Sixth report Wisconsin State Drainage Association with proceedings of the twelfth annual convention held at Park Hotel, Madison, Wis., February 16 and 17, 1926. 1926

Wisconsin State Drainage Association
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SIXTH REPORT

Wisconsin State Drainage Association

with

Proceedings of the Twelfth Annual Convention

held at

Park Hotel, Madison, Wis.
February 16 and 17, 1926.

President Frank W. Lucas, Madison, Wisconsin
Presiding

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Drainage Directory

Attorneys

Buell & Lucas, Madison, Wisconsin.
L. J. Quinn, Racine, Wisconsin.
B. M. Vaughan, Wisconsin Rapids, Wisconsin.

Culverts

Bark River Bridge & Culvert Company, Bark River, Michigan.
See page 8.

Ditching Machinery

Owensboro Ditcher & Grader Co., Owensboro, Ky.
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Dredging Contractors

Corbett, John, Babcock, Wisconsin.
McWilliams Dredging Co., 1537 McCormick Bldg., Chicago, Ill.
See page 10
Rood Construction Co., Wisconsin Rapids, Wisconsin.
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Wisconsin Drainage Co., Elkhorn, Wisconsin.
See page 12

Engineers

Walter G. Caldewell, Waukesha, Wisconsin.
Central States Engineering Co., 602 Laurel Bldg., Muscatine, Ia.
Jerry Donohue, Sheboygan, Wisconsin.
G. R. B. Elliott, 706 First Avenue, North, Minneapolis, Minn.
L. M. Schindler, Appleton, Wisconsin.
H. V. Tennant, Portage, Wisconsin.
H. Tubbs, Elkhorn, Wisconsin.

Plows for Marsh Lands

Oliver Chilled Plow Works, South Bend, Indiana.
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Tiling Contractors

Palmer & Fish, Reedsburg, Wisconsin.

Tile Manufacturers

Black Creek Tile Company, Black Creek, Wisconsin.
Bristol Tile Works, Bristol, Wisconsin.
Mason City Brick & Tile Company, Mason City, Iowa.
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Munson Bros. & Company, Capron, Illinois.
Streator Drain Tile Company, Streator, Illinois.
See back cover.
Waukesha Cement Tile Company, Waukesha, Wisconsin.
See inside back cover.
What Cheer Clay Products Company, What Cheer, Iowa.

RECLAIMAGE INEVITABLE

F. W. Lucas, Madison, Wis.

Man is absolutely dependent upon food for his existence and the ease or difficulty of obtaining food has directly limited the increase in, and affected and influenced the character, habits, and occupations of, the human race. The statement that the earth can sustain no more people than it is capable of supplying with food is self-evident. It is estimated that in 1800 the population of the earth was about 700,000,000; that in 1900 the population was 1,700,000,000; that the earth's population has doubled in the past sixty or seventy years and is now approximately 1,800,000,000. The rate of increase in population is not uniform in all countries. In some the increase has been at a much lower rate while in others the rate has been much higher. Our own country furnishes an excellent example of a country with a high rate of increase. During the one hundred years ending in 1920, the population of the United States has increased from 9,638,453 to 105,710,620 or in other words has multiplied eleven times and the population has more than doubled in the last forty years. In 1850 the population averaged 7.9 persons per square mile while in 1923 the average number of persons per square mile was estimated at 36.3. The United States Census Bureau estimates that the average gain per year since the 1920 census is in excess of 1,750,000 persons and that on July 1, 1925, the population was 113,493,720. It is therefore evident that a nation with an increasing population, but with a limited area adapted to food production, is likely to experience in the course of time the dire results of an insufficient food supply and that necessity demands an ever increasing food supply to meet such increase.

In practically every civilized country it is found that the percentage of increase drops as the population increases. Various reasons are assigned for this condition and one of the chief reasons, especially in the more populous countries, being the difficulty of securing food. Because of a greater difficulty of securing food and the higher prices that usually accompany such increased difficulty, it is argued that more persons hesitate to marry or delay marriage until older with a consequent reduction in the birth rate; that a greater number of persons are likely to be insufficiently nourished, as a consequence of which infant mortality increases and more persons are susceptible to and unable to withstand disease and pestilence. In the United States the rate of increase has dropped from 33.1 per cent per decade in 1820 to 14.9 per cent in 1920 and the average number in a family has dropped from 5.6 persons in 1850 to 4.3 persons in 1920. Although general food prices have increased in the United States during that period of time, so also have wages increased and it is questionable whether, as yet, the increased difficulty of procuring food has had much to do with the continued de-

crease in the percentage rate of increase in population. It is possible that a rising standard of living may have had more to do with this decrease than any increased difficulty of securing food. It is argued, however, that from now on the conditions in this country are likely to be more comparable with those in Europe and that the difficulty of securing food will become a much more important element in determining the rate of increase in population.

One explanation for a slower increase in population in the more densely populated countries of the world, especially European countries, lies in the fact that many of their people have migrated to newer and less densely populated countries. The difficulty of securing food is claimed to be one of the important causes of this extensive migration from the mother countries which has been directed largely to those portions of North and South America, Africa, and Australia that offer opportunities for the extensive production of food. Comparatively little migration has gone to Asia for the reason that portions of Asia already had their own problems of over-population or were little fit for colonization purposes. In fact there has been a considerable migration from the over-populated portions of Asia to lesser populated countries of the earth, the cause of which is largely explained by the difficulty of securing food in the home country.

Advances in science have provided improved methods in agriculture. Improved methods in agriculture and improved seeds have permitted an increase in yield from the same acreage. Improved transportation facilities have enabled newer and richer soils to be cultivated and the product carried to the more densely populated sections. Yet these conditions do not alone account for the continuous increase in the earth's population. Advances in medicine and surgery, a better understanding of disease and the enforcement of health regulations, have materially increased the span of human life in the more enlightened nations so that, if other conditions should have remained as they were, a greater population would be expected merely because of the increased span of human life.

Gradually the less populated and more remote portions of the earth are becoming settled and more populous. It is interesting to note how the demand for food has directed this migration. In its beginning the migration was chiefly confined to those newer countries near at hand with fertile plains and valleys and favorable climatic conditions most suitable for the certain and abundant production of food. In these newer countries, the most fertile and best located lands were the first to be settled and brought under cultivation because of their fertility and accessibility to market. As the tide of migration continued, countries more distant were occupied and the tide spread out and less fertile and less accessible lands were occupied until at the present time we find the tide extending to and occupying lands that did not appeal to the earlier tide of migration.

This trend of migration is fully exemplified in the case of our own country. In the beginning we find a few scattered colonies along the tide waters, located near the outlets of rivers, where the soil was fertile or adjacent to excellent fishing grounds. As the tide swelled we find settlements spreading out along the coast and pushing up the courses of rivers and along the lakes then constituting the most efficient highways. As the tide continued to swell it began to push away from the coast and the navigable rivers and lakes further into the interior. Steadily this tide swept on and finally with the advent of the railroad, the entire country was opened to settlement. In the early construction of railroads effort was made to tap the richer and more fertile areas and we find the tide following the railroads and spreading out from the railroads just as it spread out from the coast and the lakes and rivers. Practically everyone present recalls the time when this nation had a frontier and most of you remember the last great rush for land when the nation opened for settlement that rich territory known as Indian territory, now Oklahoma. This nation can hardly now be said to possess a frontier, at least as applied to agriculture, and it has reached the stage when it may be expected to experience the difficulties that beset a country when its increase in population demands conservation of its food supply.

There still remain, especially in the tropics, vast areas of most fertile and productive land, unsettled and unreclaimed. There are also vast territories in the semi-frigid zones that, while of lesser value for crop production, may be utilized for the production of animals suitable for food. Gradually these portions lying within the tropics are being placed under cultivation and greater use is being made of the lands lying in the semi-frigid zones for the production of animal life and such foods as they are capable of producing. We should not overlook the fact that the oceans, lakes, and rivers have produced great quantities of food and no reason can be foreseen to indicate that they will not continue to so produce. We have every reason to believe that advances will continue to be made in agricultural methods and intensive cultivation and possibly better and more successful methods will be found for fishing the waters of the earth. We also should not overlook this further fact that for years chemists have been industriously engaged in seeking to discover some means of manufacturing synthetic foods. Whether they will succeed or not is a useless speculation at this time. In view of our present knowledge, we must proceed on the theory that food, in quantity, can and will only be provided in the manner that nature has provided, aided by the labor and intelligent direction of mankind.

Possibly generations may pass before the point is reached when the earth produces food sufficient only to maintain the existing population and an insufficient supply for any further increase in the population. It may be that eventually Divine Providence will

provide some check upon a further increase in the earth's population, but the fact that the limit of the earth's production of food has not as yet been reached is no guarantee that want and even famine may not afflict certain portions or even a considerable portion of the earth. Long before the limit of the earth's productivity is reached, famine will be experienced in many portions of the earth. In fact, under existing conditions, there is scarcely a year when some portion, by reason of crop failure or otherwise, is not insufficiently supplied with food.

In a populous country a crop failure for a single year or poor crops for a number of years, may cause great hardships. The late conditions in Russia, in some sections amounting almost to famine, were due not so much to the inability of that country to produce food, but rather to political and economic conditions. Russia has been, and under normal conditions should continue to be, one of the world's great food producing countries. It is therefore apparent than an insufficient food supply may result from conditions other than lack of productive land and unfavorable seasons; that the danger of food shortage is likely to increase and become of greater concern to each country and to the world as the population increases. From the standpoint of national welfare and safety, it is better that a country should produce, or at least be capable of producing, more food than necessary to adequately supply its own people. As the various countries become more populous, with less truth may it be said of any one of them, that that country is absolutely self-supporting and independent of all other countries. A crop failure or possibly even a partial crop failure in one populous country in any year may require that it import during that year for the support of its people. Another year some other country may experience a crop or partial crop failure and food must be imported into that country. These facts show that improved methods of transportation and international commerce are beneficial and even now are necessary for the best interests of the various countries and insure a perpetual commerce between countries if for no other purpose than assuring such countries of an adequate food supply.

Until the present time, the United States has produced a greater quantity of food than necessary for the supply of its own people. Famine has been unknown and it is probable that none of us shall ever see the day when this country will not produce sufficient food to supply its own people. The United States Department of Agriculture estimates that the total acreage of arable land is 800,000,000 acres of which only approximately 500,000,000 acres have been improved or brought under cultivation. These 500,000,000 acres, however, include the more fertile and most accessible lands. Until the last quarter of a century there has been so much land readily adaptable to agriculture and it has been so cheap in price that little thought was given to bringing under cultivation wet and dry lands.

The increase in the population of the European countries, however, has made them more dependable upon the United States and other countries for a food supply. This increasing dependence of European countries, the continued increase in our own population and the growth of cities accompanying that increase, have furnished larger market for food and offered an inducement to bring under cultivation marsh lands and dry lands, especially if they be favorably located and close to market, until we now find throughout practically every state in the Union many drainage and irrigation projects organized for the purpose of bringing these less productive lands under cultivation.

A sufficient food supply is not only a matter of vital importance to a nation as an entirety but also to the individual consumer and producer. Not only is it essential that a nation should have sufficient food to maintain its people but that supply should be offered at such prices as to be available to the average consumer and furnish a fair return to the producer. The prices of food are dependable upon the law of supply and demand and that law is inflexible. When the supply of a commodity is great and the demand small, the price of the commodity is low. When the supply is small and the demand great, the price is high. When the supply of, and demand for, a commodity are more nearly equal, the price takes an intermediate range. Probably no other economic law is so generally recognized and so continually evidenced as is this law. It applies to money as well as manufactured and agricultural products, raw materials, land and labor. While money is a measure of value, it is also a commodity. You increase the supply of money and it immediately becomes cheaper and more of it is required to purchase other commodities. In this country, the truth of this fact was well illustrated by our experience with paper money during and immediately following the Civil War, and probably to some extent at present by reason of our possession of a vast portion of the monetary gold supply. It has lately been and is now being illustrated in the experiences of those European countries that have issued large quantities of paper money.

As applied to agriculture, the operation of this law of supply and demand explains, at least in a considerable degree. the periods of agricultural prosperity and depression which this country has lately experienced. Under normal conditions the United States, Canada, Russia, India, portions of Africa, Argentina, and Australia have been the great food producing and exporting countries of the world. Such was the fact at the beginning of the European War in 1914. Most of the countries engaged in that war were dependent in a considerable degree upon other countries for their food supply. Within a short time after the outbreak of the war those waring countries had millions of soldiers in the field. Many of the soldiers had previously been engaged in agricultural pursuits in their respective countries so that the first and immediate effect was to limit

the food productivity within those countries. The sudden change from a peace to a war basis also created an immediate and great demand for labor in the manufacture of war materials and supplies and other employments incidental to the conduct of the war and the maintenance of the large armies in the field. This further limited the ability of those countries and made them more dependent upon other countries for their food supply. Russia being a participant in the war and cut off from access to her allies practically ceased being a food exporting country. India, South Africa, Argentina, and Australia were so distant from the scene of conflict that comparatively few boats could be spared to transport needed supplies. The urgent necessity of the war demanded quick and continuous service and the United States and Canada being so situated that they could best supply this service became the great supply countries of the war both in food and in war materials.

This great and unusual demand for food caused prices to shoot upwards. The agricultural productivity of this nation was taxed to its limit. Farmers were exhorted to put every acre under the plow. Hundreds of thousands of tons of food were destroyed as a result of submarine warfare, thereby diminishing the supply of food that actually reached the allies. Finally when this country entered the war, its experiences were similar to those of the warring European countries. Hundreds of thousands of persons were withdrawn from agriculture and the food productivity of this country was lessened. The cry for food continued unabated and indeed increased in volume. It was argued that the central powers were like a beseiged city; that if they could be prevented from receiving food from other countries and ample supplies could be furnished the allied countries, the central powers would be defeated. In other words, food would win the war.

The effect of the demand for food was not so marked in those food producing countries lying at a considerable distance from the seat of war as upon the United States and Canada. While European countries were greatly in need of food produced by these distant countries, yet the lack of boats to bring their product to the seat of demand limited the export of food from those countries and prices of food in those countries did not rise to the level of prices for similar products in the United States and Canada. In fact the difficulty of transporting food produced from those distant countries tended to build up an excess of food in those countries. It is reported that hundreds of thousands of tons of wheat that England had purchased in Australia at ninety-five (95) cents per bushel either rotted at the wharves or were destroyed by rats merely for lack of transportation.

Actual warfare terminated in November, 1918, but still there remained the problem of returning the soldiers and the war equipment to the respective countries. It was the aim of the various countries to accomplish this so soon as possible, yet many months

elapsed before anything like a complete return of troops and equipment was accomplished. This also required the use of boats and it was only gradually that boats were released for commerce with distant food producing countries. When boats began to ply between European countries and distant countries, the excess food was offered in open competition with food from this country and as was necessarily to be expected the result was a rapid and marked decrease in agricultural prices throughout the United States.

Another situation that operated to the detriment of the United States was this. During the war the United States had become possessor of nearly one-half of the total monetary gold supply of the world. It had extended immense credits to European countries. At the conclusion of the war those European countries were impoverished. They had little gold and little credit and in order to purchase food from the United States, they must pay for the same either by further extensions of credit or with manufactured products. The United States, being itself a manufacturing country, required comparatively little of the manufactured products of these countries. Furthermore these countries possessed but little manufactured products with which to purchase food, especially immediately following the termination of the war. The consequence was that these countries were little able to purchase any considerable quantity of food from this country and certainly they could not be expected to purchase food from the United States when they could

purchase the same more cheaply from more distant countries that were in need of such manufactured products as they could supply.

The termination of the war and the demobilization of the armies released millions of men and women who had been in the armies and engaged in the manufacture of war materials and supplies and permitted them to return to their former occupations. This provided a great increase in the number of those engaged in agriculture and resulted in increasing the food productivity not only of European countries but also this country. As a consequence European countries became more independent and found it unnecessary to import the quantity of food they imported during the war. With Europe demanding less and buying elsewhere and the United States with an increased ability to produce, no other result than a decrease in prices could be expected.

Owing to the fact that millions of persons in this country had been withdrawn from their former occupations by reason of the war, other occupations had been neglected and a great demand for labor occurred in other lines. A good illustration of this is the building program which had been greatly neglected during the war, but which began with exceptional impetus so soon as the war ended. The result was that the prices of food products which the farmer had to sell fell far below the prices of those commodities which he was compelled to purchase. The experiences which this country passed through are merely a repetition of the experiences of all countries under similar conditions. In all great wars, prices of food products are among the first to rise, followed by an increase in the price of labor. Upon the termination of the war, prices of food are generally the first to fall, followed by a lowering of wages.

The condition in which agriculture finds itself is not due to the action of any class or any political party. It is but a natural working out of the law of supply and demand under conditions created by war and over which classes and political parties have little control. If the economic conditions in European countries continue to improve we may expect a gradual increase in the demand for, and in the prices of, farm products. In order to purchase our food, however, Europe must be permitted to pay largely in the manufactured products it produces. This will mean competition between lower paid European labor and the higher paid American labor and is certain to be fought by American labor. This situation presents one of the certain elements of conflict between agriculture and labor.

