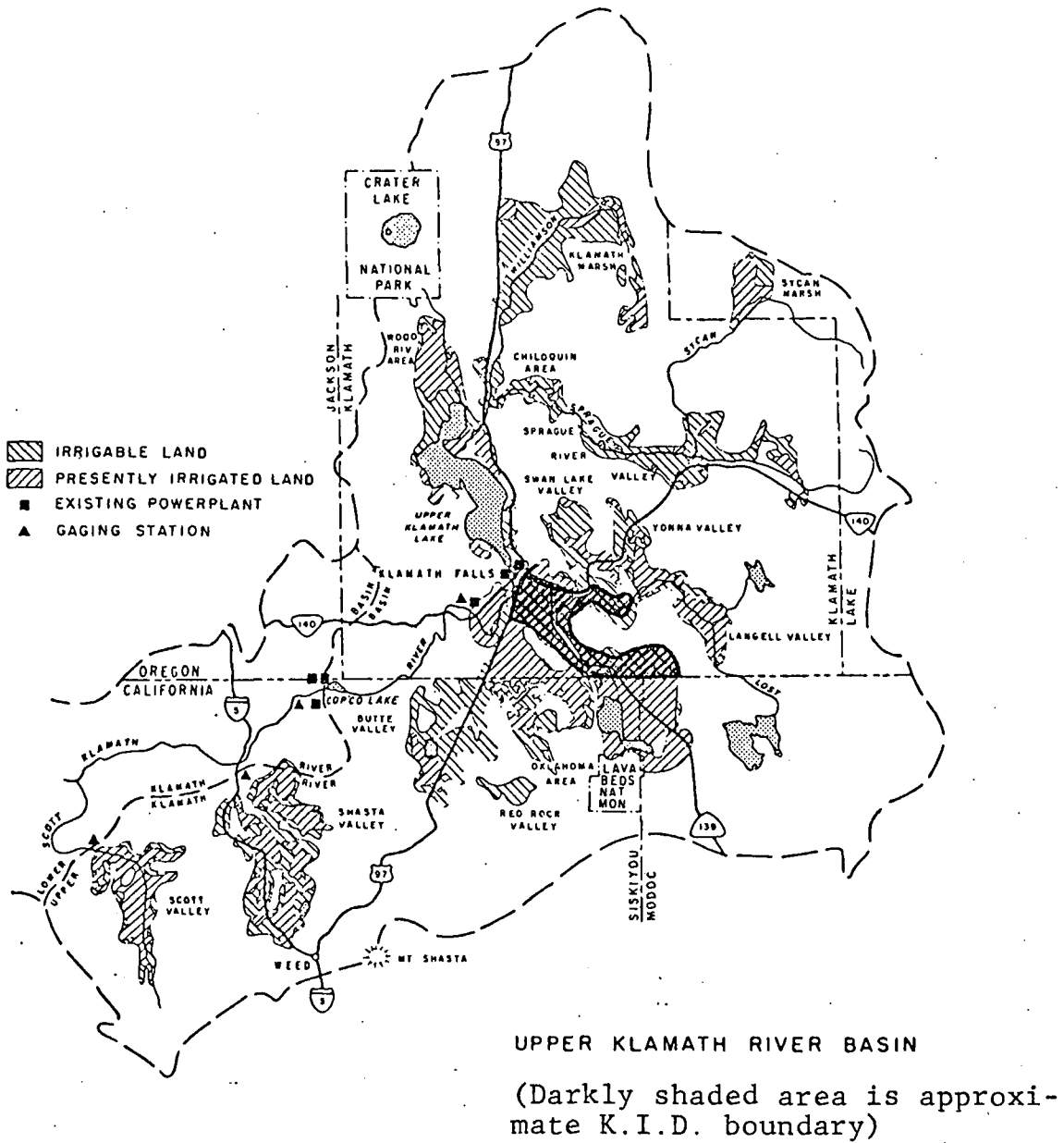


Figure 2. Klamath Irrigation District.

Project (224,000 acres) has generated a cumulative gross crop value of over \$1 billion, of which the Klamath Irrigation District represents about 17 percent, or \$170 million. Operation and maintenance of the irrigation and drainage system is paid for through an annual assessment per irrigated acre. This assessment allows each landowner a base water supply which averages about 3 ac./ft. per acre during the summer water season. In the Klamath District,⁴ this amounts to 120,000 ac./ft. per year. In 1977, this irrigation water produced a gross crop value in the district of \$7.8 million and an average value per irrigated acre of \$235.^{4/}

Owyhee Project -- North Board of
Control Irrigation District

The North Board of Control District furnishes water for 65,000 irrigable acres in Malheur County of Eastern Oregon, near the town of Nyssa. A map of the district appears in Figure 3. Some 70 to 75 percent of the irrigable acreage is adapted to production of intensive crops. The frost-free growing season ranges from 155 to 168 days. Principal crops include cereal grains, onions, alfalfa, potatoes, sugar beets, sweet corn, legume seed, and pasture. Apples, prunes, and other small fruit are grown, and produce well,

^{4/} Ibid.

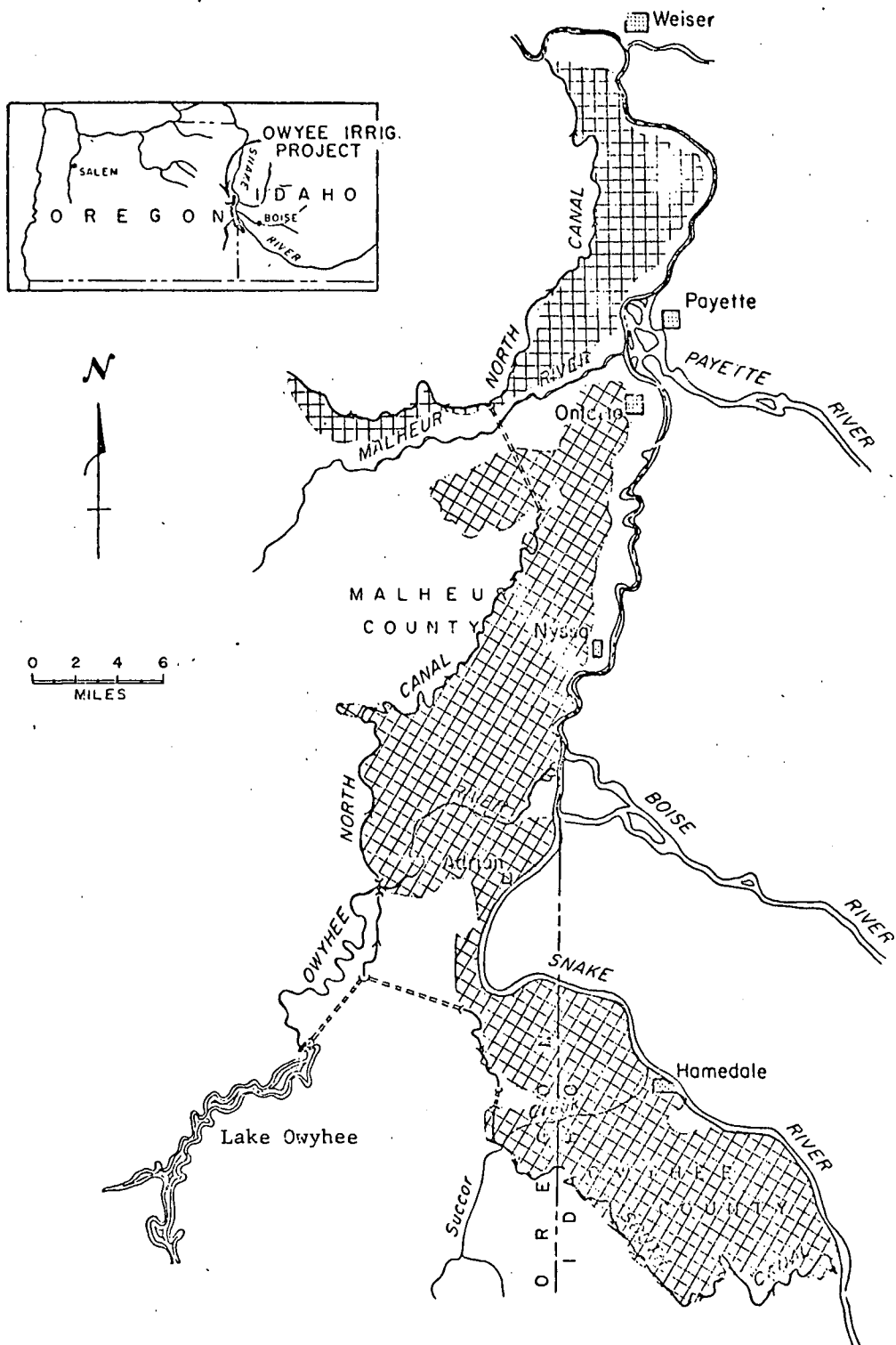


Figure 3: Owyhee Irrigation Project
Oregon - Idaho

but fruit growing has not been developed to any great extent.

Irrigation water for the district is obtained from storage in Lake Owyhee on the Owyhee River, a tributary of the Snake River. Water stored in the 1,120,000 ac./ft. Owyhee Reservoir is released through a tunnel and diverted into a main canal. In years when Owyhee Lake is not filled from snow-melt run-off, or when peak summer demands exceed the flow capacity of the delivery system, water is pumped directly from the Snake River. The main canal system is some 70 miles long and virtually unlined, making the delivery system subject to water loss from seepage and percolation. About 72 percent of the water diverted from the Owyhee Reservoir for irrigation purposes is delivered to farm water users.

Project construction began in 1928 with the first irrigation water being available in 1935. The entire Owyhee Project (118,000 acres) has produced a cumulative crop value through 1977 of over \$774 million. In 1977, over 238,000 ac./ft. of water were delivered to the North Board of Control, with an average of 3.87 ac./ft. per acre. The district produced a gross crop value of \$25.8 million for 1977, for an average value per irrigated acre of \$418.^{5/}

^{5/} Ibid.

Farmers pay an annual assessment per irrigated acre to help cover district operation and maintenance costs. This assessment provides each landowner with a base water allotment which, in recent years, has been $3\frac{1}{2}$ to 4 ac./ft. per acre. For additional water, farmers pay a graduated charge for each acre-foot used.

IV. ECONOMIC THEORIES AND EMPIRICAL LITERATURE ON ECONOMIES OF SIZE IN AGRICULTURE

The ownership and leasing limitations in the proposed amendments to the Reclamation laws, summarized in the last Chapter, have added fuel to the debate over the costs and benefits of restricting farm size. Opponents of the small family-farm concept argue that consumer prices for food will rise to offset the increasing inefficiency of production. Proponents argue that consideration of equity and non-market social benefits would outweigh the higher costs implied by such policies. Thus, it becomes relevant to investigate the economic forces which determine the size and efficiency of agricultural production units.^{6/}

This Chapter examines the relationship between farm size and economic efficiency. An attempt is made to provide a conceptual framework within which to formulate conclusions about the loss of economic efficiency in Oregon's federal irrigation districts as a result of restricting farm size. The Chapter is divided into two sections. The first examines the theory of economies of size, which provides background

^{6/} While ownership is the basic criterion under the Reclamation laws, it is the size of the farming operation (owned and leased) that is crucial to a discussion of economies of size.

information necessary for an analysis of the factors which determine farm size and efficiency. The second section incorporates empirical evidence of farm-size/efficiency relationships in Oregon with findings from previous research on economies of size in farming.

Economic Theory of Size

In analyzing the overall potential impacts of enforcing farm size restrictions, the relevant criterion is: to what extent does economic efficiency decrease with farm size. The extent of this efficiency loss, and the most effective means to mitigate it, can only be known by examining the sources of efficiency associated with size.

