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United States. Department of  
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Report on the use of maize  
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REPORT

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ON THE

USE OF MAIZE (INDIAN CORN) IN EUROPE

AND ON THE

POSSIBILITIES OF ITS EXTENSION.

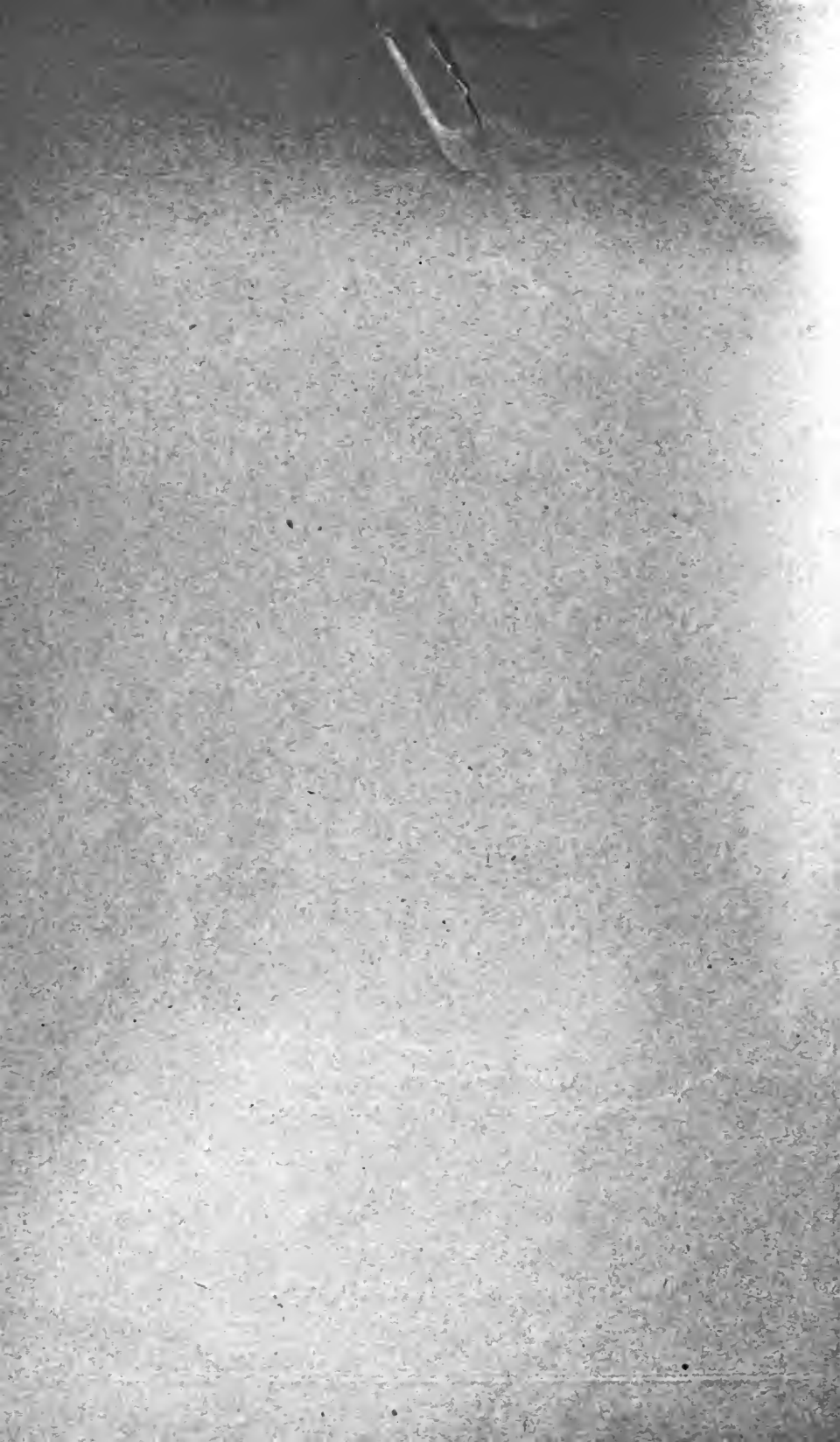
1. THE INTRODUCTION OF MAIZE INTO EUROPE.  
By CHARLES J. MURPHY, Special Agent.
2. THE FOOD VALUE OF MAIZE.  
By DR. H. W. WILEY, Chief Chemist.
3. THE INDIAN CORN INDUSTRY IN THE UNITED STATES.  
By B. W. SNOW, Assistant Statistician.