What has been previously stated has been set forth for the purpose of furnishing a perspective for the consideration of the chief question here to be discussed; namely, the future of drainage in the United States and especially within the State of Wisconsin. During the past four or five years a strong and quite extended opposition to drainage and reclaimage of lands has manifested itself in various portions of the United States. This opposition has not been confined merely to the reclaimage of wet lands, but in certain

sections has extended to the reclaimage of dry lands by means of irrigation. This opposition has arisen during the late period of agricultural depression accompanied with low prices comparatively speaking for agricultural products and a great decrease in land values following immediately after a period of unprecedented agricultural prosperity during the war accompanied by high prices for food products and high speculative land values. Had that period of agricultural prosperity continued with its accompanying demand for all the food products that this country could produce, there would now be no occasion for considering the future of drainage, and we would still be actively engaged in reclaiming our wet and dry lands.

In no section of the country has opposition to reclaimage work been more bitter and more unreasonable in its attitude than in our own state. The setting for this opposition in Wisconsin was most favorable. In its early history the northern portion of the state was covered with immense forests of pine timber and lumbering and was for years the principal industry. As a consequence large holdings of land were acquired by companies or individuals and held for a number of decades until the timber had been removed. The population was scattered and sparse and chiefly located along the streams and the various sites of the lumbering industry. As the lumbering industry waned, it was succeeded by allied industries such as paper mills, box or other factories that furnished a market for the unused timber left by the saw mills. Under these conditions agriculture was made subservient to the more important industry and general agricultural settlement and development was interfered with and delayed and when at last considerable portions of the cutover lands were offered for sale for agricultural purposes much labor and expense were still required to bring them under cultivation. As a consequence it has been chiefly in late years that any considerable thought has been given to the development of the northern portion of the state from an agricultural standpoint.

Other conditions also operated to the detriment of the agricultural development of the northern portion of the state. The latiude and climatic conditions are such that the central portion of the state just about marks the northern limit of the corn belt so that lands lying in the central and northern portions may not be relied upon to produce with safety that variety of crops that are produced by lands lying in the southern portion. In the central and northern portions of the state the marshes are as a rule more extensive and in some cases contain a poorer quality of soil than is true of the marshes in the southern portion.

The southern portion of the state presents quite a contrast with the northern portion. While in its early history it possessed considerable timber, yet the timber was not so extensive as in the northern portion and was of a type that yielded more readily to agricultural effort. The chief industry in the southern portion

from the beginning of its settlement was agriculture and with its continued increase in population and development, the timber was gradually removed, and the land divided into small farm acreages until now practically every acre of land that in its original condition was suitable for agricultural purposes has been brought under cultivation and a demand exists for land that may be made productive by drainage. In fact the agricultural development of the southern portion of the State now ranks well with the agricultural development in any portion of the country. By reason of the fact that marshes in the southern portion were as a rule smaller and the holdings were in smaller acreages, the drainage of marsh land worked in well with the general agricultural development of the section. Dairying and diversified farming furnished a demand for the reclaimage of the small marshes and even agricultural depression has failed to entirely eliminate the continuance of reclaimage work. In comparison with the values of lands in the central and northern portions of the state, values are high, giving a comparatively high valuation to marsh lands when drained and rendered fit for general agricultural purposes.

In the central and northern portions of the state; there still remain large areas sparsely settled and not as yet brought under cultivation that do not require drainage to make them productive. This fact, however, should not be overlooked that in many cases it is less difficult and less expensive to drain some of the northern marshes than to clear and bring under cultivation much of the cut-over timber lands. Numerous drainage projects have been organized and the work of construction completed, some of which projects are entirely successful while others have not met the expectation of the promoters. Those projects which have been promoted by the local resident land owners have as a rule been successful and the unsuccessful projects are chiefly confined to those wherein non-local owners of considerable acreages have been the sponsors. The successful projects are cases where there was a demand for additional lands by owners who intended, and were in a position, to make immediate use of at least a portion of the reclaimed land. The unsuccessful projects have been characterized too much by the purely speculative spirit; too little consideration has been given to the suitability of the land for agricultural purposes after drainage and to the probability that a demand existed for the land after drainage.

It is not surprising that some districts have not proven successful; that the projects have defaulted in the payment of principal and interest on their indebtedness; that some owners of lands located within drainage and irrigation projects have allowed the same to go for the unpaid taxes and assessments. In view of the number of drainage projects throughout this state, the real surprise is that so many have proven successful and continued so through the unprecedented agricultural depression. Frequently failures occur among those cultivating lands that require neither drainage nor

irrigation. Failures occur in all occupations and business ventures and if the percentage of failures in drainage work were to be compared with the percentage of failures in other lines, we doubt if the result would be unfavorable to drainage especially in view of the fact that in this state drainage is comparatively a new venture. During the last two sessions of our State legislature bills have been introduced to repeal, in its entirety, the drainage district law and thereby not only prohibit the organization of other districts but destroy the districts already organized. The evidence indicates that the persons sponsoring and supporting such legislation are influenced largely by their personal animosities and base their conclusions upon the few projects that have not proven successful, entirely overlooking the large number of successful projects. It is reported that one member of the legislature was elected upon a platform in which he pledged his best efforts to repeal the drainage district law simply to satisfy some disgrunted constituents. This action has been given wide publicity and has increased the difficulty of financing meritorious drainage projects in this state.

Frequently during the agricultural depression of the last few years, statements have been made to the effect that we have too much land under cultivation; that improved agricultural methods have so increased the productivity of lands that no reclaimage work is necessary. Those who make use of such statements to prove that we should cease reclaiming our wet and arid lands seek to prove too much. They overlook the fact that this country always has produced more food than necessary for the maintenance of its own people; that it always has been a food exporting nation and that the late agricultural depression was largely the result of a lessened foreign demand for food products. The surplus in food produced in this country during the last few years is as much the product of high lands as it is the product of reclaimed lands. In fact it is a certainty that the surplus is more attributable to the cultivation of, and the application of improved agricultural methods to, high lands than to the reclaimage of wet and arid lands. There is no just or valid reason why an owner of marsh or arid land should not have as great a right to consider the needs of mankind as has the owner of high land that requires neither drainage nor irrigation. An owner of marsh or arid land should have as great a right to increase the yield of his holdings by reclaiming his land and bringing it under cultivation as has an owner of high land to increase the yield of his holdings by the application of improved agricultural methods. The owners of contiguous marsh and arid lands should have as great a right to co-operate in improving and increasing the yield of their lands as have the owners of high lands to co-operate in improving and increasing the yield of their lands or marketing their products. The objects in all cases are the same; namely, to provide food and increase the returns to the owners. We know that food can be produced as cheaply and as abundantly on much of our reclaimed

land as on much of our high priced lands that require neither drainage nor irrigation. A proposal that would prohibit certain land owners from producing food, for the benefit of other land holders, lacks both the elements of justice and good sense. Who is the person, and by what right does he claim the authority, to determine what lands shall or shall not be put under cultivation? No person or persons have or can have such right under our form of government. It is a matter that must work itself out under the principles of economic competition and must be left to the owners of the land, just as always has been the case in times of previous agricultural depressions.

A fact applicable to this state that is quite generally overlooked by those who oppose drainage is this: That for every acre of land that has been reclaimed by drainage more than acre has been made unavailable for agriculture purposes by being included in a park, a game, a forest or other preserve, or flooded for storage purposes incidental to the operation of power dams or used for residential, business, and factory purposes. In other words the general settlement and development of the state is accompanied with losses as well as gains in agricultural acreage. The same is true in a greater or lesser degree of all the other states and is inclusive of lands reclaimed by irrigation.

Another fact that is often overlooked by those who oppose reclaimage is this: Millions of acres of land are now being cultivated that are so poor in quality that the return oft times does not repay the cost of the seed, and in the most favorable seasons furnishes a most inadequate return upon the investment and for the labor requisite in producing a crop. Improved agricultural methods and the development of plants more suitable to such soils and conditions may in the course of time improve this condition, but for the present thousands of owners of such land would profit if they sacrificed their present holdings and located on more productive land, even upon reclaimed land. This reasoning applies not alone to light, loose, permeable soils of little natural fertility, but also to worn out soils and to some of the cutover lands, where by reason of the expense of clearing of stumps and stones, the investment is increased with a resulting acreage of low productivity.

Few persons would advise the destruction of our drainage projects. Such a proposition, under the guise of the repeal of the Drainage District Law, was too radical for our legislature. Such a repeal and the prohibition of further drainage would be an act of retrogression and would be indicative of ignorance and lack of appreciation of economic conditions and relations. Such a step is no more likely to be taken than is a ban to be placed on improved agricultural processes and a return made to the agricultural conditions and methods of our fathers. The demand of an ever increasing population for an ever increasing food supply absolutely prevents any retreat from existing methods.

The United States Census Bureau estimates the average yearly gain in population in this country since the 1920 census as 1,778,750. We little realize the effect of this increase until we seek to make some direct comparison. According to the 1920 census the populations of the States of Wisconsin, Louisiana, Mississippi, Kansas, Arkansas, and South Carolina were as follows: Wisconsin, 2,631,839; Louisiana, 1,797,798; Mississippi, 1,789,384; Kansas, 1,769,257; Arkansas, 1,750,995; South Carolina, 1,683,662. It is apparent that this annual increase in population is the equivalent of more than 67% of the total population of the state of Wisconsin and is substantially the equivalent of the total population in 1920 of any one of the states of Louisiana, Mississippi, Kansas, Arkansas, and South Carolina. Such a comparison evidences the vast agricultural acreage that is required under present agricultural methods to sustain this annual increase. It illustrates how small is the reclaimed acreage added each year as a result of drainage and irrigation, in comparison with the area required to sustain this annual increase. It shows that ample opportunity will remain for the testing out and application of improved agricultural methods and that regardless of such annual reclaimed area, we must still principally rely upon intensive agriculture and improved agricultural methods to produce the food sufficient for this increase. In the five years that have elapsed since the last federal census, our population has increased to the equivalent of the total populations in 1920 of the five above named states: Louisiana, Mississippi, Kansas, Arkansas, and South Carolina. While these five states are agricultural rather than manufacturing states and produce more food than is necessary for the proper maintenance of their own population, yet the comparison presents in a vivid and impressive manner how vast a territory is required for the production of food merely for the annual increase in population. If all wet land in the State of Wisconsin could be immediately drained and placed under immediate cultivation, it would produce, under present agricultural methods, sufficient food to sustain only a portion of one year's increase in our population.

In view of the continually increasing population and the small acreage reclaimed each year, it is evident that the added product each year from newly reclaimed land supplies a very small portion of the increased annual demand. It is fairly evident that the opponents of drainage overestimate and in some cases even exaggerate the effect of this annual increase in food production from reclaimed land. We have no reason to expect that the acreage of land reclaimed in any one year is likely to be in any greater proportion than has been the case in previous years. The reclaimage of land is nothing more than a part of the general development of the country and we may expect that the proportion reclaimed will substantially keep pace with that general development. In fact we may expect that the acreage reclaimed each year during periods of

agricultural depression may fall below the acreage reclaimed in years of prosperity and that such condition will continue until agricultural conditions become normal. In accord with the general development of the country, we may expect that more reclaimage will occur in those sections that are more populous where there is a greater demand for additional acreage for agricultural purposes and in sections where there is a nearer and more ready market for the product of these lands. We may expect that the acreage reclaimed each year will be largely governed and determined by the economic conditions existing in the communities where the unreclaimed land is located.

This paper would not be complete if no mention were made of the opposition of members of the Isaac Walton League and other "lovers of the great outdoors." While some are expert hunters and fishers, yet many others seldom hunt or fish and are no more proficient in handling a gun or wielding a rod than ourselves. We often wonder why these persons are opposed to reclaimage work. Two explanations have been offered. One is that many have never fully reasoned out the matter from the standpoint of the rights of owners to improve their lands and readily admit the rights of such owners when the situation is explained to them. The other reason is that many consider the matter from a purely selfish standpoint. The oppose drainage because reclaimage of the lands would deprive them of a pastime. They are unwilling to invest their own money in wet lands and are perfectly satisfied that others should make investments in, and pay taxes on, the same provided they are permitted to make use of the lands without expense. This opposition is a variable one. In some years it is strong, in others weak. A couple of years back, sentiment was very strong and practically every newspaper contained something relative to this opposition. At the present time the opposition is at a lower ebb. It is safe to say that the rights of the owners of marsh lands will be recognized in spite of the selfish opposition of a few self-styled sportsmen and "lovers of the great outdoors."

Food! Food! Food! As essential to existence as the air we breathe! Its acquisition is an ever present problem, not alone to the individual, both for himself and those dependent upon him, but also to every nation, for no nation can be expected to rise above the well being and contentment of its people. Races have disappeared from the face of the earth because of lack of food. Other races have been absorbed by conquering races in the search for food. Nations have encouraged migration to, and colonization of, undeveloped territories for the assurance of a food supply. The history of the peoples of the earth is largely written in the history of the earth's food supply. Opponents of reclaimage may as well expect the planets to cease their courses in the heavens as to expect reclaimage to cease. Interruptions may occur, but they will be temporary. The insistent demand of a steadily increasing popula-

tion, becoming more insistent with increasing numbers, absolutely compels that that demand be satisfied if within human possibility. The fear of the consequences of an insufficient supply compels heed of that demand long before any actual deficiency in the supply occurs.

WISCONSIN DRAINAGE—PAST, PRESENT, AND FUTURE

E. R. Jones

On one side of the picture we see a vast expanse of marsh land, sodded with sedge grass or freckled with cat-tails. Perhaps scrubby dog-wood or little willows are crowding out the grass. Wild ducks hover overhead and finally alight in the wild rice at the water's edge.

Cattle have tried to pasture on these lands until the surface is broken up by bogs, knee high. Weeds finally grow there to the exclusion of everything else—a good place for the hay fever victim not to go.

Sick looking fences mark some of the "forty lines" and occasionally enclose an area from which the cattle are kept out. Here wild hay may be cut if the season isn't too wet. The hay is a little more tender than pine shavings and a little more nutritious than steel wire. Carried out on poles, and stacked at the edge of the marsh, it is hauled away the next winter for bedding, packing or feed. Poor wages is all that the hay maker gets for his work. The owner of the land commonly gets nothing at all, yet he pays taxes upward of 25 cents an acre a year on wild hay meadow and brushy marsh alike. He is actually paying out good money each year for the privilege of having some bad money invested in marsh lands.

On the other side of the picture we see in the broad level corn belt of Illinois, Iowa and southern Wisconsin and Minnesota, row on row of tasseled corn taking the place of the cat-tail. Alsike clover thrives where once grew the sedge. Artificial drainage has made the land dry enough to cultivate with safety; a 20-inch breaking plow has turned over the bogs and covered the brush; and tough fibrous peat has decomposed into a black waxy muck. This land rents for $15.00 an acre a year and sells for $200.00 an acre.

Before drainage the organic matter in these soils decomposed into plant food but slowly. It was pickled in water and soil acids. After drainage the acids leach out and bacteria come in to make food for cultivated plants.

The question is, How much of this type of land can we unpickle with profit to the individual and to the commonwealth?

Here are the 10 most important numbers on Wisconsin's drainage program:

1. Justify agricultural drainage on existing farms wherever it reduces the cost of producing crops on Wisconsin farms.

2. Favor intensive drainage rather than extensive drainage.

3. Seed to alsike clover some of the fields that have wet spots, strips or flats in them where cultivated crops drown out in wet years.

4. Tile drain the wet spots, strips and flats on farms where the wet or notched fields are needed to raise enough corn or grain to make the farm a well balanced unit.

5. Dredge the crooked, sluggish, shallow creek or install a large tile for an outlet where cultivated fields on exisiting farms require a community outlet benefiting several farms.

6. Postpone until the lands in existing drainage districts are fully utilized, the construction of community outlets on extensive marshes where the major purpose would be to create new farms rather than to benefit existing ones.

7. Concentrate the scattered settlers in the sparsely settled drainage districts into the better proportions of those districts, pay off the remaining debts of those districts in some practical way, and establish forest preserves or game refuges on the poorer portions of these drainage districts until the need for more farm land is more acute than it is now.

8. Reduce the assessed valuation for general taxation on the marshy portions of Wisconsin farms as compared with the well drained portions thereof, thus removing the temptation to drain land merely for the purpose of making it earn part of the high general taxes that marsh land now has to pay.

9. Institute a land and economic survey of the state as a basis for setting apart non-agricultural or sub-marginal lands for some purpose other than agriculture. Let agriculture compete for only the high class marshes accessible to markets and let the door be kept open for the reclamation of such marshes when the lands in existing drainage districts are fully utilized.

10. Condemn shallow or untimely drainage as worse than no drainage at all.

There is no type of land reclamation that is more tempting to the man who delights in making a cornfield blossom where nothing of marketable value grew before. No stumps to pull, no stones to carry. Merely drains to install and crops to harvest. No wonder this has been a fertile field for promoters, honest and dishonest.

Drains, Then Brains

Some drained lands are more fool-proof than good upland soils. Others require special treatment and management.

It is proverbial that the tiled swales in the cornfields of the corn belt require less manure, yield to cultivation earlier in the spring, and grow better crops than the ridges between them. These soils are well supplied with both mineral and organic matter.

