JULIUS ROSENWALD FUND
HOMAN AVENUE AND ARTHINGTON STREET
CHICAGO, ILLINOIS

EDWIN R. EMBREE
PRESIDENT

ALFRED K. STERN
DIRECTOR

June 5, 1928

My dear Rogers:

I have just returned from a most interesting three weeks in Mexico. First let me congratulate you upon the high standard of your representation in that country. If your other men are as good as Simpson, you are on the right track in this most important phase of the work, mainly personnel.

Simpson was of invaluable help to me in all my contacts with officials and others. He has already an excellent knowledge of the language and an even more important knowledge of the significant people and of the trend of movements. In addition he and his wife are attractive personally. Their home is already becoming an influential center.

Just a word confidentially about my trip. I was impressed more than I expected to be with the soundness of the government program in public schools and with the work, which against great odds, they have already accomplished. I think we might be of special service to them both morally and financially as they are getting this great enterprise of public education under way. Whether this tempermental and sensitive government will want to ask us to cooperate seems to me much less certain. The Calles Administration goes out the latter part of this year and they have said very wisely that they think such an important matter should not be taken up by an outgoing administration but should be left for decision of the new ones who are elected in July to take office the first of December.

Also for your confidential information I am enclosing a memorandum of remarks which I made at a luncheon held at the Embassy just before I left, at which the Ministers of Education, Hygiene, and Agriculture and the President of the University were guests together with representatives of the Embassy, (Mr. Morrow had left before the luncheon) and one or two interested Americans, including Thomas Robinson, son-in-law of President Calles, and Mr. Simpson.

We have expressed our interest; the next move is with the Mexican government. Ambassador Morrow and Mr. Simpson are both so much interested in the matter personally that they will see that it does not go by default. I think there is nothing more that we can do properly at this time. I am presenting a general informal report of my visit to the Trustees for the sake of keeping them currently informed.

At the risk of making a long letter let me refer to one other point. I think when you were here you mentioned the fact that you were looking for a representative to be placed in Japan and especially to keep an eye upon the Far East generally. At any rate Mr. Simpson said something of the sort to me. I am sure you are right in selecting Japan as the place at least to begin in the East. Americans recently, I think, have been absuredly negligent of Japan's importance throughout this area. While China and India may count for more in one hundred years from now, the only countries at present which mean very much in the Pacific are on one hand the United States, and on the other, Japan. One of the most important things in international relations is that these two great countries of the Pacific should properly understand each other.

There is a man, now on a visiting professorship which I arranged just before I left the Rockefeller Foundation, that might by chance meet your wants in this connection and might be interested in such a post. He is Thomas J. LeBlanc, a former student of Raymond Pearl, a man competent and promising in the field of biology and statistics. He is for the next 18 months holding a post as visiting professor of Biology in the Imperial University in Sendai and at the request of the Japanese themselves he is making his special research in the field of the population problem. Before going to Japan LeBlanc had been for several years at the University of Cincinnati. He is essentially an anthropologist and is so much interested in people that he might be just the man for a permanent post in Japan. I should think there would be no objection to his carrying on his special interests for study in statistics while he was doing the more general work that you had in mind. At any rate he might be worth thinking about. I am enclosing two of the recent letters which he sent me which give you a little idea of his flavor. He is an excellent writer. The only criticism that I ever heard of him is that he ran an article on the malaria campaign in one of the Southern states that was regarded by officers of the International Health Bureau as rather too readable.

If you are at all interested, you can get further facts from Raymond Pearl, from the people at Cincinnati and elsewhere. I make the suggestion because I have so much interest in Japan and because of my personal admiration for LeBlanc.

Yours very truly,

ERE:MW
Enc.

Mr. Walter S. Rogers,
522-5th Avenue,
New York City.

ENS..WSR..38.

Mexico City,D.F.,
Apartado 538,
June 12,1928.

My dear Mr.Rogers:

I have neglected to comment in my recent reports on a number of minor points suggested by your last few letters to me. Wherefore, the following:

1. It may not be quite the attitude one should take, but I must say that I was greatly amused by the letter from Mr. William S.Elliott, General Counsel for the Harvester Company. The more I try to picture to myself the noble and self-sacrificing International Harvester Company "fighting the battles of the American farmer against the Reguladora", the funnier the whole letter becomes. It is curious how one sentence will stick up like a sore thumb and hide everything else in a 63 page report. However, I should in all fairness add that my authority for the sentence in question was a book written by a Mexican and it may well be that I have a somewhat distorted picture of the role played by the Harvester Company in the economic affairs of Yucatan. I suggest, therefore, that, until I have had a chance to check the matter up and read the Senate document to which Mr.Elliott refered me in his letter, you insert a note at the bottom of page 21 in the original copy of my report stating that the information regarding the Harvester Company was derived from a Mexican source and <u>may</u> not be entirely accurate. Specifically,the characterization of the Harvester Company as a"powerful trust" is to be found on page 488 of Luis Monroy Duran- <u>El Ultimo Caudillo</u>, Mexico,D.F., 1924.

2. I have received and read here and there in the last batch of books which you sent me. It is a pity that Herr

Fülop-Miller's interesting account of revolutionary Russia is somewhat vitiated by his over sealous attempts to prove a thesis. Underseperate cover I am returning the two Adam's books and Eastman's, "Marx and Lenin".

3. I note what you have to say about Señor Don Carlos A.Baumbach and will, in due course, look him up.

.....

Dr.M.S.Handman, whom you will recall as the Professor of Economics in the University of Texas and student of Mexico, has just returned to the United States from a weeks visit with me here in Mexico City. He will be teaching economics in the University of Chicago this summer. I believe, if it is at all possible or convenient for you to be in Chicago at any time during the summer quarter, that it will be well worth your while to have a talk with Handman. He has a vast amount of information about Mexico and is keenly interested in the whole idea of the Institute.

Enclosed you will find the prospectus for a series of books on Latin-America which the North Carolina Press proposes to publish. The announcement was sent to me by the press with the request that I find out if the ICWA would in any way be interested.

Stamps are not very expensive but there is no use putting a five-cent stamp on a letter when two cents will do the work. Wherefore, Sir, in the sacred name of Coolidge and Economy I suggest that you present your stenographer with the enclosed clipping.