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## PREFATORY NOTE.

In publishing for general information the following report of Special Agent C. J. Murphy, to whom I intrusted the duty of introducing American corn to the attention of the people of Europe as a human food, I have thought well, for the information of those interested, to supplement it with an article prepared by Dr. H. W. Wiley, Chief Chemist of this Department, on the food value and chemical composition of corn. I have also caused to be prepared in the Statistical Division an article upon the extension of foreign trade in Indian corn, of a general character, for which the records of that division afford special facilities, to which are appended various statistical tables which will enable the reader to form a just estimate of the extent and availability of our resources in the production of this important cereal.

I desire to call special attention to two or three points in the matter which follows. In the first place, I wish to emphasize the necessity, indicated by Special Agent Murphy, for vigorously following up the efforts of this Department by the individual or combined efforts of parties interested in the trade in this product.

The thought is also suggested by the chapter on "The Food Value of Maize" that this great American cereal is specially adapted, from its constituents, for use as a part of the dietary of the inhabitants of northern climates, who are unable to produce it on their own soil. Hence, if properly introduced and adopted by these people, we may reasonably look to them for a permanent market for a portion of our corn crop.

Thirdly, in his observations on the extension of the foreign use of corn, the Statistician presents some features of special interest with reference to the availability of Indian corn as a part of the army rations—a matter of extraordinary importance for countries whose conditions necessitate the maintenance of a large standing army. Peculiar interest attaches to these considerations from the fact that our special agent in Europe has already succeeded in interesting responsible officers of a foreign government in the matter from this point of view.

Lastly, I desire to point out to those countries who are in a greater or less degree dependent upon foreign imports for a portion of their food supply the desirability of acquainting their people with the uses of so nutritious and economical a substitute for other cereal foods as

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Indian corn, particularly in view of the fact that the probability of political complications interfering with their trade with this country is especially remote. It would seem probable that the foresight of the German Government has already recognized this fact, and the cordial coöperation which our special agent is now receiving from Government circles in that country is no doubt due to the conclusion that, in the matter of food supply, it behooves a country not to limit its dependence to any other single source of foreign supply, especially to one liable to be checked at a critical moment as the result of political entanglements which can not be foreseen.

The importance of our corn crop needs not to be emphasized. The tables attached to this report present that in a stronger form than any words could do; but in the consideration of its enormous extent and the vast possibilities of its future development it is worth while to note the value of a foreign demand not dependent entirely upon reduction of price in our own country, but which might be developed, as I am confident it can be, to such an extent as to have a very sensible effect in maintaining the price of this cereal at a figure which would insure reasonable profit to the producer. Could we secure an advance of even 5 cents a bushel on an average for corn during the ensuing decade, which might well be done and still enable us to supply the foreign demand at a price far below that of other cereal foods of equal value, the result would be to add \$1,000,000,000 to the value of this crop during that period.

J. M. RUSK,  
*Secretary.*



## REPORT ON THE INTRODUCTION OF MAIZE INTO EUROPE.

Hon. J. M. RUSK,

*Secretary of Agriculture:*

SIR: The exports of our maize or Indian corn for the past ten years may be said to have averaged about 4 per cent of the entire crop. The United Kingdom, France, Germany, Belgium, Holland, and Denmark rank as our best customers for the grain, while Spain and Norway and Sweden take a small quantity. Except an insignificant amount, exported corn is chiefly used as food for animals, distillery purposes, and starch-making. The only form of corn as human food at all known abroad is corn starch, which is sold principally in the British Isles under the name of corn flour. It is also put on the market under various other names, sometimes in order that the public may not know that it is a product of Indian corn or maize, as prejudice is strong against the grain as human food. The manufacturers thereby restrict the demand, and the public are kept in ignorance of what the article really is.