Not so with the peat and muck from one to twenty feet deep

on the rest of the marshes. There, management is everything. While it doesn't cost as much to supply the deficiency of phosphorous and potash to the peat as it does to supply the necessary phosphorous, nitrogen, and organic matter to the uplands, it takes a good head to give the right treatment to the right marsh. The same peat will fail under one set of conditions and succeed under others. The peat beds at Kalamazoo, Michigan, famous for their celery, the Hollandale Farms, at Albert Lea, Minnesota, which this year are shipping trainloads of three-dollar potatoes into Iowa, and the University Marsh, at Madison, which for ten successive years has raised 17 tons of green corn per acre, are no better physically, chemically, or geographically than the Troy Marsh of 3000 acres in Walworth County, Wisconsin. Yet half of the latter, drained about 10 years ago is lying idle, and the other half is failing at general farming. It will fail until its operators specialize on the particular crops, and particular methods adapted to that marsh, and until a good market is created for those crops. Markets, crops, tools—disc plows instead of mold board plows, heavy rollers instead of plankers—everything is different on peat and muck. Yes, and the people too. It is the industrious Hollander and his family, working with hand and head, that brought success to Kalamazoo and Albert Lea.

Community Outlets and Supplemental Drains

Sluggish rivers, winding creeks and flat water courses extending through several farms, townships or counties, require community effort for improvement. Drainage through the other fellow's land can be accomplished only by unanimous consent of all land owners concerned or by state drainage laws. Over forty of the forty-eight states have such laws giving courts the right to sanction and direct organizations for the construction of outlet drains and to levy special taxes against the benefitted lands to pay for such drains. The projects are initiated by a petition of the land owners to the court. In some states the petition of a single land owner is sufficient to bring the proposed project to the attention of the court. Other states require a majority of the land owners or a majority of the acreage on the original petition. Wisconsin's more stringent law, built on the experience of other years, limits the weight of any one signature to 320 acres in determining the sufficiency of the petition. This curbs the power of the large land owner as against the smaller ones.

Community drainage projects may be divided into two general classes. First, the projects that furnish outlets for the wet fields on farms now farmed. Second, the projects on large undeveloped marshes that seek to furnish outlet drains for farms to be created and farmed by big companies or sold to settlers in small parcels. Those of the first class are to be commended as laudable enterprises so long as they contribute to the efficiency of a majority of the existing farms connected therewith. Those of the second class

are to be commended when they contribute good and needed farms to the state and nation. This means careful selection as to time, place, and manner of drainage.

The demand for game preserves is a factor. In the near future, the demand for such preserves may become so acute as to induce sportsmen to buy or lease large tracts of marsh lands for game preserves or shooting grounds, thus competing with agriculture for the use of these lands.

About 65,000,000 acres in the United States have been assessed for the construction of outlet drains. They are organized into 60,000 projects from a few hundred acres to nearly a million acres in size. About half of this area lies in the North Central states, Ohio, Indiana, Michigan, and Minnesota predominating. Nearly 40% of the total area of Indiana is in drainage organizations.

Indications are that outlet drains have been provided for about one third of the we land in the United States, but some of these outlets are inadequate and that adequate supplemental drains have not been constructed on all of the areas included in the community projects.

Drainage commissioners, appointed by the courts to direct these projects, have properly given the land owners their choice in the matter of supplemental drainage. They are empowered, where the land owners desire it, to construct the supplemental drains also and to levy a correspondingly high tax on the lands so benefitted. More often, the land owners have preferred to put in their own individual drains and to pay, in their taxes, for the outlet drains only.

TABLE I.

Laterals, Drains, Constructed Through Organization

	% land in organized drainage	Cost of organized drains	Cost per acre	Organized laterals provided	Mean depth of laterals in feet
Illinois	10.9	$51,000,000	$13.00	53%	4.8
Indiana	39.4	32,000,000	3.50	39%	5.1
Michigan	26.4	25,000,000	2.50	20%	4.3
Minnesota	17.8	44,000,000	4.50	71%	4.9
Ohio	31.1	31,000,000	4.00	27%	3.9
Wisconsin	2.2	4,564,000	5.50	89%	6.5

Table I indicates the policy of different states in the matter of lateral or supplemental drainage. No laterals are reported on 80% of the area included in the organized drainage projects of Michigan, and the laterals that were installed as community drains were shal-

low compared with other states. In Illinois a greater percentage of the drained lands were given laterals, and a larger percentage of them were of large tile rather than open ditches. This accounts for the higher cost per acre. In all of the states the lands not provided with laterals to feed the main drain are provided with such laterals by land owners themselves, individually or in cooperation with neighbors by mutual agreement. In Wisconsin less individual work was necessary because of the policy of giving every farm in the project direct access to either the main drain or a lateral.

These outlet drains, both mains and laterals, consist of open ditches from three to more than 100 feet wide at the bottom, or large tile up to 48 inches in diameter. The latter are more expensive, but waste less land and are more permanent. Seldom does an organization put in community laterals less than eight inches in diameter.

The internal drainage required by the individual farms consists largely of tile drainage. The amount of tile depends upon the depth of the drain, the nature of the soil, the seepage from surrounding upland, and the kind of crops to be raised. For the grasses, less drainage is required for potatoes! Land between two district laterals 6 feet deep or more and 80 rods apart commonly requires no additional drainage. This is true in sandy subsoils free from springs. More often lands are not so fortunate as to have a district drain on both sides of them. Such lands require laterals of 5 inch tile at the rate of from 5 to 40 rods per acre and costing about $2 a rod completely installed or from $10 to $80 an acre. Many of the farms reported in Table II as having artificial drainage of this kind are in drainage organization.

TABLE II.

Farms Needing Drainage

	Total	Farms	Farms With Artificial drainage		Farms Needing Artificial drainage	
	number	acres	number	acres	number	acres
Illinois	237,000	32,000,000	99,000	11,247,000	33,000	1,229,000
Indiana	205,000	21,000,000	111,000	8,308,000	66,000	1,717,000
Michigan	196,000	19,000,000	67,000	3,156,000	64,000	2,070,000
Minnesota	178,000	30,000,000	53,000	2,993,000	74,000	3,504,000
Ohio	257,000	23,000,000	130,000	7,365,000	85,000	2,015,000
Wisconsin	189,000	22,000,000	22,000	658,000	52,000	1,839,000

Wisconsin permits the organization of a sub-district within a district to install all of the tile drains needed on a farm if the owner so desires. This is to prevent a mortgagee from tying the mortgagor's hands as he might do by refusing to increase on existing mortgage to supply the money to pay for the necessary drains. Sub-district bonds against the farm which take priority over an existing mortgage may be sold to give the farmer the money he needs for the necessary improvement.

Wisconsin's 2.2% in drainage organizations hardly tells the whole story. It has been her policy to include in drainage organiza-

tions only such forty-acre parcels as contain wet land to be benefitted. Some Wisconsin districts have even divided forties into halves and quarters. Other states have included the whole catchment basis, whole counties and more, high land as well as low. They have levied almost uniform assessments against the whole acreage. This increases the size of the district and lightens the load of drainage taxes on the low land, on the theory that the upland should help bear the load because it sheds the damaging water upon the low land. The Wisconsin theory is that the upland by virtue of its fortunate topography, is entitled to all of the drainage resulting therefrom. Owners of the higher lands paid more for their lands in the first instance because they had natural drainage, and if these owners were afterwards made to help pay for the artificial outlets on the lower lands, they would have to pay twice for their drainage—a manifest injustice. This theory seems sound, but has had a tendency to retard organized drainage in Wisconsin.

Unlike the irrigation projects, the drainage projects have not been subsidized by the Federal government or aided by long-term, low-rate federal loans. It may be that the drainage projects did not need a subsidy because they have been generally near large centers of population where markets for farm products were good without long freight hauls. At any rate, except for the dikes along the lower Mississippi River, and some of the drainage district lands in northern Minnesota, drainage has had to pay its own way. It did not even profit from the proceeds of the sale of state swamp lands although the Federal Act of 1850 dedicated such proceeds to the drainage of such lands. The states broke their pledge. They used these moneys chiefly for schools, roads and bridges, and left the land owners to dig themselves out of the mire. In Wisconsin alone over $3,000,000 of swamp land funds to say nothing of the interest accumulating since 1850, has been diverted by the legislature to other uses. If this principal, compounded at 4% until 1930, were then available, it would pay for the outlet drains for every acre of wet land in the state.

Old Projects Inherited

Some of the drainage projects organized from 15 to 25 years ago in central Wisconsin and northern Minnesota have been inherited by the present generation as a liability. In Minnesota the county guaranteed the payment of the drainage bonds and in the poor districts, the county has had to pay. In Wisconsin, the county did not stand back of the bonds. Each project had to stand on its own feet. In both cases the promoters have lost their money due to their own mismanagement. In Minnesota the delinquent land belongs to the county. In Wisconsin the land belongs to the bondholders, if it belongs to anybody. They haven't foreclosed on their bonds and taken titles to the land for the reason that they don't want the land.

It is easy to tell where the original mistake was made. Promoters threw upon the market too much new land at one time, with poorly designed ditches and no colonization plans at all.

If the first district of 50,000 acres had been thoroughly drained, developed, farmed, and sold before the land in the second district was thrown in competition with it, the first, the second, and each subsequent district would have had a chance to succeed and it is not unlikely that there would be today 2500 contented prosperous farmers instead of 350 in the drainage districts of central Wisconsin.

The Wisconsin lands delinquent in drainage taxes are orphans. In eleven of the districts of central Wisconsin, organized prior to 1907 and containing 409,000 acres, 175,000 acres were subject to tax deed on June 1, 1924 with no takers. There was $231,000 of drainage taxes and $90,000 of general taxes plus the penalties, due against these lands.

The original indebtedness of these districts was $2,558,000 which has been reduced by annual payments to $1,226,000. Strangely enough the second half of this indebtedness seems harder to pay than the first.

To get the story of the central Wisconsin drainage districts. we must go back to the dry season of 1894 when fires ran over township after township of parched peat on the marshes and left them mellow as a garden. They were dry enough to cultivate and nobody seemed to think it would ever rain again. Some areas were planted in 1895, another dry year, and yielded bountiful crops of buckwheat, rye, and potatoes. Stories of the wonderful fertility of these lands spread and land grabbing began. Much of the area was subject to tax deed and acquisition was easy to the first comers. Large areas fell into the hands of a few men.

Soon the wet seasons returned and crops failed. The need of drainage was evident. Wisconsin had an old drainage district law under which only one or two owners of large tracts were required to sign the original petition. Plans were made on paper and a lenient court, desirous of promoting the general welfare of a sparsely settled county approved of the sale of bonds for the construction of ditches. The ditches were dug and the project settled down to wait for settlers who never came. Many who did come did so to their sorrow because the promoters charged them $40.00 an acre for the land without improvements and without helpful service to accompany the contract.

In spite of their handicaps, statements from the settlers with which the college of agriculture is in touch, indicate that they are reasonably prosperous. Profiting by the experience of those who had to abandon their farms, these farmers are using methods adapted to these lands and are making progress. What they need above all else is more neighbors. The sparse settlement makes it difficult to maintain schools and roads.

These farmers are paying their taxes. In 1924 the current drainage tax levy in the twelve districts was $140,000. Half of this was for interest and the other half for principal. The receipts were $91,000, paying all of the interest and part of the principal but leaving an increased delinquency of $49,000 for the year. The load on the delinquent lands is increasing each year and without relief to break the deadlock, their chances for redemption are becoming more remote.

An examination of the delinquent lands shows that they are of as good quality as those upon which the taxes have been paid. With a few exceptions, it was the land owner's pocketbook and not the quality of the soil that governed the payment of the taxes. The non-resident owners have not paid their taxes.

In December, 1924, I submitted to the attorney general of Wisconsin a plan for the redemption of the delinquent lands. While sound economically, it had too many legal defects to be workable. It may suggest to the bondholders a way by which they can put these lands into good hands. Briefly it was this:

Let the state of Wisconsin recall from the channels into which it was misappropriated a portion of the old swamp land fund. Let it take title to the 180,000 acres of lands in those districts now subject to tax deed. It may take $1,200,000 temporarily to do that and guarantee the payment of the balance of the undue bonds against those lands.

Concentrate the settlement by inducing the now scattered settlers to exchange their holdings for lands in the portions or districts selected for intensive settlement.

Then select 1,000 or more of the best 80-acre farms that are well drained and put them in the hands of settlers for $1,200 a farm. Generally, there would be a sandy island for a building site on each farm.

The state would thus get all of its money back and have as a public owned forest preserve or game refuge, without costing it a cent, nearly 100,000 acres of land on which the water could be controlled for fish, fowl, farm, or forest.

The soils on these marshes have been mellowed and sweetened by 20 years of drainage. The original settlers encountered a tough, sour peat, and many of them succeeded. Renters of high priced lands in Iowa and Illinois, coming in groups to facilitate co-operation, would do well to purchase these farms free from brush, stumps, and stones.

These lands have better drainage, are 300 miles nearer to the center of population of the United States than the drainage districts in states farther west whose lands will be offered in competition with them. They are 2,000 miles nearer to the center of population than other lands in the west susceptible to irrigation.

If this plan is followed it will not be long before the procession of incoming settlers will have caught up with the procession of land

reclamation, and new extensive reclamation on well selected acres will be warranted, in the logical development of Wisconsin agriculture during the decades to come.

With constitutional limitations probably preventing the state from embarking on this enterprise of relief, it may remain for the bond holders to do it.

Curbing Extensive Reclamation

On the theory that it is better to check extensive reclamation projects before they are started than to be responsible for them after they are completed, the supervision of new drainage projects in Wisconsin exceeding 200 acres, was assigned to the State Chief Engineer by the legislature in 1919. Since then the projects have been confined largely to outlets for wet lands on existing farms—intensive projects in contrast to extensive ones. Bonds of these projects sell readily.

In drainage districts all refunding bond issues must be approved by the Commissioner of Agriculture, the Commissioner of Banking, and the Attorney General. The inclusion of the two state officials last named has proven unfortunate. The legislature in its zeal to insure the safety of drainage bonds probably went a step too far. These officials hesitate, and wisely, to exercise this special prerogative when it may embarrass them later in the discharge of their regular duties. It would be just as appropriate and much less embarrassing for the president of one of the state normal schools to sit in judgment on the merits of drainage bonds as for an attorney general or a commissioner of banking.

Since 1919, 134 Wisconsin projects aggregating 328,002 acres with the proposed outlet drains that would cost $3,463,789 have been petitioned for by a majority of the land owners. Indefinite postponement was advised by the state engineer on 17 of these projects, with a limited postponement on some others. Construction has been completed on about half of them. Adjoining states have more construction work to show for these six years.

The reasons for advising the postponement of major projects have been (1) Unwillingness of land owners to install drains as deep as those recommended by the state engineer; (2) excessive cost in proportion to probable benefits; (3) ability to drain wet swales in cultivated fields without dredging the main creeks; and (4) weak colonization plans in the case of extensive projects. In one case the court was shown that the man who claimed to be the owner of 3600 acres of a 5400 acre project had such a small equity in his land that he did not command capital enough to colonize or manage it properly. The court is holding this project up until the land gets into stronger hands. It is better to let the land lie idle before the outlet drains are constructed than afterward when the interest on the drainage bonds make the carrying charge cumulative.

Even in the intensive drainage projects the financial status of

the majority of the land owners is a factor to be considered. It may be that the indebtedness on a farm is such that any increase would mean bankruptcy. In such cases the proper thing is to sell off the wet land to some one who is able to drain it, making two farms instead of one. It is better to sell marsh land at a sacrifice than to hold it in an unproductive state.

The Wisconsin drainage district law of 1919 with its amendments requires the State Chief Engineer, through the state drainage engineer, to approve of all engineers employed by drainage districts, to approve the plans, and to review the assessments against the lands. The College of Agriculture co-operates by making a soil survey of the area.

The Wisconsin Farm Drainage Law, also passed in 1919 to govern the smaller drainage organizations has the same safeguards. It is under this law that most of the projects now organize. In fact, the legislature of 1925 passed an amendment requiring all new projects to proceed under this law.

Drainage Reduces Production Costs

The drainage of the wet spot in the cultivated field is the most profitable kind of drainage. The banker who holds a mortgage on a farm with such a field does well to increase his loan sufficiently to construct the required drain. Perhaps it is merely a line of tile 40 rods long, costing $80 and saving the crop on an acre of land. The 40 bushels of corn thus saved is clear profit, and more. It is easier to cultivate that low acre when dry than to dodge it or wade through it with a plow or harrow when wet. Yet some of our bankers fail to see that this investment of $80, saving $40 worth of corn and labor annually pays an annual dividend of 50%. In fact when it is remembered that $4.80 is all it costs to hire the $80 for a year at 6% and the returns on the investment are almost ten times as great as the interest charge, it is fair to call it a dividend of 1000% each wet year, during the life of the drain, which is 100 years or more. Tile drains installed in New York in 1833 indicate that they are going to work better the second hundred years than they did the first.

It costs only $4.80 a year to pay interest on the $80 line of tile that saves 40 bushels of corn annually. Where else on a Wisconsin farm can 12-cent corn be raised?

Drainage makes possible the substitution of better lands for the lighter lands now being cultivated. It is said that there are 90 vacant farms in Waupaca County, Wisconsin. The uplands are of the light order and the marshes of that county have not been drained. May it not be fair to suggest that the reason these farms are vacant is that they are in need of the drained marshes to supplement the sandy upland by raising forage crops? That is exactly what the sand land farmers at the edge of the Portage County Drainage district have done, much to their advantage. Gradually,

they are receding from the sandy lands and depending more upon the drained marshes for corn to fill their silos. That is real progress.

