Application of the 160-acre limitation in the development and operation of farms on irrigation projects
by Paul A Pilati

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Economics
Montana State University
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Abstract:
This thesis analyzes the problem of maladjustment in the use of resources in Reclamation resulting from restrictions imposed by the 160-acre limitation. It develops suggestive analyses of the problem with respect to size of farms and shows what alternatives in size in various sites would accomplish in terms of efficiency, income producing ability, and the family farm concept as a basis for legislative and administrative decisions.

In developing the problem, a series of farm budgets were prepared. These show typical organizations, output, and costs in relation to various land classes in four Reclamation study areas. The study areas are the East Bench Unit, Greenfields Division, Huntley Project, and Heart Mountain Division.

Size of farm was the controlling variable, with net returns per acre and net hourly returns to farm family labor and management the principal indicators of efficiency. Total net returns per acre and an income goal of $3,000 were the measures of income producing ability.

The family farm concept was defined in terms of labor utilization.

In order to reflect the income producing ability of land, all crops, including pasture, were sold. For the same reason, no livestock enterprises were utilized.

In terms of efficiency, income producing ability, and the family farm concept, the findings suggest a farm size of 320 acres. At one extreme is the Huntley Project with a modal group of 240 acres while at the other extreme is the East Bench Unit with a modal group of 480 acres.

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181

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Approved:

Head, Major Department

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Errors of omission and commission remain, of course, my sole responsibility.

ABSTRACT

This thesis analyzes the problem of maladjustment in the use of resources in Reclamation resulting from restrictions imposed by the 160-acre limitation. It develops suggestive analyses of the problem with respect to size of farms and shows what alternatives in size in various sites would accomplish in terms of efficiency, income producing ability, and the family farm concept as a basis for legislative and administrative decisions.

In developing the problem, a series of farm budgets were prepared. These show typical organizations, output, and costs in relation to various land classes in four Reclamation study areas. The study areas are the East Bench Unit, Greenfields Division, Huntley Project, and Heart Mountain Division.

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In order to reflect the income producing ability of land, all crops, including pasture, were sold. For the same reason, no livestock enterprises were utilized.

In terms of efficiency, income producing ability, and the family farm concept, the findings suggest a farm size of 320 acres. At one extreme is the Huntley Project with a modal group of 240 acres while at the other extreme is the East Bench Unit with a modal group of 480 acres.

APPLICATION OF THE 160-ACRE LIMITATION IN THE DEVELOPMENT AND OPERATION OF FARMS ON IRRIGATION PROJECTS

I. INTRODUCTION

Earl L. Butz, Dean of Agriculture at Purdue University asks:

> Will the people who man the farms of America be permitted to share fully in the benefits growing out of modern science and technology, or must they live with a ceiling over opportunity imposed by governmental programs designed to maintain small, inefficient, often peasant type production and living units on the land? 1/

The Problem

Settlers on Reclamation projects have been and are experiencing economic and social difficulties--difficulties which are, at least in part, due to the initial shortcomings of our land settlement policies. Any policy, or lack of one, impinges directly on the farm firms, and through the firms it will result in adjustments in irrigated agriculture. For this reason the Reclamation farm unit will become the primary unit of study, both in appraising the effects of these institutional stimuli on the individual farm, and the aggregate effects on projects and Reclamation as a whole.

Although the reservoirs and canals built by Reclamation are a success in an engineering sense and have created wealth in land,

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1/ Earl L. Butz, United Press release, May 7, 1958.

much less can be said of the economic and social views which have symbolized Reclamation. 2/

Initially, it was assumed that the sole responsibility of Reclamation was the construction of supply and distribution works and that this in turn would be followed by successful settlement. Settlement was opened to anyone. Terms such as experience, efficiency, and capital reserve were as unfamiliar as was the practice of land-leveling. Success was measured in terms of sweat and endurance. 3/

As time progressed, the necessary ingredients of higher civilization such as suitable homes, roads, and schools reduced the settler's development capital to almost nil. This made it necessary for the government to instigate repeated amortizations and leniency acts in order to bail the settler out of financial straits. 4/

Historical Setting

Colonial America was the setting for an oppressive land monopoly thrust upon it by England. Characteristic of this English policy were

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2/ Dorothy Lampen, Economic and Social Aspects of Federal Reclamation, Baltimore; The John Hopkins Press, 1930, p. 5.

3/ Ibid.

4/ U. S. Statutes At Large XLII, 4; XLII, 489; 1324; XLII, 116.

the remnants of the antiquated feudal system including estates tilled by indentured servants, primogeniture, and entail. 5/ The Crown restricted westward emigration beyond the Alleghenies and disposed of land in large estates. This in turn led to economic and social differences among the citizenry through development of a small landed gentry and a large landless class--a class which was the main support of the Revolutionary War and from whom originated the family farm philosophy.

Confiscation of the Tory estates and vast domain of the Crown within the Colonies by the Colonial legislatures, together with agreement that the lands west of the Alleghenies should be common Colonial property, led to the breakdown of the large estates and creation of the original Public Domain. 6/ This Public Domain could mean revenue for a nearly bankrupt nation or a new way of life for the poverty stricken landless.

5/ The modern Anglo-American law of land derived from English Feudalism was established after the Norman Conquest of 1066. Theoretically, the king was the ultimate owner of all land; in practice, however, certain land was held according to earlier custom--feudal tenants always held land of another to whom obligations were paid. With primogeniture, the exclusive right of inheritance belonged to the first born male while through entail an estate was given to the donee and to his issue or a class of his issue. As a result, alienation of the land out of the prescribed line of succession was prevented.

6/ U. S. Department of Interior, Land Ownership Survey on Federal Reclamation Projects, Bureau of Reclamation, Washington; Government Printing Office, 1933, pp. 64-65.

At first the dominial policy of selling large units for comparatively high prices prevailed. This did not prove satisfactory, so in 1796 the alienation theory of selling in small plots and the 160-acre ideas were conceived. This, too, proved only half successful due to the lack of repayment ability on the part of the landless.

The Pre-emption Act of 1841 marked the end of the old conservative land policy and in it Congress recognized four important principles: 7/

1. Settlement of the public domain was more desirable than revenue from its sale.
2. The public domain should not fall into the hands of those already having sufficient land.
3. The unearned increment should be spread widely, i.e., the principle of acreage limitation was embedded in American land policy.
4. Protection of the settlers was important and a "reasonable time" for repayment was allowed.

A growing sentiment for widespread ownership of land by land settlers was evidenced by the many attempts at passage of bills containing many of the provisions later included in the Homestead Act of 1862, the Desert Land Act of 1877, and the Reclamation Act of 1902. 8/

7/ Ibid., p. 69.

8/ Congressional Record, pasim., Vol. 35, Part 7, 57th Congress, 1st Session, pp. 6678-79; see also pp. 1383-1386, 2218-2224, 2276-2285, 2381, 3812, 6669, 6674-6708, 6722-6779, 6794, 6892-6895, and 6977.

The Homestead Act made bona fide residence a condition for obtaining title, thereby supplanting the sales system--the change from use of land as a source of revenue to encouragement of homebuilding. The Desert Land Act marks the first attempt on the part of the Federal Government to aid in the reclamation of arid land.

The last 30 years of the 19th Century was used to develop a coherent public mind on irrigation and was divided into 3 periods of emphasis: 9/

1. Period of development by private enterprise--characterized by encouragement of individual effort with passage of the first irrigation district law in Utah in 1865 as a means of financing irrigation development.
2. Period of state control--characterized by passage of the Carey Act in 1894 and its placing of public lands in amounts not to exceed 1,000,000 acres, into the hands of certain states. For their part in the transaction, the states were to cause the lands to be settled, irrigated, and a portion of them cultivated.
3. Period of federal Reclamation--characterized by Federal control and financed from a revolving fund set up initially from the sale of public lands in 16 western states. Federal control dates from passage of the Reclamation Act.

9/ Dorothy Lampen, op. cit., p. 20.

In the 160 years during which the land policy of the United States was formalized, these two basic principles evolved:

1. Maximum number of settler ownership opportunities on family-sized farms.
2. Prevention of land speculation and land monopoly through a policy which was designed to distribute the benefits of Public Domain widely and which actually favored settlers against speculators and monopolists of the day.

These fundamental principles have been reiterated time and time again, not only through acts of general and special application, but also through statutory provisions, administrative rulings and opinions of the official Solicitor and the courts. 10/ This basic principle of wide ownership and prevention of speculation has been supported by major and minor political parties alike, by Republican and Democratic congresses, and by many of our presidents. 11/ We even find a historical precedent in the history of the Roman Empire. The Gracchan reforms

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10/ F. W. Mondell, Congressional Record, Vol. 35, Part 7, 57th Congress, 1st Session, pp. 6678-79. The 160-acre limitation is the device enacted by Congress to extend the historic American land policy to the combination of land and water in the arid and semi-arid west. See also pp. 1383-1386, 2218-2224, 2276-2285, 2381, 3812, 6669, 6674-6798, 6722-6779, 6794, 6892-6895, 6977.

11/ U. S. Department of Interior op. cit., p. 61. This is especially true of presidents such as Thomas Jefferson, Abraham Lincoln and Theodore Roosevelt who abolished relics of feudalism, and signed the Homestead and Reclamation Acts, respectively.

of 133-122 B.C. parallel the development in our land policy. Tiberious Gracchus wanted economic and social reform that would bring the small landowner farmer back to agriculture. 12/

Previous Work

Although scores of authors have written hundreds of volumes both eulogizing the traditional 160-acre principle as a bulwark of our democracy and bitterly denouncing it as contrary to the American tradition of free enterprise, 13/ none have managed to successfully sharpen the issues with respect to evaluation under any given circumstance. 14/

12/ Albert A. Trever, History of Ancient Civilization, New York; Harcourt, Brace and Company, 1939, pp. 155-170.

13/ See, for example, Paul S. Taylor, The 160-Acre Water Limitation and the Water Resources Commission, The Western Political Quarterly, Vol. III, No. 3, September 1950, pp. 435-449; see also F. W. Mondell, Congressional Record, op. cit.
Paul S. Taylor, The Excess Land Law: Legislative Erosion of Public Policy, Reprint, Vol. 30, No. 4, Rocky Mountain Law Review, June 1958, pp. 1-35.
U. S. Congress, Senate, Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, Acreage Limitation Review, Senate Reports 1425, 2541 and 3448, 85th Congress, 2d Session, Washington; Government Printing Office, 1958.
Angus McDonald, One Hundred and Sixty Acres of Water, the Story of the Antimonopoly Law, Public Affairs Institute, Washington, 1958.

14/ U. S. Congress, Senate, Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, op. cit.; see also California Legislature, Joint Committee on Water Problems, Transcript of Hearing of 160-Acre Limitation, February 19, 1947, Sacramento.

The greatest part of the work done to date avoids the essential economic problems and has dealt largely with limited ownership and its economic and social problems concerned with the distribution of the unearned increment in land values created by Federal Reclamation.

Generally the writings do not distinguish between (1) the extent of ownership units as compared to operating units on Federal projects, (2) the extent to which operating units on these projects actually are limited to ownership units, (3) the tenure situation including extent of absentee ownership and effects thereof in regard to cropping practices and conservation, (4) the effect of the law in relation to efficiency and organization of the individual farm firm and, finally (5) the adjustments needed in the institutions that limit the development of efficient and adequately-sized farms on irrigation projects. These are the essential problems as regards to the 160-acre rule.

Although many of the authors have attempted to present scientific studies in regard to the myriads of facets concerning the 160-acre rule, most fail to retain objectivity in their analyses. The result seems to be a trend toward either business or social objectives, with subjectivity reflecting the writers' biases.

Research Problem

The fact that settlers on Reclamation Projects are having serious economic and social difficulties gives rise to the question of whether

or not these problems are, in part, due to some deficiency in Reclamation law.

We can conclude that the basic philosophy behind Reclamation is to provide as many family farms as is possible. Essential to this philosophy is a definition of the family farm and statement of the 160-acre limitation.

> Family farm: The family farm may be defined as one for which the principle source of labor is the farm family, and one which is of sufficient size and productivity to pay expenses, including food and shelter, medical care, education and recreation, and permit the accumulation of a reserve sufficient to meet the needs of old age. 15/

Reclamation has not, however, accomplished the ends embodied within the foregoing definition. It has, on the other hand, tended to ascribe to the maximization of settler numbers. This is reflected in the establishment of a system of farms which yield minimum rates of return to farm resources, especially to operator, family management, and labor. 16/

> 160-acre limitation: 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 owner unless he be an actual bona fide resident on

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15/ Sherman E. Johnson, et al., Managing a Farm, New York; D. Van Nostrand Co., Inc., 1946, p. 23.

16/ Anonymous, Size of Farms on Federal Reclamation Projects, (Agricultural Research Service, United States Department of Agriculture) December 1957 (dittoed), p. 5.

such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefore are made. 17/

We must keep in mind that when the proposal was adopted to develop the semi-arid West, Congress used the rules that had evolved for the settlement of the humid East. These rules, especially the idea of the 160-acre limitation which was conceived in 1796 by Congressman Findley of Pennsylvania, were quite appropriate to implement the principles of our land policy during our early agriculture. They lack, however, the flexibility needed to adjust to differing environmental conditions, technological change and changes in demand.

Objectives

The general objectives of this study are:

1. To summarize the trends and problems with respect to sizes of farms and their relation to the objectives of reclamation.
2. To show the economic characteristics of alternative sizes in various sites.

Specific objectives are:

1. To show why the limitation was imposed--why 160 acres.
2. To show how the law has been interpreted and administered and how it applies today.

17/ U. S. Department of Interior, Bureau of Reclamation, Federal Reclamation Laws Annotated, 2nd Edition, Washington; Government Printing Office, 1947, p. 53.

3. To show what exceptions have been established by congressional action and upon what circumstances they were based.

4. To show the effect of the application of the law in relation to efficiency and organization of the individual firm.

5. To make recommendations for adjustments in the institutions that limit the development on irrigation projects of farms that would be efficient and produce adequate income.

II. ANALYSIS OF RECLAMATION ACT

When the Reclamation Act was passed in 1902, it stressed limitation of land monopoly through (1) promotion of family-sized farms owned and operated by the individual farmer, and (2) prevention of land speculation. 1/

Major Weaknesses

The Reclamation Act was based upon arguments which emphasized the importance of homebuidling, conservation, and relief of congested areas--matters involving social rather than economic ends. Failure to provide for differences that exist between projects associated with site such as growing season, basic soil materials, location with respect to markets, and other factors that determine production levels, costs and alternatives or even the differences in productivity of various sites within projects, has led to social as well as economic distress within Reclamation. Failure to anticipate the necessity of increased cash requirements (due to technological change) for farm operation and family living has increased this distress. Further, unavailability of capital through

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1/ F. W. Mondell, Congressional Record, op. cit., the second aim was of major importance due to the landed monopolies which flourished in the western United States during the latter part of the 19th century. The policy was designed to distribute the benefits of public domain widely by actually favoring settlers against speculators and monopolists of the day.

credit sources to small units in newly developed or high-risk areas 2/ stresses the need for introducing flexibility into reclamation law.

The politically popular motive for perpetuation of the 160-acre rule manifests itself directly in the necessity of "selling" a Reclamation project to Congress. 3/ The traditional logic used in convincing the House of Representatives in order to receive appropriations is to (1) stress creation of the maximum number of settler opportunities, and (2) stress the accepted principle of spreading the unearned increment created by Reclamation as widely as possible--hence, the stress on the traditional 160-acre rule by our lawmakers.

Firmness of principle with flexibility to allow adjustment to changing conditions was the intent of the legislators in passage of the Reclamation Act as evidenced by Congressional hearings. 4/

2/ U. S. Congress, Senate Committee on Interior and Insular Affairs, Senate Report 1482, 85th Congress, 1st Session, Washington; Government Printing Office, 1957.

3/ The 17 western Reclamation states have strength in the Senate with representation totaling 34 of the 96 members. Appropriations originate in the House of Representatives, however, wherein the Reclamation states are weak.

4/ F. W. Mondell, op. cit., p. 6679. In quoting President Roosevelt, Mr. Mondell shows that there should be adjustment possibilities in the Reclamation Act, i.e., flexibility.