A better knowledge of maize as human food, in addition to bringing into use its other forms, will increase the demand for all its products which shall call forth a supply that will cause the price in Europe to fall from its present artificial high point. Corn in Europe is the generic name for grain of whatever kind. Corn flour, therefore, does not convey the same meaning as maize flour or corn starch, the latter of which it really is. It is true, however, that some corn starch is sold as maize flour, but there is no reason to believe that the public are not aware that it is a simple product of the corn that is used for feeding cattle. Some American firms do a brisk trade in this commodity, but most that is sold abroad is manufactured in Paisley, Scotland. The fact that many Europeans have already acquired (some of them unconsciously) a taste for one product of our corn will act as a powerful lever in furthering the effort to practically demonstrate to the mass of the people the value of the entire grain, as mush (porridge), bread, etc., which are cheaper and more nutritious, entering thus into their daily life, being a means of providing economical dishes, corn starch figuring now as a delicacy or dessert which is high in price and beyond the means of the poor. Such preparations of corn as hominy, cerealine, samp, maizena, canned corn, etc., need only to be known to be appreciated, especially in the United Kingdom, where variety in food, particularly that which is cheap, does not appear on the table of either artisan or laborer.

A somewhat inferior grade of corn is grown in Italy, and its home consumption is considerable. Spain, central and southern France, produce a meager quantity, but it is less palatable as human food than the American, and the use of it in that way is insignificant. From south-eastern Europe comes Danubian corn, a small, round grain variety, which is preferred to the American as chicken feed, owing to the size of the grain. The very limited corn areas of Europe grow a grain which can not compare with ours either as to quality or price; hence the European production need not be taken into account in discussing the question of creating a European market.

It has long been a matter of surprise that Indian corn is so little known in Europe as an article of human diet. The merits of our flour, beef, pork, and other food products are everywhere recognized abroad and enter largely into the alimentary supplies of the people of other nations, but corn, the leading grain of the New World, which is eaten and enjoyed by the descendants of the various European races settled on its shores, is not yet adopted as a breadstuff in the Old World, though it is cheap, nutritious, and palatable, and scientific and medical authority and the experience of millions of mankind pronounce it to be one of the best foods supplied by bounteous nature. There are multitudes of half-nourished toilers in Europe who would welcome our golden grain, that would bring to them better living than their scanty earnings now afford, were they but taught its merits. To supply that want would be to render them a philanthropic service worthy of our best endeavors, and the increased export of the cereal would be a sure, practical, and speedy benefit to the farming interests of our country. No one can deny that to put our cereal in its proper place as a breadstuff would be to confer a blessing on mankind and contribute much to the happiness and prosperity of humanity, besides conferring on ourselves a direct material benefit. Comfort, health, and effective effort being so much dependent on what we eat, it behooves nations as well as individuals to seek the best and cheapest food. The cry of Europe is "cheap bread;" it is a bitter, agonizing cry, and we may best respond to it by instructing the toiling masses of the Old World in the excellence and cheapness of maize and the proper methods of preparing it.

Stated in a few words, the way to increase the export of it as human food, and that which I have as far as possible adopted, is to practically illustrate abroad its value by ocular demonstrations, cooking it in presence of the public, serving it free or at nominal prices, distributing literature giving full description of the grain, price as compared with wheat, oatmeal, potatoes, etc., and enlisting public interest through representative bodies and personages and the general and agricultural press. This effort, extensively put forth and persisted in, can not fail to have beneficial results. It would assist our farmers in an entirely practical manner, with benefits certain and positive, raising the price of every bushel of corn gathered by the American husbandman.

## INITIAL STEPS TO INTRODUCE CORN INTO EUROPE.

It having been my privilege to make a practical display of corn for edible purposes at the Edinburgh International Exhibition, and also at the Glasgow Industrial Exhibition, I deem it fitting to refer here to the facts and circumstances which led to these initial steps for the introduction of Indian corn into Europe as human food.