Some weeks ago I was approached by the "other representative" of the ICWA in Mexico with the following proposition:

"a.Whereas, I have not seen my parents for over a year; and

b. Whereas, I am very tired, nervous, and upset; and

c. Whereas, my clothes are in rags and my shoes are in tatters and it is impossible for me to buy new ones in Mexico-

I do, hereby, request that I be permitted to go to the United States for a period of one month."

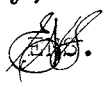
I considered this proposition at some length and, although I was impressed with the arguments adduced (especially the first two- for it is true that Keith's parents are both well past seventy years and are probably not long for this earth; and it is also true that Keith has, since our arrival in Mexico, suffered from nervous indigestion and has recently begun to show the effects of a too strenuous existence in this altitude), I was not sufficiently impressed to feel that it was just to ask the Institute for extra funds for trips which were not urgently necessary. I therefore handed down the judgement that all persons desiring to go to the United States at their own expense were at liberty to do so. The individual in question professed herself as willing and able to meet the requirements laid down by paying for her own railroad fare out of funds which she had accumulated from various dancing activities.... And so the lady of the house is now in Eureka Springs, Arkansas. She expects to stay there with her parents until the first of July. At that time she will go to Chicago for a week and then return to Mexico. I trust that this whole procedure will not meet with your disapproval.

Meantime, I have now settled down to work again and under seperate cover I am this day sending you the long delayed (by Embree's visit) article on Irrigation. There remain to be written now only two more articles on the agrarian problem- one on agricultural credit and one on the achievements of the Calles

government in this field.

With best regards, I am

Sincerely,



dup. Chap. VI. June 12, 1928

IRRIGATION AND THE AGRARIAN PROBLEM IN MEXICO.

INTRODUCTION AND STATEMENT OF THE PROBLEM.

In a previous chapter entitled, "The Geographical and Environmental Bases of the Agrarian Problem in Mexico," an effort was made to (a) describe the Mexican nation in terms of its geographical makeup; and (b) to estimate the bearing of this environmental background upon the question of agricultural production and the whole agrarian problem. The purpose of this chapter is to take up in greater detail one aspect of the relation of the physical environment to the Mexican agrarian problem- namely, that of irrigation- and to summarize some of the efforts which are being made by the government to deal with this problem.

As was seen from the various estimates presented at the end of the above mentioned chapter, it is impossible to state with any accuracy what the area of cultivable or even cultivated land is in Mexico at the present time. Various figures, both official and unofficial, have been given out from time to time, but since no survey of the agricultural resources of the country has ever been made on which such statistics could be based, they are at best only guesses. The estimates which were tentatively accepted at the end of the aforementioned chapter, it will be recalled, were as follows:

The total area of Mexico is approximately 491,000,000 acres. The total area which it is possible to cultivate <u>without</u> irrigation is about 49,000,000 acres. The total amount of land which it is possible to cultivate <u>with</u> irrigation is about 98,000,000 acres. The total amount of land in Mexico which it is possible to cultivate <u>under any circumstances</u> is somewhere between

122,500,000 and 147,000,000 acres.

That the just quoted statistics are probably much too high may be concluded from comparing them with the figures given out by the Department of National Statistics in 1923. This estimate places the total amount of cultivable land at 36,583,774 acres, or 7.45 percent of the total area; the amount of land cultivable without irrigation at 30,893,313 acres, or 6.29 percent; and the amount of irrigable land at 5,687,462 acres, or 1.16 percent of the total area.

Whatever future studies may reveal the amount of land in Mexico which can be cultivated either with or without irrigation actually to be, all authorities are agreed on one point, namely, that there are large areas in Mexico which cannot be cultivated with the present water supply. Some students are willing to go so far as to say that "irrigation is the principal, if not the only, rural problem in Mexico." Bulnes, for example, writes: "Agriculture cannot flourish where water is not provided; the agricultural production of those nations which do not dedicate large sums for the construction of the systems of irrigation which their arid regions require are fatally dependent upon the more or less uncertain rainfall. In Mexico this factor plays an important role and may be considered as the key to the national problem of misery and poverty."[1]

IRRIGATED AND UNIRRIGATED CROPS IN MEXICO.

A survey of the history of irrigation in Mexico and an examination of the program which the government now has under way will serve to reveal those areas in Mexico most in need of irrigation. However, before undertaking this survey it is appropriate to make a few general statements concerning the kinds

of crops which are at present grown in Mexico.

In 1926 there were 7,484,000 acres cultivated with corn, 1,321,000 acres with wheat, and 567,000 with cotton. The principal crops with the amount of production for the year 1926 were:

Crop.	Production.	
Wheat	10,244,000	(Bushels).
Barley	4,005,000	"
Corn	81,768,000	"
Rice	3,590,000	"
Beans	6,390,000	"
Coffee	60,074,000	(Pounds)
Cotton	192,446,000	"
Sugar[1]	405,600,000	"
Henequen	102,000	(Metric tons).
Chick-peas	81,000	"

(1. Figures for 1925. Statistics taken from United States Commerce Yearbook, 1926, Vol. II., Foreign Countries, p. 376). In addition to the crops listed above bananas and winter vegetables should also be mentioned. It is estimated that in the season 1926-27, some 9,000 cars of tomatoes and other winter vegetables were shipped from Mexico to the United States. In the same year, 142,749 metric tons of bananas were produced.

The crops which are grown wholly or almost wholly without irrigation are corn (by far the most important crop in Mexico); coffee which is grown in those regions where the rainfall is ample; and henequen, produced in the semi-arid calcerous regions of Yucatan. Beans and chile are usually planted in the same field with corn, although both are grown separately. Such tropical fruits as bananas are grown only in those regions where the rainfall is heavy. Finally, maguey, the plant from which the national drink pulque is made, is also grown without irrigation.

Wheat, the second most important crop in Mexico in point of acreage planted, is cultivated for the most part on irri-

gated lands; large areas, however, are sown under natural rainfall conditions. Although cotton in the greatest producing regions (the Laguna District and Lower California) is an irrigated crop, small amounts are grown in Tamaulipas near the Rio Grande, without irrigation. Chick-peas (except a certain variety grown for cattle feed) is an irrigation crop. Barley in order to yield adequate returns in Mexico must be grown on irrigated lands. Sugar cane is regularly irrigated, though there is an amount, sometimes estimated to be as much as a third of the crop, grown under natural conditions in the Gulf States, Oaxaca, Nayarit, and Michoacan. The rice and the winter vegetables (especially tomatoes) are typically irrigated crops.