The theory of economies of size is usually explained in terms of short-run and long-run production conditions. Short-run economies are viewed as resulting from fuller utilization of a fixed farm unit size. Long-run economies are viewed as resulting from efficiencies obtained by adjusting farm size. This concept is depicted in Figure 4.

The conventional short-run cost curves of a firm are smooth and continuous curves of costs per unit of output. These short-run average cost curves (SRAC) assume one or

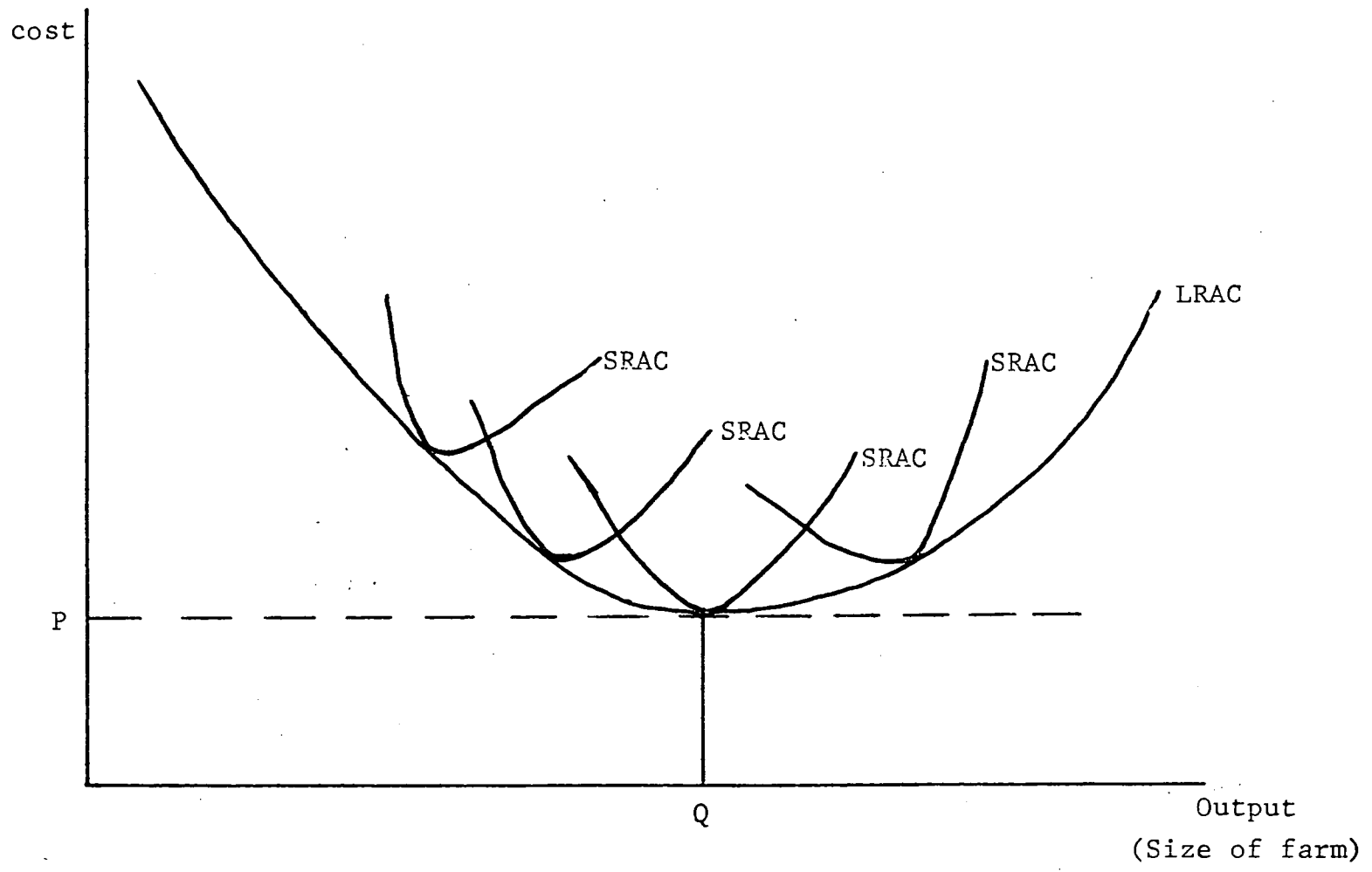


Figure 4. Short-run and Long-run Average Cost Curves

more resources to be fixed. The typical shape of these SRAC curves can be explained as follows. Average costs per unit of output decline with an initial increase of output because fixed costs are spread over more units. Eventually, however, average costs level off and then rise as other resources must be added in increasing proportions to the fixed resources to reach greater levels of output. A separate SRAC curve applies for each level of the fixed resources, for example, each farm size.

The long-run average cost curve (LRAC) assumes all resources are variable, including those designated as fixed in the short-run. An 'envelope' curve that is drawn tangent to the SRAC curves approximates the long-run economies of size curve for the various sizes of operating units represented by the short-run curves. This LRAC curve indicates the average total cost of production that would be experienced by firms of different sizes under assumed price relationships and technologies.

As the size of farms becomes larger, considering the expansion from the smallest possible farm, certain economies of size are usually realized, thus lowering average total costs. That is, after adjusting all inputs optimally in

the short-run, the unit cost of production can be reduced further by increasing the size of farms. The outstanding reasons for this were described by Adam Smith: specialization and division of labor. When the number of short-run variable inputs is expanded, fixed inputs remaining fixed, the opportunities for specialization and division of labor are rapidly exhausted. The marginal product curve rises, but it soon reaches a maximum and declines thereafter.

When both variable and fixed inputs are expanded together, however, substantial gains may be realized by division of labor and specialization in production effort.

Some fundamental economic principles should be reviewed in connection with the information implied in Figure 4.

- 1) The firm will be economically viable in the short-run as long as revenue covers variable costs, i.e., costs associated with the resources that are not fixed in the short-run. Fixed costs are associated with a specific farm size or with the resources that are considered fixed in the short-run.
- 2) The firm will be economically "viable" in the long-run as long as revenue covers total costs, both fixed and variable, or in other words, as long as the average total cost is less than or equal to the average revenue.
- 3) Under conditions of perfect competition, free entry, and resource divisibility, output prices will tend toward such a level that all profits are eradicated. In equilibrium, all firms would produce a level of output corresponding to the low point on their LRAC curve (level Q in Figure 4). The horizontal line at p , lying tangent to the LRAC curve at point Q , is the average and marginal revenue per unit of output for the firm. Profit is zero at this equilibrium

point, with the return to each resource at the level which provides exactly enough return to keep it from being drawn to alternative employment, but not enough to attract additional resources, which would expand production and lower overall net returns.

The LRAC curve is a long-run planning curve; a locus of points representing the least unit cost of producing the corresponding output. Costs tend to decline as the size of operation (acreage) increases primarily because it allows the use of larger, more specialized machinery and other capital inputs, which in turn allow a per unit cost savings. The entrepreneur, therefore, determines the most efficient size of firm by reference to this long-run curve. He would select the short-run firm size that yields the least unit cost of producing the volume of output he anticipates.

An exogenous restriction on the size of farming operations would, therefore, limit the savings of cost per unit from any available economies of size. The extent of this inefficiency in the use of resources depends on where in relation to the low point on the LRAC curve the limitation is set. It also depends on the shape of the LRAC curve. This is illustrated in Figure 5.

A hypothetical LRAC curve as depicted in Figure 5(a) has its lowest cost per unit at point K. An acreage limitation set at OJ would restrict farm operations to the declining portion of the LRAC curve and impose a cost of OB-OA on society. This cost represents a foregone

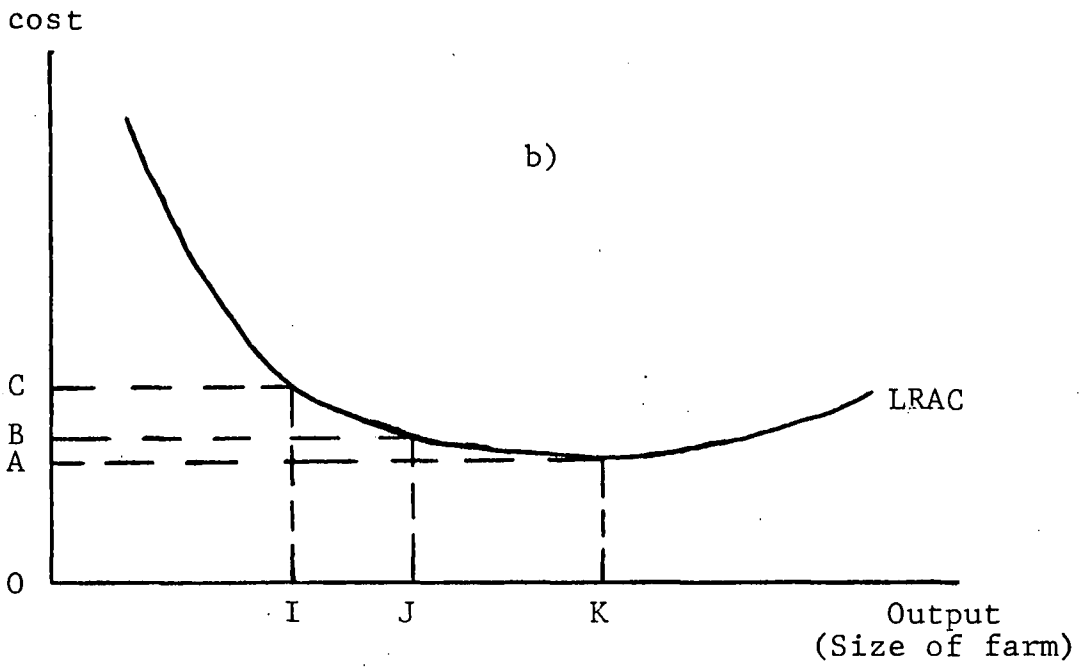
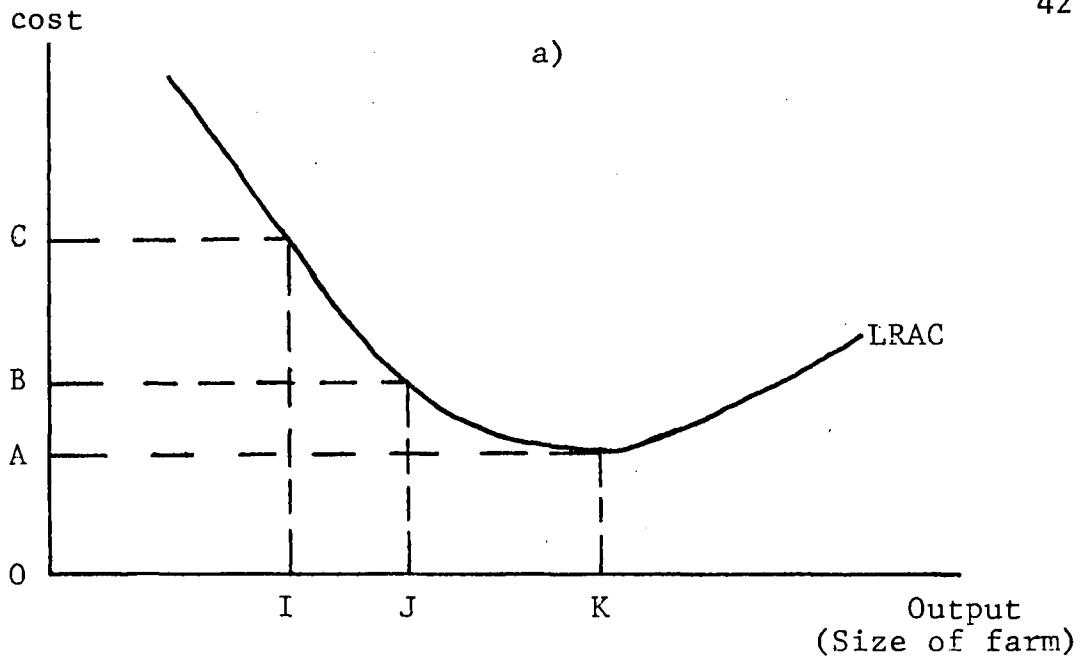


Figure 5. Comparing the Effects of Different Shapes of Long-run Average Cost Curves.

reduction in cost per unit. Likewise, a more restrictive acreage limit set at OI would impose a larger cost of OC-OA.