In 1878 Congress was asked to make an appropriation for a special exhibit in Europe of corn and its uses as human food, but no action was taken. Between that date and the Paris Exposition in 1889, occasional efforts toward the same end were made, but nothing systematic was done and no valuable results were achieved. While preparations for the Universal Exposition were under way, the officials were asked to set apart a space for a maize exhibit. This was agreed to, but it was decided that none of the money appropriated for the American exhibit could be used for preparing such an exhibit of this cereal, and as private enterprise could hardly be expected to sustain a fitting exhibition of our national grain, the magnificent opportunity to impress upon the 25,000,000 intelligent visitors its advantages from a commercial and from a dietary point of view, as a human food, was lost.

Impressed with the magnitude of the undertaking and the great good that was to be derived from a comprehensive exhibit of that nature, I sought to enlist financial aid through other sources. Under the auspices of the New York Produce Exchange I made a tour of the corn States, laying the plan before the legislatures, grain exchanges, etc. A great deal of enthusiasm in favor of the plan was manifested in the agricultural and general press and among the public, but contributions failed, however, as the opinion prevailed that the General Government should financially support a project that could well be expected to aid largely the greatest branch of agricultural industry in the United States. The propaganda, however, called attention to the fact that an immense foreign demand might be created for our corn if proper effort to that end is made, involving but slight expense and sure to result in speedy and certain good.

Despite monetary discouragement I came to Paris and, in the capacity of a private individual, labored for corn, lecturing before the National Agricultural Society of France, and endeavoring to extend the use of the grain and overcome the prejudice against it. Experience has proved that energetic action intelligently persevered in on extensive lines would result in an enormous increase in its consumption for human food. At the close of the exhibition I visited Amsterdam and Rotterdam, in Holland; Antwerp, Bruges, and Brussels, in Belgium; Liverpool and London, working while in those cities, as far as opportunity offered, to spread accurate knowledge as to the value of corn. At the great International Exhibition, Edinburgh, Scotland, I determined to erect a corn palace on my own personal account and completely develop

the general plan upon which I had been working. I secured a prominent space in the gardens for the buildings, and there during six months, before nearly three million visitors, demonstrated in a convincing manner the worth of corn as human food, serving it to the public at nominal prices, distributing literature containing cooking recipes and other necessary matter, giving free meals to inmates of charitable institutions with a view to the introduction of corn dishes therein, and interesting the people generally.

The American consul at Edinburgh reported as follows on the exhibit:

The American corn exhibit is a new move in the right direction in Europe, by Col. Charles J. Murphy, who has recently been appointed statistical agent for Europe in connection with Indian corn by Secretary Rusk, of the United States Agricultural Department. He has for years entertained the idea that the abundant corn fields of the great West should supply a cheap and nutritive food to the laboring classes of Europe. He has labored for three years in that direction, and the little handbook which he issued and distributed in Great Britain during the last few months is awakening the attention of the people at large to the fact that the stored-up sunlight in the autumn shocks of Kansas, Nebraska, and Missouri can be brought even cheaper than oatmeal, etc., to the very table of the workingman in Great Britain, France, Germany, Norway, and Sweden. His handbook presents forcibly and clearly the history, production, medicinal virtue, and the cheapness of Indian corn as human food, with one hundred and thirty formulas for preparing and cooking the same. The Scotch people are said to move cautiously and slowly, but Col. Murphy possesses the enthusiasm which is destined to win. He goes from Edinburgh to the East End Industrial Exposition in Glasgow, which opens early in December, and he is entitled to the best wishes and support of every farmer in the United States.

The exhibit was centrally located near machinery hall, and was of great interest to visitors. The tasteful building was 75 feet in length and 40 in width, where literature on the subject was issued and where food prepared from the maize in various forms could be had at a nominal price. Thousands of children from different charitable organizations were given free meals, and this has led to its use already in several institutions. One of the daily newspapers has well said:

No doubt many, after seeing and tasting the numerous excellent qualities of that form of food, will wonder why they have so long been kept in ignorance of them. The object of the exhibit, which has been brought together through the enterprise of Col. Murphy, is to stimulate throughout Europe the use of maize as an article of human food. Hitherto it has only been used in Britain for feeding cattle and for distilling purposes, but before long it is sure to take its place in the human dietary. The corn seems to be as nourishing as wheat or oatmeal, and has many other advantages. It is, for one thing, a good deal cheaper, being some years only one-third the price of wheat and about one-half the price of oatmeal, while it can be sold in this country, after importation, at a remarkably low price. If people are once acquainted with the really wholesome and nutritious forms of food which can be made from corn it is thought that it will become so popular that the exportation from America will be large enough to prevent any waste whatever. Then there is so much more land that can be put under Indian corn, and the crop is so steadily increasing in quantity and quality that there is little fear of the demand exceeding the supply. There are possibly many difficulties in the way of popularizing it; but, with energy and enterprise, which, it may be taken for granted, would not be lacking, backed by the undoubted excellence of the food itself, these difficulties ought easily

to be surmounted and the use of maize as a part of human diet become universal. The Indian corn bread is pleasant to the taste, and it is lighter than oatmeal. Corn is one of the staple articles of food in America, and the forms in which it can be prepared for the table are innumerable. Col. Murphy was awarded a silver medal for his admirable exhibition of America's great product.

The leading paper of Scotland thus refers to it:

The American corn exhibit of Mr. C. J. Murphy, New York, which occupies a position in the grounds near the machinery hall, is a source of much interest to visitors. It is designed to illustrate in a practical manner the nutritive qualities of maize as an article of human food and to bring home to the people of this country the fact that this important cereal provides a cheap, wholesome, and palatable diet, which brings breadstuffs within the reach of the poorest. Indian corn is the greatest of all the cereal crops of America. It is the staple product of seven of the largest States—Illinois, Iowa, Indiana, Ohio, Missouri, Kansas, and Nebraska—which form the great corn belt of the United States. There is no limit to the supply, the produce of the virgin soil of America being far in excess of the demand, so much so that the crop, as a rule, only realizes 40 cents per bushel, while the exports form a very small proportion of the whole—3 or 4 per cent. On this side of the Atlantic the grain is used for farm stock and for distilling purposes. In America Indian meal is a familiar article of diet, and it is presented in various nutritious and palatable forms, but for human food it is practically unknown in this country. It is said that even during the Irish famine of 1848 the starving peasants could not be induced to eat the meal that was sent from America, and there is reason to believe that the same prejudice still exists in favor of breadstuffs made from wheat, rye, or oats. Much, however, depends on the manner in which the food is prepared for edible purposes, and Mr. Murphy's exhibit does a great deal to dispel prejudice. He has fitted up a pavilion with American stoves, and there, in presence of the visitors, the corn meal is made into various kinds of food and, as the proof of the pudding is in the eating, the public are able to satisfy themselves as to the value and importance of maize as a healthy substitute for more costly food.

The results of the crusade at Edinburgh may be summed up as having made many converts to corn, of establishing a growing trade for it in Edinburgh and beyond, and marking an epoch in the history of the grain by conclusively proving to a large section of the people of the British Isles that Indian corn, besides being the best food for cattle, is also nutritious, palatable, and cheap as an article of human food. A verdict of this kind, obtained after full proof and in spite of the prejudice born of ignorance of years' and even centuries' duration, bodes well for the future of Indian corn in Europe. A jury of food experts, having awarded it a silver medal, the highest award a breadstuff could obtain at the exhibition, the indorsement of undoubted scientific and medical authority is thus given to the use of Indian corn as a food, so that all Europe may know it and recognize its claims.

#### WORK UNDER THE AUSPICES OF THE DEPARTMENT OF AGRICULTURE.

During the exhibition the receipt from the Secretary of Agriculture of a commission to investigate and to prepare a report upon the subject of the use and consumption of Indian corn in Europe, giving to my work official countenance from the United States Department of Agriculture, enabled me to continue my efforts and increased my influence with

officials and prominent persons who could not be so well approached by private effort. At the Glasgow Industrial Exhibition I followed the same methods as at Edinburgh, with like favorable results. Corn secured a foothold at Glasgow also, and there can be no doubt that the demand for it will multiply and assume large proportions. The exhibition lasted four months, and Indian corn was granted the highest award as a cheap, wholesome, and nutritious food.

