PROCEEDINGS

of the

WESTERN FARM ECONOMICS ASSOCIATION

Fourteenth Annual Meeting

June 25, 26 and 27, 1941

Hotel Utah
Salt Lake City, Utah

THE COLUMBIA BASIN IRRIGATION PROJECT

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The Columbia Basin Irrigation Project, located in what is known as the Big Bend area of the State of Washington, constitues a dreamland wherein visionaries, thinkers, planners, prophets, poets, and, in fact, dreamers of every sort may disport themselves at will. The conversion of this vast area of semi-arid and largely unproductive land into an adequately watered, flourishing agriculture with its attendant urban and industrial developments, roads, schools, and the like requires indeed careful thinking and planning in order that the greatest possible degree of success may be achieved. Although careful, systematic planning may not necessarily insure the success of the Project, it should result in a better Project than if no planning or only haphazard individual planning were done.

The Columbia Basin already has been the subject of much planning, extending over a period of more than 40 years, pertaining to its development through irrigation. Much of the area included in the Project was homesteaded and settled in the 1890's. Dry-land farming was attempted, but it soon was discovered that the natural supplies of moisture were inadequate for the production of cultivated crops. After a few years of struggling under adverse conditions, the settlers in the driest parts of the area abandoned their farms. Dry-land wheat production continued along the less arid eastern fringe of the area, and livestock ranching replaced dry-land farming in the more favored locations in other parts of the area. Irrigation farming was developed on a few thousand acres in the vicinities of Moses Lake and Quincy, where water was obtained through pumping.

This pioneer experience indicates the unfortunate consequences of the lack of careful investigational and planning work prior to settlement. Had the area been carefully examined and had settlement thereon been controlled, it is likely that many of the ensuing heartbreaks and wasted fortunes could have been avoided.

The early experience obtained in farming the area included in the Columbia Basin Irrigation Project led various people to believe that farming would be successful if only an adequate supply of water could be obtained. A succession of proposals for irrigating the area soon followed. All of them involved tapping the water supplies of the Columbia River or its tributaries and from these sources conducting the water by means of dams, canals, tunnels, aqueducts, and other structures to the Project area.

One of the plans consisted of damming the Pend Oreille River ar Newport, Washington, taking water by means of gravity from the er at that point, and conducting it through a system of canals and er structures to the eastern part of the Project area and from there stributing it throughout the area. Another plan involved taking ter by gravity from Wenatchee Lake in the Cascade Mountains and con- ting it by canals, an aqueduct across the Columbia River, and other ructures, to the northwestern part of the Project area. Still another an involved building a dam across the Columbia River at the site of e present Grand Coulee Dam, driving a tunnel approximately 30 miles ng underneath the bed of the Grand Coulee, and conducting water by avity through it to the northern part of the Project area. A fourth an consisted of constructing a dam across the Columbia River at the and Coulee, pumping water from the River into the Grand Coulee, and nducting it from there by means of gravity to the northern part of e Project area. The latter plan is the one which now is being exec- ed.

The construction of the Grand Coulee Dam was made a federal blic Works Administration project in November 1933, and a contract r excavating for the base of the dam was awarded in December of that ar. A contract for the construction of the base of the dam was warded the following year. Soon thereafter the site of the Grand oulee Dam was teeming with various construction activities. With this velopment was associated the growth of several towns to house the nstruction workers, remindful of the pioneer towns of mining activ- ties in the West. At present, the Grand Coulee Dam, the most gigantic an-made concrete structure on earth, is practically completed, and electrical power is being generated. The dam is a multiple-purpose structure designed to serve a number of useful purposes, among which e most important are the development of electrical power, the irri- ation of the Columbia Basin, improvement of navigation of the Columbia iver, and flood control. Although power already is being developed, it is not likely that any of the Columbia Basin will be irrigated until 1945 or later.

The development of the Columbia Basin Irrigation Project envis- ges investigational and planning work, in many respects as detailed nd thorough as that incident to the construction of the Grand Coulee am. In 1939 the Bureau of Reclamation developed a plan for planning known as the "Plan of Joint Investigations", the purpose of which is o facilitate the investigation of a number of problems dealing with he rational development of the Project. These investigations, which re now under way, cover 28 problems and relate to such subjects as ypes and sizes of farms, layout and equipment of farms, water require- ents, allocation of costs, repayments, control of Project lands, rate f development, villages, roads, and other transportation facilities, nderground water, rural and village electrification, manufactures, ecreational resources and needs, rural community centers, governmental rganization, and public works programming and financing. In addition, hey include an inventory of the land resources, a land classification,

and a land appraisal. Participating in these investigations are more than 40 federal, State, and other agencies, represented by more than 100 individuals, many of whom are participating in the investigation of two or more of the problems.