Major Points

Section 3 of the Reclamation Act specifies that each entry must not be less than 40 nor more than 160 acres. It also provides that the commutation provisions (substitution of money payment for usual work and resident requirements) of the Homestead Laws shall not apply to entries made hereunder. 5/

Section 4 provides that when the Secretary determines that an irrigation project is practicable, he must establish the area per entry at such acreage within the above limits as he considers necessary for the support of a family. 6/

Interpretation of section 5 provides that after establishing the initial farm unit it is necessary to relinquish that part of the farm which is in excess of one farm unit. 7/ Department decisions of the Secretary of Interior permitted a husband who was forced to relinquish that portion of his holding in excess of one farm unit to assign a portion of that farm to his wife. 8/

5/ U. S. Department of Interior, Bureau of Reclamation, Federal Reclamation Laws Annotated, op. cit., pp. 16-77.

6/ Ibid., p. 40.

7/ Instructions of the Acting Secretary, August 5, 1904, 33 L.D. 159.

8/ Case of Sadie Hawley, 1914, 43 L.D. 364.

Supplementary Legislation

In 1912 the Secretary of Interior was authorized by Congress to issue a patent to a settler upon completion of the residence, reclamation and cultivation requirements, and payments then due. 9/ This was an improvement in Reclamation Law because it allowed an entryman to mortgage his land for credit purposes, thereby removing an inhibiting hardship. The settler, however, was still limited to 160 acres.

Section 46 of the Omnibus Adjustment Act of 1926 requires contracts with irrigation districts to provide that irrigable lands held in private ownership by any one owner in excess of 160 irrigable acres shall not receive water unless the owner shall execute a contract for sale of the excess acreage. 10/ By its very nature, such a contract necessarily imposes a joint liability on all the landowners of a district. Payment in full of the joint obligation assumed by the district would be essential to effect freeing the excess land from limitation restrictions. Should the owner who has contracted with the irrigation district fail to sell the excess land within the prescribed time limit of one year, the Secretary of Interior is given power of attorney to sell the excess land at the appraised value.

9/ U. S. Department of Interior, Bureau of Reclamation, Federal Reclamation Laws Annotated, op. cit., p. 150.

10/ Ibid., pp. 318-19. This was one of the recommendations of the Fact Finders Committee which was appointed by the Secretary of Interior in 1923 to study all aspects of Reclamation.

On September 24, 1948, the Acting Commissioner transmitted a memorandum from the Chief Counsel of the Bureau of Reclamation stating that it is possible for an individual landowner holding excess lands to pay in full construction charges administratively assignable to his holdings and thus free the lands of acreage limitation. However, since the purpose of Congress is controlling in determining meaning of a law, the Supreme Court ruled that "the United States is neither bound nor estopped by acts of its officers or agents in entering into an arrangement or agreement to do or cause to be done what the law does not sanction or permit." 11/ This ruling makes it very plain that where Congress has directed a course of action, as in Section 46 of the Omnibus Adjustment Act of 1926, the Secretary is bound to comply with that direction notwithstanding any policy consideration motivated either by realism or idealism. 12/ Therefore, the individual cannot release himself from the excess lands limitation restrictions until payment in full of the joint obligation is assumed by the district as a whole.

11/ U. S. - vs - C. I. O., 335 U. S. 106, 112 (1948).

12/ U. S. Department of Interior, Office of the Solicitor, Solicitor's Opinion on Kings River Contract, Memorandum, Washington, D. C.; July 10, 1957.

Proposed Modification

The evolutionary process of introducing flexibility into reclamation law has been characterized by many attempts to place a greater amount of discretionary administrative power for setting size of farm into the hands of the Secretary of Interior. The apparent disadvantage of flexibility in this form is that it would increase the pressures exerted upon the Secretary by outside interests. 13/

Exceptions and Modifications, and Circumstances Thereto

1. Boulder Canyon Project (All-American Canal, Imperial Irrigation District, California)

Provides that the 160-acre limitation does not apply to lands in the district now irrigated and having a present water right. 14/

2. Colorado--Big Thompson Project (Colorado)

Provides that the excess land provisions are not applicable to lands having an irrigation water supply from sources other than a

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13/ Public Officials often relieve outside pressures by pointing to a statute in search of authority for action or inaction.

14/ Letter dated February 24, 1933 from the Secretary of the Interior, Ray Lyman Wilbur, to the Imperial Irrigation District, El Centro, California.

Federal Reclamation project and that these lands will receive a supplemental supply from the Colorado--Big Thompson Project. 15/

3. Water Conservation and Utilization Projects

Section 4 (c) (5) of this act grants authority to the Secretary of Interior to "establish the size of farm units of irrigable lands on each project in accordance with his findings of the area sufficient in size for the support of a family on lands to be irrigated."

It further provides that "no water may be delivered to or for more than the farm unit area of irrigable lands in the project owned by a single landowner." 16/ Under this authorization farm units have been established on the Eden Project, Wyoming, containing 200 irrigable acres more or less, depending upon land classes.

4. Truckee River Storage Project (Nevada--California) and

5. Humboldt Project (Nevada)

Provides that excess land provisions are not applicable to lands in Washoe County Water Conservation District, Nevada (irrigated from

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15/ U. S. Congress, Senate Report 4027, 75th Congress, 3d Session; see also Department of Interior Report dated June 6, 1938 and Public Law 665, 75th Congress, 3d Session, June 16, 1938.

16/ U. S. Congress, House Report 10122, 76th Congress, 3d Session, and Ibid., House Report 2944, see also Public Law 848, 76th Congress, 3d Session, October 14, 1940.

Boca Reservoir), nor to lands in Pershing County Water Conservation District, Nevada (irrigated from the Humboldt River Reservoir). 17/

6. San Luis Valley Project (Colorado)

Provides that the excess land provisions are not applicable to lands or to ownership of lands receiving supplemental or a regulated supply of water from the San Luis Valley Project, Colorado, provided that in lieu of acreage limitations no landowner shall receive a supply greater in quantity than that reasonably necessary to irrigate 480 acres of land. 18/

7. Owl Creek Unit (MRBP, Wyoming)

Provides that the excess land provisions are not applicable to lands in the Owl Creek Unit, Missouri River Basin Project. 19/

8. Santa Maria Project (California)

Provides that Section 46 of the Omnibus Adjustment Act of May 25, 1926, which concerns contract for sale of excess acreage, and any other similar provision applicable to Santa Maria Project lands

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17/ U. S. Congress, House Report 10543, see also Public Law 883, 76th Congress, 3d Session, November 29, 1940.

18/ U. S. Congress, Senate Report 2610, 82nd Congress, 2d Session and Senate Report 1594, 82nd Congress, 2d Session, May 12, 1952.

19/ U. S. Congress, Senate Report 1790, 83rd Congress, 2d Session, July 12, 1954.

does not apply so long as water utilized thereon is acquired by pumping from underground reservoirs. 20/

9. Excess lands acquired by foreclosure, etc.

Amended the previous provisions of Reclamation Law whereunder property acquired by foreclosure or other process of law, inheritance, device, etc., could be held for only 2 years by extending the permissible period during which such property can be held to 5 years. 21/

10. Washoe Project (Nevada--California)

Section 2 (b) of Public Law 858, 84th Congress, 2d Session, dated August 1, 1956 provides that contracts for supplemental water supply (under Washoe Project) may omit provisions of the third sentence, paragraph (a) Section 46, Act of May 25, 1926 (Omnibus Adjustment Act). In lieu thereof, the contract must provide that the pro rata share of irrigation allocation attributable to furnishing irrigation benefits in each particular year to land held in private ownership by any one owner in excess of 160 irrigated acres shall be returned with interest computed in accordance with

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20/ U. S. Congress, House Report 1098, 83rd Congress, 2d Session, January 7, 1954, containing Department of Interior Report on House Report 2235.

21/ U. S. Congress, House Report 1748, 84th Congress, 2d Session, February 7, 1956; see also U. S. Congress, Senate Report 2378, 84th Congress, 2d Session, June 28, 1956 and Public Law 690, 84th Congress, 2d Session, July 11, 1956.

appropriate provisions of the act. However, such payment for the excess lands shall not exceed the amount equal to the increased payment capacity of the excess lands (as determined by the Secretary) resulting from the supplemental water supply. 22/

11. Small Reclamation Projects

Section 5 (c) (2) of the aforementioned act provides for payment of interest on that pro rata share of a loan made under the act attributable to furnishing irrigation benefits in each particular year to land held in private ownership by any one owner in excess of 160 irrigable acres. 23/

12. East Bench Unit (MRBP, Montana)

Provides exemptions of Beaverhead River Valley lands from acreage limitation of Reclamation law except that ownership of bench lands alone, or a combination of bench and valley lands, in excess of 130 class I equivalent acres shall be deemed as excess under Reclamation law. We must bear in mind that the bench lands are

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22/ U. S. Congress, Senate Report 1829, 84th Congress, 2d Session, April 24, 1956; see also Public Law 858, 84th Congress, 2d Session, August 1, 1956. Terms such as "pro rata share . . attributable to furnishing irrigation benefits . . increased payment capacity" are so ambiguous that they are being used in order to circumvent the original intent of the Reclamation Act.

23/ U. S. Congress, House Report 2200, 84th Congress, 2d Session, May 23, 1956; see also Public Law 984, 84th Congress, 2d Session, August 6, 1956. Section 5 (c) (2) has the effect of providing an economic sanction to building up land monopoly in the form of corporate agriculture on Reclamation projects.

variable in profile with the result that most farm units will be a composite of land classes I, II, and III rather than one land class exclusively.

It also provides that water may be delivered to such excess lands if (1) total ownership does not exceed 160 irrigable acres, or (2) a valid recordable contract has been executed. The exception was made because of climate, hence site conditions, and includes the equivalent of 130 acres of class I land, i.e., 130, 160, and 220 acres of classes I, II, and III lands, respectively. 24/

13. Columbia Basin Project (Washington)

Among other purposes, Public Law 85-264 increases the acreage which can be owned under the Columbia Basin Project Act to (1) one or more farm units held by an individual owner but not to exceed a total of 160 irrigable acres, or (2) one or more farm units held by a family but not to exceed 320 irrigable acres, provided that water shall not be delivered to more than one farm unit held by any individual or family on September 1, 1957, except in the case of pre-1937 owners who may hold 160 irrigable acres as heretofore provided under the Project Act. 25/ The exception was granted

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24/ U. S. Congress, Senate Report 574, 85th Congress, 1st Session, July 2, 1957; see also Public Law 85-112, July 24, 1957.

25/ U. S. Congress, House Report 1238, Conference Report on Senate Report 1482, 85th Congress, 1st Session, August 23, 1957; see also Public Law 85-264, September 2, 1957.

because the original Columbia Basin Project Act was planned during the depression (1930's) and was based upon a subsistence agriculture.

14. Kendrick Project (Wyoming)

Provides that the acreage limitation applicable to the Kendrick Project shall be 480 irrigable acres in lieu of 160 as provided under basic Reclamation law. 26/

15. Seedskadee Project (Wyoming)

Prohibits delivery of water to lands in single ownership in excess of 160 acres of class I lands unless the owner of excess lands executes a recordable contract to dispose of the excess holdings. It also provides a formula for determining the "equivalent of 160 acres of class I land," i.e., 182, 225, and 372 acres of classes II, III, and IV land, respectively. 27/

16. Mercedes Division of the Lower Rio Grande Rehabilitation Project (Texas)

Provides that interest is to be paid on the pro rata share of the capital cost attributable to furnishing benefits in each

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26/ U. S. Congress, Senate Report 838 on Senate Report 1996, 85th Congress, 1st Session, August 8, 1957, containing Department of Interior Report on Senate Report 1996, see also Public Law 85-283, September 4, 1957.

27/ U. S. Congress, Senate Report 1906, 85th Congress, 2d Session, July 23, 1958.

particular year to land held in private ownership by any one owner in excess of 160 irrigable acres. 28/

17. Administrative Tolerance to Violations of the 160-Acre Rule

On many projects administrators tolerate violation of the excess land rule so long as violation is in the letter rather than the spirit of the law. This is to say that some excess farms are operated by settlers who have large families, some members of which (in all probability) will share in the operation of and tend to absorb the excess acreage upon reaching the age of majority.

Basic Arguments for Exceptions

The arguments generally advanced in support of the various exceptions to and modifications of the 160-acre rule are:

1. That the basic Reclamation Law was intended for public, not private land.
2. That Reclamation was designed to supply water for newly-developed lands, not supplemental water for previously-developed lands.
3. That the particular project differs in some aspect in regard to site such as length of growing season, soil conditions and/or location with respect to markets.

28/ U. S. Congress, Public Law 85-370, 72 Statute 82, April 7, 1958.

4. That the communities were already established, therefore the incremental value would be small.

5. That interest will be paid on the public monies invested in excess lands.

Circumvention of Rule

Because of the tendency toward inflexibility in the 160-acre limitation, various methods have been devised with which to circumvent the basic rule. One of the most popular of these is the "money alternative," i.e., payment in full of construction charges so that patent for the land will be issued and the land reverts to a private status. This method is used in connection with public land upon which the Secretary of Interior has the prerogative of setting farm sizes at less than 160 acres, i.e., from 40 to 160 acres. Reversion from public to private land through patent allows increased land ownership up to 160 acres--the size of farm initially set on private land. The exception to the rule setting farm size on private land is the Columbia Basin Project wherein the Secretary of Interior is required to establish farm units on a family farm concept and may establish the unit at less than 160 acres. Less popular is the second method of putting pressure on the Army Engineers to add irrigation to their present navigation and flood control powers. 29/

29/ This method requires pressure in the form of lobby action in Congress on particular projects which have multiple use possibilities.

The Army Engineers are not bound by the 160-acre rule. The third and least popular of the methods in circumvention is that of having the individual state take over and pay the entire cost of the project. 30/ A very popular proposal for circumvention is the so called Engle formula which would consist of an interest charge on excess land holders in lieu of requiring disposal of the excess holdings in return for water.

Need for Research

The great number of exceptions, modifications, waivers, special provisions, and administrative tolerance to deviations with respect to acreage limitation in reclamation indicates maladjustment in the organization of land resources resulting from restrictions imposed by the 160-acre rule. These circumstances make it necessary to determine whether the rule allows secular adjustment to improvements, technological change, and changes in demand. Information is needed concerning the effect of alternatives in size, both for legislative purposes and from the occupational standpoint.

30/ Proves to be much too costly for most states. An example in process, however, is the State's Feather River Project in California's Central Valley Watershed.

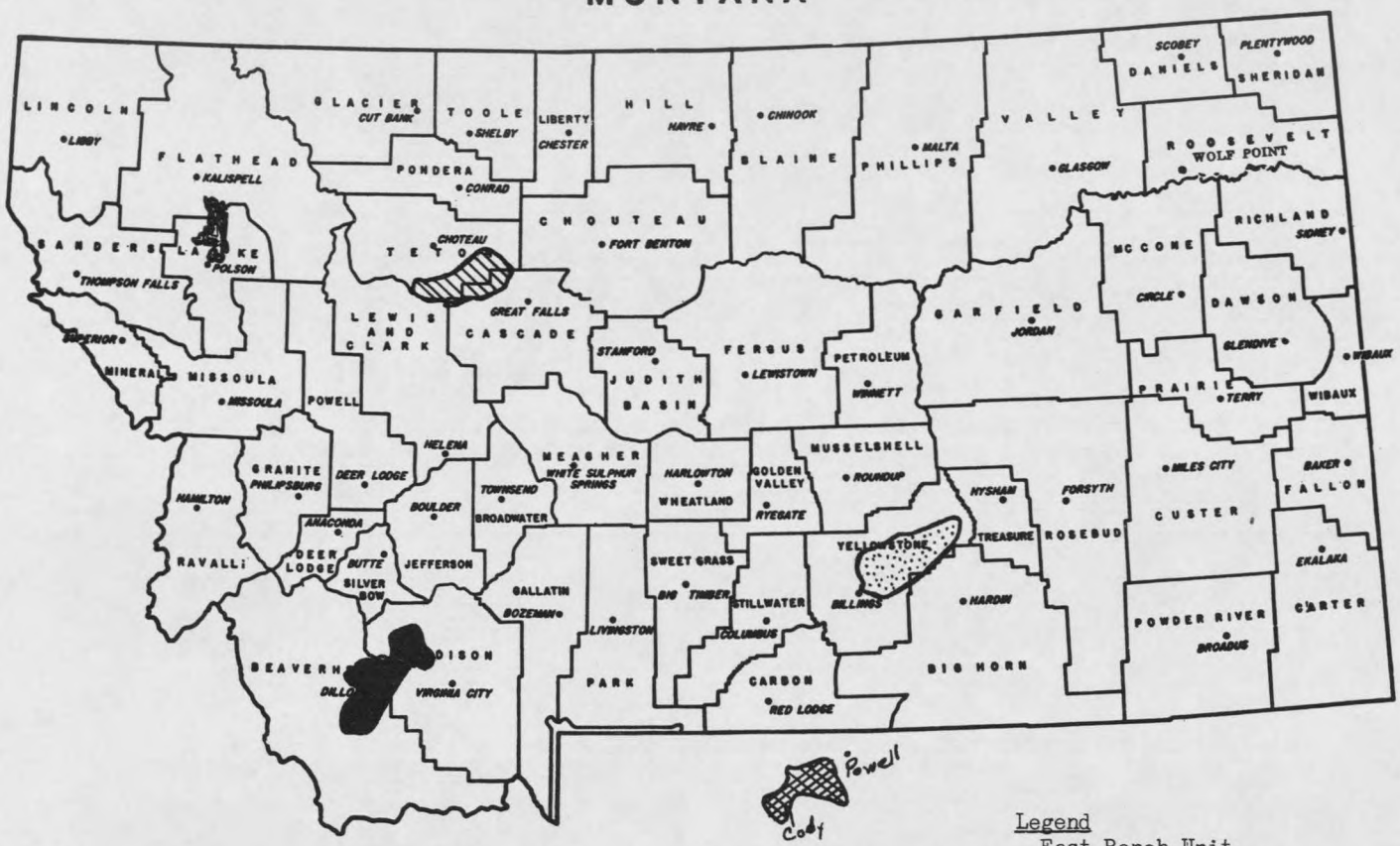
III. STUDY AREAS--SETTING AND PRESENT STATUS

Since the economic problem of too small farms on irrigated projects is most severe where high altitude and the associated short and cool growing seasons limit the basic cropping pattern to small grains, hay, and pasture, it is intended to concentrate this study on areas of such limited alternatives. These are the proposed East Bench Unit of the Missouri River Basin and the Greenfields Division of the Sun River Project with mean altitudes of 5,100 and 4,000 feet respectively. However, for comparison purposes and to point out the general problem, two areas of more intensive agriculture will also be studied. These are the Huntley Project and Heart Mountain Division of the Shoshone Reclamation Project with mean altitudes of 2,850 and 4,700 feet respectively.