IRRIGATION ON THE MESA CENTRAL.

When the Spanish conquerors reached the Central Plateau in 1519 they found the Indians in this region already possessed of a well developed system of irrigation. So well developed, indeed, was the Indian system that the Spaniards took over many of the laws and rules for the distribution of waters which the Indians had already worked out. At that time irrigation was practically unknown outside of this region and, with few exceptions, until very recent times, it has continued to be so. When one speaks of the history of irrigation in Mexico, therefore, one has in mind the developments on the Central Plateau.

As has been noted previously (see Chapter on "Geographical and Environmental Bases, etc.") the lack of water and the uncertain regime of the rains is one of the greatest drawbacks to agriculture throughout this region. Over most of the surface there is a precipitation varying from 20 to 30 inches a

year, but in certain districts it is much less. Although most of the precipitation occurs during the growing season, nevertheless, the small amount of rainfall and the irregularity of the precipitation from year to year makes a certain amount of irrigation imperative practically throughout the entire area.

During the time of the Spanish domination the Vice-royalty made notable advances in taking over, improving and enlarging upon the irrigation systems previously developed by the natives. The principal works undertaken at that time involved the utilization of the waters of the Lerma and Atoyax rivers. That the Spanish Viceroys met with some measure of success may be judged from the following statement made by Jose Herrera y Lasso: "In the last thirty years...ample legislation has been passed concerning public waters; the government has made many concessions for the construction of irrigation systems; and even an institution of credit has been founded for the encouraging of this class of work. Nevertheless, the results which have been attained leave much to be desired so far as any practical achievements are concerned. Although no statistics exist on the subject, one may hazard the guess that 80 per cent of the total area now (1920) irrigated in Mexico is irrigated by the systems and methods worked out during the time of the Colonial government."[2.]

The actual systems of irrigation which are to be found on the Central Plateau (leaving out of account, for the moment, the very recent works undertaken by the federal government) vary greatly. In many cases the ancient and relatively simple systems of the Indians persist down to the present day; in the majority of cases, as suggested above, the more or less advanced irrigation

works developed during the Colonial period are still used. During the revolution some of the most modern of the systems of irrigation developed by private individuals were expropriated by the Indian villages, and have been allowed to deteriorate. One of the striking examples of the breaking down of a formerly well maintained irrigation system is to be found in Morelos. This state was formerly the most important sugar producing region in Mexico, and had irrigation systems serving 10,458 hectareas (1 hectarea = 2.47 acres) on 28 great haciendas. In addition there were 5,000 hectareas of irrigated lands held by municipalities. With the coming of the revolution, operations on the big sugar estates were stopped and the irrigation system in Morelos have been practically abandoned. Now only a limited amount of the water available is used for the cultivation of small plots of rice, corn, beans and sugar cane for the consumption of the local population.

IRRIGATION ON THE MESA DEL NORTE.

The Mesa del Norte is the great plateau lying immediately north of the Mesa Central and extending to the border. It includes the northern parts of the states of San Luis Potosí, the western part of Nuevo León, and almost the whole of the states of Durango, Chihuahua and Coahuila. This vast region (over one half the area of the whole country) is the dryest part of Mexico. The annual rainfall over most of it is less than 20 inches a year and agriculture without irrigation is practically impossible. Less than one fifth of the population of the nation lives in this area and there are great expanses where the density is not even one person per square kilometer. Mining and stock raising activities are about the only things which have saved

the region from being totally uninhabited. Irrigation has been developed only recently and in areas where exceptional natural conditions exist.

The Laguna District.

This flat plateau district near Torreon in the state of Coahuilam is the only irrigated region of any importance in the whole Mesa del Norte. Irrigation is carried on by the surplus waters brought down during the rainy season by the Nazaz and Aguanaval rivers. The amount of water available varies greatly from year to year. The maximum recorded in a thirty year period was in 1919, with 2,898,000,000 cubic meters as against a minimum of 222,000,000 cubic meters in 1921. In an average year the water used reaches about 1,100,000,000 cubic meters. Each year the water deposits about one-fourth inch of silt over the entire irrigated area.

Irrigation is accomplished by means of dams of which there are about ten, from which canals lead off. Of main irrigation canals there are 500 kilometers serving some 10,000 kilometers of laterals. Pumps are also used rather extensively to raise a water supply supplementing the river irrigation. Division of the water is governed by regulations enforced by a water commission. The property owners are jealous of their rights and look with disfavor upon any outside interference with the established methods of apportioning them.

Practically the whole region is devoted to the raising of cotton and this has become the greatest cotton producing center in Mexico. On the average about 65,000 hectareas of cotton are cultivated, though in flood years as much as 200,000 hectareas may be planted. The irrigated lands are held

by about 1,000 small farmers and thirty or forty large plantations.

3.

IRRIGATION ON THE WEST COAST.

The territory of the West Coast, reaching from the American border to the southern boundary of the state of Nayarit, contains 154,000 square miles, and is divided from the rest of Mexico by the summit line of the Sierra Madre range. A large proportion of this area is eliminated from any agricultural development by topographical conditions, and the greater part of the coastal plain is bench land that has no water for irrigation. The only suitable soils lie in the river valleys and the deltas. Hardly one-tenth of the total area could be cultivated under any circumstances, and only one-tenth of the portion mentioned has conditions that make it right for intensive cultivation.

As in most parts of Mexico, the West Coast has only two seasons- the wet and the dry. The rainy season usually begins about the first of July and lasts three months. An average of about 43 centimeters (16.13 inches) of rainfall is registered annually over the whole area. However, it is important to note as a distinctive feature of the region the fact that there is a considerable variation in the amount of rainfall from north to south. In northwestern Sonora just across the border from the United States, extreme desert conditions obtain. Guaymas, 320 miles south of Arizona, has a rainfall of only 5 inches; from this point on the precipitation increases, gradually reaching a maximum of 60 inches in the southern part of the state of Nayarit. For the most part tropical temperatures are the rule along the West Coast. Summer temperatures average about 90°

Farenheit. Occasional frosts occur as far south as the Santiago river in Nayarit and during the winter months there are marked changes between day and night temperatures.