Problem No. 2, which deals with the most suitable types of farming for the Project area, is considered to be one of the most important of the 28 problems being studied. Participating in the investigation of this problem are the Bureau of Reclamation, the United States Department of Agriculture, the Pacific Northwest Regional Planning Commission, and the Washington Agricultural Experiment Station as leader.

At the beginning of the investigation, the leader and other investigators were confronted with the question of how to approach the problem. It could be approached from the standpoint of giving primary consideration to the production of new commodities or of those in which the nation or region is deficient, products which might be largely noncompetitive in nature. It also could be approached from the standpoint of giving primary consideration to the production of the largest volume of commodities physically adapted to the land. A further approach might be to consider the Project as a resettlement area wherein the character of the agriculture would be conditioned by the settlement of the largest practical number of families.

It was finally concluded that commercial rather than self-sufficing types of agriculture would be most appropriate for the Project. It was felt that the earning power of the Project would be maximized through commercial agriculture and that the Project thus could contribute to the highest degree in repaying construction costs and in maintaining itself. This would be in keeping with the apparent objectives of established projects. It was recognized that this procedure would result in fewer people being accommodated by the Project than would be the case were settlement and development done on a subsistence basis. The latter, of course, is not without strong supporting arguments. It was further concluded that emphasis should be given to the kinds of crops and livestock physically adapted to the area, account to be taken of the market outlook. This approach was followed.

The crops adapted to the Project area are conditioned largely by its physical characteristics. The area is approximately 85 miles long, extending from Soap Lake at the northern end to Pasco at the southern end. It is approximately 60 miles wide. The area contains more than 2,400,000 acres, of which about one-half, or 1,200,000 acres, is considered irrigable. The elevation above sea level varies from approximately 400 feet at Pasco to 1,300 feet at Ephrata. The topography varies from gently rolling land along the eastern edge to practically level land in the northern and southern portions. The area is traversed by several drainageways, including the Crab Creek Basin in the north central and western parts and the Esquatzel Coulee in the southeastern part. The west central portion is traversed by two parallel

ges extending from east to west; namely, the Frenchman Hills to
north and the Saddle Mountains to the south, both of which have
s southern slopes. The soils vary from silt loams along the east-
edge to sandy loams and loamy sands in the northern, northwestern,
southern portions. The growing season varies from approximately
- 200 days at Pasco and the lower elevations along the western part
the area to 126-150 days at the higher elevations in the northeastern
t. Precipitation varies from 8 - 10 inches along the eastern edge
the area to practically nothing along the Columbia River to the
st. Since moisture supplies are to be controlled through irrigation,
tural moisture will have only a small bearing upon crop production.
om the foregoing account it may be seen that the physical character-
tics of the area are extremely variable, suggesting a wide range of
op adaptability.

In its classification of the lands of the Columbia Basin, the
reau of Reclamation recognized three classes of irrigable land, and
s for the non-irrigable land. The three classes of irrigable land
e designated class 1, the highest grade of land suitable for irriga-
ion farming; class 2, land intermediate in quality, having unfavorable
atures such as shallow-depth soil, a higher percentage of sand or
avel, or unfavorable slope; and class 3, the poorest land considered
itable for irrigation farming. Class 3 land is just above the margin
r irrigation farming and has deficiencies of similar kind but greater
gree than those of class 2 land. Of the 1,200,000 acres of irrigable
nd, approximately one-third falls into each of the three classes of
nd to be irrigated. Because of differences in the physical character-
tics of the area, partly as reflected by the land classification,
e Project was subdivided into nine more or less homogeneous areas,
us to facilitate the determination of suitable types of farming for
ch. I shall not take time at this point to describe each of the
ine geographic subdivisions of the area. It will be sufficient to
y that each was treated as a separate unit. For each such unit the
rcentage of land in each class was ascertained and other character-
tics noted. These served as the primary basis for the determination
the crops physically adapted to each subdivision, and for the es-
imates of the acreage, yield, and production of each crop.

Since the development of the Columbia Basin through irrigation
volves a profound change in land use, principally from dry-land
razing or wheat farming to the production of irrigated crops, the pres-
nt land use and farming experience of the area are insufficient as a
uide in estimating the future agriculture. This requires that the
xperience of irrigation farming on other Western projects be examined
nd translated into probabilities on the Columbia Basin. Accordingly,
he farming experience of numerous projects throughout the West was
arefully examined, and the experience under analagous situations was
pplied to the Columbia Basin.