Drainage may increase the products of a farm without increasing the cost of operating a like amount. The farmer with 100 acres of land, but with buildings and equipment sufficient for 120 acres needs 20 acres more land to attain his maximum efficiency. The question is: Shall he drain the 20 acre marsh at the back end of his farm, or rent 20 acres of tillable land from his neighbor across the road? If the rent he would have to pay for the neighbor's 20 is decidedly less than the interest on his investment in the drainage system for his own 20, he had better rent until he feels warranted in making the permanent improvement on his own land. But more often the advantage of controlling the land absolutely and the value added to the farm by draining its 20 acre marsh makes immediate drainage the wiser course.

Lands susceptible to drainage are a safety valve to prevent inflated values. Cheap undeveloped, but highly potential lands will continue to prevent an unhealthy boosting of land values. One reason why the rent and market value of Wisconsin lands did not go higher during the inflation following the war, was that there were abundant areas of unreclaimed marsh land that could be brought under cultivation at a comparatively low cost. But for the presence of these lands, may it not be that the Wisconsin farmer would be carrying on his shoulders a land investment as high as that of his Iowa cousins?

Expansion Through Land Drainage

It can not be assumed that the tillable area of the United States has reached a stationary figure. There must be some expansion to keep pace with increasing population. The increased production of each acre now used alone can not satisfy the increasing demand for food. Some new lands, primarily adapted to agriculture, favored by quality of soil and nearness to markets, will be needed in the rational progress of the next decade and those following. Among these new lands, those susceptible to drainage are an important factor, and the door for their timely reclamation must be kept open.

Land drainage, reforestation and game preservation are not inimicable to each other when an intelligent program is followed by each. Let each be practiced on lands for which it is particularly fitted, and under conditions that are fair to all.

ON THE PROBLEM OF SETTLING DRAINED LANDS

By B. M. Vaughan

In the north two-thirds of Wisconsin are (January, 1926) more than one-half million acres of land subject to tax deed. Of that amount about two-thirds is up-land and undrained low-land. By far the greater part of the drained land, subject to deed, is good

to very good farming land, as is shown by produce grown on other like drained land in the immediate vicinity. Properly farmed, they produce large crops of tame hay, oats, rye, buckwheat, beans, soy-beans, cabbage, celery, carrots, tomatoes, potatoes, silage corn, small fruits, native plums, and several varieties of apples.

Health conditions on these drained lands are good. There is no malaria or other swamp fever of any kind.

Yet these lands are but sparsely settled.

Why are they not settled? Why are they subject to tax deed?

There are several reasons for this, that are not in any way connected with the quality, productiveness, or condition of the lands or their surroundings. Three of these reasons I will notice for a moment.

First. Before the world war, and up to the coming of the severe agricultural depression that followed, speculators owned probably 90 per cent of this delinquent drained land, and held it at prices much above its productive value, that is to say, so high that the ordinary farmer could not make good on it. Taxes, drainage assessments, interest on the price that they paid for the land and the cost of production was more than the land would produce, with farm produce at the going prices. Large tracts (many of them too large for an expert farmer with plenty of capital to successfully handle) were sold at high prices ($40.00 to $100.00 per acre) to other speculators, or to persons with little farm experience and almost no available capital. These buyers of large tracts often imagined that they wanted to farm, or imagined that a large farm would support them without work.

In either case the seller got all of the cash down that he could get—which was often all that the land was really worth—and took a heavy mortgage back upon the land for the balance of the purchase price. I know that in some cases a mortgage for $35.00 to $40.00 per acre, and I am told up to $85.00 per acre, was taken back on unimproved or only partially drained marsh, which was then worth not more than $25.00 to $35.00 per acre above drainage assessments. These mortgages were sold to banks and other investors at such discounts that the buyers thought they were making great bargains.

But deflation of farm values, and fall of prices of farm produce came. The speculators collapsed, financially, and the persons who bought large tracts, to farm them, found that they could not pay the taxes, drainage assessments, and interest on their mortgages, and labor cost, from their crops. Realizing that they had been created, and that several years might elapse before their lands would begin to pay out, they quit paying taxes.

Second. Some land owners got the mistaken idea that each tract of land in the district is liable for all of the district's debts,

and for that reason quit paying taxes when they found that taxes on other lands were defaulting.

Third. The Izaak Walton League spread abroad its propaganda, and broadcast the falsehood that these drained lands were worthless as farming lands.

Many owners of mortgages against these lands especially banks that wanted to realize on them quickly, found that these high mortgages were "frozen assets." They investigated and learned that the mortgages, taxes, and assessments were more than the lands would then bring on sale, became timid and refused to advance money to pay the drainage assessments and taxes.

Fourth. Matters were made worse by the fact that the owners of the equities of redemption refused to do anything toward clearing up the bad situation. They would neither deed their equity to the mortgage holder or make any other compromise, claiming that their equities were valuable and they expected to sell and make good what they had invested or more. In other cases large judgments have been rendered and docketed against the owners of these equities, becoming liens on the land, so that a deed from the landowner was worthless.

Essentially this condition exists, **not in case of drained lands only, but in case of hundreds of thousands of acres of good, improved, and partially improved high lands.**

These facts prevent, or render almost impossible the clearing up of government title to large tracts of these mortgaged lands.

With these obstacles in the way it is difficult and often impossible to get good title to these delinquent lands at anywhere near their present value, except by taking tax deeds and drainage assessment deeds.

Generally the county in which they are, owns the general tax certificates on these lands, and holds the drainage assessment certificates in trust for the district in which the lands are assesed.

The drainage assessment certifificates bear 10% interest per annum and the tax certifificates bear from 10% to 15%.

Under the Wisconsin tax deed statutes a tax certificate or drainage assessment certificate must be three years old before it is ripe for a deed. There are now approximately 160,000 acres of these drained lands having tax and drainage assessment certificates three years old against them. Of this more than 75,000 acres in drainage projects are drained enough for successful farming or stock raising, and suitable for one or the other. Still other of these lands have good drainage outlets and need only a little suitable supplemental drainage to make them good tame grass lands.

These drained lands, that are now subject to tax deed, are usually so bunched that they can be advantageously divided into small farms. Many of them are on fair to good public roads, or so near them that lateral roads can be easily and cheaply made to them on ditch spoil-banks, and drainage districts have power to

make spoil-bank roads. They are near railroads, shipping points and schools.

Tax deeds and drainage assessment deeds will generally cut off all prior deeds will generally cut off all prior titles, liens, and incumbrances, except future maturing drainage assessments, provided the statutes are complied with.

At present there are from $8.00 to $25.00 per acre of delinquent taxes and drainage assessments against these lands. That with deed fees and recording fees, is usually about all that a good title will cost the purchaser. If he desires to quiet title by action in court he can usually do so for $75.00 to $150.00 dollars, and often title to several descriptions of land can be quieted in one suit.

In attempting to colonize these lands two serious questions confront us.

1. Where shall we get the money to buy the drainage assessment and tax certificates?

2. Where shall we get the right settlers with which to colonize the lands?

The districts are interested but have no money that can be used to buy the certificates, and if they had the money they are not authorized to deal in lands.

Owners of drainage bonds and bond dealers are also interested, and in a few cases they are protecting their bonds on their clientele by buying the tax and drainage assessment certificates, taking deeds thereon, and preparing to colonize them, by selling them in small farms, for about the sum per acre that they cost.

A considerable amount of general tax has accumulated and become delinquent against some of these lands. Several county boards have offered to sell the general tax certificates that the county owns, at their face, without interest.

After proper proceedings the county boards have power to authorize the sale of these general tax certificates that the counties own, for less than their face.

Where that is done those lands can be had at still lower prices. They require special handling.

Drainage lands are a special class by themselves. In general they can not be very successfully farmed, as up-lands are farmed.

In the hands of men who will work them as they should be worked, they produce much more profits than do surrounding highlands. They however are not lands that will work themselves and support their owners.

The people who succeed best on them are those who have had experience in farming drained farm lands in Indiana, Illinois, Iowa, or the low lying European countries.

Those people settled on tracts of 40 to 120 acres of well drained marsh land almost invariably succeed.

DRAINED MARSH LAND DEVELOPMENT

I. A. Haverberg, Finley, Wis.

In talking to you on the "Development of Drained Marshland," I wish to present to you some facts which I believe to clearly prove that there is a development, and a real one, in this particular type of land. The history of the land development of the Cranberry Drainage district, the section I am familiar with, can be roughly divided into two parts. The first is the formation of the drainage districts by a few owners of large tracts of land whose main object was to secure a profit on their investment. Poor, inadequate ditches and final failure was the results of their endeavor. The second stage of the development, features the settler who wishes to make a home for himself and family. And it is this stage I am going to talk about today.

In every farming community regardless of where it is we find that crops will not grow if over supplied with water. Such was the condition that existed six years ago in the Cranberry Drainage district. The ditches as then existed could not carry the flood water. To remedy this situation the district was bonded sufficiently to provide money to dig ditches that would carry the water from the land rapidly. From that time on there has been a marked development in the crops of farms in the district. Permit me to quote figures of crop production on my farm which I believe to be typical of most of the farms in this district. In 1920 I produced 380 bushels of oats, 60 bushels of potatoes, 60 bushels of corn, 24 tons of wild hay. In 1925 I produced 940 bushels of oats, 200 bushels of potatoes, 150 bushels of corn, and 18 tons of timothy hay. From these figures you can see I have more than doubled the crop production of my farm in the last five years, and this is due to drainage. The land that produced forty bushels of oats per acre this year was so water-soaked five years ago that it was not practical to drive a team over the marsh. This year I used a tractor to do much of the work.

The crop production of other farmers in the community for this year tell the same story.

In close relation to the crops of the community I would like to mention the financial condition of those same farms. Five years ago not one man in my community and very few in the entire district could say their farm was free from an incumberance and the least was $1,000. Today two out of five are free from debt and the others have made substantial reductions in their total debt. And this has been done during a period of times in which thousands of farmers have left their farms because of debt and general dissatisfication. This is a fact and you will find that every man in that district is satisfied with drainage as a means to success. I will admit that on the average the buildings and general appearance of the farms are not the very best, but you will find that every man is working to

clear his farm of debt first, and to build up his place afterwards. A fine house and barn is not everything to a man, especially if he does not own them. The thought of a debt, too big to meet that has driven hundreds of farmers from well built up farms, does not bother those men for their policy is a cautious one. Try and pay as you go along. That idea may not bring a showy success, but it brings a sure one. There has been a statement made before this convention that, as did Jacob go forth to look for grapes, so did this gentleman go forth to find the fruit in the cranberry drainage district and he claimed he found none. If such was the case he did not seek, for if those satisfied farmers in the Cranberry Drainage district do not bear evidence that the fruit is there, what does?

CROP REPORT, 1925, ON DRAINED MARSH LAND

Walden Bros., Finley, Wis.

Oats, 40 acres. 10 acres were cut for hay, leaving 30 acres for grain. When threshed it amounted to 1325 bushel, a yield of 44⅙ bu. per acre.

Corn, 36 acres. 16 acres drowned out, leaving 20 acres of good stand corn.

Buckwheat, 14 acres. Threshed 181 bu. Yield per acre, 12 13/14 bu.

Soy beans. 14 acres for hay, which yielded 8 tons.

Timothy, 25 acres. 20 tons.

1100 bushels of oats on hand.

Cost of labor, $200.

I. A. Haverberg, Finley, Wis.

30 acres oats 940 bu., per acre, 31⅓ bu.

4 acres buckwheat, 50 bu. Per acre, 12½ bu.

2 acres mixed grain, 48 bu. Per acre, 24 bu.

3 acres soy beans, 4 tons hay.

15 acres timothy hay, 18 tons. Per acre 1⅕ ton.

3 acres potatoes, 200 bu. Per acre, 66⅔ bu.

¼ acre alfalfa, 1 ton.

15 acres corn, 150 bu. Per acre, 10 bu.

1925 products sold from farm up to date, $266.29.

Total number acres of oats, 121. Total number bushels of oats, 4460. Average yield per acre, 36-|- bu.

John Anderson, Finley, Wis.

40 acres oats, 1500 bu.; per acre, 37½ bu.

15 acres rye, 66 bu.; per acre, 4⅖ bu.

18 acres buckwheat, 380 bu.; per acre, 21⅑ bu.

4 acres corn.

1 acre soy beans, 23 bu.

1 acre potatoes, 1 bu.

2 acres flax.

Milking 10 cows, selling 20 gallons of cream per week.

Mrs. Peck, Finley, Wis.

21 acres oats, 795 bu.; per acre, 37⅞ bu.
5 acres rye, 48 bu.; per acre, 9⅗ bu.
3 acres potatoes, 80 bu.; per acre, 26⅔ bu.
9 acres corn. 5 double wagon boxes of husked corn.
Amount of crop on hand: 600 bu. oats; 70 bu. potatoes; 25 bu. corn, and 48 bu. rye.
1½ acres pickles sold, $225.
6 members in family.

LETTER FROM CLARENCE BROVALD

Babcock, Wisconsin
January 16, 1926.

E. R. Jones
Madison, Wis.

Dear Sir:

In answer to your letter of December 15th which I should have answered long ago, I have been unusually busy as I had about 50 tons of wire grass to bale and haul, besides my regular farm work.

I do not think I will be able to get away to attend the Drainage Convention this year as there is no one around here I feel I could trust with all the chores as I keep no hired man in the winter.

My crops last year were fairly good which consisted of oats, corn, buckwheat, potatoes and ¼ acre of beans.

I had 25 acres of oats yielding better than 1000 bu., 13 acres of corn of which two or three acres drowned out in June when we had that wet spell. With this I filled a 12x33 foot silo and shredded 6 double wagon boxes of good corn. In raising this corn I spread a light coat of barn-yard manure and 500 lbs. of 1-8-3 commercial fertilizer, which was not as strong of potash as I wanted, but all I could get at that time, this corn field had not been manured for 13 years.

I have got best results by manuring before corn, raise one crop corn, sow two oats and seed down for two or three years, then manure for corn again, etc.

A little commercial fertilizer for corn sure pays big. Should have said this 500 lbs. I used was for the whole 13 acres. Hay was a poor crop here last year and I do not know why.

I had 25 acres of buckwheat yielding 510 bu. which was the fourth crop of buckwheat on the same ground.

I only raised about enough potatoes for our own use. They were not so good this year. We tried a few string beans this year, selling them to a canning factory and find one can do well with them as a side line.

I believe this drained marsh is productive if handled right with dairy cows, but there are too many people who come here with nothing and who could not make good on the best farm in the state.

Of course as you know these marshes are far from being all

drained without tile and other small laterals, but there is considerable land near the main ditches that is dry enough to farm that is lying idle.

I have heard the remark made that this country was better off or worth more before drained, but I can's see where they get it. We have lived here 28 years next March and saw these marshes in their wettest, when it was impossible to make a living farming, and could not get to town dry without hip boots. Now we have fairly good roads which are being improved every year.

I don't think you have seen our place since we have made these improvements in 1924, so am sending you a small picture of the barn and silo, have made other improvements since this picture was taken.

Now I don't know if this letter will be of much interest to you, but I don't think, without any experience, I could give much of a talk before an audience.

Sincerely yours,
Clarence Brovald.

A YEAR'S PROGRESS IN CENTRAL WISCONSIN

O. R. Zeasman

Many historic battles have been staged by the boosters and knockers of Central Wisconsin marshes. Some boosting has been done with selfish motives, but the marshes have many staunch friends who make that region a permanent home, have faith in the future and labor for its improvement. Much of the knocking has resulted from disappointment of the transient settler who has failed to adapt himself to the extraordinary conditions. Money lenders have lost money and become bitter knockers. The unwary investor was foredoomed to lose because land there can never be in the investment banking class like the farms of southeastern Wisconsin. Much of central Wisconsin land has and probably always will have comparatively low market value. The man who farms it has a job and his farm operations should be planned to give him a good labor income and not be dependent upon profit from the increment of land values.

I am expected to discuss a year's progress in central Wisconsin marshes but it is difficult to pick a standard measure. Most of the districts have been constructed over 15 years and in some of them no development that can be called agricultural progress has occurred during their entire life history. On some of the marshes drained 20 to 30 years ago, considerable progress was made the first 10 years in sale of land, construction of buildings, breaking up wild land, expansion of areas planted to crops, etc., but development has been at a standstill in recent years. This is common history of central Wisconsin marshes.

The above conditions became aggravated by the agricultural depression that began in 1920. Since that time total agricultural production of the state shows no increase, except the expansion of a few special crops such as alfalfa. Isolated farms have by efficient

methods increased their production or cheapened unit costs and increased their profits. Other farms have been abandoned and are not producing today. The same movement has occurred in central Wisconsin. Manifestly total production of crops is no measure of progress.

I wish to consider this report of progress not as increased production but as increase of the knowledge of proper management and essential factors in the profitable farming of the drained marshes of central Wisconsin.

Due to the dark color, peat soils have been thought to be very fertile and the history of central Wisconsin marshes is no exception. The farming following their reclamation has not always been successful. The most basic reason for this failure is the fact that peat soils are frequently lacking in some important plant food elements, although abundantly supplied with organic matter or "humus" and nitrogen.

The method of peat formation has brought about this result. These marshes were shallow lakes along the shores of which water loving plants grew and crowded their way into the open water. The first generations sent their roots into the soil and obtained the elements necessary for plant growth, but as successive generations built up the deposit with plant residue, the roots were kept farther and farther away from the subsoil source of minerals. Naturally, only those plants that required small amounts of minerals survived and the peat deposit built up by the successive generations of plants of this nature is necessarily low in mineral plant food elements, notably potash and sometimes phosphorous and lime.