A differently shaped LRAC curve will alter the results. In Figure 5(b), the LRAC curve is shaped such that most of the cost per unit savings from expanding farm size are achieved at relatively smaller acreages. In this case, imposing an acreage limit at OJ would entail less of an efficiency loss.

Thus, for purposes of making public policy regarding acreage restrictions, it is useful to evaluate the LRAC curves associated with relevant production conditions. No LRAC curves are available for the three federal irrigation district study areas, and it is beyond the scope of this study to generate them. However, a review of the theory and literature pertaining to economies of size may reveal the relationships that exist between farm size and efficiency in irrigated agriculture.

Empirical Evidence for Economies of Size

The literature on economies and diseconomies of size in agriculture presents a bewildering array of production situations and analytical techniques. There are numerous empirical studies demonstrating economies of size,

supplemented in the past decade or so by a growing volume of synthesized data, using computer simulation models and engineering economic approaches (Madden).

A brief look at the most widely cited empirical analyses of economies of size will confirm the theory presented in the preceding section (Dean and Carter, Moore, Kyle and Krause, etc.). The major conclusions can be summarized tersely: They all found the LRAC curve to be L-shaped which, of course, implies that production costs decline rapidly with initial increases in size and decline thereafter very slowly, if at all.

In summarizing studies of crop-producing farms (seven types of farms, fourteen different locations or production conditions, in five different states), Madden concluded, "In most of these situations, all of the economies of size could be achieved by modern and fully mechanized 1-man or 2-man farms." (p. 54) and further,

"In many areas and for many types of farming, the most rapid increase in the number of farms is in the intermediate size classes, consisting chiefly of farms that can be operated by one or at most only a few full-time men, using modern technology and adequate capital." (p. 7)

A recent study analyzing the regional economic impacts of restricting farm size in California was made by Goldman

(1977), entitled "Economic Effect of Excess Land Sales in the Westlands Water District." This report indicates the relationship between economic efficiency, net income, and survival of production units. One of its conclusions is that, "Economic survival of any farm depends on annual net income, on its ability to sustain losses due to uncertain market and climatic conditions, and upon the firms long-run competitive cost advantage or disadvantage. Based on our trial farm projections of operator incomes, we can tentatively conclude that net income from 320 acres could amply provide for family living expenses and debt service costs." (p. 15)

Closer to Oregon, a report on the Columbia Basin Project in Washington by the Economics, Statistics and Cooperatives Service (USDA, 1978) provides a comprehensive analysis of costs and returns to different sized irrigated cropland farming operations. An attempt was made to include revenues and costs that would most likely exist for a purchaser of excess land, measured at both current and pre-project prices. Estimated returns are based on recent price-cost relationships and modern production and management practices for irrigated farms of 160, 320, and 640 acres growing alfalfa, wheat, sugar beets, and potatoes, which are quite similar to the crops grown in the North unit, Klamath, and Owyhee districts. The results indicate that, depending on crop prices, a medium sized operation (320 acres) is expected to return over \$50,000 to Management

and Operator Labor (Table III). Furthermore, analysis of cost data indicates considerable economic efficiency in moving from a 160 acre to a 320 acre farm, but not as much gain between a 320 acre farm and a 640 acre farm (Table IV).

A 1977 economic analysis of the 160 acre limitation on irrigated farms in Montana found a great deal of variation in the returns from different production units varying in size from 160 to 800 acres. (Luft, 1977). Most of the difference in the returns were found to be due to geographical factors (soil, climate, etc.). The report did conclude that in general, in Montana, medium-sized farms (320 to 640 acres) are more financially sound and able to support a family than the smaller farms, around 160 acres.

However, the authors of the report point out, "As evidenced by this study, sufficient size (to support a family) varies from area to area. A simple blanket increase in the acreage limitation, then, would not be desirable. If any acreage restriction at all must be imposed, it should be determined separately for each project, or category of projects, and be subject to periodic review."

Thus, it seems appropriate in an analysis of economies of size to consider the production situation specific to the area under study. Although no enterprise cost/revenue data are available for different size production units in the North Unit, Klamath, and Owyhee Irrigation districts, the

TABLE III. ESTIMATED NET RETURNS TO MANAGEMENT AND OPERATOR
LABOR, COLUMBIA BASIN PROJECT, 1977

Alternative farm sizes (acres)	Estimated net returns with:			
	Current land price ^{7/}	Pre-project land price ^{8/}	25% increase in crop prices	25% decrease in crop prices
160	\$ 19,000	\$ 35,000	\$ 55,000	\$ 5,000
320	53,000	85,000	145,000	25,000
640	125,000	189,000	309,000	69,000

^{7/} Assumes current market price of \$1500 per acre.

^{8/} Bureau of Reclamation reports pre-project land price to be \$400 per acre.

Source: U.S.D.A., E.S.C.S. Report, February 1978.

TABLE IV. TOTAL COSTS PER DOLLAR OF TOTAL
REVENUE BY FARM SIZE,
COLUMBIA BASIN PROJECT, 1977

Crop mix	Farm size (acres)		
	160	320	640
Alfalfa	0.50	0.46	0.46
Wheat, alfalfa, potatoes	0.66	0.58	0.54
Wheat, potatoes	0.66	0.60	0.56

Source: USDA, ESCS Report, February 1978.

economic theory discussed above provides the relevant framework within which to evaluate size/efficiency relationships. The empirical literature cited describes what results might be expected in analyzing the long-run average costs of agricultural production in these irrigation districts.

If the enforcement of the proposed acreage limitations will effectively hold production units to the declining portion of their LRAC curves, a significant efficiency loss will be imposed on the economy, because the farms will be operating at a higher cost per unit of production than that potentially available from economies of size.

Many empirical studies of long-run average costs in agriculture show a relatively horizontal LRAC curve after the rapidly declining costs per unit have leveled off (Madden and Portenheiner, Hall and Le Veen, Seckler and Young). Thus, theoretically and empirically, the possibility exists for a range of farm sizes, all operating at approximately the same efficiency (in terms of cost per unit). As long as diseconomies do not exist, in a competitive industry more units of production are preferable to fewer, even at the same net profit per unit of production. This is because by expanding output a firm can reduce unit costs, and so increase revenue. In addition, there may be other incentives to increased farm sizes such as investment in real

estate, as well as constraints on expansion such as capital, land, and managerial constraints.

For purposes of evaluating public policy concerning acreage limitations and farm size, the issue revolves around efficiency considerations. One can get a measure of the amount of land in farms that will be affected by acreage limitations by applying various restrictions on farm sizes as determined empirically. That is what the analytical portion of this thesis attempts to do.

For an evaluation of the economic efficiency of acreage limitations, an analysis of the long-run average costs of different sized farming operations would be necessary but not sufficient. Economic efficiency encompasses many items other than change in cost, e.g., short-run production effects, welfare of the farm community, etc. A complete analysis of the effects on economic efficiency from restricting farm size would indeed be a complex and difficult undertaking.

V. ANALYTICAL METHODOLOGY

In developing the method of analysis for this research project, it became obvious that the collection of data on leasing would be both the most important aspect of the study, and the primary obstacle. Telephone conversations and visits with irrigation district offices, the extension service, and tax assessors, all indicated a basic lack of systematic records of leasing arrangements in Oregon's federal irrigation districts. It became evident that a survey type method of data collection would be the only way to generate information on leasing. Furthermore, a limited research budget dictated the choice of a mailed survey questionnaire, as opposed to the relatively more expensive telephone or personal interview techniques.

This Chapter, in two parts, describes the method whereby data are collected and analyzed in the process of achieving the objectives outlined in Chapter One. The first part, on the survey method, explains questionnaire design, sampling technique, and specific goals of the survey. The second part explains the analytical method utilized in evaluating the survey data.

Survey Method

Information on ownership and residency of district landowners were obtained directly from the local irrigation district offices. This involved a personal visit to the district office and manually transcribing the names, addresses, and irrigated acreages of the landowners. These lists of landowners then became the population from which the survey sample was taken. The ownership records revealed that in each of these districts there was a relatively large number of smaller land parcels (up to 50 acres), and a relatively small number of larger land parcels (over 50 acres), all of which received project water. Therefore, since the object was to evaluate commercial agriculture, rather than randomly sample all the landowners in each district, it was decided to survey all the landowners who received water for more than 50 acres. In this way, it was possible to include in the analysis the greatest amount of irrigated acreage, and at the same time exclude from analysis small 'hobby' farms and residential water users.

It was quite evident that surveying farmers to get information on such a controversial issue as acreage limitation could involve biased responses, if any responses at all. In order to prompt a higher rate of return on the survey, a simple, straight-forward, brief, and "non-intrusive" type of questionnaire was designed. This design included

an individually addressed questionnaire cover-letter, to add the "personal touch," and which stressed the importance of the analysis for public decision-making purposes. The letter also stressed the confidentiality of the respondent's information. A copy of the questionnaire appears in the appendix to this report.

Seven questions were asked, (some multiple), with the three major survey objectives being to:

- 1) Collect information on the extent of leasing (questions 1 and 2);
- 2) collect information on ownership and residency which could be checked, through a coded-questionnaire system, against irrigation district records, to verify responses and evaluate biases (questions 1 and 5);
- 3) provide the individual farmer the opportunity to express his own views on acreage limitations and leasing restrictions (questions 4 and 6). Although this information is subjective, and cannot be considered analytical, it was felt that the farmer's perception of providing such input would increase the survey response rate.

Table V presents the response rates from the survey, as well as the amount of acreage in each district represented in the completed responses. In general, for mailed surveys, response rates between 30 and 50 percent are not considered exceptional. However, considering the controversy surround the acreage limitation issues, these response rates are acceptable.

TABLE V. SURVEY RESPONSE DATA BY IRRIGATION DISTRICT

Item	North Unit Irrigation District	Klamath Irrigation District	Owyhee-North Board Irrigation District
Questionnaires sent ^{9/}	366	170	200
Completed questionnaires received	194	74	63
Response rate	53.0%	43.5%	31.5%
Total acres in district	49,997	39,875	65,000
Total acres represented in survey	42,948	27,539	35,785
Total acres represented in completed questionnaires	26,405	15,540	9,031
Percent of acres surveyed in completed questionnaires	61.4%	56.4%	25.2%

^{9/} Sent to all owners of over 50 acres irrigated land in each district.

Method of Analysis

The analytical methodology used in this study consists of three parts:

- 1) Determination of excess lands resulting from enforcement of ownership, leasing, and residency restrictions of the proposed amendments to the Reclamation Laws.
- 2) Extrapolation of the resulting excess land data to the entire area of each respective irrigation district.
- 3) Evaluation of the tendency for bias and distortion in the survey responses.

1) Determination of Excess Lands --

For this part of the analysis, responses received from each irrigation district were evaluated in terms of land ownership, leasing, and residency of landowners relative to the irrigated parcel which they own. The amount of excess land resulting from enforcement of each of the four proposals was determined. This determination was made by applying the restrictions in each proposal to the situation in each irrigation district, as delineated by the survey responses. For example, if a farmer reported owning 360 acres and leasing 300 more, for a total operation of 660 acres, this total would be compared to the four acreage limitation proposals to determine how many acres, if any, would be in excess of each proposal.