In speaking of the agriculture on the West Coast and of the related problems of irrigation, one must think in terms not of large level expanses of farming lands, but rather in terms of a series of relatively narrow river valleys. As we have noted, rainfall increases from north to south. Irrigation is, therefore, especially needed in the northern river valleys such as the Yaqui, Mayo, Fuerte and Sinaloa. It is estimated that there are already some 247,000 acres of land irrigated in these valleys and that if systems could be fully developed the irrigated area in these northern valleys alone would total 1,976,000 acres.

Because of the growing agricultural importance of the West Coast (especially in such crops as chick peas, rice, sugar and fresh vegetables) and because of the numerous attempts which have been made in the past (mostly by private American companies) to establish irrigation systems, it is worthwhile to undertake a rather detailed enumeration of the various irrigation developments and possibilities in this region. Beginning with the north and coming down the coast the projects are as follows:

Colorado River Delta Project.

The lands of the "Colorado River Project" lie in the region of the old mouth of the Colorado River. Irrigation for the some 200,000 acres included in the project will have to be provided by pumping water either from wells or from the Colorado River. A company was incorporated in 1922 under the

new laws governing the ownership of lands in Mexico and American capital is interested. It is thought that settlers can be easily attracted to the region which is said to be excellent for grain growing. The development is now held up until satisfactory international arrangements can be made.

The Guaymas District.

A few miles to the north and east of Guaymas there are thousands of acres of good land which can be irrigated from wells at a depth of from 20 to 50 feet. These lands have been farmed on a small scale by Chinese, growing principally truck vegetables and tomatoes for export. During the years of revolution (and specifically on account of the Yaqui Indian depredations) this area has been practically abandoned.

The Sonora Valley.

Preliminary reports made by the engineers of the Mexican government in 1920-21 indicate that it is feasible to construct a dam at a point near Ures at a relatively low cost (probably about $2,000,000 dollars). This dam would store about 80,000 acre-feet of water and provide enough water to irrigate some 65,000 acres, or considerably more land than there is in the Ures Valley. The surplus could be used in the irrigation of the Sonora River Valley farther down below Hermosillo. By building diversion dams at other points the whole project could be enlarged and more than 500,000 acres irrigated. At the present time the development of this project is delayed by lack of government funds.

The Yaqui Valley.

The watershed area of the Yaqui River (the largest river in the state of Sonora) is estimated at about 26,000

square miles, of which 500,000 acres are river bottom lands. About 75,000 acres are irrigable without storage. The stream has a capacity of 850,000 acre feet of storage water. The mean annual rainfall of the drainage area is 26 inches and the assumed run-off is 3 inches.

The original concession for the development of this region was obtained under the Díaz regime by an American concern known as the Yaqui River Land and Water Co. Operations on a large scale were not begun until 1904 when the Richardson Bros. Construction Co. of Los Angeles undertook to build a railroad through the valley and to construct an irrigation system for a total of 75,000 acres of land. By 1909 this company had completed 25 miles of main canal, 15 miles of main laterals, 15 miles of secondary laterals, and 15 miles of tertiary laterals. In addition, a good part of the railroad had been constructed and arrangements had been made with the Southern Pacific to extend the road 800 miles further down the West Coast to Guadalajara.

Later on the Richardson Construction Co. entered into a contract with the Madero Government to construct an irrigation system for all of the available lands in the Yaqui valley, regardless of ownership. This contract was without subsidy, bonus, land grant or other consideration, except the usual exemption of import tax on materials and the exemption, for five years only, of tax on its investment in the irrigation system. The total estimated cost of the work was $12,000,000 (Amer. Gold). Up to June 30, 1917, the company had constructed a temporary diverting dam and built about 350 miles of canals. The cultivable area was increased to about 75,000 acres. Also, the company had opened and maintained 400 miles of dirt roads and built more

than 150 bridges.

Under the terms of the contract with the Madero government, the company agreed to subdivide all lands available for cultivation and to sell them in parcels-- no sale to any given individual to exceed more than 5,000 acres. More than 300 practical irrigation farmers were sold on an average 100 acres each and some $900,000 (Amer. Gold) were spent in the improvement of these properties.

With the coming of the revolutionary years and the various outbreaks of the Yaqui Indians, work had to be suspended and the contract with the Richardson Construction Co. was declared cancelled for non-fulfillment on March 26, 1919.

Another contract with the Mexican Department of Agriculture was signed on December 13, 1922 amending the previous contract of August 18, 1911 to enable the company to furnish water to 100,000 acres of land in addition to the 35,000 acres then under irrigation.

In the early part of 1927 President Calles announced that the government planned shortly to acquire by purchase from the Richardson Company the Yaqui River Valley improvements and to undertake the conversion of the zone "into the greatest extent of irrigated lands in the world." The amount of land that could be irrigated was estimated at the time at approximately 750,000 acres. The completion of the purchase arrangements was announced in 1928.

The Mayo Valley.

The watershed area of the Mayo River is estimated at 7,250 square miles. The valley contains a total of 120,000 acres of bottom lands subject to irrigation of which some

15,000 acres can be irrigated without storage water provisions. As a matter of fact at the present time there are some 27,000 acres irrigated by the bolso or pocket system. Sixteen canals are owned by individuals or associations, all of whom are Mexican. The method now in use, which consists of simply flooding the fields during the ~~flood~~ rainy season, is both primitive and wasteful.

In 1926 the National Commission of Irrigation published in its official bulletin the outlines of a project for developing the Mayo Valley by impounding water at a point called Mocúsari. By creating a lake about 20 kilometers in length it is estimated that 71,000 hectameters of water could be drawn off each year to irrigate approximately 200,000 acres of land. The project which would involve an expenditure of 20,000,000 pesos over a period of five years is now being studied by the J.G. White Engineering Co. and is considered very promising. The local population (almost exclusively Mexican) is reported to be relatively large for such a region, communications are passably developed and the access to markets, due to rail connections, is favorable.

The Fuerte River Valley.

The watershed area of the Fuerte River is estimated at 15,145 square miles. The entire area of the valley is 5,240 aquare miles, of which the arable section is 781 square miles and the present (1923) cultivated area about 65 square miles. Approximately 234 square miles are irrigable, requiring, according to estimates, 675,000 acre-feet of water. The average annual run-off of the river is 4,480,000 acre feet of water.