This fundamental fact about peat must be thoroughly appreciated. One of the biggest obstacles to the development of marshes in central Wisconsin has been the unwillingness to face this fact. Even friends of the marshes have impeded permanent progress by minimizing this limitation. It has often been proved that no man can lift himself by his boot straps. Fertility cannot be built up on the marshes from the marshes, but the elements that are lacking or present in too small amounts for profitable crop production must be furnished from the outside.

In the growth of plants, 4 elements used in considerable amounts are commonly called critical elements. (1) Nitrogen is found in the organic matter of soils. Therefore, marshes high in organic matter have an abundant supply of this element. Nitrogen goes into protein formation and is found in large amounts in the leaves of legume plants and in seeds. Deficient supply is indicated by stunted growth and yellowish color of leaves instead of the deep green. (2) Phosphorous also goes into protein formation and is found in largest amounts associated with nitrogen. Phosphorous aids root development and promotes early ripening. A deficient supply is indicated by poorly filled, slow ripening grain and small yields of legume hays. (3) Potash assists in starch and sugar for-

mation and in the general toning up of the plant. It aids in the stiffening of the stem. It does not go into the formation of plant tissue but remains in the stems and leaves as sap residue. Insufficient supply is indicated by the appearance of round brown spots in the leaves. The tips of the leaves frequently turn brown. In advanced stages, a potash starved field of grain or grass has the appearance of suffering from drought. (4) Lime is required as a soil sweetener to make the soil fit for legume bacteria and as a plant food. It occurrs largely in the leaves of plants. An insufficient supply is indicated by the yellow color and falling off of leaves, especially of legume plants. I have briefly outlined above the plant food needs and symptoms of deficient supply to see if it does not bring to your mind the appearance of many fields you have observed in central Wisconsin marshes.

We have repeatedly been told that if the settler begins farming the marshes with livestock, he can be successful without using commercial fertilizers. I do not believe that is possible. Livestock farming cannot be profitable unless at least the roughage is grown, and without potash other than that contained in the peat soil not enough roughage can be grown on a reasonable acreage to give a fair return for the labor. Some farmers have managed to get along without commercial fertilizers by sheer hard labor over big acreages, but the same labor together with the proper commercial fertilizers would have made him prosperous. If I were a dairyman on marsh land in central Wisconsin, I would rather grow 15 tons of good clover hay on 10 acres fertilized at a cost of $25, than the same tonnage of poorer than average timothy on 20 acres without fertilizer, but with more labor and greater overhead. Not every man who used commercial fertilizers will on that account be successful, because other factors enter, but if he does not use them, he must inevitably fail. Feeding livestock and dairying is a profitable market for feed, but under ordinary farm conditions, it will not pay if the roughage must be purchased or, because of poor quality, be supplemented with large amounts of expensive concentrates. A more substantial policy for the settler is to use a portion of his livestock capital for fertilizers. With this he can produce more and better feed for the livestock, and receive bigger returns from the feeding operations. Proper conservation and use of the manure will help expand the acreage and increase the herd to a desirable unit.

To bring the fertilizer needs of different soils to the attention of farmers, field demonstrations have been conducted by the Soils Department of the College of Agriculture. Following are the results of a few representative tests made in 1925.

In the Jackson County Drainage District a large percentage of the soil is Vesper fine sandy loam. A field plot on this soil was fertilized in 1924 and seeded to oats and timothy and alsike clover. No yield was obtained in 1924 because the oats was cut for hay.

In 1925 the unfertilized portion yielded 1.21 tons of timothy hay per acre, the manured section 1.35 tons, and 125 pounds of treble-super phosphate gave a yield of 1.57 tons. Two tons of lime alone yielded 2.68 tons of hay while 2 tons of lime and 125 pounds treble-phosphate gave a yield of 2.88 tons. The plots that were limed contained a large percentage of clover hay while the unlimed plots were all timothy. The lime and phosphate showed a net profit of over $15.00 per acre for the one year to say nothing about the residual effect.

On a peat soil near Coloma 200 pounds of Muriate of Potash gave an acreage of 32-7 bushels of oats per acre over the unfertilized portion of the field. With oats at 40 cents a bushel, the net profit is $8.85 per acre for the first crop. A marked result will be obtained for another couple of years.

Plots in the Little Yellow Drainage District were treated in 1924 as follows: (1) 2 tons of lime (2) 300 pounds 0-8-24 fertilizer (3) 2 tons lime and 300 pounds 0-8-24 fertilizer. The 1924 crop of corn showed the beneficial effects of the fertilizer but the harvest was not measured. In 1925, oats was grown on the plot. The check yielded 16.3 bushels; lime alone 22.3 bushels, 0-8-24 fertilizer 54.1 bushels, and lime and 0-8-24 fertilizer yielded 59.8 bushels of oats per acre. This gave a very good profit for the fertilizer alone and in combination with lime. The effect of the lime will be more marked on the clover crop that is to follow.

Potatoes use larger quantities of potash than phosphorous but some peats are so low in the available form of this element that they show a decided response to the use of phosphate fertilizers. Table I reports the result on a well decayed compact peat that has been pastured for years. This field was tile drained in 1924, plowed that fall and planted to potatoes in 1925.

TABLE I

Juneau County Poor Farm—New Lisbon

Treatment	Bushels Potatoes		Bushels Increase	Value of Increase over fert. cost. Potatoes $1.00 per bu.
	Small	Marketable		
Blank	48	217	000	
125lb Treble Superphosphate	26.6	320	103	$100.00
200lb Muriate of potash	37.3	309	92	87.00
125lb Treble superphosphate and 200lb Muriate of potash	32	357	140	132.00

These typical cases show two things. (1) Different marshes may vary in their requirements. These examples are representative of marshes in their respective localities. (2) The use of fertilizers judiciously selected is very profitable.

Data like the above and work on the experiment farm at Coddington furnish a basis for general classification of the fertilizer needs of the marshes of central Wisconsin. Roughly, the Wisconsin River divides them into two classes. Those on the east side show excellent returns from potash but to date do not respond to phosphate and lime although continuous cropping will develop the need. Those west of the river in general need phosphate and lime as well as potash. This statement will serve as a guide for the management of these soils until the individual needs can be tested by the growth of crops on fertilizer plots.

Experience points to the following program of cropping and fertilization. As a crop on breaking, soy beans and rye are reasonably safe without fertilizers. The second year the field ought to be fertilized and seeded to rye or oats and timothy and alsike or medium red clover. Feed a moderate sized herd. While the farm is being developed, hay may be sold as a cash crop provided the fertilizing elements are returned as commercial fertilizers. Root crops give good yields and provide succulent winter feeds for the small herd but build a silo as soon as size of herd justifies. Use the manure on as large an acreage as possible, generally on old meadows or pasture a year before corn. This is the easiest place for spreading and removes it farther from the small grain than if used directly on corn. Use commercial fertilizers and lime when required on the small grain. They help to stiffen the straw and lessen lodging. rye and oats, varieties with small straw give the best results. Adopt a rotation that eliminates plowing except that of sod and use the time saved for discing, dragging and cultivating as weed killing measures. Do all the plowing in fall. Use about 100 pounds muriate of potash and 100 pounds of acid phosphate or its equivalent in manure per year for ordinary crops. The phosphate required in a rotation and 200 pounds of potash should be applied with a fertilizer drill or thoroughly disked in before seeding the grain crop. At other places in the rotation, potash can be used as a surface dressing if that is more convenient than mixing with the soil. Phosphate and lime must be put down into the moist soil for immediate results. As the farm is expanded, the herd increased, more manure is available and may reduce the necessary amounts of commrcial fertilizer. All the liquid manure should be absorbed with bedding or peat in order to save the much needed potash, 3-4 of which is contained in the liquid. Straw contains considerable potash and should be returned through the manure to the field.

Perhaps an example of larger scale farming would be more convincing than small plot tests. James Isherwood owns a farm at the northern border of the Portage County Drainage District. He had

cultivated his 60 acres of marsh for years at a loss. In 1923 he observed the work on the experimental farm at Coddington and resolved to use potash fertilizers. In 1924 he used a limited amount on oats seeded to medium red clover and timothy and experimented on small patches of other crops. He was so well satisfied that he bought a ton of muriate of potash in 1925. He fertilized 12 acres of corn at the rate of 100 pounds per acre and used the balance on oats and potatoes. The fertilized corn made the largest growth of any in the locality while the unfertilized rows were scarcely 2 feet high. The fertilized potatoes were good but the rows planted without fertilizer for a check were not worth harvesting. The meadow fertilized the year before yielded 4 times as much hay as the unfertilized portion and the quality was better with a high percentage of clover. Mr. Isherwood now says, "I will plant only as much of the marsh as I can fertilize. Potash is as essential as seed."

I believe that it is the duty of every booster of the central Wisconsin marshes to acknowledge the fact that these marshes require some mineral fertilizers. Failure to supply them has retarded and will retard development. I want to adopt as a measure of progress there the increased intelligent use of commercial fertilizers. Without them I can see nothing but hardship and failure for the settler. By their judicious use, farming can be made profitable, settlements made permanent and progressive communities developed.

FINDING THE RIGHT SETTLER

By L. A. Gutowski

The problem of finding a right settler for any agricultural land involves numerous factors, such as organization, publicity, salesmanship, personal contact, social and communal adjustment. Whether it be the settling of a single farm with one family, or a large area of land with many people, the methods of bringing the right kind of people from one community to another are similiar in many respects. The knowledge of a particular nationality is not so essential as the knowledge of social and economic conditions existing in each locality. Men do not move freely from one locality to another and in order to make them leave their old home and move to a new place a definite program of publicity and salesmanship is necessary.

Settling of large areas of land, in former years, was conducted on a great scale by national or government organizations, and the problems involved were purely nationalistic. At present, however, the agricultural situation in this country does not warrant any elaborate measures on the part of the government to conduct a settlement program on remaining vacant lands. But a private organization may undertake a settlement plan and sponsor a movement of people from over-populated and over-crowded industrial

centers of the country to the rural districts for the benefit of all concerned.

The settlement of vacant lands is becoming a very important national problem, in view of the fact that the industry and cities cannot accommodate the rapidily increasing population. Altho, the immigration to the United States was considerably curtailed by the enactment of the restrictive immigration laws, the industries continue recruiting foreign-born farmers and green help to such an extent that the living conditions in cities and industrial centers become unbearable. For example, the bituminous coal mining industry is both over-developed and over-manned. It is estimated that there are 250,000 more miners than are needed to supply the country with coal. If those men could be placed on the farms the remaining would be able to work six days per week and their living conditions would be improved.

Similar conditions exist in nearly all industrial centers and in order to relieve the urban condition and bring about balancing situation between the agriculture and industry, it is necessary to attract people back to the farm. Rural life offers the greatest reward to the young man and woman who have had farm experience. Present day farming on drained lands may be considered as a venture in modernized pioneering. A settler has the satisfaction of starting at the bottom, and has the benefit of virgin and fruitful soil. He does not need to have great means to establish himself on the land. The material for his house may be purchased for a small cost at a nearby lumbering mill. He need not locate far off the gravel roads; he has no occasion to locate farther from railway stations than he cares to. He can leave his children in a nearby school during the full school year, and he need not live beyond the daily reach of mails, or the sound of his church bell. In many sections he may have the service of the farmers' telephone lines. No matter where he settles, he is certain of opportunities to build a home where land in the future be of highest value, as is always the case in a dairy country.

Drained sections are ready for immediate cultivation, and while potatoes, cabbage and corn are growing, he can build his home. A dilapidated second-hand car will take him to the best markets in the state within a few hours over the excellent all year and concrete highways. He can practically market everything that he can produce and in case of need he can find plenty of work in nearby factories at good pay.

In view of the fact that the problem of settling drainage areas in Wisconsin received no attention from the public in general, special methods of attracting actual farmers to these lands must be adopted. The experiences of other countries in the world with successful drainage areas similiar to those in Wisconsin are exceedingly numerous, such as the English Fens with 680,000 acres; the Haarlem Lake, Holland, with 43,700 acres; La Gironde and Forez, France,

with one and a half million acres; Regio, Italy, with 80,000 acres, and many other large drainage districts in Germany and Russia.

Many people who came from the above mentioned districts were scattered among our industries where they had to be adjusted to the new surroundings and different living conditions. They long for the opportunity to get on lands with which they are familiar. The adjustment to the city life for the foreign-born farmers is very difficult—they live but do not thrive. Why Hollanders in Holdale, Minn., or Kalamazoo, Mich., are successful on swampy lands may be attributed directly to the experience they have had in their native country. The same may be said about Russians, Poles and Italians developing marshes in New Jersey into veritable gardens of America. Native farmers, however, are not tempted to develop drained lands and as long as there are cheap upland farms they will shun drained areas.

In order to induce foreign-born farmers to move to new surroundings, one must understand the psychology of the city dweller. Men are either drawn or driven to break the ties which bind them to their localities. The first distinction may be classified as "positive" and involving such factors as advantages, satisfaction, material gain, etc., and the second as "negative"—discomforts, suppression, compulsion, persecution, etc. The force which causes people to move must be great and must embody one of two aspects —it must be either attractive or repellent. Attractions often operate by inducing dissatisfaction through comparison. There is no attraction in a new region unless it seems superior to the old.

To convert these drained areas into productive farms, it is necessary to have an organization and capital for consistent development and advertisement of these lands. Without these main factors there is no hope of seeing drained areas of land under cultivated crops in the very near future. The present existing conditions may be easily overcome by human efforts, and the cat tails, wire grass, and flags converted into valuable farm products. The local sentiment has no particular bearing on the situation, as long as the elements of nature are in favor of developing these lands. Fertility of the soil, proximity to the markets and climatic conditions are the greatest assets of drainage areas in Wisconsin.

The value of these lands should not be overestimated on account of some limitations. A series of wet seasons and unfortunate climatic conditions, also low prices of products will lower the land value. The cost per acre should depend on what it can produce, considering the cost of labor, the crop yield and the price the farmer gets for his products.

To allow these lands to remain unoccupied entails great economic loss to the state. Nothing can be gained by reverting into original condition. The state and the people of Wisconsin would be much better off if these lands were populated with actual farmers and placed under the plow.

In conclusion, I wish to point out some of the existing conditions in drainage districts of central Wisconsin.

1. The present system of land taxation is unreasonably high.
2. Some lands need additional drainage.
3. Nearly all lands need commercial fertilizers, such as lime, potash and phosphorous.
4. Popular attitude towards drained lands is unfavorable.
5. Climatic conditions do not warrant specialization and intensive cultivation of special crops.

Suggestions for Settlement Plan

1. Adequate financing by a private or cooperative enterprise.
2. Adoption of an effective publicity campaign.
3. Managerial administration.
4. Selection of foreign-born farmers accustomed to produce the best under similar conditions.
5. Limiting the number of acres of land for each family.
6. Cooperative organization for production, marketing and buying purposes.
7. Communal and social organization.

MARKETING MARSH SOIL PRODUCTS

Theodore Macklin

College of Agriculture, Madison, Wis.

Ordinarily in discussing the subject of marketing a farm product, it may be taken for granted that the product is available. In approaching this subject of marsh soil products, the facts handed to me indicate that there are 427,000 acres of marsh soils in drainage districts in Wisconsin. Some 56,000 acres of this area are in the boundaries of 350 farms. The remaining 371,000 acres are vacant. Fully 170,000 acres are under tax title. Upon this large acreage the farms actually being operated are widely scattered. As a consequence, from a marketing point of view, there is at this time neither total volume, standardization nor concentration of product that makes possible an improved marketing system.

If these lands are suitable to profitable use in the production of marsh soil products, such as celery, onions, or other vegetables and a marketable standardized volume of some one of these commodities were produced, effective merchandising would then be a possibility. Examples of improved marketing organizations for highly specialized farm output similar in problem to marsh soil crops are found in the Door County Fruit Growers' Union for cherries, the Sparta Produce Exchange, for strawberries, the American Cranberry Exchange for cranberries, the Tillamook County Creamery Association for cheese, and many others too numerous to mention.

To discuss marketing for this area which has very little if anything to market at this time presupposes production first. Yet the area is unoccupied in large part. Hence, production would have to be

preceded by settlement. Land settlement is a vast problem. There are times when further settlement means further output of products which cause increased intensity of competition on the market and contributes to still lower prices when they are already too low. The time for land settlement is when demand is large and supply is scarce. This is not such a time. However, when conditions become such that there is a real need for more production which would clearly present a profitable opportunity of farming marsh soils in a large and comprehensive way, so that there would result a volume large enough to support a marketing organization, then an effective system of merchandising could be set up.

To provide a marketable volume of marsh soil products on the areas referred to would require capable leadership to function along four main lines. First, a suitable settlement plan would have to be formulated. Second, financing in amount and terms to result in properly equipped and operated farms would be essential over a period of years. Third, production along definite lines would need to be undertaken so that a product of sufficient volume, rigidly standardized along high quality lines would result. Fourth, a cooperative marketing enterprise of real effectiveness would need to be set up to function for the disposal of all crop output.

To carry into practice work referred to in the four lines would require subject matter that may be tapped from every part of the Wisconsin Experiment Station and other State Departments related to agriculture and marketing.

PROVING THAT DRAINAGE IS PROFITABLE

P. H. Hintze

The assignment of this topic to me was the result of a conversation between Mr. Jones and myself in which he asked me about a hundred acre farm, all drained marsh, that Mr. Dahlen and myself are developing from the raw stage to the finished product.