The exhibit occupied a large space and was well to the front. Everyone entering the building was furnished with a circular setting forth the merits of corn, and many visited the exhibition to partake of the food. I am able to state that I rarely found a person who was not entirely pleased with it. The value of corn is becoming appreciated, and if the movement which has been so successfully begun be extended and widened under the authority of the present Secretary of Agriculture, a market for many millions of bushels of our corn can be opened in a direct, simple, and easy way with exceedingly small expenditure of money, by a continuance of the method of education already adopted, pursued as circumstances may suggest and time develop, but preserving the essentials of ocular demonstration, distribution of literature, and giving the food to the public free or at nominal cost.

While American wheat is meeting with competition from Hungary, Russia, India, and recently even from the Argentine Republic, it is satisfactory to note that no country in the world can compete with our corn as to quality or price. The incomparable soil and climate of the United States are conducive to a superior growth of the grain, while the cold winters harden and dry it, and the favorable summers bring it to perfection. Thoroughly developed railway facilities and a short ocean voyage give us a marked advantage over Danubian and Argentine Republic corn. Occasionally Argentine corn undersells the American, but this is only because the former "sweats" on the long ocean journey, caused by the intense heat of the tropics, and arrives in a damaged state, the owners having therefore to sell it for less than the market rate. American corn is less liable to deterioration, as it comes a shorter distance, and is generally landed sound.

In order to obtain the best results, corn intended for human food in foreign countries should be kiln-dried before shipment. When that is done, it keeps for a long time in prime order. European millers are not familiar with, or if so do not practice, the proper methods of grinding corn; consequently an inferior meal is produced, which strongly militates against its introduction on the table. Kiln-dried, home-ground meal is the first essential in order to make an effective and creditable display of the nutritive qualities and general excellence of the grain. This point should be strongly urged on all interested. The corn used at the exhibits referred to was kiln-dried, home-ground, and gave perfect satisfaction, but very little could be done with the meal that was ground in Ireland, where most of the foreign-ground meal is obtained.

Foreigners who assert that corn is not a fit or palatable article of food base their opinion on their experience with European varieties of the grain, which are all distinctly inferior to the American, inasmuch as the taste is harsh and somewhat bitter. The little American meal which is used as human food on this side is improperly ground by foreign millers, and this fact, together with ignorance of formulas for preparing and cooking it, has often added to the prejudice against it. The only way that these false impressions and unfounded prejudices can be dispelled is by practical ocular illustrations of its value, using the best American home-ground, kiln-dried meal.

In Ireland corn in the form of mush, or, as they style it, "stirabout," is consumed largely in some parts of the country. When several ship-loads of it were sent over in 1848 the peasants at first refused it, but the pressure of hunger soon drove them to it. Since then its use has been slowly coming into favor, especially when the potato crop fails, though the familiar tuber is generally preferred when plenty, notwithstanding that corn is cheaper and more nourishing. The corn, not being kiln-dried, arrived in poor condition, and the peasants not knowing how to cook it, the "famine food" did not have a fair trial. Under these circumstances it could not be expected to become popular, yet Ireland takes more corn as human food than any other country in Europe.

One instance may be here given as to the old prejudice against corn in the city of Glasgow a few years ago, before any attempt was made to enlighten the people as to its merits for edible purposes. It was proposed by a member of the poorhouse board to substitute Indian corn for a costlier food in their institution. The mere suggestion brought a storm about his ears, and at the ensuing election he was overwhelmingly defeated because of his inhumanity in thrusting on the defenseless paupers a food which the honorable legislators thought only fit for pigs.

American canned goods of all kinds are largely sold in Europe, but it is a sad fact that the delicious canned corn is rarely seen. This should not be; there is no reason why it should not figure on the table of the European as well as on that of the American. The demand that should exist for it would mean hundreds of thousands of dollars yearly to the proprietors and workers of our extensive canneries. Of those that have partaken of it at my exhibit I have not seen one reject it, and it is therefore plain to me that the present small volume of trade could readily be augmented to greater proportions by a few more exhibitions on the same lines.

The partiality which people have shown to the dishes prepared and distributed at the exhibition referred to, and the favorable notices received from various representatives of public and medical opinion, are evidence that the seed sown has fallen on good ground, and if the efforts be continued in other fields a rich harvest will be the reward.