The largest irrigation system in the valley is maintained by The United Sugar Companies (American). This company by an

old concession from the Mexican government controls 75 percent of the water of the Fuerte River and through a pumping system has over 11,000 acres (1923) of sugar cane under irrigation. Although sugar cane is the dominant crop in the valley, other crops (tomatoes, alfalfa, corn, beans, chile, canteloupes and other winter vegetables) are also grown. Transportation is furnished by a railroad running the length of the valley and by steamers from the port of Topolobampo.

Any expansion of agricultural activities in the Fuerte Valley will depend upon the further development of the water resources. Cultivation is now approaching the limit possible with the available water supply, but this can be greatly increased at reasonable expense by the construction of a storage dam on the upper waters of the river. Two such storage dam sites have been projected by the United Sugar Company and it has been estimated that 96,000 acre feet of water could be provided at a cost of $570,000 (Amer. Gold). This work, however, has not been carried forward due to the fact that the Mexican Agrarian Commission has suggested that it will take over the lands in this region and divide them.

The Culiacan River Valley.

The Rosales Canal is designed to irrigate a total of 148,200 acres in the Culiacan River valley just below the city of the same name. This canal was built by money advanced by the Federal Government to the State of Sinaloa through the initiative of Gen. Angel Flores. From the time the work started in 1920 up until October, 1922, a total of 2,200,000 pesos had been expended, and funds estimated at 800,000 pesos were necessary to complete the project. This money was to be contributed by the State of Sinaloa from its current revenues.

American investors own about 150,000 acres (or approximately one-half of the best arable alluvial lands) in the valley. For a while before the revolution these holdings were being subdivided and sold to American and Mexican farmers. This process was stopped by the revolution and now it is said that there are only two or three American families in the whole valley. The legal status of the American holdings will remain in doubt until the questions raised by Article 27 of the 1917 constitution are settled. (This article states that no foreigner can own land within a zone 50 Kilometers from the seacoasts; most of the American owned lands are in this zone.)

To the south of the Culiacan River lie a number of smaller streams of which there are irrigable lands in small scattered patches. At the present time some of these areas are cultivated by very primitive means and no scientific development has as yet been undertaken.

The Santiago River Valley.

The combined San Pedro and Santiago Valleys may be said to be fully equal to either the Yaqui or Fuerte valley in extent of good river-bottom lands, and the total absence of frost and more adequate rainfall give the Nayarit country advantages not found further along the West Coast.

Prior to 1910 the Compañía Agrícola Tepiqueña secured a concession from the Mexican Government for the use of the waters of the Santiago River in the State of Nayarit. It was planned to irrigate some 50,000 acres of land which was to be subdivided and sold to Japanese colonists. This company secured a loan of 1,000,000 pesos from the Caja de Préstamos (an agricultural loan

bank established during the Díaz regime) in 1910 and work was started. A report made in 1911 stated that 75,000 acres were subject to irrigation. By 1911 the main supply canal of the project had been completed for a distance of 50 kilometers; 64 kilometers of lateral canals were finished; and, in addition, a pumping plant to supply 5,000 acres had been installed. Due to the disturbed conditions brought on by the revolution this whole development had been allowed to fall into ruins and the lands are now idle. The Compañía Agrícola Tepiqueña is insolvent and its property has reverted to the Caja de Préstamos.

Irrigation in Lower California.

Perhaps the most significant and extensive irrigation development in Mexico is that of the Mexicali Valley. This valley, which lies just south of the boundary between the United States and Mexico, is an extension of the famous Imperial Valley on the American side and contains something over 1,000,000 acres of which 200,000 acres are available for irrigation. The development on the Mexican side began in 1901 when the first water crossed the line in canals. In 1908 there was a total of 6,935 acres irrigated and planted. This total has increased year by year until in 1919, the peak year, 188,716 acres were under irrigation on the Mexican side. Cotton is the principal crop grown, but also considerable acreage is devoted to alfalfa, wheat and fruit.

By far the largest land holdings on the Mexican side are those of the Colorado River and Land Company with a total area of 832,000 acres. The second largest holding is that of the Southern Pacific Co. The original tract of this company totaled 55,192 acres, but to date (1923) 27,615 acres have been

sold to farmers under a plan to dispose of the lands in order to promote their active development in agriculture. In order to comply with the new Mexican agrarian laws these and other properties are now held by special Mexican companies formed for the purpose.

It is generally thought that the lands on the Mexican side are superior to those on the American side of the boundary line. The proposed Boulder Dam in the United States which will provide flood control for the entire irrigated region on both sides of the line, will mean a further expansion of the agricultural activities in the Mexicali Valley.

IRRIGATION ON THE EAST AND GULF COASTS.

With the exception of the state of Yucatan the east and the Gulf coasts of Mexico have ample rainfall and are, therefore, not of importance in any consideration of the problem of irrigation in Mexico. (In Yucatan, irrigation is not a matter of concern because the chief crop-- henequen-- is essentially a waterless crop.)

THE IRRIGATION PROGRAM OF THE FEDERAL GOVERNMENT.

No active irrigation program on the part of the Federal government in Mexico was started until the end of the Díaz regime. On July 17, 1908, the Caja de Préstamos para Obras de Irrigación y Fomento was established and subsequently loaned funds estimated at between 70 and 80 million pesos, only a small part of which, however, were used for irrigation purposes. No report covering the activities of this bank has been published. The first really comprehensive project of the Federal Government dates from the passage of the Irrigation Law of January 9, 1926. This measure creates a National Irrigation Commission of three members; declares irrigation of private agricultural properties

to be a matter of public utility, and authorizes the government to construct irrigation works on private lands if the owners are unwilling to do so, repaying itself for the cost of the work by taking a portion of the lands benefited. A decree of January 28, 1926, authorizes the Commission to purchase existing irrigation works or to make changes therein.

In an official report dated Jan. 7, 1928, the Comisión Nacional de Irrigación sets forth the following summary of its work up to December, 1927:

The Dirección de Irrigación, a department of the Secretaría de Agricultura y Fomento, carried on during the years 1921 to 1924 various extensive studies with a view to investigating the possibilities of irrigation in Mexico. Previous studies of a similar type had been made by other government agencies (specifically by the Dirección de Aguas) but to this department belongs the credit for really surveying the whole problem in a serious and methodical fashion.