For purposes of simplicity throughout the remaining text, the Greenfields Division of the Sun River Project and the Heart Mountain Division of the Shoshone Project will be termed the Greenfields Division and the Heart Mountain Division, respectively.

East Bench Unit

The proposed East Bench Reclamation Unit lies in the valley of the Beaverhead River in Beaverhead and Madison Counties near Dillon, Montana. It extends from the proposed Clark Canyon Dam near Armstead, Montana northeast 40 miles to near Twin Bridges, as shown on the following page in Figure I. Elevations within the area range from 5,450 at the proposed Clark Canyon Dam to 4,700 feet at its northeast point.



Legend

East Bench Unit
Elevation.....5,100
Frost Free Period..114 days

Greenfields Division
Elevation.....4,000
Frost Free Period..118 days

Heart Mountain Division
Elevation.....4,700
Frost Free Period..125 days

Huntley Project
Elevation.....2,850
Frost Free Period..135 days

Figure I. Comparison of Site Locations, Elevations, and Frost Free Periods of Various Reclamation Study Areas, 1958.

The climate is semi-arid with annual precipitation of 16 inches. The frost-free period is 114 days with an average range from May 22nd to September 13. Variation is great, however, with the latest killing frost recorded on June 30th and the earliest killing frost on August 31st. 1/

Total area of the project consists of 48,401 acres--28,401 acres being supplemental water while 20,000 acres are classified as full water supply.

Greenfields Division

The Greenfields Division is located in Teton and Cascade counties approximately 35 miles northwest of Great Falls, Montana as indicated in Figure I. This division comprises some 83,502 acres--part of which has been in operation since 1915. 2/

Average annual precipitation is 13 inches. The frost-free period is 118 days with the last killing frost recorded May 10th and the first killing frost September 22nd. 3/ Mean elevation is 4,000 feet. Principal

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1/ U. S. Department of Interior, Bureau of Reclamation, Definite Plan Report, Appendixes G, H, I, J, K, M, N, O, East Bench Unit, Montana Missouri River Basin Project, Region 6, Great Falls, Montana, 1956, p. G3.

2/ U. S. Department of Interior, Bureau of Reclamation, Crop Production Report, Greenfields Division, Sun River Project, Montana, 1957, p. 1.

3/ P. L. Slagsvold, An Analysis of the Present Status of Agriculture on the Sun River Irrigation Project, Bulletin No. 321, Montana State College, Agricultural Experiment Station, Bozeman, Montana, pp. 9-10.

crops are of the extensive type consisting of grains, hay and irrigated pasture. In 1957, there were 509 full-time operating units and 5 part-time units on the division. 4/

Huntley Project

Located in Yellowstone County in southcentral Montana, the Huntley Project extends from 15 to 45 miles northeast of Billings, Montana as indicated in Figure I. Construction was begun in 1905 and the project was opened for settlement in 1907. Precipitation averages 13.7 inches. The elevation ranges between 2,700 and 3,000 feet with a frost-free period of 126 days. Average dates of the last and first killing frosts are May 18 and September 21. 5/

Total area of the project is 33,107 acres. A diversified cropping pattern predominates with sugar beets the principal cash crop. In 1957 there were 186 full-time and 42 part-time units on the Huntley Project.

Heart Mountain Division

Located in Park County in northwestern Wyoming, the Heart Mountain Division extends from one mile north of Cody, Wyoming northeast approximately 18 miles as shown in Figure I. It encompasses 25,973 acres of

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4/ U. S. Department of Interior, Bureau of Reclamation, Crop Production Report, op. cit., General Summary Sheet.

5/ P. L. Slagsvold, Agriculture on the Huntley Project, Bulletin No. 342, Montana State College, Agricultural Experiment Station, Bozeman, Montana, pp. 2-4.

irrigable land, has a mean elevation of 4,700 feet, a growing period of 130 days, and average annual precipitation ranging from 9.4 inches at Cody to 5.9 inches at Powell, Wyoming. 6/ The division is the last of four to be opened to settlement in the Shoshone Project. Construction was initiated in 1936 and the first land of the division was opened to settlement in 1946.

Agriculture of the divison is diversified. Extensive crops such as hay, grains and pasture are supplemented with beans, the principal cash crop. In 1957 there were 174 full-time and no part-time farming units on the Heart Mountain Division.

6/ J. R. Tompkin, Guy Brock, Jr., and Paul Petzolt, Riverton-Shoshone Settlers - An Economic Study, Bulletin 323, Wyoming Agricultural Experiment Station, April, 1953, p. 5.

IV. PROCEDURE

The origins, applications, general appraisal, and effects of the 160-acre limitation will be analyzed and conclusions drawn from a review of public documents, publications on irrigation and Reclamation, and from interviews with public officials, farmers, and businessmen closely connected with Reclamation.

Method of Analysis

It is hypothesized that the acreage limitation as currently imposed causes problems of too small farms on most irrigation projects in this general area. The problem is most severe where high altitude and the associated short and cool growing seasons limit the crop alternatives. In such situations the basic cropping pattern is small grains, hay, and pasture. The proportion of cash crops and hay is usually further restricted on the lower grades of land. It is intended, then, to concentrate this study on problems associated with these areas of limited alternatives, although for purposes of comparison and to point out the general nature of the problem, attention will also be given to the more intensive types of irrigated agriculture.

Four Reclamation projects will be surveyed. These include, (1) the East Bench Unit--a project of limited alternatives which is in the planning and preconstruction stage, (2) the Greenfields Division of the Sun River--an old, well developed, extensive type project with limited alternatives, (3) the Huntley--an old, well developed by intensive type

project, and (4) the Heart Mountain Division of the Shoshone--a comparatively new, diversified project containing elements of both extensive and intensive agriculture.

The survey will obtain data on (1) the size of the original tracts which were intended to be both individual ownerships and farms, (2) size of the present ownerships, (3) the present operating size and tenure patterns of the farm land used, and (4) various trends on each of the projects. Analysis of the East Bench Unit, which is still in the planning stage, is based on plans and projections.

Farm budgets will be prepared to show typical organizations, output and costs in relation to classes I, II, and III lands and a series of size groups. Units of 160, 240, 320, and 480 acres will be used to determine the ranges of efficiency and incomes appropriate to the problem.

Several criteria appropriate to Reclamation development will be established. These include efficiency of operation, income-producing ability, and "family farm" concept. Returns per acre to farm family labor and management with size of farm the controlling variable will be the principal indicator of efficiency, while the total of such returns will be the measure of income-producing ability. The "family farm" concept will be defined in terms of labor utilization.

The farms of various sizes, both as listed previously and those now found in the areas studied, will be evaluated with respect to these criteria. Further, sizes appropriate to any given criterion will be

evaluated with respect to others. How efficient is a "family farm"? What are the income-producing abilities and the level of efficiency of farms as they now exist?

From this analysis the adjustment in size necessary to meet specific policy objectives can be postulated for the study areas. Principles and procedures will be developed that can be applied in the evaluation of other areas. It will also be possible to postulate general policies and demonstrate the results in terms of their application to local areas.

Assumptions

For purposes of this study the farm budget may be defined broadly as a schedule of the farm organization, showing the cropping pattern, distribution of investment between real estate and chattels and anticipated income and expenditures for the operating year.

Many physical input factors such as labor, power requirements, crop yields, and inputs for machinery and buildings can be based on experience. Yield assumptions for budget computation on the Greenfields Division of the Sun River, the Huntley, and the Heart Mountain Division of the Shoshone Reclamation Projects will be obtained from their respective crop production reports for 1957. Adjustments will be made on the considered judgment of project managers and preceeding crop production reports in order to achieve a projected long term average yield. Yields

used on the East Bench Reclamation Unit will be based upon assumptions obtained from the Bureau of Reclamation's Definite Plan Report. 1/

Prices and rates paid by farmers, including items used in production, interest, taxes, and wages, will be tied to an all product index of 265 (1910 - 14 = 100). Prices received by farmers will be tied to an all product index of 235 as reflected in Agricultural Price and Cost Projections. 2/

All prices and costs will be adjusted to reflect local conditions as closely as is possible. The construction cost index utilized will be 685 (1913 = 100). Land development charges for the various land classes will be taken from the East Bench Unit's plans and projections as contained in the Definite Plan Report and will be adjusted to achieve a long-term projected level. 3/

It is recognized that settlers can increase the return to farm family labor and management through the utilization of livestock. However, in order to reflect the income producing ability of the land, this study has been restricted to the production of crops. The crops, including pasture, will be sold.

1/ U. S. Department of Interior, Bureau of Reclamation, Definite Plan Report, Appendixes G, H, I, J, K, L, M, N, O, East Bench Unit, Montana, Missouri River Basin Project, Region 6, Great Falls, Montana, 1956.

2/ U. S. Department of Agriculture, Agricultural Research Service and Agricultural Marketing Service, Agricultural Price and Cost Projections (estimates for official use only), Washington; September, 1957.

3/ U. S. Department of Interior, Bureau of Reclamation, op. cit.

Each budget will be acclimatized as nearly as is possible to its respective physical area and to the economic practices and trends of that area. The principal crops of each study area will be included in the respective budgets. Necessary equipment and improvement investments will be made in similar amounts for each of the various land classes at the 160, 240, 320, and 480 acre farm sizes.

The ratio of tilled and intertilled crops to sod crops will be 2:2 on class I, 2:3 on class II and 2:4 on class III soils. No pasture crops will be introduced on class I lands but will be utilized in an increasing proportion on class II and class III lands.

The purpose of this study is to provide comprehensive information on the 160-acre rule which is meaningful to legislators and administrators so as to contribute to a basis for legislative action and administrative decision. The language of the study, therefore, is nontechnical as is possible so as to be usable by layman and technician alike.

Source of Data

Much of the data for the statistical analysis will be secured from the United States Reclamation offices at Billings, Ballantine, and Fairfield, Montana and Powell, Wyoming--the headquarters of the various project study areas. Records pertaining to development, irrigation, and cropping practices will be available in the annual reports of the project managers. Data concerning the original and present ownership

sizes will be derived from the farm unit plots of the projects as found in the regional headquarters office at Billings, Montana.

Supplementary data will be obtained from farmers and leaders in each area. Soil, topography, and climatological data will be secured from various soil surveys and Montana State College Agricultural Experiment bulletins. Tax data will be secured from reports of the Montana State Board of Equalization. Miscellaneous data will be derived from numerous public documents and publications on irrigation and reclamation.

Data on work requirements, seasonal distribution of labor, buildings, improvements, farm machinery needed for various cropping practices, and sundry budget essentials will be derived from the Farm Budget Standards for Irrigation Farming. 4/ This data will be adjusted by the projected long term averages for Montana. 5/ Land class II will serve as a standard for work requirement data, while work requirements will be adjusted in accordance with yield for land classes I and III.

Data for the East Bench Reclamation Unit will be derived chiefly from the Bureau of Reclamation's Definite Plan Report. 6/

4/ U. S. Department of Interior, Bureau of Reclamation, Farm Budget Standards for Irrigation Farming, Region 6, Billings, 1948.

5/ U. S. Department of Agriculture, op. cit.

6/ U. S. Department of Interior, Bureau of Reclamation, op. cit.

V. ANALYSIS OF PROBLEM

The problem of too small farms on most irrigation projects is magnified when coupled with high altitude and the associated short and cool growing seasons which limit crop alternatives to small grains, hay, and pasture. This situation is aggravated by cash crop restriction on lower grades of land.

The ratio of tilled and intertilled crop to sod crops in the Reclamation study areas is generally 2:2 on class I, 2:3 on class II, and 2:4 on class III soils. While pasture crops are generally not introduced on class I lands, they are utilized in an increasing proportion on class II and III lands.

In addition, land classes I, II, and III vary in initial development cost in such a manner that there is an economic rent in class I, very little rent in class II, and no rent in class III lands. Economic rent is defined as the surplus return above production expenses including charges for labor and management.

Class I land has no deficiency for use in irrigated agriculture. The development charge was estimated on the East Bench Unit at approximately $31.00 per acre. 1/ Class II land usually has a single deficiency in soil, topography, or drainage that either somewhat reduces the productive capacity or requires a moderately higher investment for the

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1/ U. S. Department of Interior, Bureau of Reclamation, Definite Plan Report, Appendixes G, H, I, J, K, L, M, N, O, East Bench Unit, Montana, Missouri River Basin Project, Region 6, Great Falls, Montana, 1956.

development or management of land. Comparable development charges averaged $46.00 per acre on class II land. 2/ Class III land usually has two or three deficiencies as mentioned in class II land but in some cases has a single deficiency that markedly reduces the productive capacity of the land or requires an expensive but feasible investment for development or operation. Comparable development charges here were estimated at $42.00 per acre. 3/

We must bear in mind that in many instances the lands are variable in profile with the result that the farm units will be a composite of land classes I, II, and III rather than one land class exclusively.

Components of Analysis

Efficiency, income-producing ability, and the family farm concept are the criteria which will be utilized in order to evaluate the farms of various sizes, both as found in each of the Reclamation areas and in the related series of prepared farm budgets. Further, sizes appropriate to any given criteria will be evaluated with respect to the other criteria.

Efficiency

Efficiency is essentially the ratio of useful input to output. Under pure competition the firm is compelled by the forces of the market

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2/ Ibid.

3/ Ibid.

to operate at the minimum point on its average cost curve at zero profit in the long run. This is shown by Figure 2.

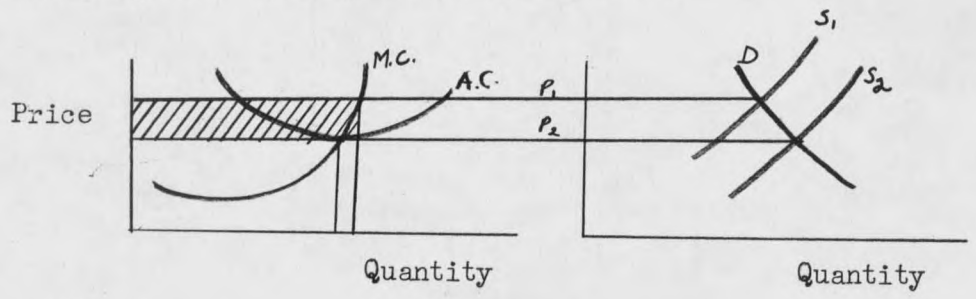


Figure 2. The Competitive Firm and The Industry Market Place

Since the demand curve of the farm firm is a straight horizontal line, the total revenue curve of the purely competitive firm will be a straight line, the slope of which is equal to the marginal revenue. Because the firm is just covering cost, the total cost curve will be tangent to the total revenue curve in a perfectly competitive equilibrium as shown in Figure 3.