We, jointly, bought the undrained land, and with the help of others, prepared and circulated the petitions and did the engineering work necessary to complete the project. This particular one hundred acre tract is located in the Blooming Grove Drainage District, which district contains about one thousand acres of actual marsh. The drainage of this district was completed about four years ago. It was estimated to cost about $15 per acre for drainage, but due to the fact that the contracts were let at the peak of war time prices, the ultimate cost will be approximately one third more, or about $20 per acre.

The price paid for the land was high for that class of marsh land due to the fact that it is only four miles from the City of Madison. With the exception of about 900 feet of 8 inch tile laid, the drainage is accomplished entirely by the main ditch and one lateral ditch, both of them being open ditches. These open ditches give about 7 feet of drainage to all this land.

During the autumn of the second season after the drainage was

completed this land was plowed with a tractor and one of the large marsh plows. The next season corn and flax were put in, but owing to the short, wet season the corn did not mature and the flax was very weedy. The crops raised were not very promising and the returns just about paid the price of the plowing. However, the fact that this first crop was not very successful did not discourage us as the crops all thru this immediate section were about on a par with the marsh crops. So the next season, which was the season of 1925, we sowed 20 acres to Alsike clover and timothy and put approximately 60 acres into corn. We did this without plowing, just going over the land with disc and drag. However, I think we should have been money ahead had we plowed the land again as our corn was very weedy. But the harvesting of the crop showed that we had obtained approximately 50 bushels per acre of very good Golden Glow corn from the 60 acres of land. I expected to be able at this time to give some exact figures on the total cost and the total returns connected with the raising of this crop, but in as much as we are still holding the corn I do not know what the selling price will be. I can give an idea of what work was necessary. One man with a Moline tractor did all the work except the planting, to the end of the cultivating period. The husking was done with a team, one man and a boy helper part of the time. So far there has been 35 acres husked which yielded 1750 bushels of corn.

The results of our attempts to utilize this land for crops leads to the conclusion that the land is on a par and even exceeds, in certain crops grown, the high lands in this vicinity. So, ultimately, when it has lived down the stigma of its lowly origin, it will take its place as a farm along side the surrounding high land farms. When that time comes it will be recognized as being worth about the same as other farms in this vicinity.

Now, as to proving drainage is profitable—if we take what we have done as an indication of what can be done right along over a period of years—I think we can prove that drainage is profitable as compared with other farms. If you consider other investments such as Florida and California real estate propositions, the returns from any farm is apt to look small, but, in these propositions the element of uncertainty enters into it to such an extent that the average person calls them speculations instead of investments.

We all know that a very large percentage of the farms throughout the country today are not earning an actual 6% above all expenses on the investment. Part of this is justified by the fact that the farm is a very safe investment, increasing in value from year to year and providing a place upon which a man has a home, rent free, with employment as steady as the farmer wishes to make it. If any farm is worth owning as an investment, surely a marsh farm is. The land is so rich that only the man that knows nothing of crop rotation can deplete it.

So, if the average marsh farm owner will select the crops which newly drained marsh will grow best and will watch that he does not

become overloaded with diversified equipment—he can earn good interest on his investment. At the same time he will, by his efforts, produce as fine a farm as there is in the vicinity at the end of a few years.

Finally, to sum up the situation in a few words—he buys cheap land which when drained does not represent an investment as great as the ordinary farm; he grows as large or larger crops as the ordinary farm at less cost per acre; and when he sells, he sells at practically the same prices as the ordinary farm. That is the proof that drainage is profitable.

IOWA STILL DRAINING

James A. King, Mason City, Iowa

Our Iowa drainage problems are somewhat different in some respects from what you have over here in Wisconsin. And yet, in the more basic features they are identical. The first difference is that our soils are predominatingly clays and clay loams; we have little or no sand, and peat only in small and isolated cases or spots. The second difference is that we have but very little idle or unused land; ours is all in farms that are occupied and used in some manner or other. Again, our lands have a higher market value than have yours; the range is all the way from $100.00 to $250.00 an acre—even today after the boom has all subsided and before we have gotten very far back on the return trip in values. This gives a materially higher acre carrying charge than what you have for interest and taxes. Because of the difference in soil types the acre cost for complete drainage is much higher with us than with you, as thorough tiling is necessary to give us complete drainage.

And yet our problem is the same as yours in the great underlying, basic necessity that our agriculture must be profitable. In fact our problem in this respect is even heavier than yours because we have the larger load of carrying charges—interest and taxes—to earn out of the land than you have to carry. But still our problem is the same in principle;—different only in degree, if in anything at all. To be successful and permanent, to be attractive to men and women to take it up or to stick to it, agriculture must be profitable.

Up to the present time the great bulk of our Iowa farm fortunes have been made out of the rise in the market value of the land. A farm family could just manage to get along, make a meagre living and manage to meet their interest and taxes, and by the time they were ready to retire they would have accumulated a good competence in the rise in the market value of their lands because the country was getting settled up with the consequent increment in land values. How great would be the amount of wealth accumulated by such a farm family depended on the acreage which they had managed to hold.

But that time is now gone. The bulk of the increment in farm land values that is possible has already been cashed in. The farmer of this and future generations in Iowa is confronted with the mighty big problem of making any wealth he accumulates out of the profits

from the operation of his farm; it must be an operating profit, not a real estate profit. So we are facing, as we never faced before, the big problem of making farming profitable simply as an operating business.

The amount of profit a man makes from his farm is going to depend on two things. The first of these is the margin of profit made on each unit of produce he sells. The other is the number of units he sells at a profit. The width of that margin of unit profit is determined by the difference between the sales price, and the cost of producing the unit.

In general only the production volume and the production cost are within the control of the individual farmer. So his one sure chance, and his one quick opportunity, to increase his total annual profit is to reduce his cost of producing each unit and to increase the number of units he produces at this lower cost. Regardless of what the selling price may be, the man who produces at the lowest unit cost sells at the widest unit margin of profit; and if no one makes a profit, then his unit loss will be least.

In northern Iowa the most universally successful method of reducing unit costs is to increase unit production per acre without increasing correspondingly the acre cost of production. You see that by spreading our acre cost of production over more units we then have a smaller cost per individual unit. This method not only reduces the unit cost and so increases the unit profit, but it also gives more units to sell at this wider margin of profit. In this way we accomplish both of those things that are necessary to increase the total annual profit.

Possibly what I am trying to get by all this prattle about units, margins, costs and profits can be made a little clearer by a little illustration taken from the records of the 1925 Cerro Gordo Corn Contest. When Ed Jones asked me to come over and speak to you folks today I told him I did not know for sure what I was going to talk about but I would no doubt tell you at least something about this contest. You see at just that time I was so deeply immersed in the tabulation of the immense amount of data from this contest in question that I was unable to think or talk much about anything else. And this seems to be a pretty good place in which to make good on that threat, so I will inject it right here and now.

The Mason City Brick and Tile Co gives each year one thousand dollars in prizes for the largest yield of corn per acre grown on five acres of corn ground. These five acre tracts are not special plots that have been given special treatment. They are simply the very best five acre tracts out of the regular commercial corn fields of our county. Our purpose in giving these prizes is to make the corn fields of our county answer that great and vital question of what practice or method will produce the most profitable corn crop in Cerro Gordo County, Iowa.

In this 1925 Corn Contest we took yield records from 396 corn fields in our one county. At the start of this discussion I want to keep

before you the fact that a survey made in 1923 by the Iowa State College in an Iowa county that is quite comparable to our own, showed that the average acre cost of producing a crop of corn was approximately $25.00 an acre of corn grown. The lowest yield in these contest fields this year was 33.9 bushels per acre, the highest was 108.95 bushels and the average of all was 69.15 bushels per acre. On December first of 1925 the local price for number four corn was 56 cents a bushel. Then the man with the lowest yield produced his crop at a loss of approximately six dollars an acre, and that in spite of the fact that this was what he himself had picked out as absolutely the best five acres in his entire corn crop. The average of all 396 fields paid a net profit of thirteen and a half dollars an acre. But notice that the man with the highest yield earned, on this same basis, a profit of $36.00 an acre as compared to the low man's loss of $6.00 an acre. And these differences of income are just about right because our farmers produce their corn crops in much the same way, their land values are about the same, and they each spend about the same amount of labor on an acre of corn crop.

Now notice these further facts: The man with the low yield produced his corn crop at a cost of a small fraction of a cent over 70 cents a bushel, a loss of fourteen cents a bushel. But the man with the high yield produced his crop at a cost of only twenty-two cents a bushel, a profit of thirty four cents a bushel—and he had over three times as many bushels off each acre to sell at this thirty-four cent profit per bushel.

In northern Iowa the first requisite for larger acre yields and lower bushel costs of producing a corn crop is thorough tile drainage. Remember that I am not giving you theories this afternoon, but facts that have been taught by the fields of northern Iowa. So I am going to verify that statement I have just made by reading you a letter written us this fall by one of our Cerro Gordo County farmers.

> "On my farm in the northwest quarter of section 2, Geneseo township, I have a tract of 20 acres of land which has been in pasture for eight or more years because it was too wet to put into cultivated crops. This pasture I believe was worth to me about $5.00 per acre, making my annual income from this 20 acre tract equal to $100.00.
>
> "My taxes on this land were approximately $3.00 per acre. The land is worth $200.00 an acre which, at 5½% interest, makes an interest charge of $11.00 an acre, or a total carrying charge of $14.00 an acre, or $280.00 for the 20 acres. Thus I was carrying this 20 acre tract at a loss of $180.00 a year.
>
> "In the fall of 1924 I tiled this with 5" tile laid approximately 3½' deep and ditches about 90 feet apart, at a cost of $350.00 for the tile and $125.00 for laying them with a machine, making a total cost of $475.00 for tiling the land.
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> "In 1925 this field was planted to corn; yielded at the rate of 70 bushels an acre of excellent quality corn worth at least 70c a

bushel, making a total crop income of $980.00 from the 20 acres which formerly brought me an income of about $100.00.

"Thus the crop from the land the first year after draining it paid not only the annual carrying charges of $280.00, but also paid the entire cost of the drainage improvement and left me a net profit of $225.00."

The Adams brothers, H. C., and E. A., own some 4500 acres of farm land in the wet belt of northern Iowa. They have kept records on these various farms which they say prove to them conclusively that every wet acre in a cultivated field eats up the profits from at least two other acres. This is sort of a modern version of the old Biblical story of the Egyptian king's vision in which he saw ten lean and hungry kine eat up seven other sleek and fat kine.

Some of our farmers have learned to their surprise that tile drainage not only increases their yields in wet years but that it also does the same thing in dry years. Parts of our county suffered from a dry June, getting not a drop of rainfall in that month, and a total precipitation of only 20 to 25 inches for the entire year, when our normal precipitation is 30 to 35 inches. Yet one of our corn yield contestants from that section of the county obtained a yield of over 104 bushels per acre. Last month that man sat in my office and told me that he was very much surprised to find that this tiled field stood the drought much better than did his untiled land.

Some six months ago I had a very interesting visit with a drainage engineer who operates at Huron, South Dakota in which he told me the following startling facts: The land about Huron is a very flat, tight gumbo type of soil. The normal railfall there is 20 inches, but last year they had only 10 inches total precipitation. Most of this comes in the form of rains during the growing season. A farmer near Huron had 200 acres that he tiled only with "storm sewers" to remove the surplus run off from these summer rains. Fifteen acres were drained thoroughly, as thoroughly as engineering difficulties would permit, from the standpoint of moisture conservation. Another 40 acres were tiled about half way between these two extremes. Last year this farmer got no corn from his untiled land. He got only very small yields from the 200 acres—only over and near the ditches. From the 40 acres he got yields of 20 to 30 bushels of corn per acre, but from that 15 acres he got 50 to 60 bushels. This land never did yield grain crops until it was drained. The first crop after tiling the farm paid the entire cost of the improvement. The only corn fields in the vicinity of Huron that gave any yields of grain at all last year were tile drained.

This simply verifies and crystalizes a vague dream which has been forming in my mind for some years that tile drainage is the best possible insurance against drouth damage to clay soils—that tile drainage will increase yields and reduce unit costs in dry climates as well as in wet climates.

Drainage activity has been slight in Iowa the past few years. Not because Iowa is drained out. Rather because farm owners have

been using most of their money to satisfy new desires and cater to new standards of living more than their fathers before them ever did. But the Iowa farm mind is again realizing that the land itself and the labor spent on it must yield this more money for satisfying these new desires and appetites. They are realizing that to earn more, the land must produce more; and that to produce more, it must be drained. Consequently, we are having a slight and gradual increased interest in drainage.

Iowa is not drained out. Not by any manner of means. In fact, it has only just begun to tile. A careful check up on Cerro Gordo county was made by our county agent a few years ago. This survey showed that if all the lands in that one country that would pay a profitable return on the cost of the improvement were to be tiled in one year it would be necessary for our seven factories with a capacity of 1200 tons per day to operate continuously for 365 days producing the drain tile that would be needed to drain thoroughly that one county.

We are just beginning to realize certain facts as follows: (1) That our higher lying lands will respond profitably to drainage. Lands once considered to have adequate natural drainage are now found to be wet ask compared with the old sloughs and bogs that have been drained. (2) That tile drainage warms up and aerates our tight, cold, slow soils so that crops start quicker in the spring, grow faster all season long, and yield more. (3) That tile drainage is an excellent insurance against drouth damage on clay and clay loam soils. It pulverizes and opens up these soils so that more of the water from each rain storm soaks into the soil and so more water is stored in each cubic foot of soil in that beneficial form known as film moisture. In the spring when root systems are being established the roots penetrate to greater depths than in similar soils that are not tile drained. Thus each plant is able to draw both food and water from more cubic feet of soil, each of which contains a larger supply of available plant food and water than do the untiled soils of similar character.

We have hardly yet dreamed of the service that tile drainage may be made to render as a soil ventilator. In fact, we are yet only mere babes in the woods in the science and the art of tile drainage. I anticipate that our children will look back upon our practices and say that we were actually pikers. Many people think that I am a nut, a crazy loon, but I expect to live to see the day when motor fans will be installed in tile mains to draw air down through the soil, using the ditches as soil ventilating flues to warm the soil, and to aerate it so that bacterial action will be faster to prepare more plant food for the use of crops. Furthermore, I would not be surprised to see people having drainage systems coming close to their homes connect these up with a ventilating system at the house so that the cool air from these ditches will keep their houses cool in summer time.

In northern Iowa our outlet systems are already pretty well worked out and installed. In our county alone I understand there are now over 100 officially drainage districts. But the installation of outlet systems is about as far as we have gone. We have simply made it

possible to drain Iowa. There is probably not in all the wet section of northern Iowa a single farm that is completely tiled. Only a few have approached anywhere near to complete drainage.

Our major problem now is to put in this complete drainage. This is mainly a financing problem. A goodly percent of our farm owners are already convinced that they need at least some tile drainage. But one or more of three things is holding them back. They haven't the money, they're afraid to go into debt for drainage, or they can't borrow the money when they do have the courage to do so.

But two cheering factors have begun to show up. 1. Our farm mortgage companies are learning that the only way they can operate successfully, or sell advantageously, the farms on which they have been forced to foreclose mortgages is to drain the wet lands in them. 2. Our banks are learning that their business is safest and most profitable when they confine their operations entirely to the business of dealing in moneys and credits. That the banks are better off when their farm customers and all farmers are prosperous.

So some farm mortgage companies and some bankers are learning that it is good business to loan a farmer more money so he can tile out the wet land he is now working at a loss. In a great many cases a modest loan for thorough drainage will keep a farmer from insolvency and will enable him to repay this additional loan and all his other debts when he could not pay his present debts without drainage.

In order to help spread this gospel of increasing the stability and the profit of farming, we are now carrying a quarter page advertisement in each issue of the Northwestern Banker for the purpose of selling bankers on the value of drainage for their farm customers.

TALES FROM THE TRENCHES

L. S. Keeley, Mayville, Wis.

With us in Dodge County, farm drainage has been almost at a standstill during the past year notwithstanding the fact that where proper drainage has been installed the cost of producing crops was thereby decreased and the production was increased. We have busied ourselves defending what we have; and we have pounded some pebbles of hard truth into the opponents of drainage. We have held our ground and are looking hopefully ahead.

Three causes were at work which were sufficient to cause us to proceed cautiously with petitions for the installation of new projects. In the first place, there was a general depression among farmers during the year 1924; then, there was a strong opposition to drainage by a certain class of sportsmen operating within the Izaak Walton League; and least, but not least, there was the legislation adverse to drainage passed by the last two legislatures of Wisconsin.

The depression was strongly urged against further drainage. The commissioner of agriculture of this state, in a recent address, said that probably fifty years will pass before we shall need the farms already abandoned in drainage territory because of the failure

of their owners to make them pay; and the call, "Back to the Farm," is no longer heard for we are producing more than enough to feed the total population of our country. Those statements were made before an audience composed mainly, I think, of Waltonians; but that would not excuse any partiality in their utterance. They came from a man in high position and from a supposed expert on farm conditions and farm problems. He was listened to by a few farmers, at least, who are trying to see higher rewards for their toil as they peer into the beatitudes of the future.

Farmers need to be better organized along social, economic, and industrial lines, but weakness along those lines is not the greatest obstacle in the way of success and improvement in drainage and other lines. Success depends upon the management of the farm and the conduct of its affairs; and for those the farmer must rely almost wholly upon himself. He may seek and obtain advice but the problems on the farm are his to solve. Some farmers made money during the period of depression without giving much if any attention to the matter of farm organizations. They made the most of their own resources of body and mind. They have learned to dig for themselves and to climb without being boosted. Some of them are farming on drained lands and others of them are seeking to get better drainage. All of them were judicious in their land purchases; and they maintain a proper relation between their land and working capital. They take farm papers, and agricultural bulletins and the knowledge gleaned from these is applied by each individual to his own conditions. The sum total of individual efforts intelligently directed makes a prosperous community.