The investigation has proceeded through the determination of
crop and livestock enterprises. In the determination of crops consider-
ation was given to the soil conservation requirements of the land, it

ing recognized that much of the land is deficient in organic matter d thus requires both the building up of organic matter and the main- nance of it at a higher level than now exists. In the consideration crops, attention also was given to the market outlook, account being ken of trends and future possibilities. An extensive study of mar- ts for Columbia Basin products is under way by the Bureau of Agricul- ral Economics, and as soon as the results are available, it is likely t modifications will be required in the tentative estimates already ached concerning crops and livestock.

On the basis of the foregoing considerations, the percentage istribution of irrigated acreage in various crops has been estimated follows: forage and pasture crops, 67 percent; grain, 14 percent; sh field crops, 10 percent; and truck and fruit crops, 9 percent. It is estimated that approximately 40 percent of the acreage will be util- ed by alfalfa hay alone and 20 percent by pastures. The high per- ntage of the land in forage and pasture crops should serve both to ild up and maintain the fertility of the soil. Corn and wheat each count for about five percent of the total acreage, and various other ops each for smaller percentages.

The expected distribution of the crops is by no means uniform roughout the Project area. It is estimated that a relatively larger rcentage of the silt loam soils will be devoted to field crops such s sugar beets and beans, also fruits and vegetables, than will be the se with the poorer soils consisting of sandy loams and loamy sands. igher percentages of the latter soils probably will be devoted to forage crops and irrigated pastures. Moreover, it will be necessary maintain steep slopes, regardless of the type of soil, in alfalfa, sture, and other close-growing crops.

An abundance of feed supplies consisting largely of legume hay, sture, and by-product feeds is in prospect on the Columbia Basin roject. Since livestock constitute an excellent medium for the util- ation of such feeds, and since legume production and livestock are important factors in soil conservation, it is expected that they will comprise an important part of the agriculture of the Project. It is estimated that the Project at the mature stage of agricultural develop- ent will include approximately 260,000 dairy cows, not including other dairy cattle. This figure compares with a total of 330,000 kept for ilk production in the State of Washington in 1940. Although dairying is expected to become the most important livestock enterprise on ir- igated farms of the Project, other kinds of livestock are expected to be of considerable importance. It is expected that there will be a otal of approximately 150,000 sheep, 150,000 hogs, and more than a illion chickens and turkeys on the Project. In addition, feeder tock to the extent of 120,000 head of cattle and 650,000 head of lambs an be accommodated annually by the prospective feed supplies. Thus, he Project should result in the production of large quantities of ilk and other dairy products, poultry products, and hogs, beef, mut- on, and wool. In the case of beef and pork, the production will serve

largely to replace similar products imported into the State. In the case of other products, the increased amounts may result in State but not necessarily regional or national surpluses.

From this brief review of the results of the investigation it may be observed that the Project will be characterized by general rather than specialized farming. However, as the Project is developed and experience is gained in the production of crops and livestock, and as markets change and new situations arise, changes in the pattern of agriculture are expected to follow. Nevertheless, the physical characteristics of the area, which are similar to those of many other irrigation projects now in operation, require in the interest of conservation that a high percentage of the land be in legumes, pastures, and other close-growing crops. Large percentages of forage crops usually mean livestock, which in turn usually mean general farms.

Investigational work concerning the most suitable types of farming for the Project is still in progress. It now has reached the stage of the preparation of farm budgets and the construction of plans of farming systems of various types and sizes designed to fit the various physical, economic, and political conditions pertaining to the Project.

In the conduct of the investigation the leader and other investigators are continually confronted with broad issues and problems. A few of these, such as whether or not emphasis should be placed on deficient or non-competitive crops, have already been mentioned. In this connection it has been suggested that since the United States is on an import basis with respect to sugar and flax, a large percentage of the Project should be devoted to such crops. The investigators contemplate that a small percentage of the area will be used for the production of sugar beets. A much larger percentage could be put into sugar beets, but good soil conservation practices, balanced crop rotations, and the relative advantage of other crops are likely to preclude the production of sugar beets on a substantial percentage of the area. The adaptability of flax and other deficient crops has not yet been clearly demonstrated, and further research dealing with their adaptability is desirable. Similarly, it has been suggested that those types of livestock in which the Pacific Northwest and particularly the State of Washington are deficient, such as hogs and beef cattle, be produced on the Project so as not to increase unduly the production of surplus commodities. Again it becomes a problem of comparative advantage. Farmers will strive to produce those crops which yield them the greatest net income. This raises the question to what extent, if any, should the government in the interests of the national welfare subsidize the production of commodities in which the nation or region is deficient? The investigators thus far have proceeded on the assumption that the Project would have to maintain itself in the same manner as is expected of other projects except insofar as all of them receive indirect subsidies consisting of deferred payments and waiver of interest charges on construction costs.