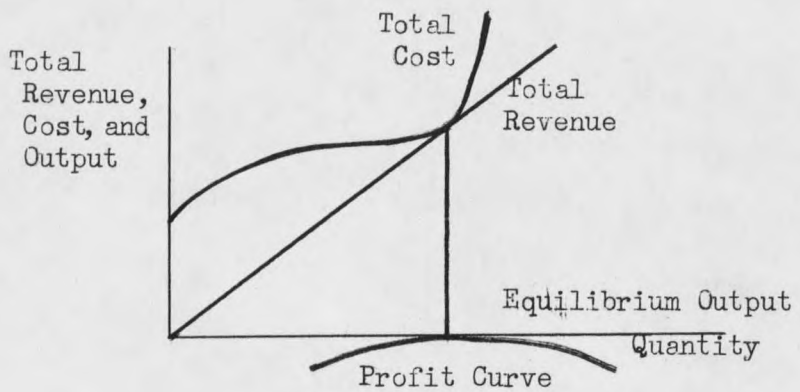


Figure 3. Total Cost and Total Revenue Under Pure Competition

Equality and tangency of the slopes of the total cost curve and total revenue curve indicates that the marginal cost equals the marginal revenue. Optimum efficiency of the firm is reached, given the factors of production and technology, when marginal cost equals the marginal revenue in the long run equilibrium.

However, for purposes of this study, it is impractical to execute a marginal analysis in order to equate the marginal cost with the marginal revenue. Therefore, the term efficiency will be used hereafter to indicate the area of optimum combination of resources rather than efficiency in the strict sense of the word. Net returns per acre and net hourly returns to farm family labor and management with the size of farm as the controlling variable have been used as measures of efficiency.

Income Producing Ability

Consensus of the Reclamation project managers is that income producing ability is limited by lack of sufficient managerial ability on the part of the farm firm operator to a maximum mean average of 320 acres on the Greenfields and Heart Mountain Divisions, and 240 acres on the Huntley Project.

It is believed that the earning capacities of farmers are equal to those of semi-skilled and skilled workers in non-farm employment. 4/ It is also believed that in a competitive economy, the greatest total of

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4/ D. G. Johnson, Comparability of Labor Capacities of Farm and Nonfarm Labor, Amer. Econ. Rev. 43: 296-313.

goods and services available to the consumer is achieved as the earnings in all employments approach equality for the same kinds of production factors labor, capital, and land. 5/ If this is true, it would follow that an income goal to use as a tool in analyzing the income producing abilities of the various farm sizes in the budget series would be that which is equal to the annual dollar return of the workers in semi-skilled and skilled non-farm employment. This amount is $3,000 and will be referred to as the $3,000 standard hereafter in text discussion. 6/

Total of net returns per acre to farm family labor and management with size of farm the controlling variable and an income goal of $3,000 have been used as the principal indicators of income producing ability.

Family Farm

The family farm concept has been defined in terms of labor utilization. Full utilization of farm family labor and management is based upon the Farm Budget Standards for Irrigation Farming. The supply is set at a maximum of 2,000 hours on the part of the operator and 420 hours on the part of the family--a total of 2,420 hours in a cropping operation for use in analyzing this problem. 7/ The 2,420 hours are

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5/ U. S. Department of Agriculture, Agricultural Research Service, Farm Resources Needed for Specified Income Levels, Agriculture Information Bulletin No. 180, Washington; December, 1957, p. 1.

6/ Ibid.

7/ U. S. Department of Interior, Bureau of Reclamation, Farm Budget Standards for Irrigation Farming, Region 6, Billings, 1948.

those specifically labeled as productive work and are assignable to particular crops.

In addition to this directly productive work will be some labor of a nature which cannot be directly assigned to any one crop such as fence maintenance and repair and upkeep of farm roads. The non-assignable labor, site conditions of such a nature that work must be completed within rigid time limits, and time off for sickness and bad weather are reasons why a larger number of man hours are not utilized even under a well-planned farm organization.

Study Area Differences

The problem of too small farms on irrigation projects in the Reclamation study area is most severe where high altitude and the associated short and cool growing seasons, and other factors, limit crop alternatives. In order to point out these differences in the various Reclamation units, a comparison will be made of the soil types, heat units, and the evolutionary growth of ownership farm units. The growth of the ownership farm units will also be compared with the 1957 operating farm unit size.

Land Classes

Land classification in Reclamation is conducted primarily for the purpose of establishing the degree of suitability of lands for sustained irrigation agriculture. It is one of the basic functions necessary for selecting proper land use, land development needs, and size of farm units.

A detailed soil survey is not available for the Huntley Project. Irrigable land is listed in land classes I through IV (19,618 acres) or in land class V (12,869 acres). 8/ Detailed soil studies are available for the East Bench Unit and the Greenfields and Heart Mountain Divisons, however. Following is a table comparing land classes I, II, and III of these units.

TABLE I. COMPARISON OF (IRRIGABLE ACREAGE) LAND CLASSES I, II, AND III WITHIN AND BETWEEN THREE RECLAMATION STUDY AREAS

Land Class	East Bench Unit a/	Greenfields Division b/	Heart Mountain Division c/
I	6.6%	62.3%	7.2%
II	53.5%	26.4%	50.0%
III	39.9%	3.8%	35.4%

a/ U. S. Department of Interior, Bureau of Reclamation, Definite Plan Report, op. cit., p. G 24.

b/ P. L. Slagsvold, An Analysis of the Present Status of Agriculture on the Sun River Irrigation Project, op. cit., p. 12.

c/ U. S. Department of Interior, Bureau of Reclamation, Economic Report and Repayment Plan, Heart Mountain Division, Shoshone Project, Wyoming, Yellowstone-Big Horn Projects Office, Cody, Wyoming, 1958, p. 1.

The East Bench Unit and the Heart Mountain Division have similar proportions of classes I, II, and III lands with approximately 7, 50, and

8/ U. S. Department of Interior, Bureau of Reclamation, Crops Production Report, Huntley Project, Montana, 1957.

40% of each, respectively. The Greenfields Division has, on the other hand, a 62, 26, and 4% division of land class I, II, and III.

Heat Units

In one way or another, temperature influences every chemical and physical process connected with plants--solubility of minerals, absorption of water, gases and mineral nutrients, diffusion, synthesis--as well as the vital processes such as growth and reproduction. Since these processes are necessary for plants to survive, temperature limits the distribution of plants in the various regions. More than this, temperature limits the areas of successful production of most agricultural crops.

For each variety of crop there is a temperature below which growth is not possible--the minimum growth temperature. There is also a maximum temperature above which growth ceases. Between these limits there is an optimum temperature at which growth proceeds with greatest rapidity. The growth rate of plants doubles for every 18° F. rise in temperature from the minimum to the optimum growth points. Above the optimum temperature, the growth rate falls off rapidly until the maximum is reached where growth ceases. 9/ Grain crops, for example, have a minimum growing temperature of 32-41° F., an optimum of 77-88° F., and a maximum of 88-99° F.

9/ U. S. Department of Agriculture, Climate and Man, Yearbook of Agriculture, Government Printing Office, Washington; 1941, p. 294.

Using as a base the minimum temperature at which growth occurs, heat units can be computed by adding the number of degree-hours (a degree-hour being 1 degree of temperature above the base for the duration of an hour) during the growing season.

Although the frost-free period varies but eight days between the extensive crop-type Greenfields Division (118 days) and the intensive crop-type Huntley Project (126 days), heat units vary a great deal and are much more important insofar as cropping alternatives are concerned. Table II illustrates the extreme differences in growing conditions at Fairfield, Montana (Greenfields Division) with growing season heat units totaling 2,121 and Huntley, Montana with growing season heat units totaling 50% more or 3,173.

TABLE II. COMPARISON OF AVERAGE NUMBER OF HEAT UNITS AT SELECTED POINTS*

Location	April	May	June	July	Aug.	Sept.	Total
Fairfield	0	84	450	706	642	239	2121
Huntley	75	364	626	886	802	420	3173

* P. L. Slagsvold, An Analysis of the Present Status of Agriculture on the Sun River Irrigation Project, op. cit., p. 11.

Size of Farms

A comparison of the original ownership, 1957 ownership, and the 1957 operating size of farms in the Greenfields Division, the Huntley Project and the Heart Mountain Division show a substantial increase in size of farm. This increase is especially marked in both of the older projects, i.e., the extensive type Greenfields Division, part of which has been in operation since 1915, and the intensive type Huntley Project which has been in operation since 1907. Farm size comparisons for the various Reclamation study areas are illustrated in Figure 4.

The 1957 ownership farm unit on the Greenfields Division was 99% larger (165 acres) than the original ownership size of 83 acres. Operating size in 1957 was 152% (251 acres) of the 1957 ownership unit. This indicates that 34% of the 1957 operating unit was leased land--a deviation from the original intent of Congress which advocated farm units owned and operated by the farm family.

Ownership size for 1957 on the Huntley Project was 38% larger (64 acres) than the original ownership farm unit size of 46 acres while the 1957 operating size of 116 acres was 82% larger than the 1957 ownership farm size. This indicates that 45% of the operating unit in 1957 was leased land--again a deviation from the original intent of Congress.

Because the Heart Mountain Division is a comparatively new project (development period concluded in 1957), ownership farm unit size has increased only 2% during the period 1949 to 1957. The 1957 operating

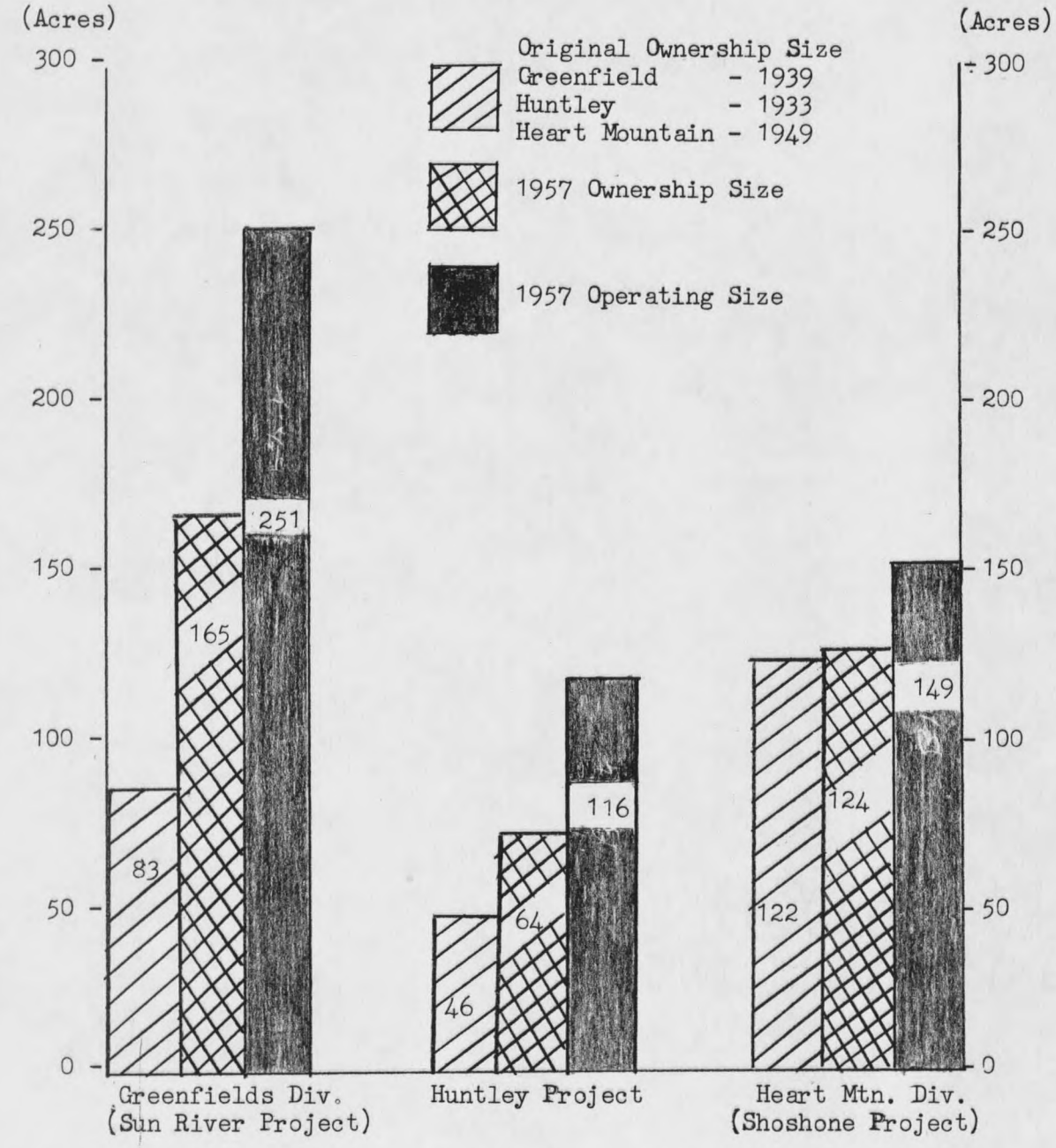


Figure 4. Comparison Of Original Ownership, 1957 Ownership, And 1957 Operating Size Of Farms Within And Between Three Reclamation Study Areas, 1958.

size of 149 acres was 20% larger than the 1957 ownership size, however. Leased land, therefore, constitutes 17% of the 1957 operating units.

In Reclamation projects such as the Greenfields Division where the ownership farm unit size has doubled since initial settlement, investment in and disinvestment of one or both of the original farmsteads results in a monetary loss to the settler. The alternatives to the settler are to (1) operate less efficiently from one or both of the farmsteads or (2) invest in an enlarged, centrally located farmstead capable of servicing the entire farm unit more efficiently. Initial units of larger size would reduce this costly problem.

Efficiency

Budgets have been prepared for each of the four Reclamation study areas for land classes I, II, and III in a farm size series of 160, 240, 320, and 480 acres. Hereafter, for simplicity in discussion, these budgets will be referred to as the budget series. 10/

Net returns per acre and net hourly returns to farm family labor and management with size of farm as the controlling variable have been used as measures of efficiency.

Returns Per Acre

East Bench Unit: Figure 5 (a) illustrates the result in return to increment of size on the East Bench Unit. The net return to labor and

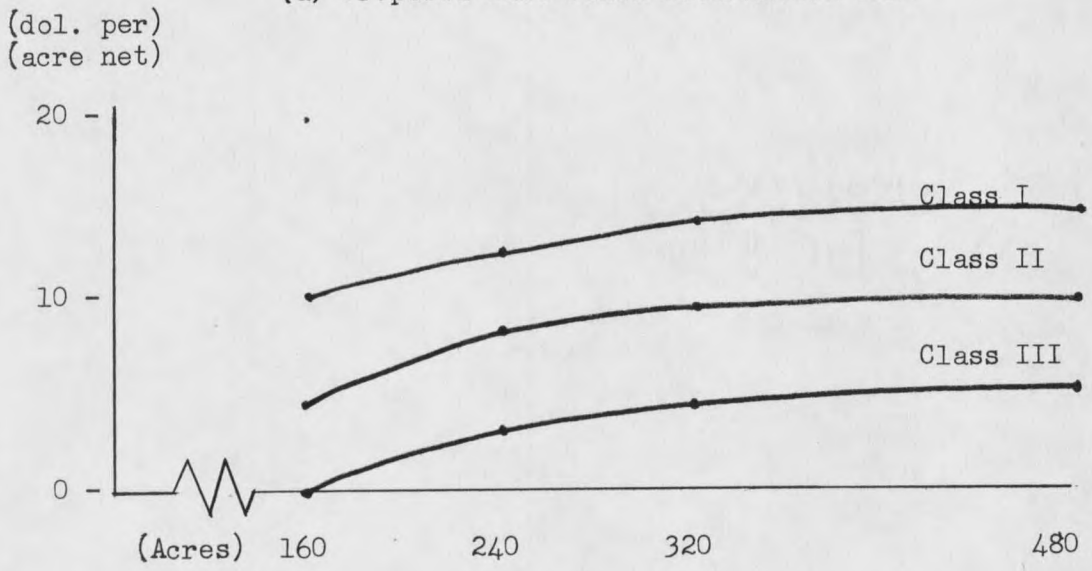
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10/ For values used see Farm Budget Summaries, Tables I, II, III, and IV, Appendix A.

management increases from $10.41 per acre on class I land at the 160 acre farm size, to $14.20 and $14.90 per acre on the 320 and 480-acre farm units, respectively. As a percentage of net return per acre to the 160 acre farm unit, the increase in net return per acre to the 480 acre farm unit is 43% on class I land. This percentage increases many times on class III lands where net return per acre varies from a minus 7¢ figure on the 160 acre farm unit to plus $5.62 on the 480 acre farm unit. This point illustrates the importance of land classes and the necessity of larger farm units in areas of high altitude and the associated short and cool growing seasons which limit crop alternatives to small grains, hay, and pasture.