The use of potato, tobacco, and tomato, all of American origin, spread

through Europe and other parts of the world in a few years and added to the comfort and happiness of millions. There is more hope for corn now than there was for any of those commodities, as it is already in use by a large portion of mankind, and an active press and comparatively enlightened people, which did not exist in former times, will be powerful factors in disseminating knowledge of corn, and will effectively aid our Government in its endeavor to extend the demand for our great staple.

In addition to showing corn and its different uses at exhibitions, fairs, and other public gatherings throughout Europe, and presenting it to the attention of vegetarian food-reform societies and similar bodies when opportunity may allow, a grocery-store propaganda could be successfully carried out which would aid materially in introducing the food. Under this plan a large retail grocery establishment should be selected for each city or town, in which a few feet of space can be utilized for a small gas stove and an expert baker who would prepare Indian corn before the people, describing its merits and distributing literature and samples free to customers of the house. A few weeks' effort of that kind would make the district thoroughly acquainted with the food and build up a trade for the grocer without expense to him. By this system every man, woman, and child would be able to test thoroughly our corn without trouble or expense, as the poorest part of the population can not always afford to visit an exhibition. By giving away the food many would be induced to try it for that reason alone, as people are generally averse to paying for experiments they are asked to make.

To give away anything, especially food, is a rare proceeding in Europe, and the unusual spectacle would, in all probability, be fully appreciated. No one could refuse to give it a trial under those circumstances, and, basing my belief on the result of long observation and experience in the exhibition work outlined, I am of the opinion that many so reached would become corn-eaters, and the new converts could not fail to influence others. It would not require many weeks to win over a whole city to corn in this manner through a small corn display in the largest grocery establishments of each district, as customers from other stores would be drawn, and the notice of the general public would be attracted by publicity in the newspapers and by other means of effective advertisement. Unlike exhibitions, the groceries would be always open; they could be visited without charge, and as fast as a demand was created the corn to supply it could be procured from the grocer at lowest market prices. To issue circulars to the families of the district, inviting them to partake of the food at the grocery stores where exhibited, would insure complete results and enhance the value of the scheme. It will be obvious to all that this method would be efficacious and very inexpensive. Having interviewed some of the leading grocers, I find that the idea is received with favor, and there would therefore be no obstacle to the immediate opening of a campaign through the United Kingdom



and other countries on the lines I have indicated. The work done at exhibitions and other popular gatherings is valuable, though to properly display corn at such places calls for considerable expenditure, and there is always the possibility of not reaching all classes of people, the very poor and the very rich.

In addition to the plan of grocery store missionary work just outlined, there is another opportunity for the spread of knowledge of corn in the United Kingdom, which would be most effective and could be easily seized upon, as I have already demonstrated by actual experience. In Great Britain, and upon the continent to a less extent, traveling cooking schools or exhibitions, maintained usually by philanthropic effort, go from town to town, instructing the people by means of lectures, literature, and experimental cooking, in the proper preparation of various foods. Knowledge of cooking as an art is thus disseminated free of cost, it being the intelligent opinion of those who support these peripatetic schools of instruction that no better charity can be done or service rendered to humanity than by spreading a knowledge of the proper methods of preparing food. These schools do more than give instructions in the art of preparing edible dishes; they give advice as to variety in food, necessary food for differing conditions, comparative value from a scientific standpoint of different articles, and other points valuable to the housewife for an economic study of the daily family table.

The persons conducting these exhibitions are intelligent, easily approached, and working solely for the purpose of elevating the standard of living and promoting the general welfare of the people. With proper effort it would be possible to make arrangements to have at least one dish prepared from corn included in the lecture or exhibition of each school, it being necessary in advance to instruct their teachers in the best methods of preparing palatable dishes, for of this all classes are alike without information, and to furnish sufficient meal for use in the practical exhibition. Literature or circulars giving other recipes, miscellaneous data upon the subject generally, and information as to where the meal might be obtained, could also be circulated at the meetings without very much expense. After a trade had been established, grocers handling the meal might reasonably be called upon to bear a share in such an expense in return for the advertisements which a statement that the product might be obtained at their place would give them.