Likewise, the residency restrictions will be evaluated in each irrigation district study area on the basis of the total acres that would be found in violation of each proposed restriction.

2) Extrapolation of Results --

The excess lands resulting from enforcement of the proposals can only be directly evaluated from the acreage represented in the completed survey responses. Therefore, the resulting excess in each entire irrigation district will have to be extrapolated from the survey data. In each district, this extrapolation will be based on the percentage of the total district acreage covered by the survey data (Table III). For example, determined excess land in the North Unit District would be divided by .61 because the non-extrapolated excess land represents that which can be expected on 61 percent of the total acreage surveyed in the district.

It must be pointed out that the empirical value of any data extrapolation is tenuous, and this is only considered an approximation. The validity of the technique itself is based on the assumption of similarity in the distribution of owned and leased land, and thus a similarity in the potential for excess land,

between that represented in the completed responses and that in the remainder of the district.

3) Evaluation of Bias --

There are two potential sources of bias in the results of this survey. The first could arise from any tendency for landowners to simply not respond to the survey in some systematic way. This could be a problem if, for example, most owners of a certain size operating unit in the district refused to respond. The second source of bias could arise from any tendency for the landowners to intentionally distort their responses, for whatever reason.

The extent of these biases will be analyzed in the following way. Systematic non-response will be evaluated by comparing the distributions of ownership parcels of those who responded to the survey to those who did not respond. If there is little or no bias in the data, these distribution patterns will be about the same.^{10/}

The second source of bias, from distorted responses, will be evaluated by comparing the

^{10/} Each questionnaire's return envelope was previously coded to allow for this analysis of bias. The codes were not used for any other purpose.

distributions of owned and irrigated lands represented in the responses with that available from irrigation district records. If there is no systematic bias of this sort, these distributions should be approximately the same.

The ability of these evaluative tests to reveal the full extent of distortion in the survey responses is limited. They will provide reasonable estimates of significant tendencies for biased responses on ownership size, but not on leasing. There is no way to evaluate the accuracy of leasing data apart from ownership data, except perhaps by a follow-up survey, wherein completed questionnaires are verified by personally contacting the respondents.

VI. RESULTS OF ANALYSIS

The survey data were obtained from a total of 331 owners of land in the three federal irrigation district study areas. These respondents reported, and distinguished between, the amount of irrigated land which they owned, and the amount of irrigated land which they leased from and to other landowners and farmers. The composite of land owned and leased for each individual respondent was regarded as an operating unit.^{11/}

Under the proposed rules and regulations, each operating unit receiving federal irrigation water is subject to acreage limitations on ownership and leasing, as well as a residency restriction on the registered owners of the land. The results of the evaluation of the potential effects of enforcing these regulations is the subject of this Chapter.

Data from the survey are summarized in Table VI. These data indicate that the major portion of irrigated land in all three districts is farmed by owners, but a substantial amount of irrigated land is leased out by the owners in the North Unit and Owyhee Districts (33 and 24 percent, respectively). In addition, the owners of

^{11/} Although custom-farmed acreage was also identified in the survey questionnaire, the amount of land in this category was on the whole, relatively insignificant.

TABLE VI. ACRES OWNED, FARMED, AND LEASED, FROM
SURVEY DATA, BY IRRIGATION DISTRICT

	North Unit District	Klamath District	Owyhee District
Questionnaires sent	366	170	200
Acres represented in questionnaires sent	42,948	27,539	35,785
Completed questionnaires	194	74	63
Response rate (percent)	53.0	43.5	31.5
Acres represented in com- pleted questionnaires	26,405	15,540	9,031
Percent of total district acreage surveyed <u>12/</u>	61.4	56.4	25.2
Acres owned and farmed by owner <u>13/</u>	17,292	14,393	6,456
Percent	65.4	92.6	71.4
Acres owned and leased out by owner	8,526	917	2,181
Percent	32.2	5.9	24.1
Acres farmed not owned	11,418	6,013	3,176
Acres leased in	10,682	5,328	3,176
Custom farmed land	736	685	--

12/ Total district acreage surveyed is based on owners of more than 50 irrigated acres.

13/ Total acres minus leased-out and custom-farmed land.

irrigated land responding to the survey reported land which they farmed but did not own. Most of this land is leased and amounts to almost 12,000 acres in the North Unit District, 6,000 acres in the Klamath, and 3,000 acres in the Owyhee District. These data imply that one cannot analyze the effect of restricting farm size in these districts by only observing the patterns of ownership, but should also include the leased land, as it is a significant variable of local farm operating units.

Distribution of Farm Sizes

Insofar as the restriction of farm size is the relevant issue in this analysis, the distribution of operating units (acres owned and leased) should be considered. A distribution of operating units will reveal the relative frequency of different size farms in each district and thus give an indication of the extent of the effects of various restrictions on farm size. These distributions are presented in Figures 6-a, 6-b, and 6-c.

It appears from these distributions that in all three study areas most operating units are 320 acres or less in size. This seems consistent with empirical studies of farm-size/efficiency relationships presented in Chapter IV, most of which indicate that a moderately sized irrigated

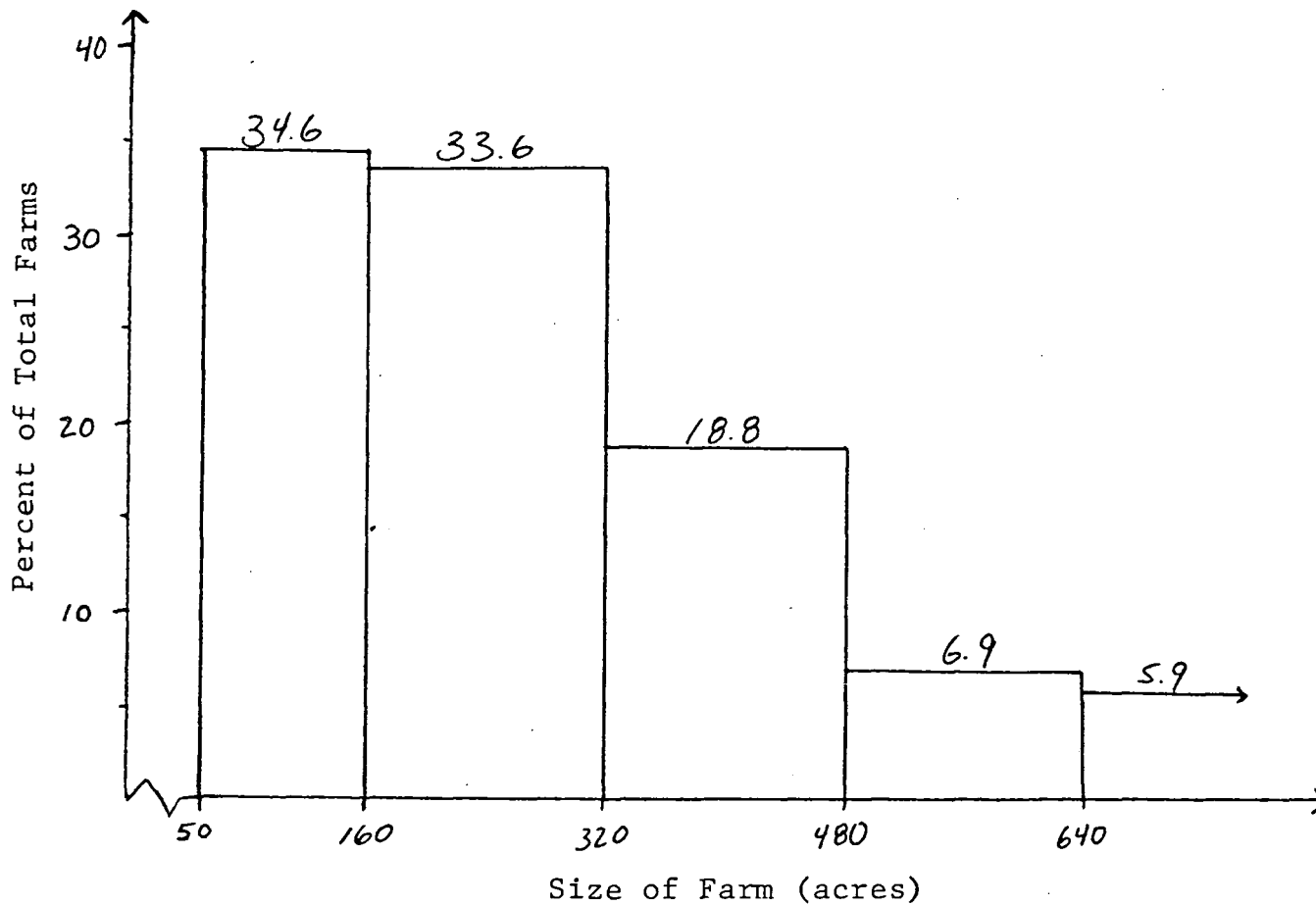


Figure 6-a. Frequency Distribution of Farm Sizes Based on Survey Data -- North Unit District

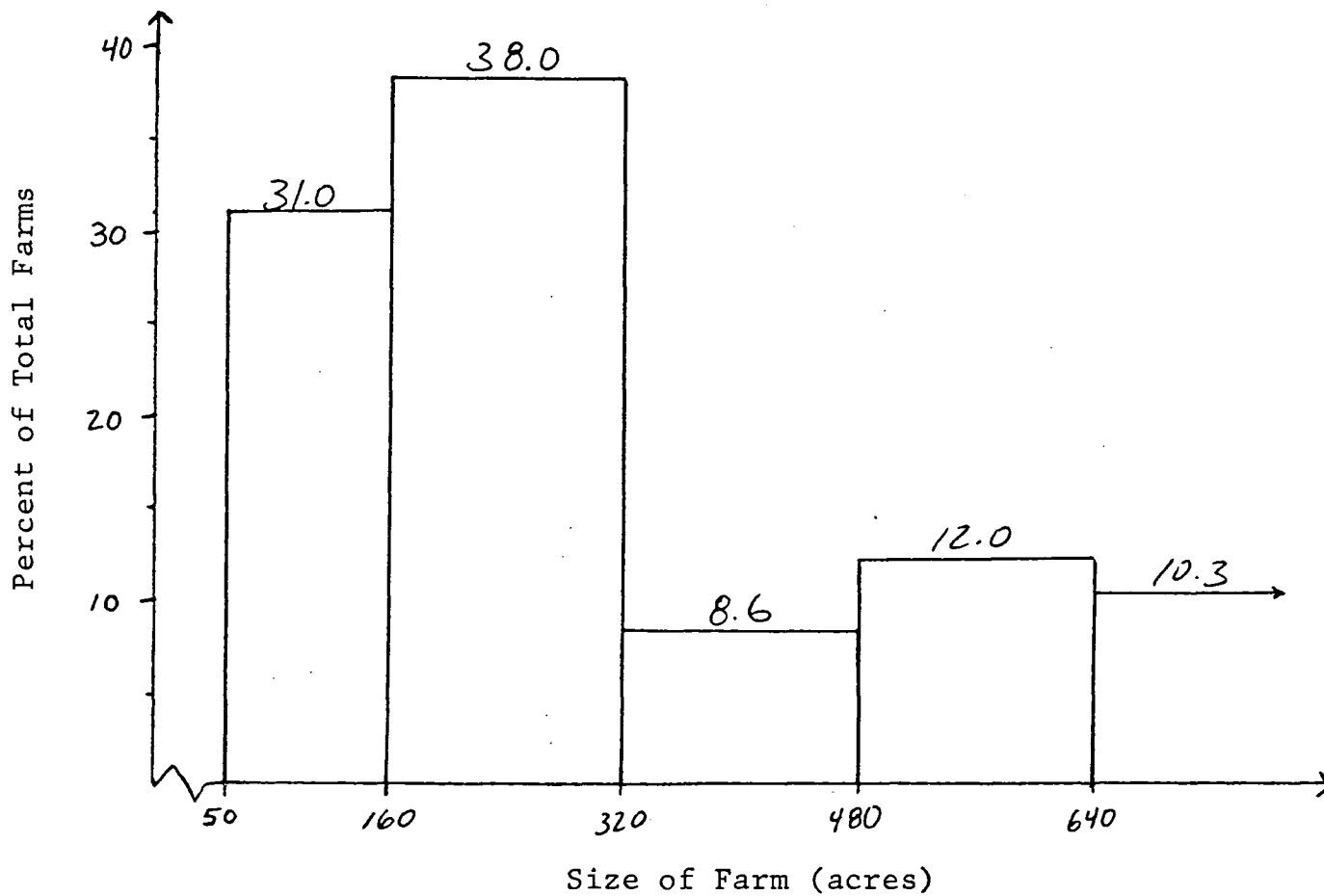


Figure 6-b. Frequency Distribution of Farm Sizes Based on Survey Data -- Klamath District