The comparison of per acre return to labor and management as shown in Figure 5 (a) indicates that on class I land the curve tends to flatten slightly more between the 320 and 480 acre farm unit size than it does in the class II and III soils. This seems to indicate that the rate of efficiency of farm resources on the East Bench Unit decreases somewhat so that the optimum combination is nearer the 320 acre size on class I land and approximately 480 acres on class II and III soils, depending upon (1) the point where the curve will flatten, and (2) the acreage which constitutes a maximum management load on the part of the settler. It is interesting to note that in this extreme, extensive crop-type project the optimum farm resource combination size appears to be two and three times the traditional 160 acre farm.

(a) Proposed East Bench Reclamation Unit



(b) Greenfields Division, Sun River Reclamation Project

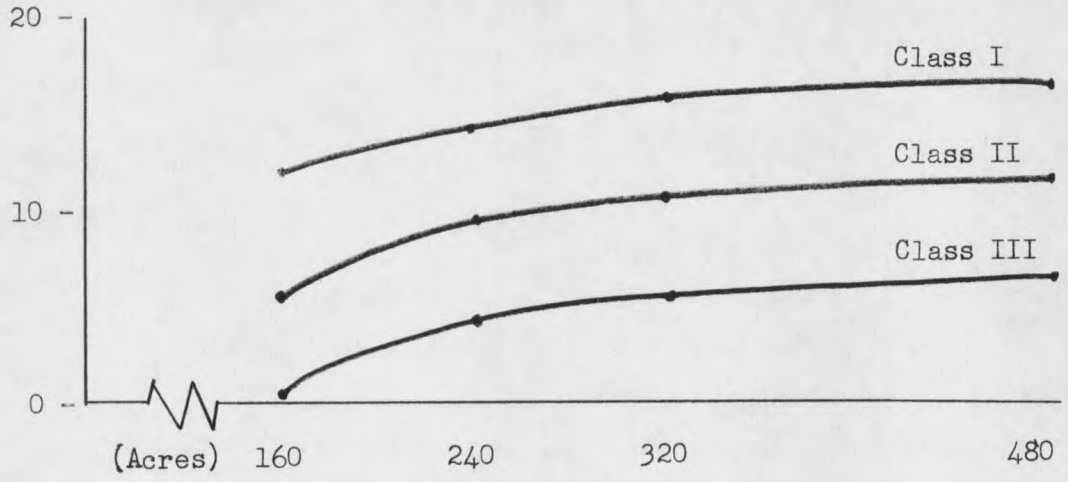
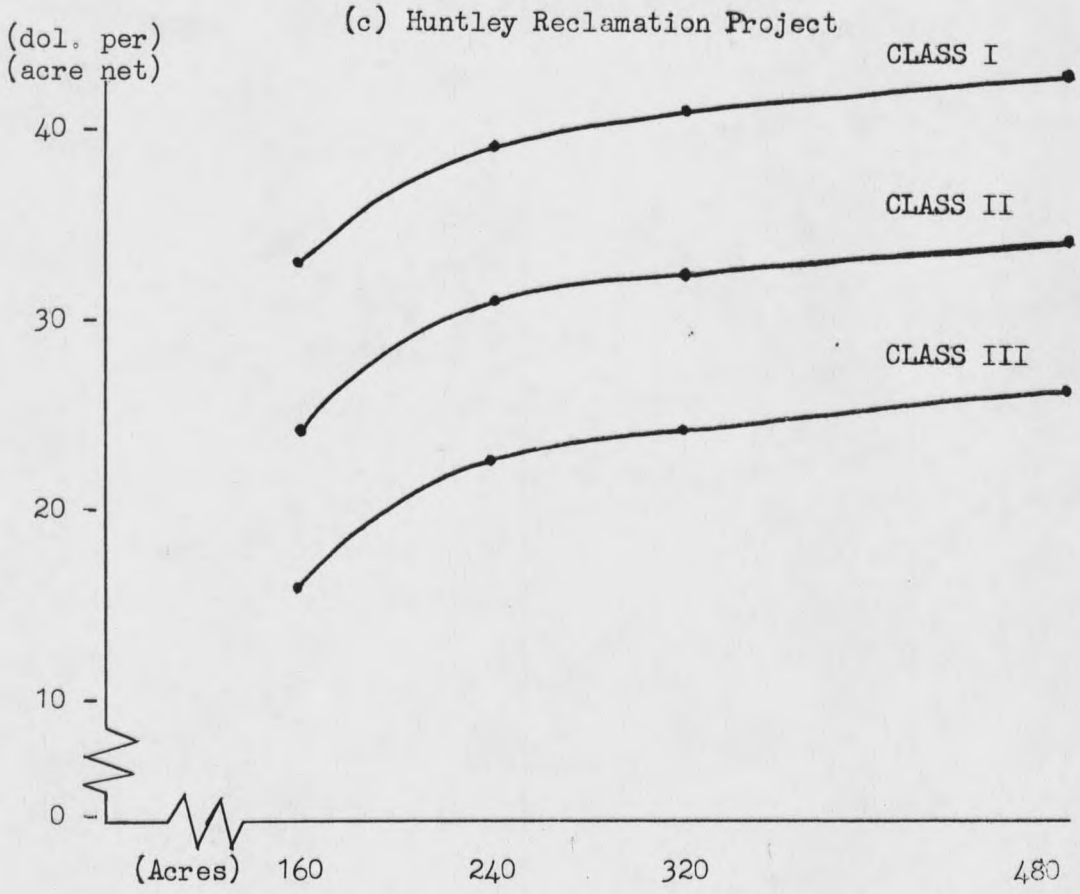
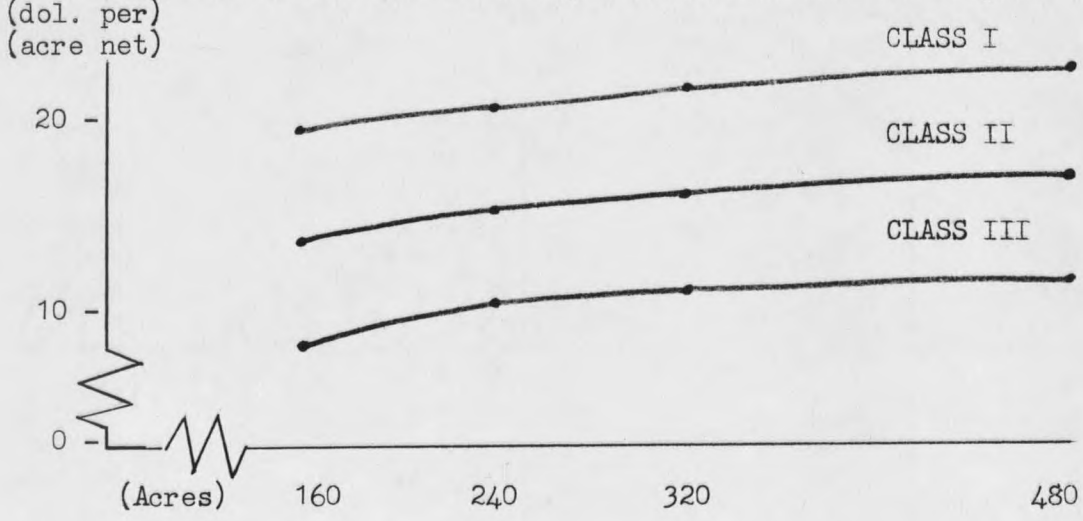


Figure 5. Comparison Of Per Acre Returns To Labor And Management On Various Size Farms In Three Soil Classes On Four Reclamation Study Areas, 1958. (Data obtained from Tables I, II, III, and IV, Appendix A).

(c) Huntley Reclamation Project



(d) Heart Mountain Division, Shoshone Reclamation Project



Greenfields Division: Figure 5 (b) illustrates the result in return to increment in size on the Greenfields Divison. The net return to labor and management increases from $12.05 per acre net on the class I 160 acre farm size to $15.98 and $16.72 on the 320 and 480 acre farm units, respectively.

As a percentage of the net return per acre to labor and management on the 160 acre farm unit, the increase in net return per acre to the 480 acre size is 39% on class I soils. This percentage increases many times on class III soils where net return per acre varies from 65¢ on the 160 acre farm to $6.36 on the 480 acre farm. These figures illustrate the importance of land classes to the settler and the necessity of larger farm units in Reclamation where site conditions limit crop alternatives to grain, hay, and pasture.

Comparison of per acre returns to labor and management as shown in Figure 5 (b) indicates that the curve tends to flatten more between the 320 and 480 acre farm unit size on class I than it does on the class II and III lands. Again, this seems to indicate a need for larger units on the poorer soils--a 320 acre farm unit on class I and more than 320 acres on class II and III soils. The optimum combination of farm resources pattern follows that of the East Bench Unit, however, it is not so clearly marked.

Huntley Project: Increment in return to size of farm on the Huntley Project is illustrated in Figure 5 (c). The net return to labor and management increases from $33.73 per acre on class I land at the 160 acre

farm size to $41.38 and $43.24 per acre on the 320 and 480 farm unit's, respectively. As a percentage of net return per acre to the 160 acre farm unit, the increase in net return per acre to the 480 acre farm unit is 28% on class I land. This percentage increases to 63 on class III lands where net per acre increases from $16.40 to $26.79 on the 160 and 480 acre farm units, respectively. Even on this intensive crop-type Reclamation unit which has a longer frost free period and heat units totaling 50% more than the Greenfields Division, it is quite evident that the increment in return to size of farm is increased to a greater degree, both relatively and absolutely, on the lower grades of land. With percentages of 7, 54, and 40 of land classes I, II, and III in the Huntley Project, increment in return to farm size is significant.

Comparison of return per acre to labor and management as shown in Figure 5 (c) illustrates a much lower, although steady, increase after the 240 acre farm size. Considering the limitation imposed by lack of managerial ability on the part of most settlers, it would seem that the optimum combination of farm resources would be between 240 and 320 acres, depending upon land class and settler managerial ability.

Heart Mountain Division: Increment in return to size of farm on the Heart Mountain Division is illustrated in Figure 5 (d). The net return to labor and management increases from $20.72 on class I land at the 160 acre farm size to $22.73 and $23.66 on the 320 and 480 acre farm units, respectively. As a percentage of net return per acre to the 160 acre farm unit, the increase in net returns per acre to the 480 acre farm is

14% on class I land. This percentage increases to 40 on class III lands where net per acre increases from $9.18 to $12.83 on the 160 and 480 acre farm units, respectively. Again, it is quite evident that the increment in return to size of farm is increased to a greater degree, both in the relative and absolute sense, on the lower grades of land. With percentages of 7, 50, and 35 on land classes I, II, and III in the Heart Mountain Division, increment in return to size becomes even more significant.

Due to a diversified cropping pattern including a comparatively high value crop with a relatively low fixed cost, the increment in return to size is almost a straight line increase on class I lands and only slightly curved on land classes II and III. The limitation in size of farm, therefore, would be that due to limitation in managerial ability on the part of the settler.

Returns Per Hour of Farm Family Labor and Management

The component parts of Figure 6 illustrate the theoretical net hourly returns to farm family labor and management due to increment in size of farm. In reality, however, returns are limited by lack of sufficient managerial ability on part of the farm firm operator to an approximate maximum farm size of 320 acres, with variation of 240 and 480 acres on the Huntley Project and East Bench Unit, respectively.

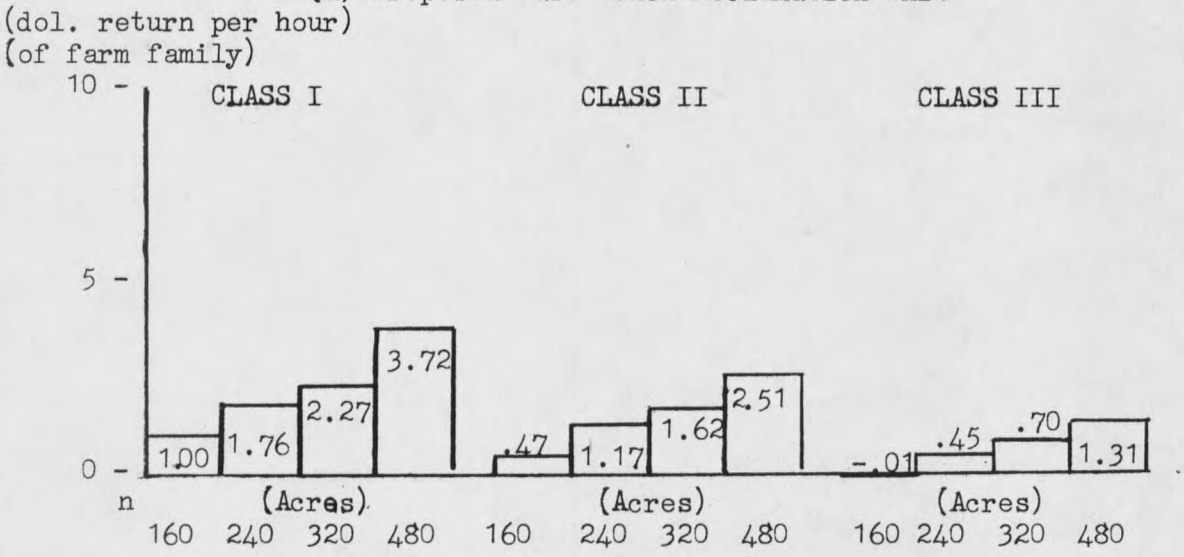
Analysis of Figure 6 shows increasing returns to scale throughout the four Reclamation study areas. Although it would be desirable to

find the point of decreasing returns to scale, it is not possible at this point to correlate decreasing return to scale with so little known of the limitations on managerial ability.

Returns per hour to increment in size are relatively more variable in the lower grades of land and in the projects where site conditions preclude intensive agriculture. The alternatives for expansion therefore, are (1) ideal site conditions and intensive agriculture or (2) extensive agriculture on a larger scale. Since this study deals largely with areas of limited alternatives, we must reiterate the need for larger farm units in areas of high altitude and associated short and cool growing seasons.

Figure 6 is based on Table I, Appendix B.