Every farmer should devote a part of his leasure time to a consideration of community welfare, the State and the Nation. Keeping informed on export trade will relieve him of all worry over the remark that the farms now vacant will not be needed for the next fifty years. One and one-half billion dollars from foreign orders were divided among the farmers of this country in 1925. This foreign trade has been the sustenance of the American grain farmers. Untold benefits will yet come when economic conditions are more settled and the world's markets have fully recovered.

During the year, from the platform and through the press, indiscriminate attacks upon drainage have been made by members of the Izaak Walton League. Those attacks have centered around the drainage of Horicon Marsh. After the hunting season had closed, farmers in the vicinity of the marsh listened by radio to speakers in Arkansas and Tennessee bewailing the work of the dredge, the resultant loss of rainfall, the drying up of wells, the fields laid waste by flood waters in the Rock River valley, and the luxurious growth of cat tails and Canada thistles where once wild life had a home and the hunter had a paradise.

Those speeches are the ebullition of minds that are bent upon having Horicon marsh converted into a reservation for wild life and a recreation place for hunters during the open season. They try to create the impression that the marsh land has no value for any other purpose. The claims which they make, from the point of view of the land owners, are full of false pretenses; and there is a growing conviction among the farmers in the vicinity of the marsh that the hunters are backing a scheme which if successful will amount to a confiscation of their lands.

Last year, a petition addressed to the Governor, the Attorney General and the Railroad Commission, was widely circulated and signed by members of the Izaak Walton League, alleging that the course of the river and that several bodies of navigable lakes had been destroyed by the drainage of the marsh and asking that an investigation be made and suit be commenced against the land owners whom they claimed had put in a drainage system in violation of law. This petition was later embodied into a joint resolution and introduced into the legislature with a view to have an action commenced against the drainage people and to have the marsh restored to its condition before drainage. The petition and the resolution called forth a very strong opposition among the farmers along the border of the marsh and resulted in the formation of the "Horicon Farm Land Protective Association," which includes in its membership all farmers who are interested in the marsh. Through the influence of this association the joint resolution was defeated in the legislature. Since then the Waltonians have been trying to organize a counter association of farmers along Rock River to the South with the view of creating a sentiment for the erection of dams at certain points, especially one at Horicon, for their protection against flood waters. While the battle is still on between the farmers and the hunters, the thought that the Federal Government or the State will ever condemn this area for a game refuge and commit the prodigious waste of lands valuable for agriculture by submerging them, paying therefore their fair value, is beyond reasonable probability.

Two measures were passed by the last legislature which were intended as a check upon drainage. One was the repeal of the district drainage law in so far as it relates to new projects. No considerable loss is suffered by this repeal as the farm drainage law is sufficient to take care of all, or nearly all, new projects. The spirit back of the repeal was bad. Vicious attacks were made upon drainage and upon all connected with it. There was much misrepresentation regarding the law and its application. The efforts of the friends of drainage were not without considerable compensation. The district drainage law is still in effect as to all projects begun and to those completed before the repeal took effect. The farm drainage law is intact; and through farm journals and periodicals much useful information was distributed among farmers and an interest in drainage was awakened as never before; and never before in our section has drainage stood in greater favor with the people as a whole.

The other measure referred to is that known as Chapter 428, Laws of 1925 relating to farm "drainage." Section 1 of this law provides that the owners of a majority of the land in farm "drainage" may file a petition with the court having jurisdiction, requesting that no more work be done in and no more expense be made against such "drainage." If at the hearing on this petition the court finds that the petition is signed by the required number of owners and that the notice of hearing was properly given, the court may enter an order directing that no more work be done in or expense created against such "drainage."

Section 2 provides for relief in cases where the work as constructed substantially fails to give results intended solely through lack of sufficient outlet; and it empowers the court upon sufficient proof to order the necessary additional work to be done, with the proviso, however, that in no proceeding now pending or hereafter commenced shall any such order be made or relief granted, where a court or judge having jurisdiction thereof has previously denied the same in substance or effect.

Under the provisions of this law the opponents of drainage can do a great deal of mischief. Men who have had experience on drainage boards will generally agree that in many cases men who signed petitions for drainage are easily induced to change their minds before the assessments are confirmed by the court. And this law gives them another chance to come in to court, and on a mere petition, make a laughing stock of what their signatures had already accomplished in the way of drainage.

But the law in question will suffer the most evil to be done where old ditches are in need of repairs and better outlets. I have now in mind a district organized under the town laws, now repealed, where the lands in the upper part of the district have a good fall and complete drainage, while down below the land is quite level and the drain as constructed fails to give any benfit to one of the land owners. It appears that in this lowland several thousand cubic yards of earth that should have been removed under the orginal construction never were removed and that he paid for benefits which he never received. Under section 2 of this law, the farm drainage board may petition the court to grant an order for his relief; and when that is done, his neighbors who own a majority of the lands will invoke section 1 of the same law to defeat the petition. Many other cases may arise where this law will stand a barrier against relief. It is a jackass law.

Slowly but surely, the owners of wet lands are learning the benefits that arise from proper drainage; of its place in the improvement of the public health; in the development of our resources; in the increase of agricultural production and the maintenance of raw materials at a fair cost to consumers; and the increase in farm profits to which it gives rise. We stand firmly for the retention against destruction of all wet lands that are valuable for agriculture. They are necessary for the future increase in our population; and for the encouragement of more citizens to buy homes and thus enjoy the bless-

ings of life heretofore denied to many of them. The fears that hold that he employ science as developed in the last 25 years and make some because of the want or a ready market and of prices being less than the cost of production will disappear when people reflect that those conditions are purely temporary; and that they are due to the fact that a large part of the world has been bankrupt and credit has been destroyed. A new era is at hand. The world is now building new economic structures and new social conditions are arising from the ashes of the old, all of which presage a brighter future.

THE ENGINEER MEETS THE FARMER

Jerry Donohue, Sheboygan, Wis.

The title of this paper might properly be broadened into Engineering and Farming for the officers of this society have extended to me the privilege of discussing some of the problems relating to engineers and farmers, calling attention in a general way to things that both the municipal engineer and the farmer are interested in.

It has been my pleasure during the past few years to attend several meetings between legislative bodies composed principally of farmers, and civic clubs made up of men interested in the industrial life of their respective cities. At these meetings the subject of the relations between the farmer and the city man was generally discussed and the thought was usually emphasized that there should be a better co-operation between the farmers and the city folks for such co-operation would naturally result in a better understanding of each others problems.

The farmer is the producer, and city people usually are the consumers. In order that the farmer may produce a maximum crop on his farm and dispose of it profitably it is absolutely essential use of his land to it's utmost productive ability. Engineering and farming have both advanced during the past 25 years. Farmers are now taking advantage of the efficiency of improved farm machinery. They have cleared their cut-over land by modern methods, and under scientific supervision they have drained the low areas in their fields, thus increasing the intrinsic value of their farms. They have adopted practically all of the improvements formerly enjoyed only by the residents of some of the larger cities. The farmer today may have practically all the comforts of a modern city home, and even the most modest of country houses now have conveniences unknown to Royalty 100 years ago. Modern demand and scientific industry have placed the bath tub in the most unpretentious homes and when we stop to consider that George Washington did not have one either in his mansion at Mt. Vernon or in the White House while he was President, we begin to appreciate some of the strides that have been made in sanitary conveniences.

Demands for these improvements by the farmer have opened up new fields for the municipal engineer. City engineers have strug-

gled for years with problems involving the design and construction of sewerage disposal plants, water works systems, pavements, and city planning, but it was only quite recently that municipal engineers were called into the rural communities at the request of the farmer, who is now insisting that he, too, be given these improvements. The farmer wants good roads, he wants his family to enjoy the same things that his city cousins enjoy, providing they can be had without putting a mortgage on his farm. The construction of these improvements for the farmer has put the engineer in continuous touch with his requirements and the engineer is very glad to discuss these problems with him. The farmer appreciates the value of good roads and would like to have the highway that his farm is located on improved so that it would cost him less to transport his farm produce to market.

The same comparison as to the advance in modern sanitary engineering over the practices of 25 years ago applies equally well to transportation. Transportation enters into the cost of everything we consume. If modern transportation had not been developed to enable people from distant points to dispose of their surplus then we would still be existing as the people of the 18th century existed. The home undoubtedly would be the manufacturing center, and all of the goods made and crops produced would be consumed by the family. The head of the family would have to solve the engineering problems, the production problems, the construction problems, and all other problems pertaining to food, shelter, and clothing. And if this method were in practice now most of our modern municipal engineers would be kept busy sawing wood, tilling the fields or hunting to provide their own food, shelter, and clothing. Modern science, however, has given to the farmer the improvements that all must have under our present standard of living and the modern engineer has been invited in to discuss the design and construction of such improvements that any farm today must have to keep the family contented and make the farm a real producer.

The first of these improvements that the farmer became interested in was a system of drainage. Perhaps he did some ditching which resulted in reclaiming certain parts of his farm. At least he installed an under-ground outlet which carried the water away from the kitchen sink to the nearby creek and later he began installing tile to drain his land. This finally resulted in his having a comprehensive tile drainage system outlined for his farm. After he put his land upon this improved basis he gave some attention to the comforts of his family and he installed a sewer which permitted him to put in a bathroom and other house conveniences. This, of course, required that he pipe his house for water and the old oaken bucket which used to drop into the open well was replaced by a pump connected to a drilled well from which an abundant supply of pure water could be obtained. This pump used to be connected to a gasoline engine which supplied the necessary power pressure for his

house, water works system. Later he replaced the gasoline engine with an automatic electrical driven unit. This electrical unit of course required that he purchase a modern farm lighting plant or connect on to the nearest high tension line. This permitted him to install electric lights in his house and barns, motorize his dairy equipment, and give his family and help the convenience of electric light and power.

The most recent improvement extended to the farmer is gas service from the nearby city gas plant. Gas, under a high pressure distribution system can now be forced as far as 40 miles from the central plant and the farmer has been given the opportunity of connecting into these distributing mains and his kitchen now contains a modern gas range.

In connection with the study of these improvements the farmer has had his attention called to certain political controversies which quite recently have stimulated research along the line of drainage and sewerage problems. Those of you who happen to live in Eastern Wisconsin are perhaps more interested in the present controversy of lake levels than those who live in Central and Western Wisconsin. It is well, however, to call this convention's attention to the Chicago drainage situation for all farmers are interested in these facts. Chicago, by adopting the diultion system of sewage disposal at a time when that system offered the easiest remedy of her sewage problem, has at the present time aroused the indignation of all of her sister cities on the Great Lakes by demanding that she be permitted to take water enough out of Lake Michigan to so dilute this sewage as to carry it down the Illinois River to the Mississippi River. The amount of water being taken, is equivalent to the combined discharge of the two largest rivers flowing into Lake Michigan and this flow of water and sewage has damaged the farms in Central Illinois, putting their drainage systems out of commission, polluting the water of the river, destroying the fishing industries, and summer homes all because the selfish interests of a great city did not in time make provision for reducing this sewage in a disposal plant which would make it unnecessary to take this volume of water.

The rights of others must be respected. If the Great Lakes were a deposit of coal instead of water and Chicago had been permitted to tunnel into that mass of coal to promote her own particular interests, then the country at large could appreciate the injustice of such an act. Mr. Farmer in Western Wisconsin is interested in this problem because in a way his own farm may be compared to Chicago. If he throws his refuse and sewage down onto his neighbor without first purifying it his neighbor has the same grievance that the farmers in Illinois have. If Mr. Farmer. in order to do this, has to pump water from the nearby lake in such quantities so as to affect the level of that lake and damage to the property of the ripiarian owners on the lake, Mr. Farmer is in the same position

that Chicago is in with reference to the level of Lake Michigan and its resulting relations to transportation on the Great Lakes.

The farmer, however, is more interested in his own individual problem than he is in the controversy that may now exist between Chicago and her neighboring municipalities. He is more interested in meeting the municipal engineer and discussing some of the problems with him relative to the improvements that are now necessary to make his farm one of the best in the section. He may also be interested in meeting this same engineer and discussing the installation of some of these improvements in the village that a part of his farm happens to be located in. I have found in my work in Wisconsin that the farmer is generally found on the Village Board and that although he may be conservative in approving of expenditures for public improvements, still, after proper deliberation, he is always convinced that when public funds are spent judiciously his village should have the benefit of any improvements that the taxpayer can afford to authorize.

May the municipal engineer continue to meet the farmer in the progressive days of the future. May the engineer enjoy the wonderful inspiration exemplified by the progress that the farmer has made in the past 25 years, and may the farmer invite the assistance of the engineer to help make a scientific analysis of some of these problems that are continuously arising on the farm and may their solution result in a more prosperous farm and a happy relationship among those destined to enjoy the improvements of the future.

SURFACE INTAKES IN DRAIN TILE

J. J. Degen. Burlington, Wis.

Burlington, Wis., Feb 9, 1926

Wisconsin State Drainage Association:

Gentlemen:

First, I wish to state that I am sorry I cannot be with you today in person, especially so, after receiving such an appealing invitation from Prof. Jones, but at this particular time, due to various reasons, I am unable to leave Burlington. So please permit my pen to fill my place on this occasion.

The subject which I am to meditate upon is **Surface Intakes** for tile drain. I might say it is that particular part of a drain given the least consideration when a drainage improvement in contemplated. I have often noticed, in going over drainage projects, that few, if any, intakes are built, and usually those built express in their construction the little importance given their necessity. First, a poorly, haphazardly built intake is a detriment to the drain rather than a benefit as it permits earth and weeds to enter tile drains, for which purpose the drain was not intended. Second, I often find a hole cut in the tile, which naturally weakens the tile. Plus this fact the intake is supported upon the same tile by method of using

tile upright or piling large stones upon the tile to give access to surface water.

An intake properly built answers two purposes: first, it admits air to the drain proper; this is very important, as a matter of fact, is essential for the proper functioning of any tile drain. Many engineers maintain that ample air enters a drain with the water as it percolates through the soil to the drain, but experience has taught me that this is not always true, depending largely upon the nature of the soil, of course, but in all cases to make sure the drain shall operate to its full capacity, especially so immediately after a storm, when a few hours is the farmer's profit or loss, the surface intake feeds the drain to full capacity without interruption due to seeping through three or four feet of earth.

Second, intakes are necessary in various soils. For example in blue clay which firmly cements a floor between the surface and the drain. (Drifting from the subject for a moment, I might say in a case as above, blue clay soil, it is well to fill the trench over the tile with corn cobs, which will decay, but at the same time change the nature of the blue clay to the extent that it will permit water to seep through. Gravel has also been tried by the writer, but unsuccessfully, due to the fact that blue clay runs into the gravel and gradually cemented it shut again.) An intake takes the bulk of the surface water in connection with a seam over the tile as above referred to, this will give sufficient drainage to save the crop.

Method of Construction

An intake should not be built over the drain proper but similar to a curb and gutter intake, off to one side. The bottom of the basin should be 18 to 24 inches deeper than the basin outlet. The outlet should be a lateral to the drain. The basin can be constructed of brick approximately 2 feet inside with a grate over the top so as to permit the water, yet keep out all unsuitable material, such as musk rats, rabbits, straw, etc., and they should be placed at low points where the surface water gathers immediately after a rain.

TILE OR OPEN DITCHES

Nels Holman, Madison, Wis.

Whether tile or open ditches are preferable in any particular district must be determined in each case by the physical conditions of the territory to be drained. Both systems have their advantages and disadvantages. In most districts both open ditches and tile work out to mutual advantage.

If the territory has steep watersheds and a tight top soil contributing to flooding, a means of quickly removing the water on the surface is desirable. In this case the open ditch commends itself. But the open ditch carries with it many difficulties besides that of leaving a perpetual gash in the land. In the first place the

open ditch must have sufficient fall to enable it to carry off the sediment and to even scour out the weeds that grow in the ditch during low water, otherwise it will fill up. In Dane County we have learned by experience that the maintenance of open ditches is a considerable item of expense. In the Koshkonong-Mud Creek district where we have twelve miles of dredged ditch and fourteen miles of smaller ditch we have levied $500 per year for maintenance practically every year since its construction in 1914 and last year we levied $1000. Simply leaving an opening in the spoil bank and allowing the flood water to pour over the side of the ditch does not work out in practice. Even a very moderate flood running over the side of the ditch very soon erodes the side making a gully which in time extends back into the land considerable distances and proportionately filling the ditch.

In the more recent ditches we have constructed we have anticipated flood conditions and provided culvert pipe of ample size in time to have them dug into the side by the dredge and then making the spoil bank continuous over them. In previously dug ditches where erosion has developed we have sometimes put in pipe and closed the gap in the spoil bank or else built wire flood fences. Either method will produce the desired protection, although in some cases we found it necessary to combine both the pipe and the flood fences.