Much of the class 3 lands, particularly in the northern part of the Project, consists of shallow sandy and rocky soils, being at or near the margin for use as irrigated crop land. Its best agricultural use appears to be in the form of irrigated pastures. Such large bodies of pasture land do not lend themselves well to utilization in the form of individual farm units. It therefore seems that they might be used as grazing units to supplement the feed produced on individual farms. This situation presents the problem of the best form of land ownership and method of administering the land. Should the land be owned by the federal government, the irrigation district, or some other public or quasi-public body and be utilized by livestock on a fee basis, as is being done in the case of National Forest grazing, or should the land be owned in common by individual farmers and utilized as community pastures? It is believed that such land, which may not be suitable for inclusion in individual farm units, might be used as pastures, provided a suitable form of ownership and administration could be determined.

A further question relates to the extent to which the area should be divided into small so-called subsistence units and settled by persons disadvantaged elsewhere, instead of being developed on the basis of family-sized commercial farms by experienced local people. The establishment of family-sized commercial farms would result in an agriculture similar to that on other irrigation projects and perhaps would be the least disturbing to the established economy of the State. Moreover, it should result in a self-sustaining type of development, one which probably could contribute most to the payment of the construction and maintenance of the Project. On the other hand, development on the basis of part-time and subsistence farms, although providing for more settlers, probably would require associated industries or federal subsidies in order to become relatively successful. The investigational work now being done on types of farming, farming systems, and the like can be utilized in the development of either kind of settlement and development of the Project although it has envisaged mostly family-sized commercial farms. This issue resolves itself into a question of social versus individual interests.

Another problem deals with the allocation of costs. It is estimated that the land to be irrigated will be charged a construction cost averaging approximately $85 per acre. As pointed out earlier, all land is not of equal quality. This suggests that the class 1 and other land of better than average quality bear a cost somewhat above the average, and that class 3 and other lower than average quality land bear a cost somewhat below the average cost. It is generally agreed that the different grades of land should bear costs commensurate with quality. The question arises, however, as to how much above the average costs can the better lands stand, and how much below the average costs the poorer lands? Determination of the charges on the basis of crop yields leads to one result and on the basis of net incomes to another. Moreover, there are many grades of land and possible yields of crops. Thus it becomes a complicated problem to select a simple basis for determining the proper range of charges to be borne by different qualities of land.

associated problem deals with the question of whether the entire roject under optimum conditions will yield sufficient income above the ounts required for farm expenses and family living to cover the pres- t construction allocation of $85 per acre. If the income is not suf- ficient on the basis of a 40-year payment plan, should the period of ayment be extended, or should the construction costs allocated to the and be reduced and the excess charged against the power to be develop- d by the dam, or should the excess be borne by the public in general?

Although the investigators are confronted with numerous problems uch as just described, only an additional one will be presented. It eals with the control of the development of the Project. Approximately 5 percent of the Project land is in private ownership, another five ercent consists of railroad grant land, and the remaining 10 percent s in public ownership. Thus any plans to control the character and ate of development must take into account this fact of private owner- ip of most of the land. The Anti-Speculation Act of 1937 provides mong other things that an individual may obtain water for not to ex- eed 40 acres, and a man and wife water for not to exceed 80 acres. rovision for raising these limits is included in pending legislation. efore water can be furnished to individuals or couples owning more rrigable land than the maximum permitted for which water may be sup- lied, it will become necessary for them to dispose of such land. To he extent that such excess lands may be acquired by the Federal Govern- ent, by irrigation districts, or by some quasi-public body, it should e possible definitely to control both the character and rate of devel- pment of them. However, it is likely that a large proportion of the and will remain in private ownership. Thus, unless positive measures re taken, the character of the agriculture and the treatment of the and may vary according to the particular interests of the respective rivate individuals, and this may mean an agriculture not conducive to he best long-time interests of either the public or the individuals con- erned. The rate of development will be conditioned by the pressure of ndividuals owning the land, by the rapidity with which it is technically ossible to extend the irrigation distribution system, and by the avail- bility of funds. An orderly development extending over a period of ears seems to be the most desirable, but if the construction is has- oned, it may result in unwise development. The rational development f the Project similarly will require controls over other features, such s the layout of farms, the development of villages, roads, and the like.

From the foregoing account it may be seen that the development f the Columbia Basin Irrigation Project has many aspects, only a few f which have been touched upon in this paper. Many of the issues and roblems lend themselves to several solutions, depending partly upon he point of view t[illegible]m. The research pertaining to the development f the Project of necessity must be forward looking. All conditioning actors may not be taken into account, and some may not be evaluated orrectly. Nevertheless, careful planning for the development of the roject should result in better usage of the land and in greater hap- iness of the people upon it than if no planning were done.