(a) Proposed East Bench Reclamation Unit



(b) Greenfields Division, Sun River Reclamation Project

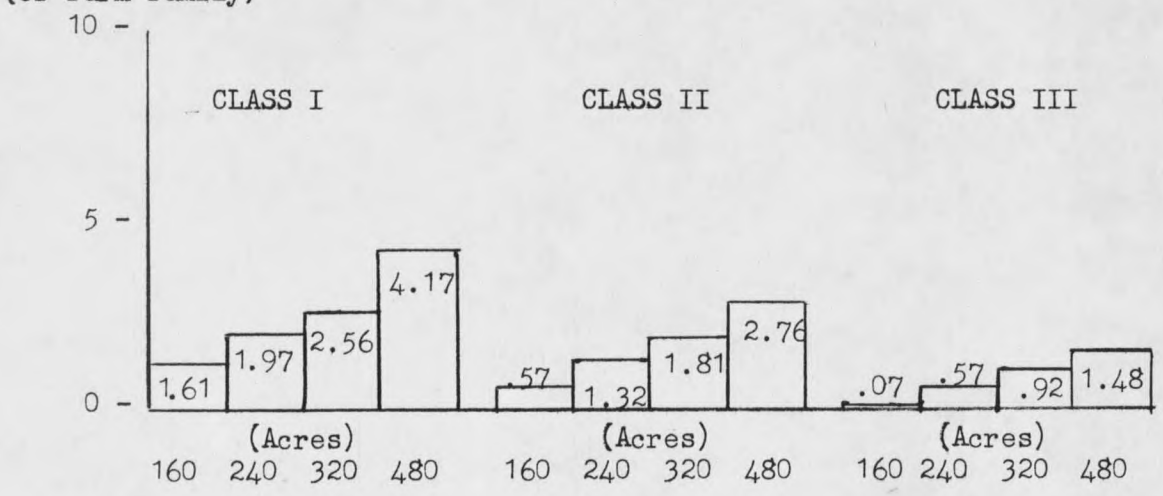
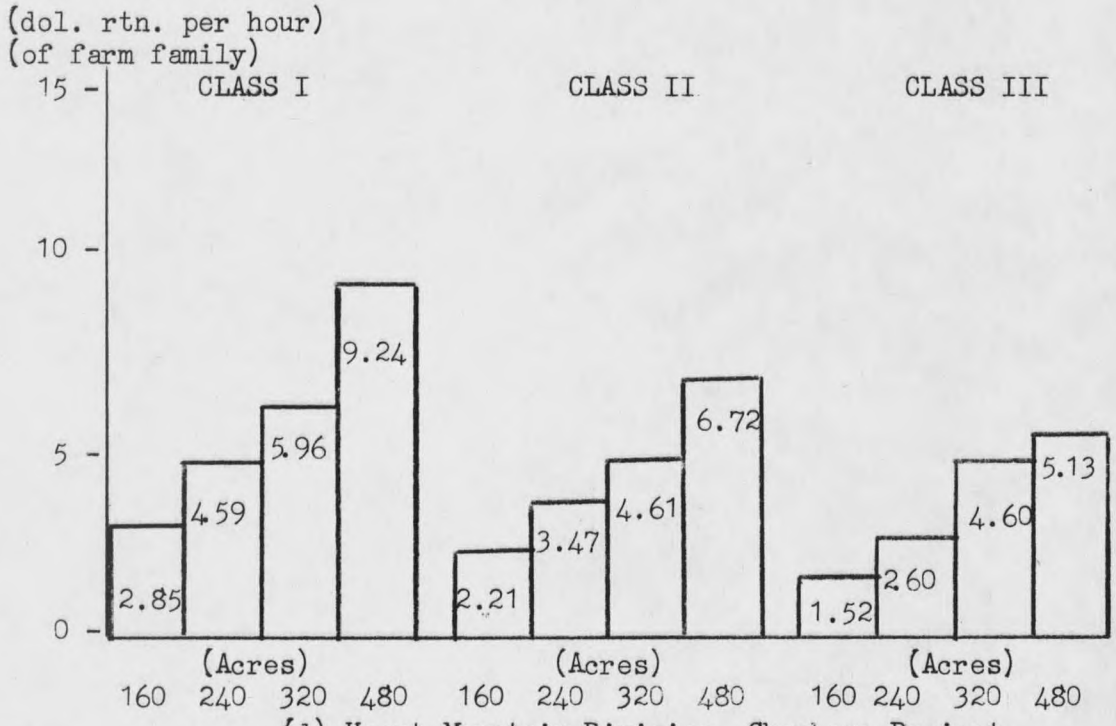


Figure 6. Comparison Of Per Hour Returns To Labor And Management On Various Size Farms In Three Soil Classes On Four Reclamation Study Areas, 1958. (Data obtained from Tables I, II, III, and IV, Appendix A)

(c) Huntley Reclamation Project



(d) Heart Mountain Division, Shoshone Project

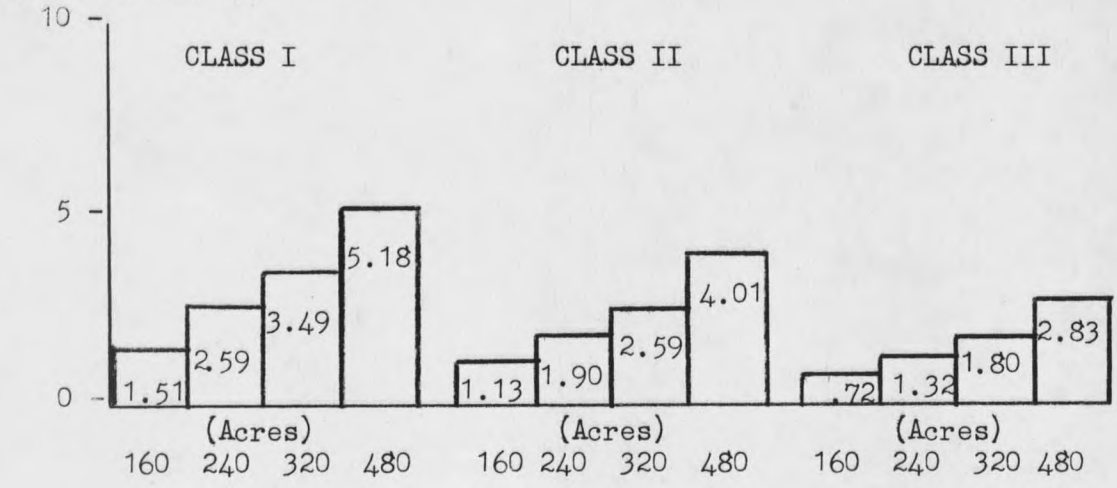


Figure 6. (Continued)

Income Producing Ability

Net dollar returns to farm family labor and management for three land classes and four farm sizes in the various Reclamation study areas are illustrated in Figures 7, 8, 9, and 10. 11/ Financial summaries showing the relation of farm receipts, expenses, net income, interest on investment, and return to farm family labor and management follow each figure in Tables III, IV, V, and VI. 12/

The net dollar returns to farm family labor and management will, in turn, be compared to the $3,000 income goal. Again, in analysis, we must bear in mind the income limitation imposed by lack of managerial ability.

East Bench Unit

The total income to farm family labor and management on the East Bench Unit for the 160 acre farm size in land classes I, II, and III, is $1,666.00, $728.00, and $-.12 respectively. It is quite apparent that the return to farm family labor and management on the East Bench Unit's 160 acre farm units does not approach the $3,000 goal.

Class I land requires 240 acres in order to reach this figure, class II requires 320 acres and class III requires in excess of 480 acres.

11/ For values used see Farm Budget Summaries, Tables I, II, III and IV, Appendix A.

12/ Ibid.

Figure 7 illustrates returns to farm family labor and management to increment in size while Table III is a financial summary of the East Bench Unit.

TABLE III. FINANCIAL SUMMARIES--PROPOSED EAST BENCH RECLAMATION UNIT*

(Farm Size-acres)	160	240	320	480
Land Class I:				
Farm Receipts	5959	9070	12,126	18,304
Farm Expenses	2739	4114	5330	8220
Net Income	3220	4956	6796	10,084
Interest on Investment	1554	1908	2251	2930
Return to Labor and Mgmt.	1666	3048	4545	7154
Land Class II:				
Farm Receipts	5078	7721	10,379	15,559
Farm Expenses	2686	3597	4837	7258
Net Income	2392	4142	5542	8301
Interest on Investment	1664	2064	2470	3242
Return to Labor and Mgmt.	728	2060	3072	5059
Land Class III:				
Farm Receipts	4237	6449	8614	13,062
Farm Expenses	2629	3665	4762	7236
Net Income	2392	4142	5542	8301
Interest on Investment	1620	2006	2385	3130
Return to Labor and Mgmt.	-12	778	1467	2696

*For values used see Table I, Appendix A.

Greenfields Division

Again, as on the East Bench Unit, the 160-acre (average Greenfields farm unit ownership = 165 acres) farm unit falls short of the $3,000 goal in return to farm family labor and management on the Greenfields Division with its return of $1,928.00, $893.00, and $104.00 for land

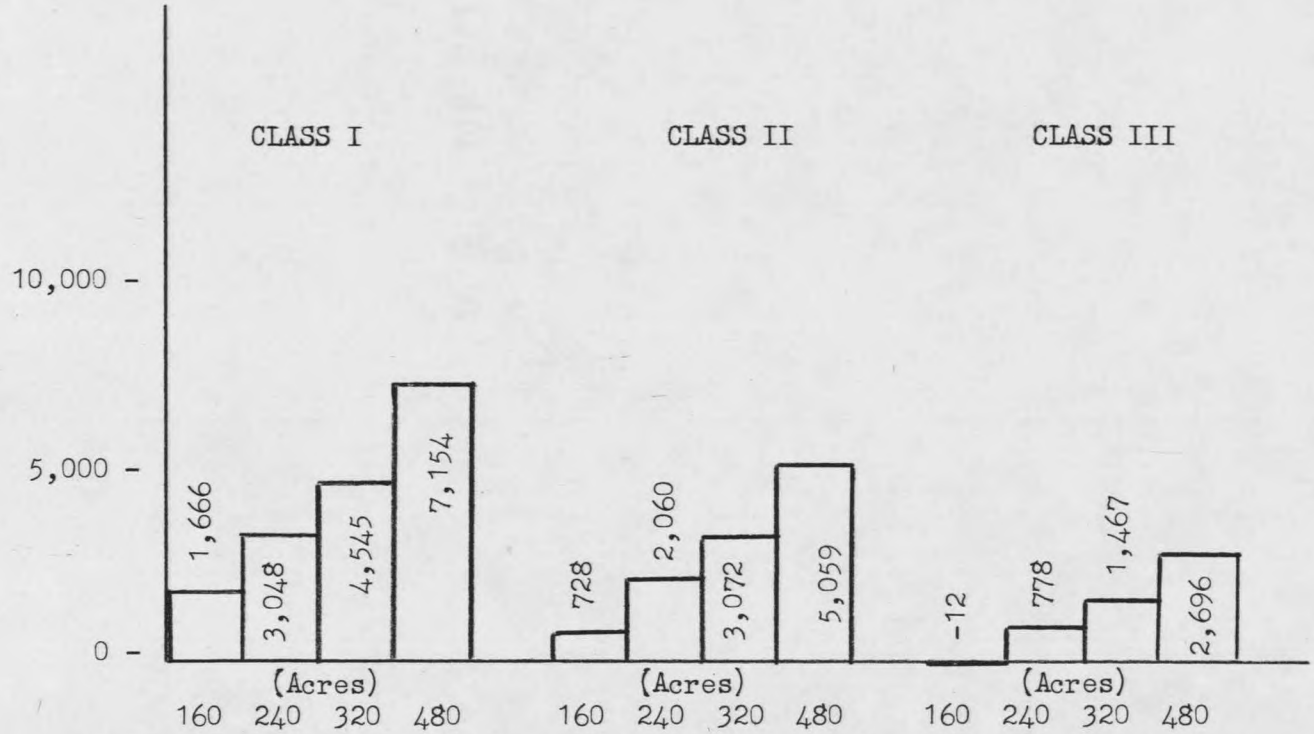


Figure 7. Comparison Of Returns To Labor And Management On Various Size Farms In Three Soil Classes On The Proposed East Bench Unit, Montana, 1958. (Data obtained from Table I, Appendix A)

classes I, II, and III respectively. To meet the desired goal a class I land unit requires 240 acres, a class II unit 320 acres, and a class III unit 480 acres.

Figure 8 illustrates the returns to farm family labor and management to increment in size for three soil classes while Table IV is a financial summary of the Greenfields Division.

TABLE IV. FINANCIAL SUMMARIES--GREENFIELDS DIVISION, SUN RIVER PROJECT*

Land Class I: (Farm Size-acres)	160	240	320	480
Farm Receipts	6222	9437	12,705	19,203
Farm Expenses	2739	4116	5335	8232
Net Income	3483	5321	7370	10,971
Interest on Investment	1555	1910	2256	2943
Return to Labor and Mgmt.	1928	3411	5114	8028
Land Class II:				
Farm Receipts	5236	7993	10,732	16,072
Farm Expenses	2682	3600	4840	7269
Net Income	2554	4393	5892	8805
Interest on Investment	1661	2067	2473	3253
Return to Labor and Mgmt.	893	2326	3419	5550
Land Class III:				
Farm Receipts	4357	6663	8863	13,435
Farm Expenses	2631	3669	4767	7243
Net Income	1726	2994	4096	6192
Interest on Investment	1622	2009	2390	3138
Return to Labor and Mgmt.	104	985	1706	3054

*For values used see Table II, Appendix A.

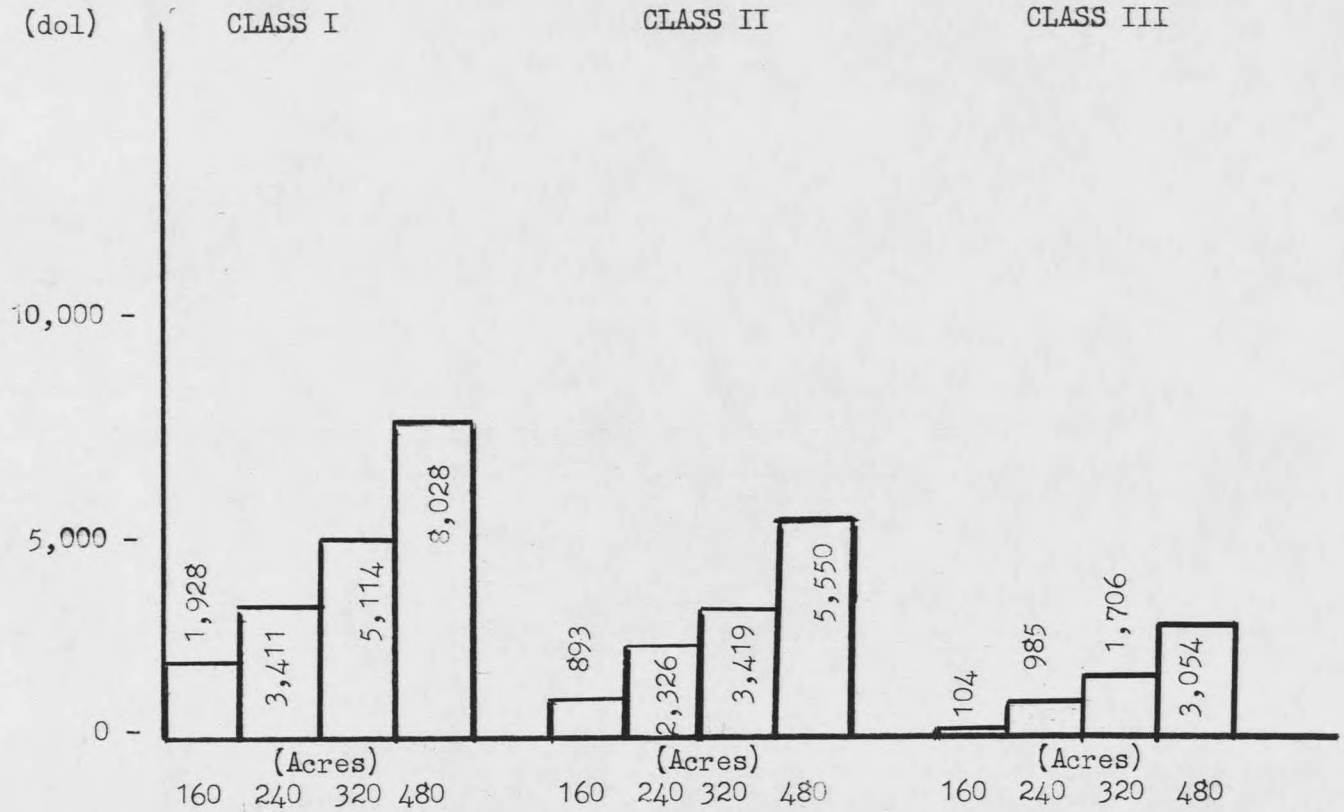


Figure 8. Comparison Of Returns To Labor And Management On Various Size Farms In Three Soil Classes On The Greenfields Division, Sun River Project, Montana, 1958. (Data obtained from Table II, Appendix A)

Huntley Project

The 160 acre Huntley Project farm unit exceeds the $3,000 income goal to family farm labor and management in all except the class III land with its return of $2,624. Land classes I and II return $5,396 and $3,946 respectively. The greatly increased return is due to site conditions which are conducive to intensive cultivation of the high value sugar beet crop.

In reality, however, the 1957 ownership size is but 64 acres--40% of the 160 acre farm. Return, therefore, to farm family labor and management falls much below the $3,000 goal on the Huntley Project. This point serves to emphasize one of the injustices resulting because of initial too small (46 acres) Reclamation farm units--perpetuation of units (64 acres in 1957) below standard in ability to reach a desired income goal.

Figure 9 illustrates net dollar return to farm family labor and management to increment in size for the various land classes while Table V is a financial summary of the Huntley Project.