Another method of preventing erosion which we have discussed but not yet tried out is to spread a couple thicknesses of chicken wire over the flood path and down over the side of the ditch. I am satisfied from my observation of wire flood fences that it would prevent erosion but how durable it would be I have no fixed opinion. The method of fastening down the wire would also have to be worked out. In the use of this method the cattle would have to be fenced out from the wired surface. A ditch we finished last year ended about 20 feet through a highway bridge where we knew a large amount of flood water would enter and cause heavy erosion. At this place we put a 3-foot culvert pipe in the bottom of the ditch under the bridge, lined the sides and bottom of the ditch north of the bridge with concrete, faced the ends of the bridge from abutment to abutment to the ends of the pipe and then floored the entire bridge to a depth of about six inches over the tile. On the south side of the bridge the ditch is also lined, sides and bottom to the highway line. This was done because large quantities of water flow down the highway ditches. The culvert pipe will take the low water running off. In case of flood the excess runs over the concrete floor above.

In addition to the items mentioned above, which may all be charged to maintenance, you are all familiar with the bridges and fences needed in connection with the open ditch and these are perpetual. Securing the acceptance of awards for private bridges is generally accompanied by either actual or pretended dissatisfaction

on the part of the land owner, and if the commissioners succeeded in driving a good bargain it simply means the transference of part of the cost of the bridge from the district as a whole onto the individual land owner, which to my mind is of questionable virtue.

Another most constant source of irritation is that of getting the land owner to keep his cattle away from the ditch. We have had instances where we found it necessary to bring land owners into court to get results, but such methods do not promote good relations between commissioners and land owners. Last year we had circulars printed with the law governing damages to ditches and sent to each land owner, but the usual recalcitrant ones seemed to pay no attention to them.

While I have thus dwelt on the difficulty connected with the maintenance of open ditches it does not follow that tile are free from every difficulty and disappointment. As already stated, they will not handle floods where there are steep watersheds. It may be answered that this matter can be taken care of with surface runs. That is only partially true. It is our observation that if a surface run has good fall, it will scour and gully. If it is flat and grass grows over the bottom, sediment will collect in the grass and fill the ditch. We have had good results from surface intakes set in the tile, but in several instances the heaving of the ground in winter has broken them loose. Laying tile in sandy soil is, of course, a serious business. I believe it would be economy to have one of the commissioners, if he knows his business, oversee the laying of every tile where sand is encountered. In two of our late districts, at the suggestion of Prof. Jones, we wrapped every joint with building paper. So far it seems to have worked out all right. But on the whole, tile has, of course, great advantages over the open ditch. It does not leave a perpetual gash in the ground, it will operate, when carefully laid, with a flatter grade, it will not erode the sides or grow up to weeds; and it eliminates the necessity for bridges and fances.

DITCH CLEANING MACHINERY

G. M. Hill, Wisconsin Rapids, Wis.

Our company had a contract with the Brown County Farm Drainage Board to dig a ditch and keep it dug. Man power was too expensive and mother necessity camped on our trail at every turn. Five miles of ditch from 6-10 to 3 feet above grade stared us in the face. We had to get an invention that was capable of taking the material from a ditch grade six to nine feet from the top and 35 feet wide in places, and carrying it to the dump over the berm.

We conceived the idea of building a machine with a very high "A" frame and long, narrow boom. In fact, it is only six feet wide on the bottom by 24 feet long, weighs only 5 tons and is pulled ahead with a wire cable and digs from behind and toward the

machine. Three gallons of gas will move 100 yards of material. The reason for this saving is that only the part being used is operated at one time. It needs only one operator and a helper and will move material a maximum of fifty feet. We use a half-yard dipper. We plan to build the machine to fit the job as there are no two cleanout jobs that are just alike. We plan placing a machine on a boat and facing our dipper the other way, thus making a small floater for places where there is too much water to use the dry land dredge. We have moved as high as 700 yards per day with this type of dredge on new work, but this was in peat digging.

CLASSIFICATION AND USE OF WISCONSIN LAND

A. R. Whitson

The soils of the state totaling 35,363,790 acres as shown by the reconnoissance and detailed maps of the soil survey which now covers 80 per cent of the state are classified as follows:

Sand and fine sand	7,334 sq. mi.	or	13.8%
Sandy loam and fine sandy loam	9,925 sq. mi.	or	18.1%
Loam and silt loam, originally wooded	18,984 sq. mi.	or	34.8%
Loam and silt loam, originally prairies	2,980 sq. mi.	or	5.5%
Clay loam and clay	3,490 sq. mi.	or	6.4%
Peat	3,970 sq. mi.	or	7.2%
Other wet lands, including overflow lands along streams, wet sandy and marsh border lands	3,655 sq. mi.	or	6.6%
Rough stony land (untillable)	4,228 sq. mi.	or	7.6%

This diversity of soil gives the state the possibility of great diversity of crops and systems of farming. We have soils adapted to every crop our climate will permit. Ample areas of the best soils are to be found for potatoes, tobacco, canning peas, corn, beets, and for cabbage, onions, and many others. But in all probability dairying will remain our chief industry for many generations and by far the greater part of our crops will be those used as feed for cattle, horses, hogs, and sheep. We are now using 90 per cent of our tilled land for these crops.

One of the chief questions now being discussed is that of the advisability of developing more farms or of using most of the undeveloped land—amounting to about one-third of the whole, or twelve million acres,—as state or private forest.

The question of relative needs of agricultural and forest crops by succeeding generations is, of course, one which it is impossible to solve in any definite way since its solution would imply knowledge of the state of conditions in the future, which will be the result of the interaction of many important and complicated factors now operating and very likely of factors not now operating.

The chief things that it is practicable to consider at present in connection with this problem are first, the area of land necessary

for the production of the food crops which will be needed by the increase in population and second; the area which will be needed for the production of forestry crops. In connection with the latter, the statement is made by Grey, Baker, Zon, and others of the U. S. Department of Agriculture in the year book of 1923 of that department, page 484, that if the consumption of wood in the United States were at the same rate as in Germany before the war and the rate of growth were the same as it now is in the United States, the present area of growing timber, amounting to 470,000,000 acres, would be sufficient for the needs of 235,000,000 people. If its rate of growth were equal to that of Germany it would be sufficient for the needs of 485,000,000 people. From this it would appear that if the rate of growth were that of Germany there would be sufficient forestry products to supply over 240,000,000 people with twice the amount per capita of that used in Germany.

While it is of course true that lumber and forest products are rapidly increasing in value, the returns from forestry use are still relatively small in comparison with the returns from the agricultural use of land. H. S. Graves, in charge of the Forestry Service of the U. S. Department of Agriculture, states in his "Principles of Handling Woodlands" that a typical public forest in Europe yields about 2½% per annum compound interest on the value of the investment. Under very favorable conditions in this country, this would probably be larger. It should be borne in mind, however, that the use of any considerable portion of our state for forestyr purposes would necessarily mean a lower total population. While it is true that timber seems to be getting scarce and the value is certainly increasing greatly, this is due to the fact that we have been cutting off the virgin growth of an immense area with the utmost lavishness in every conceivable way and not only for our own use, but for exportation and the price it has commanded in a time of comparatively cheap labor, therefore, can be in no sense taken as a basis for what it can possibly be under more stable conditions of continued production. The per capita use must inevitably greatly decline and the substitution of other constructional material must take place.

The conclusion which seems logical to the writer, therefore, is that it should be Wisconsin's policy to develop her lands for the highest class of agriculture possible and use for forestry only those lands not suitable for agriculture. In considering this question, it must be borne in mind that pasturage furnishes by all means the most economical feed during the pasture season and that much land can be profitably used for pasture that is not suitable for tillage. It is probably safe to estimate that on the average one-third of the area of the dairy or stock farm can be used to best advantage as pasture.

While it is true that Wisconsin has considerable areas of marsh land, and of rough and very stony land, it must be born in mind

that a large portion of all of these classes of land occur in small areas widely distributed and closely associated with good tillable land. This is true of the rough bluff land of the southwestern part of the state. It is true of a considerable part of the stony land of the northern part and it is true of the marsh land to a very large extent. While it may not be advisable to undertake the drainage of extensive tracts of marsh land under present conditions, it is unquestionably profitable to drain the areas of marsh land which constitute a fraction of otherwise improved farms.

The extent of marsh land occurring in small areas associated with good upland soil is well illustrated in the case of Jefferson County in which there are 128 quarter sections consisting entirely of marsh land; 203 quarter sections entirely upland; and 1,934 quarter sections containing both marsh and upland soils. Over 90 per cent of the quarter sections of that county contain important areas of both marsh and upland soil and the full and economic development of the farm requires the improvement of the marsh as well as upland.

The same principle applies to the hilly country of the southwestern part of the state where the use of much of the land too steep for tillage as pasture is profitable. It also applies in the northern part of the state where the most stony land occurs as patches from two to forty or sixty acres in extent in such a way that for the most part they can be set aside and developed as pasture and tilled fields can be worked out on the less stony portions.

This use for pasture of land of apparently low agricultural value gives it a value not much less that that of the best agricultural land and certainly a greater value than it would have for forestry purposes. It would seem, therefore, that the best policy for the state to follow is one of encouraging agricultural development on all land which can be developed for that purpose, leaving for forestry only such land as is not suitable for tillage or pasture use. This includes rough or stony land occuring in relatively large areas.

Another portion is of such low agricultural value on account of its sandy character that a part at least should be used for forestry purposes as far as possible, and by such use the remaining portion will be improved through the lessening of sand blowing and snow drifting. A part of the peat and wet lands is incapable of agricultural reclamation through lack of drainage outlet, and if possible should be used for the growth of such forestry products as it will support.

Of the 4,228 square miles classified as rough stony land, and unfit for tillage, a large portion occurs in tracts of considerable extent, practically all of which should undoubtedly be devoted to forestry use, but an important portion occurs in areas too small to be used for commercial forestry, though it would be available for the production of fire wood and other home uses. We estimate that of the 100 square miles of rough stony land occurring in the south-

eastern part of the state, half or 50 square miles could wisely be used for commercial forest purposes; of the 1,200 square miles in the southwestern portion, one-third or 400 square miles; of the 905 square miles in the sandy area, 800; of the 415 square miles in the area of Colby soils in the north-central portion of the state, 300; and of the 1568 square miles in the Kennan loam area of the northern part of the state, 1,000 square miles should be used for forestry purposes, making a total of 2,550 square miles of rough stony land which should be devoted to forestry use.

Of the sandy soils probably one-third of the 2,300 square miles in the central sandy area of the state, or at least 700 square miles should be used for forest growth. Of the 1,220 square miles in the northeastern sandy area, one-half or 600 miles; of the 1,225 square miles in the northwestern sandy area, one-half or 600; of the 1,020 square miles of the north-central sandy areas in Vilas and adjoining counties, perhaps 700 should be used for forestry purposes in addition to which there are approximately 200 square miles of very sandy land included in the area of the Kennan loams making a total of 2,800 square miles of sandy land which under present conditions it would seem should be used for forestry purposes.

Of the peat and wet lands, we estimate that the following areas are so situated with respect to drainage outlets as to be entirely unadapted to agricultural development and would be therefore available for such forest use as can be made of them: in the southeastern area 100 square miles; in the sandy area of the north-central 200; of the central 200; of the northwestern 50; and of the northeastern 50; of the 1,200 square miles of the marsh-lands in the Kennan loam area one-third or 400; and of the 725 square miles of marsh land in the Miami silt loam area 200; making a total of 1,200 square miles of peat and other wet lands not suitable for agricultural use. These areas total 6,550 square miles or something over 4,000,000 acres of land which on account of its very low agricultural value is obviously available for forestry use.

While the chief consideration in regard to the use of Wisconsin lands is that with reference to agriculture and forestry, the needs for recreation such as parks, fishing, and hunting grounds, should not be overlooked, but the agricultural and forestry development outlined will still leave adequate opportunity for meeting these needs.

RESOLUTIONS

WHEREAS it is a fact that there are many types of land and soil that should be devoted to the purpose for which it is best adapted and:

WHEREAS the agriculture of every comumnity and county is interrelated to the other industries therein therefore the Committe on Resolutions desire to recommend the following resolutions:

I

BE IT RESOLVED that the Wisconsin State Drainage Association go on record as strongly favoring an economic survey of land and other economic resources in the State of Wisconsin similar to the survey now being made by the states of Michigan and Tennessee and that a copy of this resolution be sent to the governor of the State of Wisconsin.

II

BE IT RESOLVED that the Wisconsin State Drainage Association extend a rising vote of thanks to our retiring president, F. W. Lucas, for his faithful service, his splendid and efficient administration and the well prepared and instructive paper which he read to this convention.

III

BE IT RESOLVED that we extend to the Park Hotel management our appreciation of the courteous service it has rendered to the members of the association attending this convention.

Unanimously adopted.

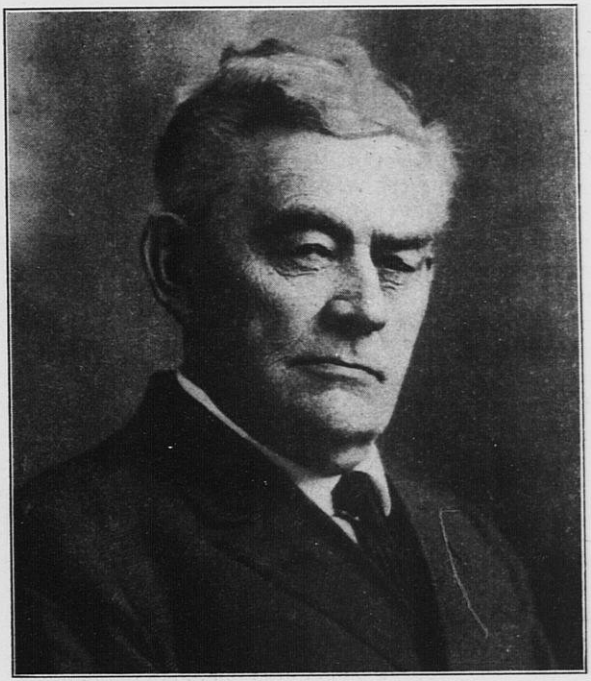
REPORT OF COMMITTEE ON EXHIBITS

1. The committee recommends that the Wisconsin State Drainage Association sponsor exhibits of products grown on drained marshes at:
   a. Wisconsin State Fair.
   b. County fairs in counties having any considerable drained area.
   c. At the Legislature of 1927.
2. That the president appoint a committee to organize farmers to produce and prepare material for these exhibits. The committee and farmers are to determine the county fairs and put on the exhibits.
3. That suitable news articles showing the benefits of drainage be sent to the argicultural press of the state to counteract the propaganda against drainage and drained lands.
4. That every member assume personal responsibility to furnish such material to the secretary who will edit the material and forward it to the papers.

Signed Committee

L. S. Keeley, Chairman,
P. B. Coffin,
I. A. Haverberg,
G. A. McDowell,
O. R. Zeasman.

In Memoriam



CHARLES F. LEINS
West Bend, Washington County, Wisconsin.

BORN JUNE 3, 1852

DIED JUNE 13, 1926

Prominent in educational, insurance and drainage circles; school master 13 years; town clerk 8 years; county superintendent of schools 4 years; county surveyor 3 years; register of deeds 6 years; member of school board 20 years; commissioner of County Farm 20 years; secretary of local mutual insurance company 32 years. No man in Washington County was more highly respected by the citizens than he. They loved him for the enemies he made.

He sacrificed his time to serve as commissioner in five drainage districts—time that he might have spent with greater pecuniary profit to himself in his many other pursuits. He was a disciple of better drainage and for the humble reward of duty well performed he gave himself ungrudgingly to the farmers of Washington and Ozaukee Counties. For this and his service to the rural schools he was awarded Honorary Recognition by the College of Agriculture in 1924, an honor fittingly bestowed.

He served as president of the Wisconsin State Drainage Association during 1918, and at ten annual conventions was there to give counsel. Not until 1925 did ill health force him to send his regrets.

In his sphere of activity he was a real statesman who stood uncompromisingly for truth, right and progress.

FINANCIAL REPORT

January 1, 1925 to July 1, 1926

Receipts

Balance on Hand, Jan. 1, 1925	$ 10.43
40 membership fees for 1925	40.00
24 magazine subscriptions 1925	24.00
What Cheer Clay Products Co., What Cheer, Ia.	10.00
Streator Drain Tile Co., Streator, Ill.	10.00
Mason City Brick & Tile Co., Mason City, Ia.	10.00
Waukesha Cement Tile Co., Waukesha, Wis.	10.00
Plymouth Clay Products Co., Ft. Dodge, Ia.	10.00
52 membership fees for 1926	52.00
15 magazine subscriptions for 1926	15.00
Donation of G. M. Hill	5.00
Donation of John Corbett	5.00
43 banquet tickets	43.00
Re-prints for advertisers	15.60
Received from advertisers in this report	137.70
Due from advertisers in this report	140.00
Total	$537.73

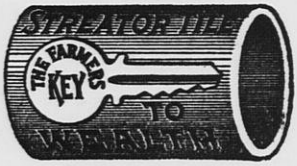
Expenditures

Expenses of W. J. Schlick, February, 1925	$ 45.00
Postage ($5.50 still on hand)	20.00
24 magazine subscriptions 1925	24.00
Annual dues National Drainage Congress 1925	15.00
Engraving for 1925 report	9.60
Banquet expenses February 16, 1926	53.00
Stenographic help	5.00
Printing convention programs	41.05
15 magazine subscriptions 1926	15.00
Total	$227.65

Recapitulation

Expenditures to date	$227.65
Estimated cost of printing and mailing this report	250.00
Total	$477.65
Total receipts and bills due	$537.73
Estimated balance after reports are mailed	$ 60.08

Drain for the Future as Well as the Present



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