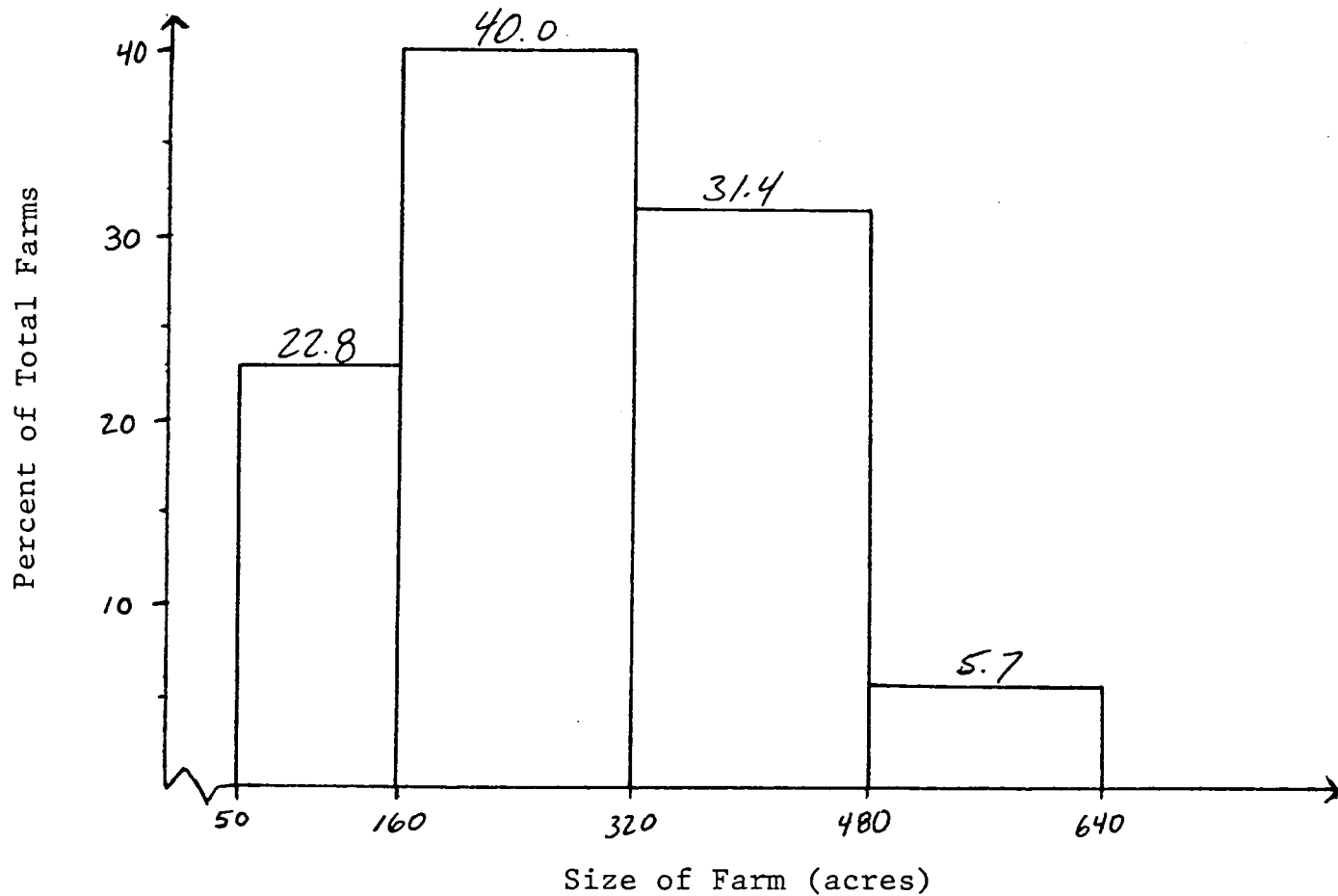


Figure 6-c. Frequency Distribution of Farm Sizes Based on Survey Data -- Owyhee - North Board District

farm can acquire most of the benefits of modern agricultural technology.

Restricting farm size to 320 acres or below would result in approximately 30 percent of the farms in the North Unit and Klamath Districts, and 37 percent in the Owyhee District, to be in excess of the limitation. These figures do not reveal the absolute amount of excess land but, rather, the percentage of farms greater than 50 acres in size which will be found to have owned and/or leased land in excess of the acreage limitation.

It seems reasonable to suggest, therefore, in regard to public decision making, that the 320 acre farm be the lower limit when considering acreage limitations on the size of irrigated farms in these three districts. In this way, the majority of farm operations would not be in excess and thereby subject to enforced divestiture of excess land and re-allocation of production resources.

Excess Land Resulting from Acreage Limitations

Analysis of the survey data indicates that excess land resulting from imposition of the proposed acreage limitations will vary considerably between the three study areas. The determination of excess land is based on the farm size

(acres owned and leased) of each owner of irrigated land in the three districts. From the farm size of each owner is subtracted the total acres allowed (owned and leased) under each limitation proposal. The results, presented in Table VII, show the number of owners and the total acreage which would be found in excess in each district, for each proposed acreage limit.

The Klamath irrigation district would appear to have the most land potentially in excess of the three irrigation districts analyzed. The Owyhee irrigation district would seem to have no excess land for any of the proposals. Little or no excess land would result in the North Unit District, depending on which acreage limitation is imposed.

The varying degrees of restriction on farm size, represented by the different proposals, are quite evident in these results. The most restrictive proposal, that of the National Land for People, Inc., results in the most excess land, over 5,400 acres total, of which 4,550 acres are in the Klamath irrigation district. The least restrictive proposal, that of the Farm/Water Alliance, would result in no excess land in any of the districts.^{15/} This proposal is the only one of the four that would allow unlimited multiple

^{15/} This assumes the existence of multiple-ownership (which is allowed under this proposal), for 20 land-owners and 6,700 acres over all three districts.

TABLE VII. EXCESS LAND RESULTING FROM ACREAGE LIMITATION, BY IRRIGATION DISTRICT

Proposed Limitations	North Unit District		Klamath District		Owyhee District	
	# of owners	Total excess acres	# of owners	Total excess acres	# of owners	Total excess acres
<u>Department of Interior</u>						
640 acre ownership limit.....	2	110	4	2880	-	-
320 acre leasing limit.....	3	685	3	990	-	-
Total excess.....	5	795	7	3870	-	-
Extrapolated excess acreage..	-	1303	-	6861	-	-
<u>Church-Hatfield</u>						
1280 ac. Ownership limit....	-	-	2	1440	-	-
Leasing limit.....	-	-	-	-	-	-
Total excess.....	-	-	2	1440	-	-
Extrapolated excess acreage..	-	-	-	2553	-	-
<u>National Land for People</u>						
640 acre ownership limit.....	5	870	8	4554	-	-
(no leasing allowed) ^{14/}	-	-	-	-	-	-
Total excess.....	5	870	8	4554	-	-
Extrapolated excess acreage..	-	1476	-	8074	-	-
<u>Farm/Water Alliance</u>						
No effective limitation						

^{14/} Current leases would be valid for five years, with option to buy if not in excess of ownership restriction.

ownerships and unlimited leasing. In effect, this puts no restriction on farm size. The Church/Hatfield Bill represents a relatively moderate proposal and would result in only a small amount of excess land, exclusively in the Klamath District.

The extrapolation of these figures provides an approximate measure of the excess land that would be expected to result if the various acreage limitations were to be enforced across the entire acreage surveyed in each district. The excess land that is calculated from the data in the completed survey questionnaires is extrapolated to the entire acreage covered by the survey, i.e., all the acreage owned and leased by owners of fifty or more acres. Extrapolated excess acreage is calculated by dividing the unextrapolated excess acreage (from the survey data) by the percentage of total acres surveyed that is represented in completed questionnaires.

The distribution of extrapolated excess acreage is the same as the unextrapolated and, again, indicates that only in the Klamath District would there be substantial excess acreage. For example, enforcement of the Department of Interior's acreage limitation in the Klamath District would cause 6,861 acres to be in excess, or 17 percent of the district's 39,875 total acres. Outside the Klamath District, the Interior's proposal would put only 1,300 acres in excess, all of it in the North Unit District.

The only other proposal for acreage limitation that would cause substantial amounts of excess land would be that of the National Land for People. In this case, over 9,500 acres will be in excess across all three districts, and 8,000 of which will be in the Klamath District.

Acreage limitations are not the only element of the proposals that would result in excess land if enforced in these districts. Excess land from residency restrictions should also be considered in an analysis of these proposals.

Excess Land Resulting from Residency Restrictions

Analysis of the survey data indicates that the residency restrictions in the proposed amendments to the Reclamation laws would result in excess land primarily in only one of the three study areas: the North Unit District (Table VIII).

The proposed amendments specify three different restrictions on the distance a landowner can reside from his irrigated land. Two of the proposals have no restriction (Church/Hatfield and Farm/Water Alliance). One is set at 50 miles (Department of Interior), and one at 15 miles (National Land for People). The survey data indicate that the 50 mile restriction will result in 4,460 acres of land in excess, of which almost 80 percent is in the North Unit

TABLE VIII. EXCESS LAND RESULTING FROM RESIDENCY RESTRICTIONS,
BY IRRIGATION DISTRICT

Proposed Restrictions	North Unit District		Klamath District		Owyhee District	
	# of owners	Total excess acres	# of owners	Total excess acres	# of owners	Total excess acres
50-mile Restriction	33	3559	5	277	3	680
Extrapolated Excess Acreage.....	-	5834	-	491	-	2698
15-mile Restriction.....	40	4187	7	1649	7	1140
Exrapolated Excess Acreage.....	-	6863	-	2924	-	4524

District. The 15-mile restriction would result in nearly 7,000 acres of which 60 percent is in the North Unit District.

When these figures are extrapolated to represent the total acreage surveyed in each district, over 9,000 acres would be in excess over all the districts under the 50-mile restriction (with 65 percent in the North Unit District), and over 14,000 acres under the 15-mile restriction (with over 40 percent in the North Unit District).

It is clear that residency restrictions will have different effects in each irrigation district. The excess land resulting from a 50-mile restriction would be minimal in the Klamath District, while the North Unit and Owyhee Districts would have 5,800 and 2,700 acres in excess, respectively. A 15-mile restriction would produce proportionately more excess acreage in all districts, ranging from 3,000 acres in the Klamath, to 4,500 in the Owyhee, and 7,000 acres in the North Unit District.