However, the necessity of reducing expenses made it necessary to suspend the work of the Dirección de Irrigación for a period of two years. In 1926 President Calles, convinced that the hope for the economic rehabilitation of the nation lay in agriculture and that the exploitation of the agricultural resources of the nation would not be possible without adequate irrigation in the more arid portions of the country, resolved to attack the problem anew and to proceed at once with some of the projects whose feasibility had been demonstrated by the studies of the Dirección de Irrigación.

In January 1926 a law was passed dealing with the

problem of irrigation. This law authorized the creation of an administrative organ to be known as the Comisión Nacional de Irrigación...to be formed of three members and an executive director. The Comisión organized its central offices and designated various technical commissions to finish the studies started by the previously existing Dirección de Irrigación. In due time it was decided to undertake four projects and a contract was signed with the J.G. White Engineering Corporation to organize and execute the work of construction.

[Under its contract with the J.G. White Engineering Corporation, the National Irrigation Commission pays, with certain exceptions, all expenses and fees arising out of the construction undertaken. The White Corporation receives for its services a percentage of the cost of construction, less certain items borne by the government. This percentage is arranged on a sliding scale running from 10 percent for the first ten million pesos of construction cost of the work in question down to 6.5 on the twentieth million. The laborers paid by the commission for doing the work of construction are considered for all legal purposes employees of the Government.]

From the date of its establishment until November of the present year (1927) the Commission has spent in round numbers 14,600,000 pesos, distributed as follows:

Purchase of already existing systems of irrigation	1,700,000
Construction costs.....	6,400,000
Surveys of projects.....	980,000
General office expenses.....	1,200,000
Machinery, tools, and accessories....	2,600,000
Apparatus and instruments.....	250,000
Equipment for camps....	250,000
Transportation equipment...	900,000
Office furniture, library, etc.	180,000
Indemnization and sundry.....	140,000
	14,600,000

It is estimated that the three large projects which the Commission hopes to complete in all the essential elements by the end of the year 1928 will irrigate 110,000 hectareas of land. The various projects which are now under study and others which have been started indicate the possibility of irrigating more than 750,000 acres of land in various parts of the Republic.

To this statement by the Irrigation Commission should be added the fact that the national budget for 1928 sets aside 20,000,000 pesos for irrigation works.

Projects Under Construction.[4]

The following paragraphs present a detailed description of the works which the Federal Government now has under way.

Calles Dam, Aguascalientes.

This project involves the damming up of the waters of Santiago, Pabellón, San Pedro, Chicalote, and Mocinique rivers. It is estimated that it will be possible to store up in the canyon of Santiago (across the mouth of which the principal wall is being constructed) some 350 million cubic meters of water and that this will irrigate approximately 35,000 hectareas (c. 87,500 acres) of land. The area to be irrigated will lie in a strip about 40 kilometers long and varying in width from 6 to 10 kilometers. The length of the main dam will be 300 meters and at its highest point 60 meters from the bed of the river. A subsidiary dam 40 meters in height will be built at another point on the river. The principal canal whose first outlet is in a tunnel 60 kilometers in length will have a capacity of 13,250 liters per second. This region is about 1,900 meters above sea level and has an average annual precipitation of 550 millimeters. The area

covered by the lake formed by the dam will be approximately 2,250 hectareas (c. 5,625 acres). It is estimated that it will take about 20,000 farmers to cultivate this region. The work is in charge of the J.G. White Engineering Corporation, and it is planned to complete the major portion of the construction by the end of 1928. The cost is estimated at between 8,000,000 and 9,000,000 pesos.

"Don Martín" Dam, Coahuila and Nuevo León.

Located in the northeastern part of the Mesa del Norte, 70 kilometers from the International boundary and 10 kilometers from the line dividing the states of Coahuila and Nuevo León, the principal element of this project is: a dam and a storage lake for the waters of the Salado river with a capacity of 1,400 million cubic meters. The main wall of the dam, which is to be constructed of earth with a protecting face of concrete on the inner side, will be 1,062 meters in length, 117 meters in width at the base and 32 at the top, and 32 meters high. The principal canal will be 65 kilometers in length and will have an initial flow of 63.4 cubic meters of water per second. The irrigable area is calculated at 65,000 hectareas (c. 162,500 acres) and will lie in a strip about 75 kilometers in length, varying in width from 10 to 18 kilometers. It is also planned to develop no less than 30,000 h.p. of electrical power. The precipitation in this region varies between 200 and 400 millimeters a year. The J.G. White Engineering Corporation, engineers in charge, are now working some 1,500 men in day and night shifts and it is hoped that the major part of the work will be completed before the end of 1928. This is one of the largest undertakings of this type on the American Continent. The cost is estimated at about 15,000,000

pesos.

Rio Mante Dam, Tamaulipas.

This work which is also in charge of the J.G. White Engineering Corporation will in its essential elements be completed by the middle of 1928. It includes a dam across the Mante river located in the S.E. part of the state of Tamaulipas, about 140 kilometers from Tampico. The dam will be 60 meters in length and 7 meters in height and will feed two principal canals of 13 and 22 kilometers with a capacity of 11 cubic meters per second. It is estimated that the irrigated area will be between 18,000 and 20,000 hectareas (c. 45,000 and 50,000 acres). A branch railroad is being constructed through the area which is already fairly well settled and developed. It is hoped to develop a certain amount of electrical power in connection with this and various other irrigation projects of a similar nature which are being studied in the region. Estimates of cost run about 2,200,000 pesos.

The Guatimape Project, Durango.

The storage basin of Santiaguillo with a capacity of 305 million cubic meters has already been completed. A main wall of earth has been constructed 2,400 meters in length and 14.5 meters in height. There is also a subsidiary wall 2 kilometers in length which helps direct the waters into the basin of the main dam. About 11,000 hectareas (c. 27,500 acres) can be irrigated directly and 7,000 hectareas (c. 17,500 acres) additional by the use of pumps. The work of constructing canals has been held up due to the poor quality of the lands in the immediate vicinity of the dam. A plan is now under consideration to conduct the water by a canal to a neighboring valley where the lands

are better. This will necessitate the construction of another dam in the Catedral canyon. This project also includes the development of 15,000 h.p. of electricity.

The Mezquital Valley Project, Hidalgo.