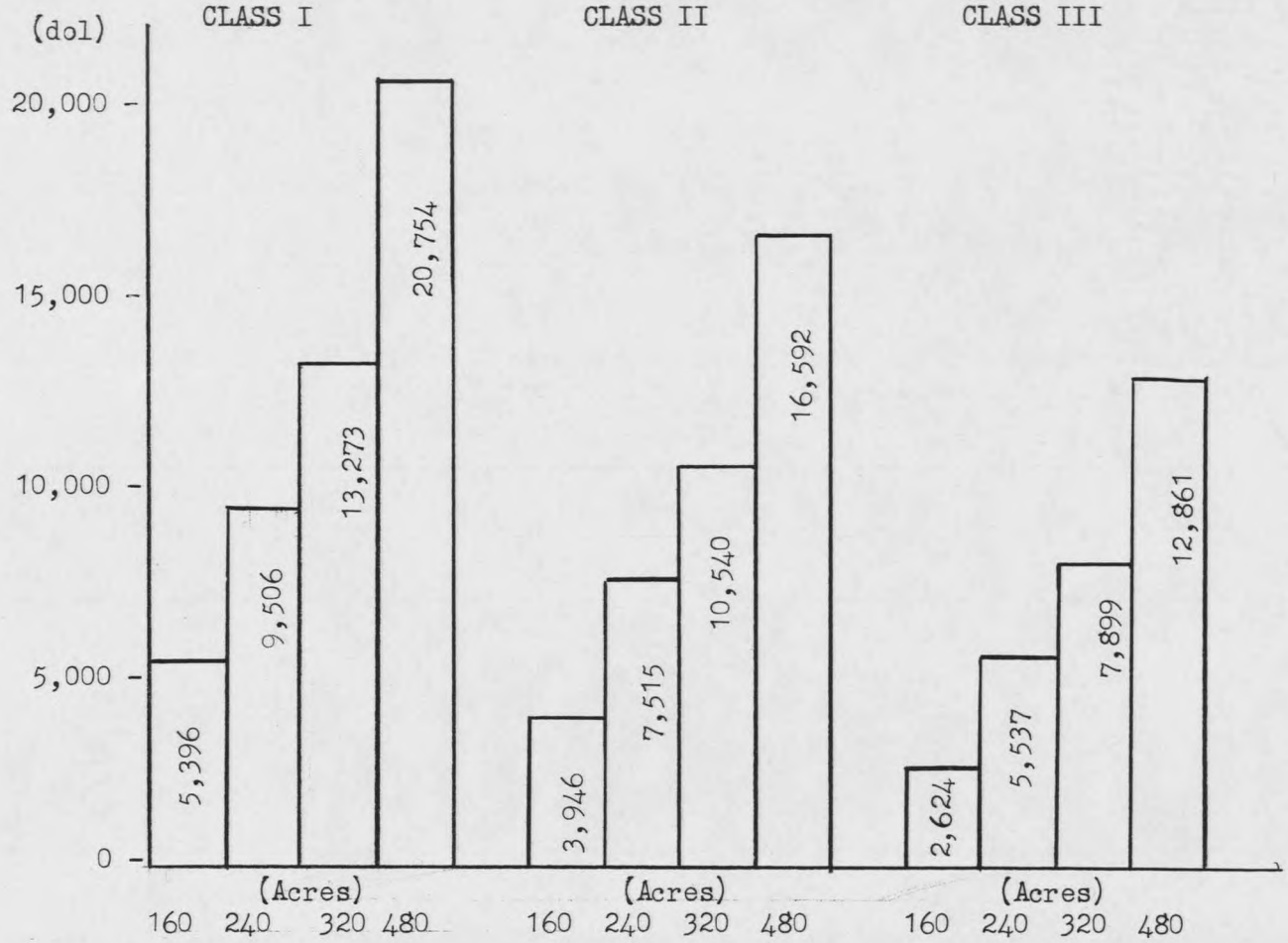


Figure 9. Comparison Of Returns To Labor And Management On Various Size Farms In Three Soil Classes On The Huntley Reclamation Project, Montana, 1958. (Data obtained from Table III, Appendix A)

TABLE V. FINANCIAL SUMMARIES--HUNTLEY RECLAMATION PROJECT*

Land Class I:				
(Farm Size-acres)	160	240	320	480
Farm Receipts	11,886	18,030	23,985	36,291
Farm Expenses	4589	6315	8161	12,284
Net Income	7277	11,725	15,821	24,007
Interest on Investment	1881	2209	2581	3253
Return to Labor and Mgmt.	5396	9506	13,243	20,754
Land Class II:				
Farm Receipts	10,372	15,775	21,014	31,735
Farm Expenses	4440	5890	7683	11,581
Net Income	5932	9885	13,331	20,154
Interest on Investment	1986	2366	2791	3562
Return to Labor and Mgmt.	3946	7519	10,540	16,592
Land Class III:				
Farm Receipts	9029	13,741	18,170	27,612
Farm Expenses	4456	5894	7580	11,229
Net Income	4573	7847	10,590	16,313
Interest on Investment	2949	2310	2691	3452
Return to Labor and Mgmt.	2624	5537	7899	12,861

*For values used see Table III, Appendix A.

Heart Mountain Division

Since it is a diversified Reclamation area, the Heart Mountain Division of the Shoshone Project returns more than the $3,000 income goal to farm family labor and management on Class I land with its return of $3,315 to the 160 acre farm. It falls short of the $3,000 goal, however, in its class II and III soils with returns of $2,359 and $1.468 respectively. Land class II requires almost 240 acres to reach the $3,000 goal while land class III requires between 240 and 320 acres. Actual 1957 ownership farm size is 124 acres, however, so that net dollar

returns to farm family labor and management in the Heart Mountain Division is much below the desired income goal.

Figure 10 illustrates net dollar returns to farm family labor and management to increment in size of farm for the various land classes while Table VI is a financial summary of the Heart Mountain Division.

TABLE VI. FINANCIAL SUMMARIES--HEART MOUNTAIN DIVISION, SHOSHONE PROJECT*

Land Class I:				
(Farm Size-acres)	160	240	320	480
Farm Receipts	8305	12,587	16,803	25,379
Farm Expenses	3391	5441	7207	11,047
Net Income	4914	7146	9546	14,332
Interest on Investment	1599	1945	2323	1976
Return to Labor and Mgmt.	3315	5201	7273	11,356
Land Class II:				
Farm Receipts	7398	11,149	14,890	22,440
Farm Expenses	3333	5147	6878	10,433
Net Income	4065	6002	8012	12,007
Interest on Investment	1706	2100	2559	3297
Return to Labor and Mgmt.	2359	3902	5473	8710
Land Class III:				
Farm Receipts	6423	9762	12,996	19,671
Farm Expenses	3283	4972	6722	10,318
Net Income	3140	4790	6245	9353
Interest on Investment	1672	2048	2467	3193
Return to Labor and Mgmt.	1468	2742	3778	6160

*For values used see Table IV, Appendix A.

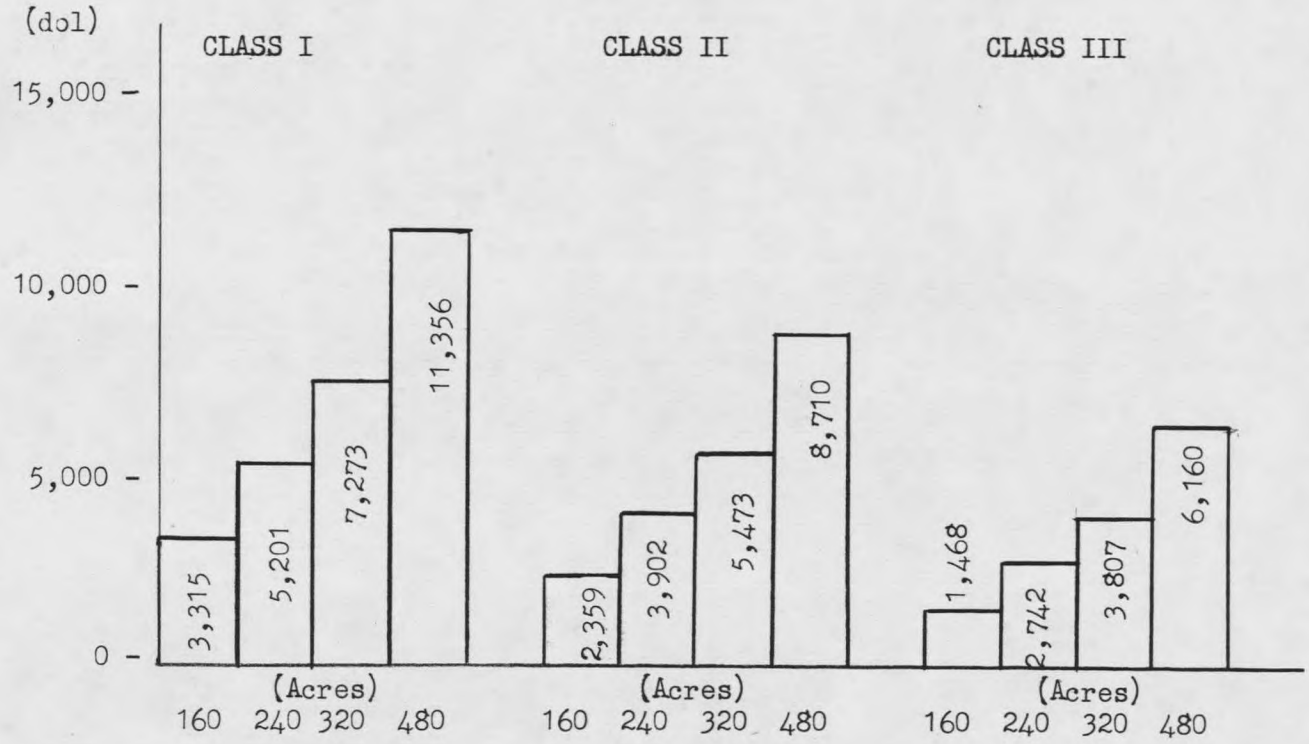


Figure 10. Comparison Of Returns To Labor And Management On Various Size Farms In Three Soil Classes On The Heart Mountain Division, Shoshone Project, Wyoming, 1958. (Data obtained from Table IV, Appendix A)

Family Farm

The final component of analysis is the family farm--a concept which has been defined in terms of labor utilization such that full utilization of farm family labor in a cropping operation within the various Reclamation study areas has been set at 2,420 hours. 13/

Seasonal crops demand that work be completed within rigid time limits. Therefore, full utilization of farm family labor is not made in any of the budget series. The 2,420 hour limit is reached only in two instances--on the Huntley Projects' 480 acre farm units in land classes II and III. 14/ In each of the other 46 farm unit sizes only partial utilization of farm family labor is had. Extremes vary from a 61% utilization on a class III 160 acre East Bench farm unit to a 95% utilization on a class III 320 acre Huntley Project farm unit.

Utilization of farm family labor bears a direct relationship to ideal site location and soil class. This relationship reiterates the need for larger farm units on poorer soils and in areas of limited crop alternatives.

13/ See p. 41 of text for definition of family farm and reason for use of 2,420 hours.

14/ See p. R, Tables I, II, III, and IV, Appendix A.

VI. CONCLUSIONS

To be most useful, laws must reflect contemporary economic and social conditions tempered with justice and equity. To adhere to the traditional 160 acre limitation without deviation as though it were immutable is as much a folly as would be a vacillating policy.

The United States Congress in establishing policy and the Bureau of Reclamation in administering the program seem to have sought to develop as many farms as possible on Reclamation projects rather than to develop projects composed of efficient units which could pay off indebtedness in the shortest time possible. This is reflected in the establishment of a system of farms which yield minimum rates of return to farm resources, especially to operator, family management, and labor. It is due to basing the Reclamation Act upon arguments which emphasized the importance of home building, conservation and relief of congested areas--matters involving social rather than economic ends. The result not only reduces the repayment possibilities but also increases the total repayment costs. Many projects have been promoted to bring business to nearby communities with little attention being given to the production possibilities or welfare of the settler. The record of changes made in repayment periods--from 10 years in 1902 to 40 years plus a 10 year development period in 1939--bears testimony to this injustice.

Several unfavorable factors cast doubt upon the economic justification for building irrigation works in areas of extremely limited crop alternatives. These factors hinge upon site and soil conditions such that there exists a relatively low value crop and high fixed cost--a distinct disadvantage when compared to areas of more favorable environmental conditions.

If built, a system oriented to larger farms would be more appropriate than one oriented to the traditional 160 acre farm. This would allow the settler to incorporate a more extensive operation, thereby reducing his fixed cost. Initial units of sizes oriented to efficiency and adequate economic returns would reduce many of the permanent problems associated with Reclamation, such as physical farm resource reorganizations and the necessity for repeated amortizations and leniency acts in order to bail the settler out of financial straits.

Policy Implications

This study has summarized the problems, trends, and economic characteristics of alternative sizes of farms in various sites in regard to their relation to the objectives of Reclamation. The findings are as follows:

1. Postulated farm unit sizes as evaluated through the criteria of efficiency, income producing ability, and the family farm concept are:

In terms of	Land Class	(Reclamation Units) East Bench	Green-fields	Huntley	Heart Mtn.
a. Efficiency: (Evaluated by net/acre returns and net hourly returns)	I	320	320	240	$\leq$ 320
	II	480	$>$320	$>$240	320
	III	480	$>$320	$>$240	$>$320
b. Income Producing Ability: (Evaluated by total net returns and a $3,000 income goal)	I	240	240	$<$160	160
	II	320	320	$<$160	$>$160
	III	$>$480	480	$<$240	$<$320
c. Family Farm Concept: (Evaluated in terms of labor utilization to maximum of managerial ability)		$>$480	320	240	320

2. In terms of efficiency, income producing ability, and the family farm concept, the findings suggest a farm unit size oriented to efficiency, and adequate economic returns rather than a rigid 160 acre limitation.

3. The farms in the study areas and the 160 acre farm in areas of limited crop alternatives are too small to utilize completely the available labor resource. Returns to farm family labor and management are especially low in areas where altitude and the associated short and cool growing seasons limit the basic cropping pattern to small grains, hay and pasture.

4. One important method of increasing returns to labor and management is to decrease farm expenses. This involves an increase in the management function. Second only to farm size in reducing farm income is lack of managerial ability on part of the operator.

Should size of farm be increased on Reclamation projects, the need for the services of a management consultant will increase. Managerial ability is limited at present to a farm size of 320 acres.

5. Administrative flexibility in farm size limitation should be introduced in order to provide an ownership farm size range to accommodate variations due to site location, land class, managerial ability, proximity to market, and operational ends of the farm family. This would more nearly provide an economic unit.

Need for Further Research

The criteria used in evaluation--efficiency, income producing ability, and the family farm concept--were applied in evaluation of farm returns only. In reality, however, farm income consists not only of farm returns, but also of supplemental income. A study, therefore, should be conducted to determine the proportion of income derived from the farm, part-time off farm work, and miscellaneous sources. This study should also include the effect on farm efficiency of part-time farm work by the principal operator.

Research should also be done on the feasibility of placing sample farms within Reclamation units as an educational technique in providing technical guidance. Many settlers do well in managing a particular enterprise but fall down in grasping the overall farm management concept. Observation of successful overall farm operation may be the answer to increasing the settler's limited knowledge of complete farm management.