An estimate of the total excess acreage that would result in each district from enforcement of both acreage and residency restrictions appears in Table IX. These figures are obtained by summing the extrapolated excess acreage based on the acreage and residency restrictions for each proposal, eliminating any overlapping excess acreage.

TABLE IX. TOTAL EXCESS LAND (IN ACRES) RESULTING FROM PROPOSED RESTRICTIONS ON OWNERSHIP, LEASING, AND RESIDENCY, BY IRRIGATION DISTRICT

Proposal	North Unit District	Klamath District	Owyhee District	Total
<u>Department of Interior</u>				
Excess land from acreage limitation.....	1303	6861	-	8164
Excess land from (50 mile) residency restriction.....	<u>5834</u>	<u>491</u>	<u>2698</u>	<u>9023</u>
Total excess land.....	7137	7352	2698	17,187
<u>Church-Hatfield</u>				
Excess land from acreage limitation.....	-	2553	-	2553
No residency restriction.....	-	<u>-</u>	-	<u>-</u>
Total excess land.....	-	2553	-	2553
<u>National Land for People, Inc.</u>				
Excess land from acreage limitation.....	1476	8074	-	9550
Excess land from (15 mile) residency restriction.....	<u>6863</u>	<u>1921^{16/}</u>	<u>4524</u>	<u>13,308</u>
Total excess land.....	8339	9995	4524	22,858
<u>Farm/Water Alliance</u>				
No effective limitations				

^{16/} Divergence from extrapolated acreage in Table VIII is due to elimination of the overlapping excess acreage between residency and residency restrictions.

(Overlapping excess acreage between acreage and residency restrictions occurred for only one farm operation in the survey data, in the Klamath District).

The results indicate the relative effects, in terms of excess land, of enforcing each of the proposed amendments to the Reclamation laws. The proposals of the Department of Interior and the National Land for People would result in the displacement of approximately 17,000 and 23,000 acres of agricultural land, respectively, across all three irrigation districts. The proposals of the Farm/Water Alliance and Church-Hatfield would result in practically no change from the present distribution of federally irrigated land in these three districts.

Evaluation of Survey Data Bias

Insofar as the results of an analysis are only as good as the data on which they are based, the purpose of this section is to evaluate bias in the survey data and determine its source and extent.

The first hypothesized source of bias is that arising from a systematic tendency of non-response from the sampled owners of certain sizes of irrigated parcels. The second source might arise from a tendency on the part of those farmers who did respond to distort their responses in some systematic fashion. Both of these forms of bias will be

evaluated only in terms of the irrigated acreage owned by the farmers and will not include data on leased land, because there is no systematic record of leased land with which to compare the survey responses.

The first form of bias, arising from non-response, can be determined by comparing the distribution of owned and irrigated parcels of land in different size classes, as given in irrigation district records, with those reported in the survey responses. Figures 7-a, 7-b, and 7-c compare these distributions for the North Unit, Klamath, and Owyhee-North Board irrigation districts, respectively.

These figures indicate that in the the North Unit and Klamath Districts, there was a tendency for owners of small parcels (50-159 acres) not to respond to the survey, relative to owners of larger size acreages. More specifically, this size class, as a percentage of the total number of parcels sampled, is understated in the survey responses as compared to district records. This discrepancy amounts to 13 percent in the North Unit District and 16 percent in the Klamath District. The difference in the Owyhee District is less than five percent.

The next larger size class (160-319 acres) is overstated in the survey responses, especially in the North Unit and Klamath Districts, where the discrepancy amounts to about ten percent in each. The Owyhee District again

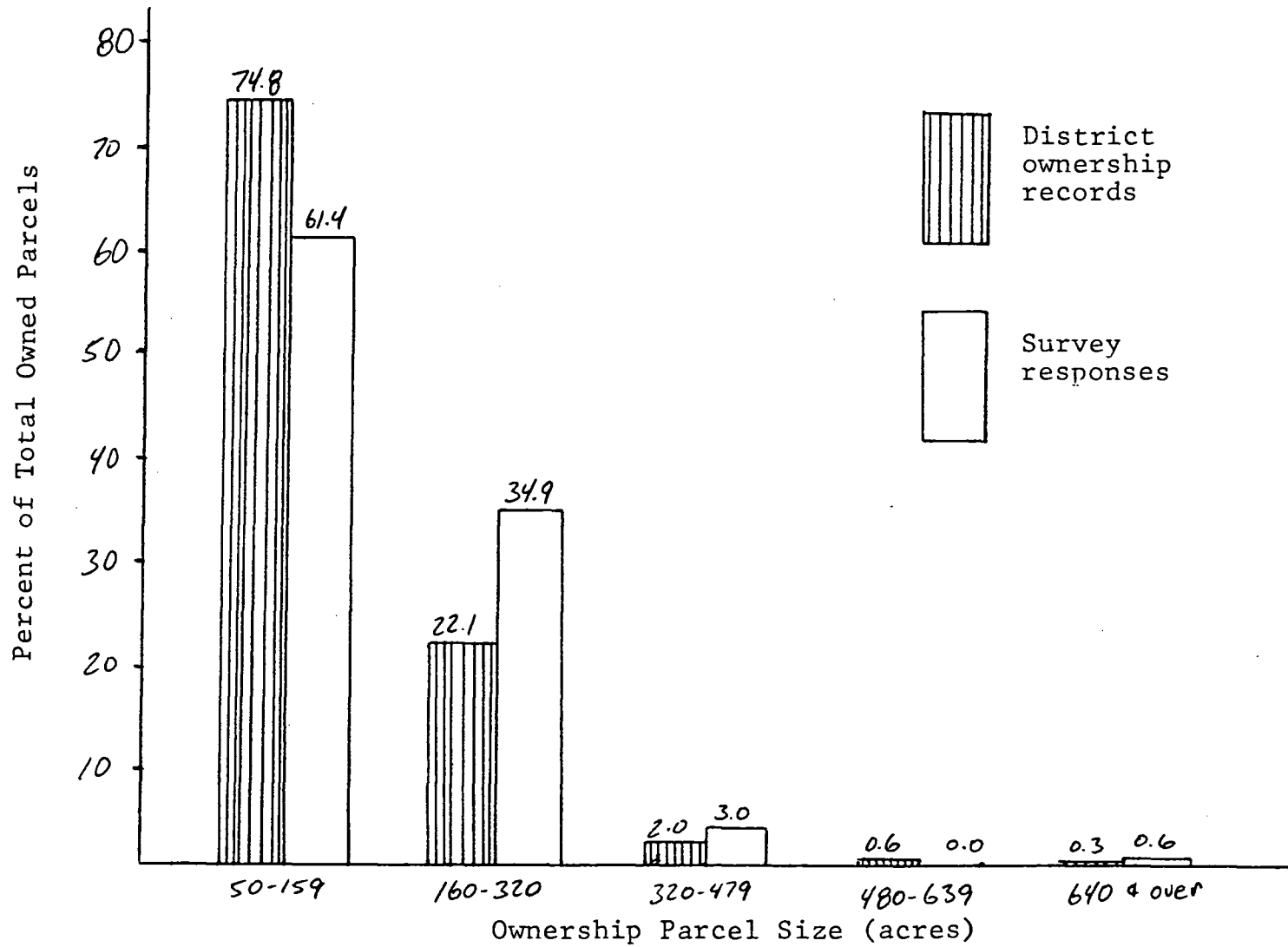


Figure 7-a. Comparison of the Distribution of Irrigated Ownership Parcels -- North Unit District

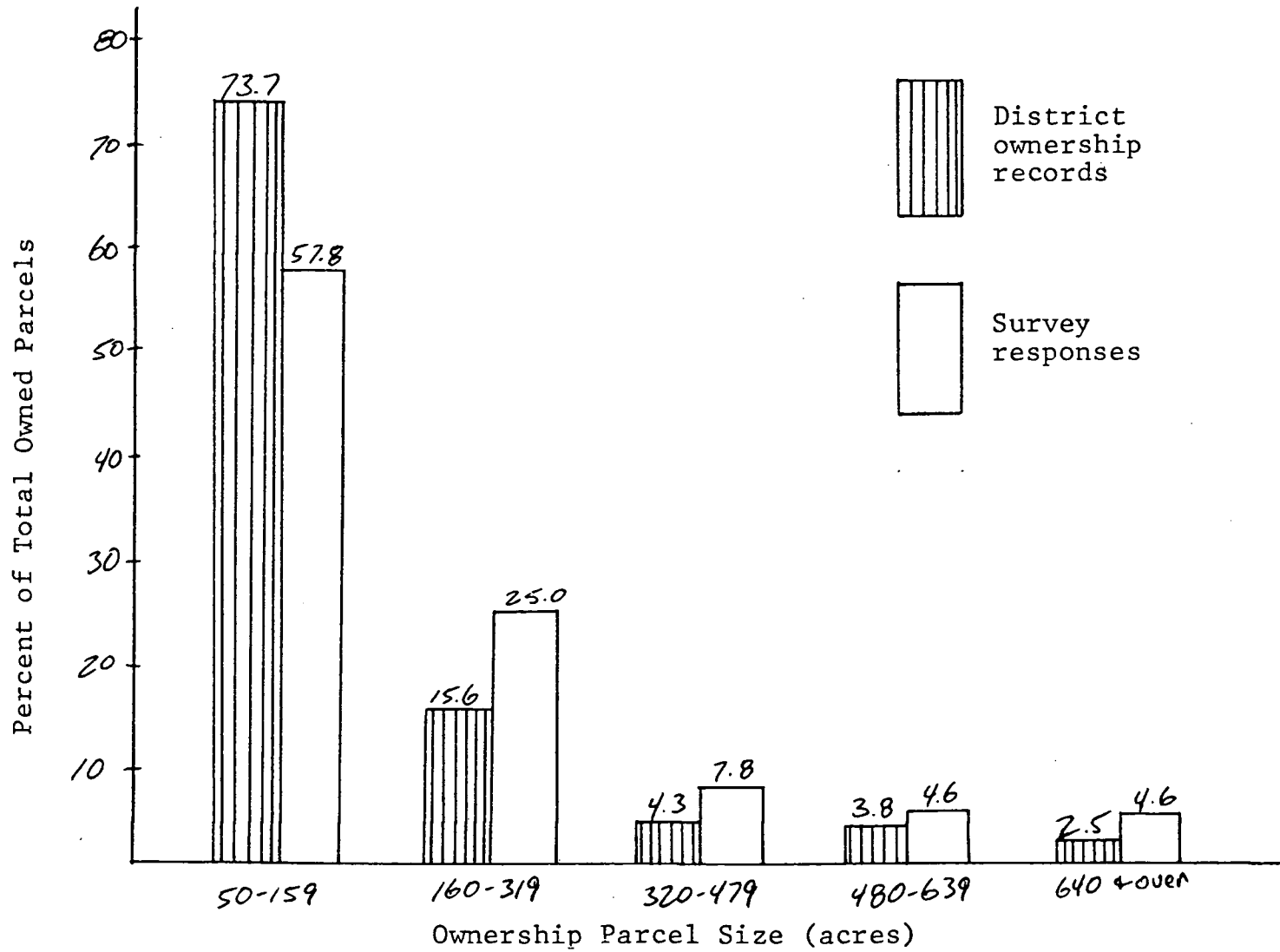


Figure 7-b. Comparison of the Distribution of Irrigated Ownership Parcels -- Klamath District