Concerning this project an official report of the Irrigation Commission says: "In the first months of its work the Commission adquired for the Federal government the system of irrigation in the Valley of Mezquital in the state of Hidalgo, which had been constructed and was being exploited by the Light, Power and Railroad Company of the city of Pachuca. The object of this purchase was to enlarge and improve the project and to exploit it under government auspices for the benefit of the farmers in that region. Specifically the Requena dam was enlarged and now has a capacity of 70 million cubic meters. It is planned to continue this work by enlarging the system of canals. In this way it will be possible to irrigate from 25,000 to 30,000 hectareas of land (c. 62,500 to 75,000 acres) located in the heart of the nation. This land is less than 60 miles from the city of Mexico. The region is densely populated, has a good climate and is equipped with adequate means of communication."

The Regularization of the Rio Lerma and the Tepuxtepec Dam.

The Tepuxtepec dam (located on the Rio Lerma 35 kilometers northwest of El Oro in the state of Michoacan) differs from the other projects which have been described in that its construction as the essential part of the larger plan to regularize the whole Lerma River, is being undertaken by a private company. "The Mexican Light and Power Company" (English) entered into a contract with the Federal government (October 1926) to build and defray the expenses of the Tepuxtepec dam; in return the govern-

ment agrees to give this company the rights to the water power resulting therefrom. The dam, to be constructed of rock reinforced by concrete, will be 560 meters in length, 45 meters high (maximum) and have a capacity of 500 million cubic meters. The total cost is estimated at 20 million pesos and it is calculated that between 30,000 and 40,000 h.p. of electrical energy will be produced. The work, if present plans do not miscarry, will be completed in 1930. With this dam and various other supplementary works to be constructed by the government not only will it be possible to irrigate a very large area (about 50,000 hectareas) of rich farm land, but also the Lerma River, which yearly causes enormous losses by floods, will be controlled.

Projects Under Study.

All of the above described projects represent works which are either actually under construction or have been completed. In addition to these the Irrigation Commission has the following projects under study and advisement:

Saucedo River, Durango.

Storage basin of 160 million cubic meters; concrete dam, 130 meters in length and with a maximum height of 30 meters; area to be irrigated: 17,000 hectareas.

Río Grande, Morelia.

Correction and rectification of the bed of the river for a distance of 100 kilometers; protection against floods; drainage of swamps.

Santa Maria River, Chihuahua.

Construction of two storage basins and two canals 50 kilometers in length: irrigation of 60,000 hectareas of land in the San Luis and San Buenaventura valleys.

Conchos River, Chihuahua.

Irrigation of the region between Santa Rosalia and the right bank of the Chuviscar river utilizing the waters of the Conchos and San Pedro rivers.

Río de la Compañía, México.

Study of a system of drainage for the lands of the old haciendas of the Compañía y Xico near the city of Mexico.

Santa Gertrudis River, Tamaulipas.

Irrigation of 5,000 hectareas located between the villages of Camargoy and Reynosa; storage basin of 50 million cubic meters; possible enlargement of project by utilizing in addition the waters of the San Juan river thus irrigating 40,000 hectareas.

Yaqui River, Sonora.

Regularization and utilization of the waters of the whole river valley. This project was formerly in the hands of the Richardson Brothers Construction Company of Los Angeles (see above p.). It is now being studied by the J.G. White Company.

CONCLUSION AND CRITICAL COMMENT.

Every large irrigation project involves a number of diverse and oftimes highly complicated problems each one of which must be solved successfully. In addition to the obvious and fundamental technical and engineering problems basic to the actual work of construction of dams, canals, locks and dikes there are the equally important questions of colonization, distribution of the irrigated lands, financing of the agricultural settlers and the placing of the project on a paying basis which will permit the recovery of the original investment.

The Mexican government, if one may judge from the following statement in one of the official reports by the National

Commission of Irrigation, is not unaware of the nature of the difficulties with which it is faced in bringing to successful fruition the irrigation program which has been described above. "There are two aspects to the problem which the Commission has in its charge: the technical; and the social and economic. The first includes the provision and the conduction of water to the lands to be irrigated; the preparation of the lands to receive the permanent benefits of irrigation; and the acquisition of an exact knowledge of the conditions and agricultural capacities of the lands in question. Under the second aspect of the problem the Commission must be concerned with the equable and efficient distribution of the water; the settling and colonization of the agriculturalists in groups based on a community of interests; the opening of ways of communication which will give easy and cheap access to the markets; the establishing and maintaining of agricultural experiment stations; the working out of a plan for reimbursing the government for the original cost of the system; the organization and sale of the lands to the colonists and the provision of credit for the same, etc."

To be aware of the problems with which one must deal, however, is not the same thing as being able to solve them. Whether or not the Mexican government will be able to find suitable solutions for each one of the problems with which it is (and for many years to come inevitably will continue to be) confronted in attempting to carry out its irrigation program remains to be seen. Meanwhile it may be of some assistance in understanding the significance of this program in the life of the nation and in estimating its probable chances for success to raise the following questions.

1. The Mexican government has already spent 14,600,000 pesos and plans during the year 1928 to spend 20,000,000 more pesos on irrigation. This relatively large sum is being spent in works of construction alone and represents only a part of the total outlay which will be necessary before the various irrigated lands in question can be brought to a state of economically profitable production. Furthermore, it is obvious that the properties involved are what the economists call "marginal lands"-- i.e., lands which are being put under cultivation at a large initial capital outlay and, therefore, lands which in competition with other non-marginal lands are "penalized" from the start. In view of the fact that there are still large areas of land in Mexico which could be brought under cultivation without vast outlays of capital for irrigation systems and still other large areas which through ignorance or bad management are only being partially exploited the question arises: Would it not be wiser for a nation already pressed for funds to have put its money first into agricultural schools, experimental stations, agricultural banks and whatever else might be necessary to bring its non-marginal lands into production before entering upon a hazardous program of reclamation of marginal lands? Would it not be better to foment and help agriculture on those lands which will bring relatively immediate returns in increased production rather than to tie up the nation's funds in enterprises which, even if successful, are in the nature of the case long term investments with slow returns?

2. Leaving aside for the moment the question of whether or not the various irrigation works which the government has under way have been planned with sufficient care and are being executed efficiently and economically (and in some cases it is doubtful

whether these conditions are being met) it is obvious that the real problem which the government must face is yet to be solved-- the problem of colonization and settlement.