APPENDIX

TABLE I. FARM BUDGET SUMMARIES--PROPOSED EAST BENCH RECLAMATION UNIT

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Land use:													
Barley	Acre	40	60	82	120	30	45	60	96	22	34	44	68
Oats	Acre	18	30	38	60	15	24	33	45	15	23	30	46
Wheat	Acre	18	27	38	60	15	24	33	45	15	23	30	46
Alf. Hay	Acre	76	114	152	228	56	84	112	168	50	76	102	155
Irr. Past.	Acre	0	0	0	0	36	54	72	114	50	75	104	153
Farmstead	Acre	8	9	10	23	8	9	10	12	88	9	10	12
Totals	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Crop Value	Dol.	5959	9070	12,126	18,304	5078	7721	10,379	15,559	4237	6449	8614	13,062
Farm Exp.													
Seed	Dol.	106	162	213	219	103	115	206	313	106	159	216	325
Fert.	Dol.	291	442	593	892	288	438	586	886	289	442	590	892
Misc. Crop	Dol.	70	108	146	224	54	87	119	173	49	77	100	153
Hrd. Lbr.	Dol.	0	568	906	2,286	0	204	568	1,589	0	272	606	1,657
Deprec.	Dol.	504	591	709	795	502	584	722	783	496	579	695	773
Repairs	Dol.	408	446	502	560	406	440	498	547	400	434	488	539
Ins.	Dol.	100	109	129	181	100	109	128	179	99	108	127	178
Elec.	Dol.	75	90	104	116	75	90	104	116	75	90	104	116
Motor Veh.	Dol.	987	1,338	1,708	2,404	934	1,236	1,539	2,162	900	1,222	1,486	2,116
Taxes	Dol.	171	219	267	362	197	258	319	438	189	246	303	415
Misc.	Dol.	17	41	53	81	27	36	48	72	26	36	47	72
Totals	Dol.	2,739	4,114	5,330	8,220	2,686	3,597	4,837	7,258	2,629	3,665	4,762	7,236

TABLE I.--Continued

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Dol.	160	240	320	480	160	240	320	480	160	240	320	480
Investment													
Land	Dol.	5,838	8,758	17,677	17,515	8,160	12,240	16,320	24,480	7,758	11,338	15,117	22,675
Bldgs. & Improv.	Dol.	13,237	14,143	15,350	17,305	13,135	13,830	15,043	16,149	12,866	13,560	14,643	16,247
Equip.	Dol.	11,904	15,104	17,791	23,461	11,904	15,104	17,866	23,461	11,904	15,104	17,791	23,461
Seed	Dol.	102	157	211	321	80	124	170	249	71	109	141	216
Total Inv.	Dol.	31,081	38,162	45,029	58,602	33,279	41,288	49,499	64,839	32,339	40,111	47,692	61,599
Farm Work													
Crops													
Man	Hrs.	1,583	2,307	2,814	4,516	1,485	1,922	2,470	3,744	1,414	1,984	2,470	3,913
Trctr.	Hrs.	630	1,005	1,235	1,902	526	827	1,022	1,552	469	730	894	1,386
Misc.	Hrs.	109	165	203	321	100	137	176	265	94	136	169	165
Total	Hrs.	2,322	3,477	4,252	7,739	2,111	2,886	3,668	5,561	1,977	2,850	3,533	5,564
Work by:													
Oper. & Fam.	Hrs.	1,662	1,732	1,998	1,923	1,559	1,766	1,896	2,014	1,485	1,741	1,846	2,065
Hired	Hrs.		690	1,116	2,819		252	698	1,917		342	748	2,044
Financial Summary													
Farm Rec.	Dol.	5,959	9,070	12,126	18,304	5,078	7,721	10,379	15,559	4,237	6,449	8,614	13,062
Farm Exp.	Dol.	2,739	4,114	5,330	8,220	2,686	3,597	4,837	7,258	2,629	3,665	4,762	7,236
Net Farm Income	Dol.	3,220	4,956	6,796	10,084	2,392	4,124	5,542	8,301	1,608	2,784	3,852	5,826
Int. on Inv.	Dol.	1,554	1,908	2,251	2,930	1,664	2,064	2,470	3,242	1,620	2,006	2,385	3,130
Return to Lbr. & Mgmt.	Dol.	1,666	3,048	4,545	7,154	728	1,060	3,072	5,059	-12	778	1,467	2,696

TABLE II.--FARM BUDGET SUMMARIES GREENFIELDS DIVISION, SUN RIVER RECLAMATION PROJECT

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Land Use:													
Barley	Acre	40	60	82	120	30	45	60	69	22	34	44	68
Oats	Acre	18	30	38	60	15	24	33	45	15	23	30	46
Wheat	Acre	18	27	38	60	15	24	33	45	15	23	30	46
Alf. Hay	Acre	76	114	152	228	56	84	112	168	50	76	102	155
Irr. Past.	Acre	0	0	0	0	36	54	72	114	50	75	104	153
Farmstead	Acre	8	9	10	12	8	9	10	12	8	9	10	12
Totals	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Crop Value	Dol.	6,222	9,437	12,705	19,203	5,236	7,993	10,732	16,072	4,357	6,663	8,863	13,435
Farm Exp.													
Seed	Dol.	106	162	213	319	103	115	206	313	106	159	216	325
Fert.	Dol.	291	442	593	892	288	438	586	886	289	442	590	892
Misc. Crop	Dol.	70	108	146	224	54	87	119	173	49	77	100	153
Hrd. Lbr.	Dol.	0	568	906	2,286	0	204	586	1,589	0	272	606	1,657
Deprec.	Dol.	504	592	711	800	500	586	722	786	497	581	697	776
Repairs	Dol.	408	447	504	565	404	441	499	552	401	436	490	542
Ins.	Dol.	100	109	129	181	100	109	129	180	99	100	128	178
Elec.	Dol.	75	90	104	116	75	90	104	116	75	90	104	116
Motor Veh.	Dol.	987	1,338	1,708	2,404	934	1,236	1,539	2,162	900	1,222	1,486	2,116
Taxes	Dol.	171	219	268	363	197	258	320	440	189	246	303	416
Misc.	Dol.	27	41	53	81	27	36	48	72	26	36	47	72
Totals	Dol.	2,739	4,116	5,335	8,232	2,682	3,600	4,840	7,269	2,631	3,669	4,767	7,243

TABLE II.--Continued

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Dol.	160	240	320	480	160	240	320	480	160	240	320	480
Investment													
Land	Dol.	5,038	8,758	11,677	17,515	8,160	12,240	16,320	24,480	7,558	11,338	15,117	22,675
Bldgs. & Improv.	Dol.	13,267	14,184	15,441	17,553	13,067	13,875	15,104	16,878	12,916	13,636	14,742	16,400
Equip.	Dol.	11,904	15,104	17,791	23,461	11,904	15,104	17,866	23,461	11,904	15,104	17,791	23,461
Seed	Dol.	102	157	211	321	80	124	170	249	71	109	141	216
Total Inv.	Dol.	31,108	38,203	45,120	58,850	33,211	41,343	49,460	65,068	32,449	40,177	47,791	62,752
Farm Work													
Crops													
Man	Hrs.	1,583	2,307	2,814	4,516	1,485	1,922	2,470	3,744	1,414	1,984	2,470	3,913
Trctr.	Hrs.	630	1,005	1,235	1,902	526	827	1,022	1,552	469	730	894	1,386
Misc.	Hrs.	111	165	203	221	100	147	175	265	94	136	169	265
Total	Hrs.	2,324	3,477	4,252	6,640	2,111	2,896	3,667	5,561	2,977	1,850	3,533	5,564
Work by:													
Oper. & Fam.	Hrs.	1,662	1,732	1,998	1,923	1,559	1,766	1,894	2,014	1,485	1,741	1,846	2,065
Hired	Hrs.		690	1,116	2,819		252	698	1,917		342	748	2,044
Financial Summary													
Farm Rec.	Dol.	6,222	9,437	12,705	19,203	5,236	7,993	10,732	16,072	4,357	6,663	8,863	13,435
Farm Exp.	Dol.	2,739	4,116	5,335	8,232	2,682	3,600	4,840	7,269	2,631	3,669	4,767	7,243
Net Farm Income	Dol.	3,483	5,321	7,370	10,971	2,554	4,393	5,892	8,803	1,726	2,994	4,096	6,192
Int. on INv.	Dol.	1,555	1,910	2,256	2,943	1,661	2,067	2,473	3,253	1,622	2,009	2,390	3,138
Return to Lbr. & Mgt.	Dol.	1,928	3,411	5,114	8,028	893	2,326	3,419	5,550	104	985	1,706	3,054

TABLE III.--FARM BUDGET SUMMARIES--HUNTLEY RECLAMATION PROJECT

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Land Use:													
Barley	Acre	23	35	46	70	13	20	27	40	10	15	20	30
Oats	Acre	15	23	33	52	12	20	27	36	19	15	20	30
Wheat	Acre	15	24	33	48	12	18	26	40	10	15	18	30
Alf. Hay	Acre	76	114	152	228	56	84	112	168	50	76	102	155
Sug. Bts.	Acre	23	35	46	70	23	35	46	70	23	35	46	70
Beet Tops	Acre	23	35	46	70	0	0	0	0	0	0	0	0
Irr. Past.	Acre	0	0	0	0	36	54	72	114	50	75	104	153
Farmstead	Acre	8	9	10	12	8	9	10	12	8	9	10	12
Totals	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Crop Value	Acre	11,866	18,030	23,985	36,291	10,372	15,775	21,014	31,735	9,029	13,741	18,170	27,612
Farm Exp:													
Seed	Dol.	164	250	328	494	103	243	321	448	164	247	331	500
Fert.	Dol.	768	1,122	1,485	2,255	735	1,117	1,481	2,248	739	1,121	1,485	2,255
Misc. Crop	Dol.	526	761	1,017	1,534	515	783	987	1,497	507	771	965	1,476
Hrd. Lbr.	Dol.	0	586	1,022	2,663	0	216	724	1,970	0	272	699	2,007
Deprec.	Dol.	757	843	999	1,111	753	857	991	1,097	750	832	985	1,089
Repairs	Dol.	529	565	655	712	525	558	649	698	523	554	634	690
Ins.	Dol.	175	176	178	191	174	175	177	189	174	174	175	187
Elect.	Dol.	75	90	104	116	75	90	104	116	75	90	104	116
Motor Veh.	Dol.	1,354	1,617	1,998	2,700	1,295	1,533	1,830	1,700	1,266	1,506	1,802	2,427
Taxes	Dol.	196	242	242	386	221	280	343	465	214	269	325	439
Misc.	Dol.	45	63	81	122	44	58	76	115	44	58	75	112
Totals	Dol.	4,589	6,315	8,161	12,284	4,440	5,890	7,683	11,581	4,456	5,894	7,580	11,299

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TABLE III.--Continued

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Dol.	160	240	320	480	160	240	320	480	160	240	320	480
Investment													
Land	Dol.	5,838	8,758	11,677	17,515	8,160	12,240	16,320	24,480	7,558	11,338	15,117	22,675
Bldgs. & Improv.	Dol.	13,072	13,881	15,124	16,969	12,867	13,576	24,710	16,266	12,735	13,364	13,961	15,856
Equip.	Dol.	18,644	21,434	24,671	30,341	18,644	21,434	24,671	30,341	18,644	21,434	24,671	30,341
Seed	Dol.	72	111	151	229	50	79	109	157	40	62	79	160
Total Inv.	Dol.	37,626	44,184	51,623	65,054	39,721	47,329	55,810	71,244	38,977	46,198	53,828	69,032
Farm Work													
Crops													
Man	Hrs.	1,802	2,660	3,317	5,269	1,702	2,315	3,027	4,666	1,641	2,349	3,002	4,745
Trctr.	Hrs.	731	1,153	1,462	2,238	626	975	1,249	1,954	573	883	1,135	1,780
Misc.	Hrs.	127	191	239	375	116	165	213	331	111	161	207	326
Total	Hrs.	2,660	4,004	5,018	7,882	2,444	3,455	4,489	6,951	2,325	3,399	4,344	6,851
Work by:													
Oper. & Fam.	Hrs.	1,892	1,070	2,221	2,247	1,789	2,165	2,285	2,469	1,723	2,128	2,291	2,508
Hired	Hrs.		723	1,262	3,285		266	893	2,430		338	861	2,474
Financial Summary													
Farm Recp.	Dol.	11,866	18,030	23,985	36,291	10,372	15,775	21,014	31,735	9,019	13,741	18,170	27,612
Farm Exp.	Dol.	4,589	6,315	8,161	12,284	4,440	5,890	7,683	11,581	4,456	5,894	7,580	11,299
Net Farm Income	Dol.	7,277	11,715	15,821	24,007	5,932	9,885	13,331	20,254	4,573	7,847	10,590	16,313
Int. on Inv.	Dol.	1,881	2,209	2,581	3,253	1,986	2,366	2,791	3,562	1,949	2,310	2,691	3,452
Return to Lbr. & Mgt.	Dol.	5,396	9,406	13,243	10,754	3,946	7,519	10,540	16,592	2,624	5,537	7,899	12,861

TABLE IV.--FARM BUDGET SUMMARIES--HEART MOUNTAIN DIVISION, SHOSHONE RECLAMATION PROJECT

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Land Use:													
Barley	Acre	10	16	24	37	3	9	10	18	3	4	6	10
Oats	Acre	11	18	24	38	4	9	15	18	3	5	7	10
Wheat	Acre	12	18	24	36	10	10	15	20	3	6	6	10
Alf. Hay	Acre	76	114	152	228	56	84	112	168	50	76	102	155
Beans	Acre	43	65	86	130	43	65	86	130	43	65	86	130
Irr. Past.	Acre	0	0	0	0	36	54	72	114	50	75	104	153
Farmstead	Acre	8	9	10	12	8	9	10	12	8	9	10	12
Totals	Acre	160	240	320	480	160	240	320	480	160	240	320	480
Crop Value	Dol.	8,305	12,587	16,803	25,379	7,398	11,149	14,890	22,440	6,423	9,762	12,996	19,671
Farm Exp.													
Seed	Dol.	429	650	858	1,295	426	643	851	1,289	429	647	861	1,301
Fert.	Dol.	306	465	619	935	404	457	611	928	303	461	620	935
Misc. Crop	Dol.	129	188	179	270	116	279	147	218	104	161	126	193
Hrd. Lbr.	Dol.	0	1,017	1,650	3,496	0	715	1,439	3,019	0	704	1,378	3,042
Deprec.	Dol.	588	670	831	908	585	666	797	898	583	663	821	893
Repairs	Dol.	434	467	545	594	431	462	539	585	430	460	535	480
Ins.	Dol.	99	107	127	177	99	107	126	176	99	107	100	175
Elect.	Dol.	75	90	104	116	75	90	104	116	75	90	104	116
Motor Veh.	Dol.	1,123	1,513	1,951	1,783	1,065	1,418	1,873	2,261	1,035	1,381	1,831	2,562
Taxes	Dol.	174	220	272	364	200	259	323	440	192	249	308	419
Misc.	Dol.	34	54	71	109	33	51	68	103	33	49	67	102
Totals	Dol.	3,391	5,441	7,207	11,047	3,333	5,147	6,878	10,433	3,283	4,972	6,751	10,318

TABLE IV.--Continued

Item	Unit	Land Class I				Land Class II				Land Class III			
Size of Farm	Dol.	160	240	320	480	160	240	320	480	160	240	320	480
Investment													
Land	Dol.	5,838	8,758	11,677	17,515	8,160	12,240	16,320	24,480	7,558	11,338	15,117	22,675
Bldgs. & Improv.	Dol.	12,749	13,392	14,463	15,965	12,600	13,171	14,171	15,477	12,532	13,052	13,947	15,235
Equip.	Dol.	13,342	16,542	20,229	25,899	13,342	16,542	20,229	25,899	13,342	16,542	20,229	25,899
Seed	Dol.	45	204	98	144	23	38	55	76	13	21	25	41
Total Inv.	Dol.	31,974	32,896	46,467	59,523	34,125	41,991	50,775	65,932	33,445	40,953	49,345	63,850
Farm Work													
Crops													
Man	Hrs.	2,087	3,106	3,942	6,200	1,989	2,795	3,700	5,626	1,936	2,805	3,622	5,637
Trctr.	Hrs.	874	1,365	1,772	2,695	770	1,187	1,560	2,377	720	1,100	1,440	2,197
Misc.	Hrs.	148	223	286	445	138	199	263	400	133	195	253	392
Total	Hrs.	3,109	4,694	6,000	9,340	2,897	4,181	5,523	8,403	2,789	4,100	5,315	8,226
Work by:													
Oper. & Fam.	Hrs.	2,191	2,008	2,103	2,192	2,088	2,053	2,110	2,172	2,033	2,075	2,103	2,173
Hired	Hrs.		1,253	2,036	4,318		882	1,775	3,735		870	1,700	3,746
Financial Summary													
Farm Recp.	Dol.	8,305	12,587	16,803	25,379	7,398	11,149	14,890	22,440	6,423	9,762	12,996	19,671
Farm Exp.	Dol.	3,391	5,441	7,207	11,047	3,333	5,147	6,878	10,433	3,283	4,972	6,722	10,318
Net Farm Income	Dol.	4,914	7,146	9,596	14,332	4,065	6,002	8,012	12,007	3,140	4,790	6,245	9,353
Int. on Inv.	Dol.	1,599	1,945	2,323	2,976	1,706	2,100	2,539	3,297	1,672	2,048	2,467	3,193
Return to Lbr. & Mgt.	Dol.	3,315	5,201	7,273	11,356	2,359	3,902	5,473	8,710	1,468	2,742	3,778	6,160

TABLE I.* RETURN PER HOUR TO FARM FAMILY LABOR AND MANAGEMENT IN THE VARIOUS RECLAMATION STUDY AREAS

Land Class	Farm Size	Reclamation Study Areas			
		East Bench Unit	Greenfields Division	Huntley Project	Heart Mtn. Division
	Acre	Dol.	Dol.	Dol.	Dol.
I	160	1.00	1.16	2.85	1.51
	240	1.76	1.97	4.59	2.59
	320	2.27	2.56	5.96	3.49
	480	3.72	4.17	9.24	5.18
II	160	.47	.57	2.21	1.13
	240	1.17	1.32	3.47	1.90
	320	1.62	1.81	4.61	2.59
	480	2.51	2.76	6.72	4.01
III	160	-.01	.07	1.52	.72
	240	.45	.57	2.60	1.32
	320	.79	.92	4.62	1.80
	480	1.31	1.48	5.13	2.83

*For values used in computation, see Tables I - IV, Appendix A.

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