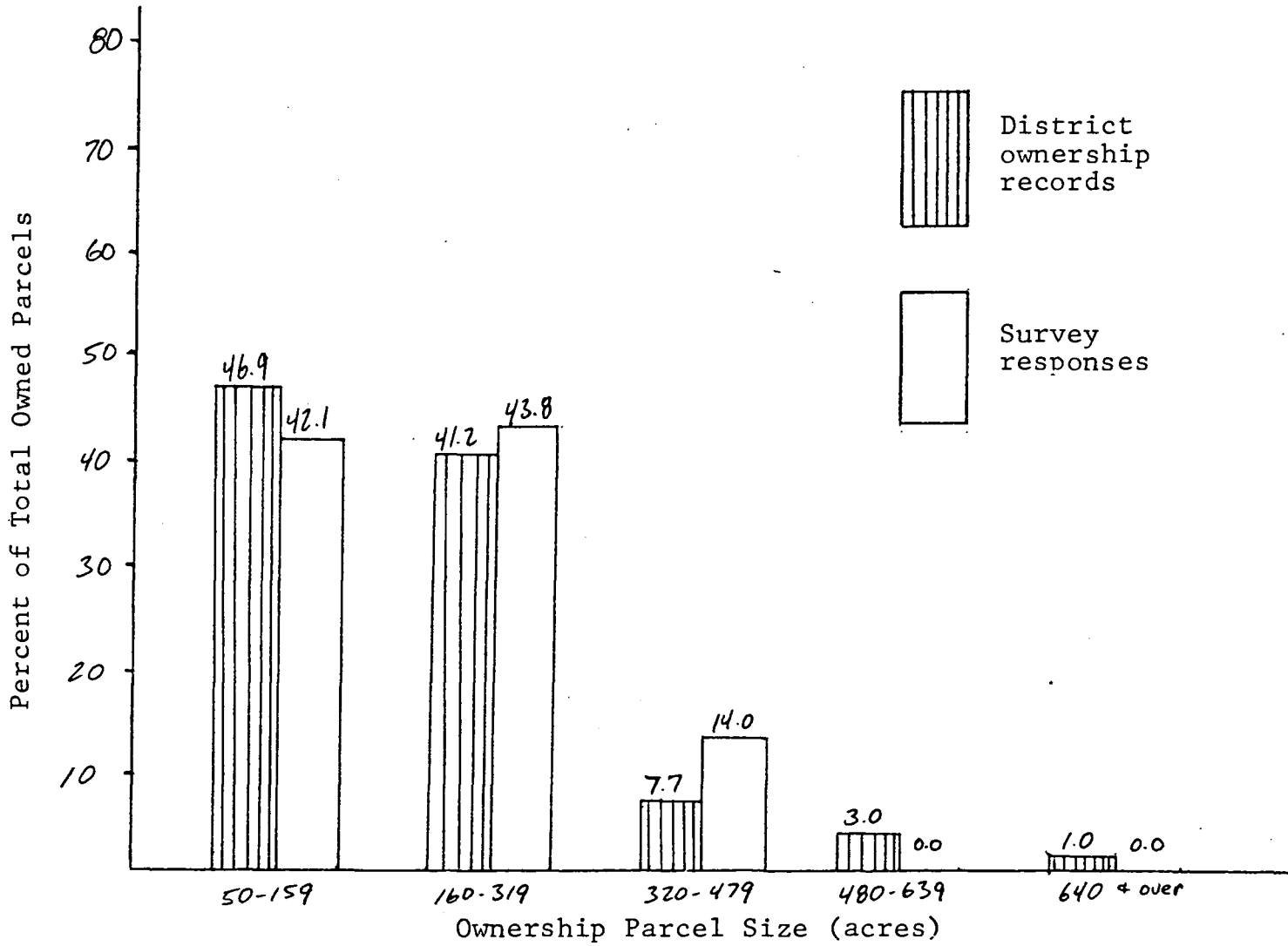


Figure 7-c. Comparison of the Distribution of Irrigated Ownership Parcels -- North Board District

shows little difference between survey data and district ownership records: less than five percent.

For the owned parcels surveyed that are larger than 320 acres, the general trend indicates that the survey data overstate the actual distribution by less than five percent.

In general, it appears that the owners of small acreages (50-159 acres) tended not to respond to the survey relative to larger landowners (over 160 acres). This would mean that in reality there are approximately ten percent more owners of smaller acreages and from one to five percent fewer owners of larger acreages than the survey data indicate. To the extent that this is true, the distributions of farm sizes given earlier will tend to shift slightly to the smaller acreage sizes. In this case, the percentage of farms in excess of a 320 acre limitation would be reduced by ten percent.

The second source of bias, arising from distortion in individual responses, can be evaluated by comparing the size of owned and irrigated parcels of land, as given in the survey responses, with the size as registered for each individual in the irrigation district ownership records. For this procedure, coded questionnaires were used so that each response could be compared to the district records. Figures 8-a, 8-b, and 8-c compare these responses for the

North Unit, Klamath, and Owyhee-North Board Districts, respectively.

In these figures, a negative deviation from zero shows that there was a tendency for the respondents to understate their land ownership (on the average, for each size class). A positive deviation from zero shows that the respondents, on the average, overstated their land holdings, for that size class. It should also be kept in mind when analyzing these results that a given percentage deviation from zero for a smaller acreage class implies less distortion than for larger sizes of land, since the deviations for larger size classes were averaged over relatively fewer parcels.

The figures indicate mixed results. All three districts show a tendency to overstate the size of their land ownership in the smallest sized category (50-159 acres), by an average of seven percent. The next largest size class (160-320 acres) is only distorted in the North Unit District, where landholdings were understated by 11 percent. The greatest amount of distortion for all three districts occurred in the 320-479 acre category. In this case, the North Unit respondents understated landownership by ten percent, while those in the Klamath and Owyhee Districts understated ownership by 22 percent and 20 percent, respectively. The data for the larger size classes suggest that the deviations are small except in the Klamath

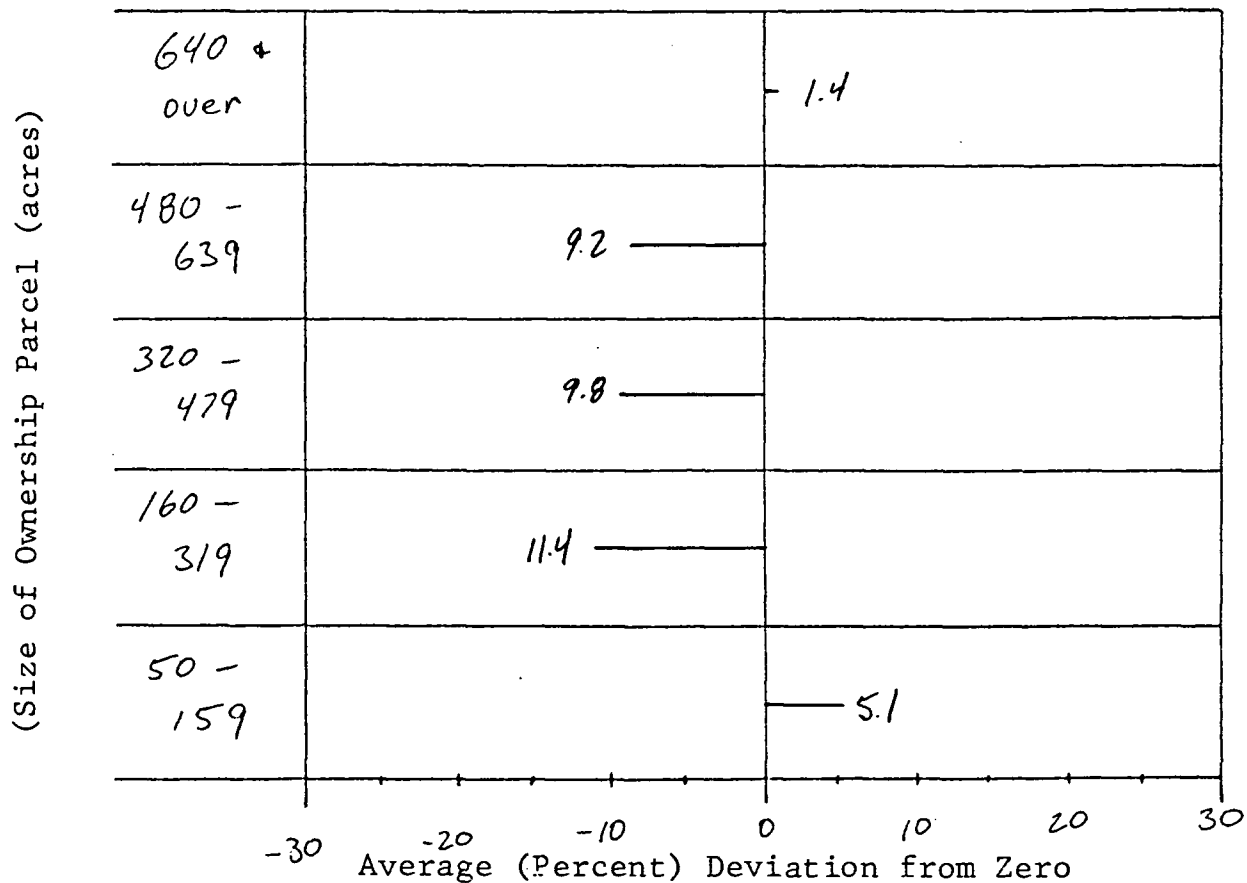


Figure 8-a. Measure of the Deviation between Observed and Expected Size of Irrigated Ownership Parcels -- North Unit District

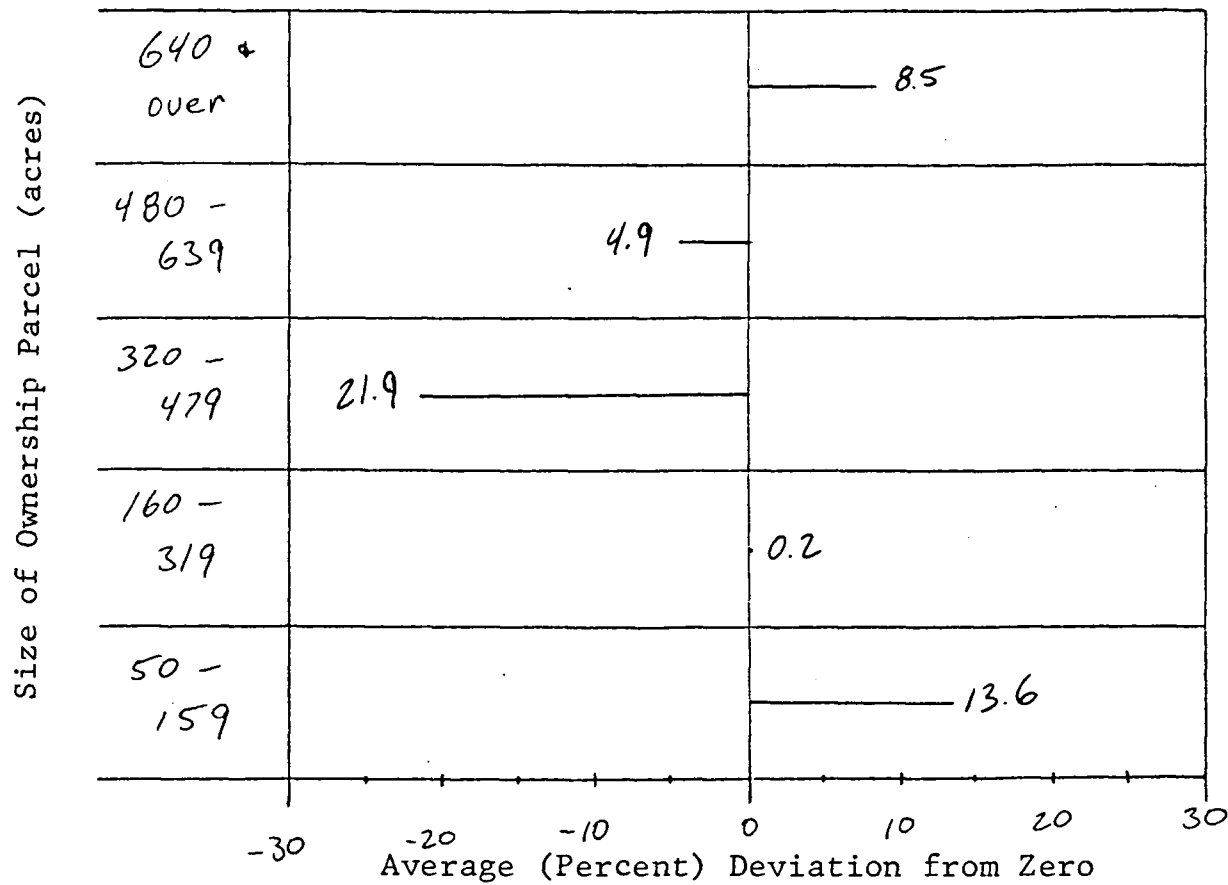


Figure 8-b. Measure of the Deviation between Observed and Expected Size of Irrigated Ownership Parcels -- Klamath District