For the most part the sections of the country which it is proposed to bring under irrigation are sparsely settled and, even where this is not the case, the agricultural population is almost completely ignorant of the techniques necessary to carry on successfully irrigation farming. In other words, the real trouble is going to be to find a sufficient number of capable farmers to work the lands which are about to be opened up. If the problem were simply one of agricultural education, it might in time through agricultural schools, experimental farms and demonstration stations be solved; but there still remains the troublesome question of financing these prospective farmers. Experience in other countries has proved conclusively that unless the settler himself has some money to risk in the enterprise, failure and bankruptcy are bound to follow. And the truth of the matter is that it is almost impossible to find in Mexico at the present time any very large number of farmers with even a few thousand pesos of capital. If the irrigated areas are turned over to the rich <u>hacendados</u> to farm on a large scale in big estates, this will mean the negation of the most cherished ideals in the Mexican agrarian reform movement. On the other hand if the projects are to be distributed on a more or less charitable basis and the colonists financed by government controlled banks, not only is there the danger of destroying the morale of the settlers and thus courting failure, but also the government is faced with the necessity of making another large capital outlay for institutions of agricultural credit.

The National Commission of Irrigation is at the present

time grappling with the question of how best to solve the problem of colonization. Mexico has had some experience with this matter in the past, but never on a very large scale. There is only one relatively small project under government control on which water is now being delivered. The lands of this project (see above p "The Mezquital Valley Project") were already settled when the government took them over from a private concern. And even in this case difficulties are already beginning to arise which promise much trouble in their solution.

On paper the plan which has been worked out for the other projects which it is hoped to complete this year calls for selling land in small lots (from 6 to 150 hectareas) at a price between the cost of the lands to the government and the market price of such lands, but in any case slightly below the latter.

The farms when turned over to the colonists are to be going concerns except for operating utensils. These latter also the colonists can acquire without cash. At the beginning the government plans to treat the colonists as children of the state, and make contracts with them similar to those made by individuals on the "share system." Seeds, utensils, and farm stock will be supplied, the government taking a certain share of the yearly production of each farmer. With this share the government will pay for the operation of the system, recover its operations outlay and pay off the capital charges of interest and amortization.

It is planned to organize the colonists as rapidly as possible into co-operatives which will gradually take over the financing functions, allowing the state to retire from direct participation in the enterprises.

The period of payment for the lands occupied by the colo-

nists is to be determined by the executive and may run up to 20, 40 or even 90 years. A most important part of the program concerns the choice of the settlers. Various conditions, including the necessity of a capital outlay on the part of the colonist varying with the amount of land taken up, have been laid down to insure the best possible type of farmer. Also, it is hoped that the opening up of the large areas of irrigated land will act to stop the steady stream of emigration to the United States and even that many of the Mexicans now in the United States will be attracted back to their native soil to take up irrigated lands.

One need not be a confirmed pessimist to point the fact that this plan of colonization will offer certain difficulties in the working. Not the least of these, as has been indicated, will be the necessity for an additional large capital outlay in order to finance the farmers during the first years of their settlement. It is not without its bearing on the matter that in the United States at the end of twenty four years experience in irrigation and reclamation projects had been repaid only $50,000,000 of the $200,000,000 outlay by the government; and in the years 1920-24 irrigation settlers in the United States were delinquent in their payments to the United States by $8,652,000. If this has been the experience in the United States, what can Mexico hope for?

3. Finally, as the Mexican critics themselves have not been slow to point out, not the least obstacle in the path of the government's irrigation program is involved in the traditional political nature of Mexican public administration. "If the directors of the irrigation companies," states an editorial in one of the leading morning newspapers of Mexico City, "owe their positions

to politics and are subject to influences of political bosses, it will make no difference whether these companies are private or official-- they will fall heir to all of the evils of bureaucracy and politics."

The present Irrigation law in Mexico places great power in the hands of the administrative officers of the projects. They have the right to determine who shall receive the lands and at what price. They fix the time and the amount which the colonists must pay. The past experience of Mexico in the administration of public undertakings does not, to say the least, give one absolute confidence that the irrigation program will always and everywhere be carried out with efficiency and honesty. There is, no doubt, still reason why Dr. Luis Lara Pardo should write on the editorial page of El Excelsior-- "Let us pray that the principle will be adopted that these irrigation works have been constructed not to reward favored individuals but to stimulate and foment to the highest degree possible the national productivity."

In short, the question is: Will Mexico be able to set up an administrative organization to function over a period of some thirty or forty years with any assurance that its officers will be allowed to perform their functions free from the influences of politics, graft, and favoritism. Unless this ideal can at least be approximated, the outcome of the whole irrigation program will, to put it mildly, be extremely doubtful.

Notes.

1. Herrera y Lasso, José-- Apuntes Sobre Irrigación- Su Organización Económica en el Extranjero y en México; Antigua Librería de E Murguia, Mexico 1920, pp.xiv-xv.

2. Ibid, p.x.

3. Bell, P.L. and Mackenzie, P.L.- Mexican West Coast and Lower California- A Commercial and Industrial Survey, Department of Commerce, Washington, D.C.; Special Agents Series No. 220, 1923.

Note: Materials in this section have been freely taken from this reference.

4. The facts cited in the description of the various government projects have been taken from Vol. I., Nos. 2 and 3; Vol. II., Nos. 3, 4, 5 of the magazine Ingeneria published in Mexico City; and from various official reports issued by the Comisión Nacional de Irrigación.

WSR..EWS..

June 14th, 1928

Dear Eyler:

I acknowledge your letter of June 1st.

I have also heard from Embree who seemingly is enthusiastic over his trip - and over you and Keith. Before writing you much in detail I wish to talk with him. Two or three days ago I telegraphed asking when he would be in New York. Thus far I have had no reply.

My general impression is that you should devote yourself to the problem of creating a situation which will result in the Rosenwald Fund being asked to contribute. Such an activity will provide you with a chance to try out yourself as a statesman - as a manipulator in the realm of high politics seeking a definite end.

John is here en route to Chicago. I am suggesting that he write to you. I am also suggesting that, while in Chicago, he talk with Mr. Rosenwald and Mr. Embree.

You are doing a fine piece of work and I would drink to you but this is a bone-dry town where it is impossible - quite impossible - to get anything beyond a milk-shake.

WSR/FC

Sincerely,