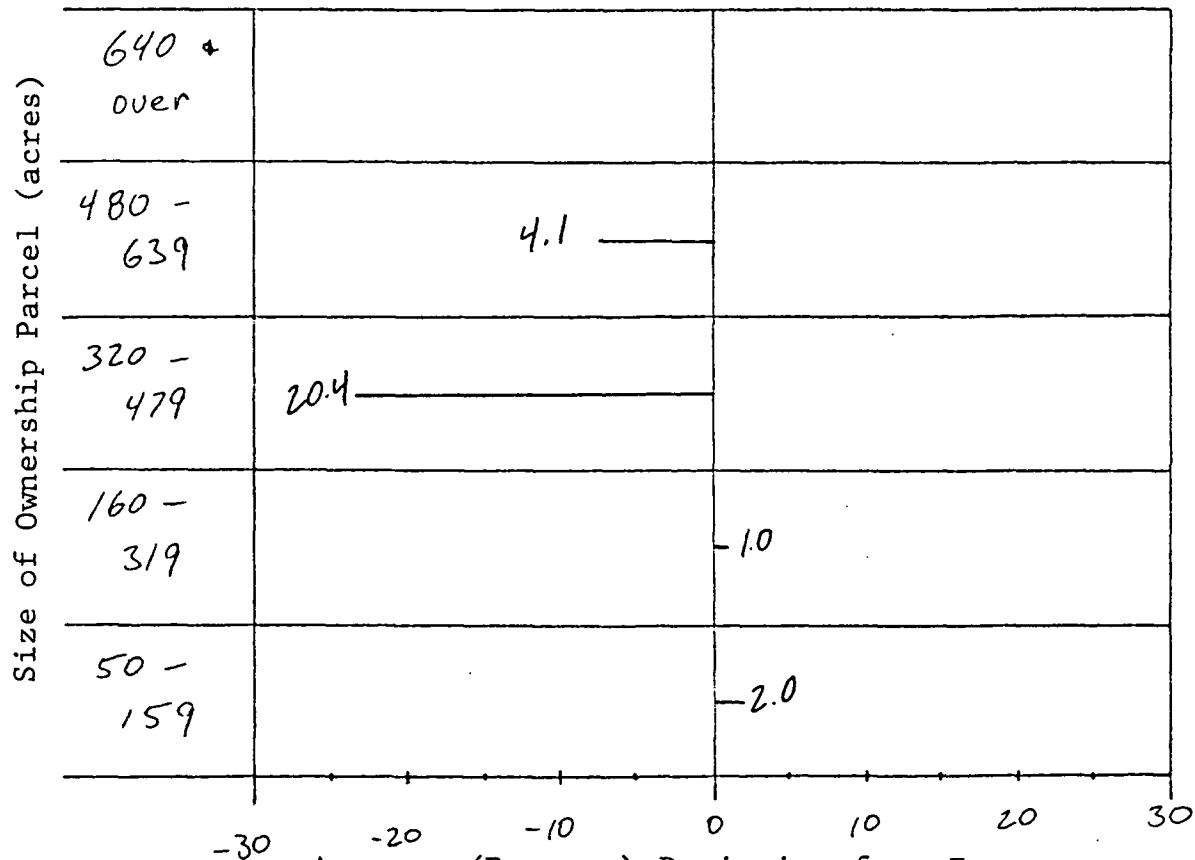


Figure 8-c. Measure of the Deviation between Observed and Expected Size of Irrigated Ownership Parcels -- Owyhee - North Board District

District, where a few owners of irrigated land tended to overstate their land ownership, perhaps by including non-irrigated landholdings in their response to the survey.

The overall evaluation of bias seems to indicate the presence of some distortion of reality in the survey response data. This bias is in the form of both understatements and overstatements of landownership. These deviations, presented in Figures 7 and 8, for the North Unit, Klamath, and Owyhee Districts, indicate an average distortion in the survey data of \pm ten percent, conservatively estimated, and depending on the specific irrigation district and parcel size. This implies that the sizes and distributions of ownership parcels, farm sizes, and excess land, estimated from these data, are within approximately ten percent of the true situation in each of the irrigation districts.

This estimation of bias is based on ownership data, and does not include in the evaluation data on leased land from the survey responses. Although not possible in the present study, an evaluation of the accuracy of the data on leased land would be a logical next step in this research.

Conclusions

The objective of this thesis has been to provide information to help answer the question:

"To what extent will the federally irrigated farms in the North Unit, Klamath, and Owyhee Districts be affected by the proposals to amend the Reclamation laws?"

The answers to this question can be stated as conclusions which are drawn from the research:

- 1) A distribution of farm sizes in each district was determined by generating data on both the owned and leased portions of each farm. These distributions indicate that between 60 and 70 percent of the operating farm units in these districts are under 320 acres, and would not be affected by any of the acreage limitation proposals on farm size.
- 2) The distribution of potential excess land is a reflection of the current distribution of farm sizes (acres owned and leased). Two of the proposals to limit farm size, the Department of Interior's and that of the National Land for People, Inc., are restrictive enough to cause excess acreage on larger farms if enforced. This excess acreage will be primarily in the Klamath District, which could have as many as 7,000 acres in excess under the Department of Interior's proposals. The North Unit District would have over 1,000 acres in excess under the Department of Interior's proposals, and the Owyhee-North Board

District would have little or no excess land under either of the proposals.

The other two proposals to limit farm size, that of Farm/Water Alliance and Church-Hatfield, would result in almost no excess acreage in any of the districts. This is because the former has basically no limit on farm size, and the latter's restrictions (1,280 acres) is well above almost all federally irrigated farms in these districts.

3) The enforcement of a 50-mile residency restriction would cause 9,000 excess acres across all three districts, 65 percent of which would be in the North Unit District. The imbalance of excess land in this case is due to the fact that, of the three districts, the North Unit has by far the greatest number of owners who reside more than 50 miles from their land. A 15-mile residency restriction would result in as much as 14,000 acres in excess over all three districts taken together.

4) The excess land resulting from enforcement of both acreage and residency restrictions is, in general, the sum of the excess land resulting from each restriction taken separately. This is because there is very little overlap between the acreage owned by residents living

more than 50 (or even 15) miles away from the land, and the acreage owned which is in excess of the acreage limitations.

When both the acreage limitations and residency restrictions of each proposal are applied to the existing pattern of owned and leased land in the three study areas, the results obtained, in terms of excess land, differ significantly. The proposed amendments of the National Land for People and those of the Department of Interior would result in 23,000 and 17,000 acres of excess land, respectively. The proposals of the Church-Hatfield Bill would result in approximately 2,500 acres, while the proposals of Farm/Water Alliance would result in no excess land.

5) The evaluation of bias in the survey data reveals an overall distortion of \pm ten percent, depending on the irrigation district and size of the parcel of land owned. This implies that the farm size distributions and calculations of excess land are accurate, at most, to within ten percent. Additionally, the evaluation of bias was based on ownership data only, leaving possible bias in the survey data for leased land unaccounted for. This state of affairs is a reflection of the lack of systematic data on leasing with which to compare the figures generated through the survey, and highlights

one of the main objectives of the thesis, i.e., to generate data on leasing.

Suggestions for Further Research

The evaluation of the acreage and residency restrictions of the proposed amendments to the Reclamation laws is a broad objective. Uncertainty surrounding the results of this thesis is a reflection of the lack of a definitive substratum upon which research efforts could be focused. Further efforts in this direction might concentrate upon one particular irrigation district, and thus allow for a more exhaustive analysis of existing patterns of land use. Alternatively, further research efforts might concentrate on one aspect of agricultural land use, especially leasing arrangements, and thereby produce a definitive set of data, perhaps verified through a personal contact with each landowner. Additional research efforts could also be productively employed investigating the economic relations between farm size, modern agricultural methods, and returns to society.

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APPENDICES

APPENDIX I - GLOSSARY

The definitions of some key terms pertaining to Reclamation laws and procedures are presented below. These definitions and several others were presented in the Federal Register, Volume 42, No. 165, Section 426.4, August 25, 1977.

- 1) Irrigable land - The area to which acreage limitations are applicable. More specifically, the net acreage possessing irrigated crop production potential, after excluding areas that are occupied by and currently used for homesites, together with dedicated roads open for general use by the public.
- 2) Non excess land - Irrigable land beneficially held by one landowner that does not exceed the acreage permitted by statute. Unless otherwise authorized by statute, non excess land is 160 irrigable acres in the beneficial ownership of one individual or entity.
- 3) Excess land - Irrigable land served with water from any federal project under reclamation laws, exclusive of exempt acreage, beneficially held by one landowner, which is in excess of that acreage which is non excess.
- 4) Exempt land - That area of privately owned irrigable land to which the acreage provisions do not apply by statute.
- 5) Eligible land - Acreage which is beneficially owned by individuals who have met all requirements of Reclamation law, and which, after the acquisition of project water, will not cause any individual owner to be in excess of acreage limitation provisions, or for which the owner has filed a recordable contract.
- 6) Project water - Water furnished by or through federally financed facilities to a district pursuant to a water service or repayment contract with the United States.

- 7) District - Any entity which has contracted with the United States for a water supply.
- 8) Recordable contract - A document wherein the landowner agrees to sell his excess lands upon terms and conditions satisfactory to the Secretary, and at prices not to exceed those fixed by the Secretary in order to be eligible to receive project water for those excess lands.

APPENDIX II - SURVEY QUESTIONNAIRE

CONFIDENTIAL

Department of
Agricultural and
Resource Economics



Corvallis, Oregon 97331 (503) 754-2942

160 Acre Limitation

- 1) How many acres of federally irrigated land do you own?
Of these federally irrigated acres you own, how many do you:
- a) farm? _____ acres.
b) lease? _____ acres.
c) have custom farmed? _____ acres.
- 2) How many acres of federally irrigated land do you farm but not own?
Of these federally irrigated acres you farm but not own, how many are?
- a) leased? _____ acres.
b) custom farmed? _____ acres.
- 3) Do you receive water from more than one irrigation district? Yes No
- 4) Current reclamation laws limit the ownership of federally irrigated land, but there are no restrictions on leasing land. Do you think there should be an acreage limitation on leasing land? Yes No
- If your answer is yes, what should the limit be? _____ acres.
- 5) How far from the federally irrigated land that you own do you live? _____ miles.
- 6) Do you consider 160 irrigated acres to be an adequately sized family farm unit in your region? Yes No
- If not, how many acres would you consider adequate? _____ acres.
- 7) What percent of your family income is earned from employment other than your farming operation? _____ percent.