#### INDORSEMENTS OF THE WORK.

Recognizing the fact that persons above the average in intelligence are more open to conviction than the general public, their prejudices giving way sooner when the truth is presented, I have made a special effort to attract the attention of prominent persons to my work. Another reason for this is the influence which well-known names exercise in molding public opinion. By securing an indorsement from such sources I have been very much assisted in my efforts to dispel the prej-

udice which exists in the common mind against the use of corn. I have sent samples of bread and other preparations to prominent and public personages, and they have almost uniformly given a warm approval of the work. I need mention only one name that will be of special interest to all Americans. The ex-premier of England, Right Hon. W. E. Gladstone, writes me that the corn bread received from me suited his taste perfectly, and he would be most happy to know that the British people were taking more of our corn than they have in the past.

American diplomatic and consular representatives abroad, who have been communicated with, are unanimous in their opinion that American corn can be introduced into Europe as human food if proper methods are taken to instruct Europeans as to its merits and cheapness. A few extracts may be quoted from some of the letters that have come to me. Consul R. W. Turner, of Cadiz, Spain, writes:

I am quite sure that if the food uses of corn were understood it would become a kitchen staple in Spain. The masses are poor, wages low, and all kinds of food supplies very high. There is no doubt in my mind that the fearful mortality in Spain is largely due to the lack of a plenty of cheap and wholesome food. I am sure that the proper efforts to instruct Spain in the food virtues of corn would meet with success.

Our minister to Copenhagen, Clark E. Carr, esq., states:

Indian corn is slightly known in the northern countries as human food. I tried to procure some not long ago, but failed. Corn starch was the only product of Indian corn known in the market. Finally I had some corn ground at the local mill, but the corn was not in good condition, and further, being improperly ground, the result was not happy. I think that with systematic effort, as you propose, our Indian corn can be brought into general use in all Scandinavian countries. I believe that in introducing this wholesome, nutritious food among these people we shall be doing them a greater kindness than to ourselves.

Consul Turner reports to the State Department as follows:

The great question with the working classes of Spain is how to get bread. This question would be less difficult of solution were the food uses of Indian corn as well understood here as in the United States. Corn bread, etc., would be great gifts to the workers of Europe, and it would seem that an understanding of their value might be brought about wherever the bread is hard to get. Being wholesome and cheap, corn should win its way. While corn has sold in the Missouri Valley at 15 to 20 cents a bushel, the people of Spain pay 8 cents a pound for bread. Biscuits manufactured by Peek, Frean & Co., London, retail in Cadiz for \$1 a kilogram.

Consul Roosevelt, Brussels, Belgium, writes:

Corn is not used by the Belgians as an article of food. Belgian peasants are not epicures, and devour almost everything that grows, except horse chestnuts. They live principally on black bread, though the well-to-do classes use wheat bread. I am confident that if corn were properly introduced in this market, and pamphlets published in the French language showing the different methods of preparing the same for food, the result would be that within twelve months two-thirds of the peasants, mechanics, and well-to-do classes would be using it. It would not only be a blessing to the poor, but as corn can not be properly raised in this country, it would make a market for farmers of the Western States of our country. Once the people of Europe are convinced that Indian corn is such a valuable breadstuff, there will be a great demand for it, and inasmuch as we are the great corn-producing country, the supply must naturally come from us.

I endeavored to have an exhibit at the great Agricultural Exhibition, Vienna (1890), but I could not come to a satisfactory arrangement with the authorities. I conducted part of the correspondence through our consul-general at Vienna, Julius Goldschmidt, esq., who warmly interested himself in my efforts. Referring to the exhibition, in his report to the State Department, he says:

The people of Europe and adjacent countries do not eat what in America is called corn, the word here meaning almost the same as grain does with us. Corn is our largest crop, yet it is that which we get least for, and such exhibits (Indian corn displays) would certainly result in an enlarged demand, which is at present only about 3 per cent of the whole yearly sum of our exportation. Many enterprises would profit by it besides the farmers, corn merchants, shippers, and transportation companies. A display of our corn at Vienna could be regarded as a nucleus and starting point of a series of similar exhibits in other parts of Europe. There is room in Europe for the consumption of several hundred million bushels of American corn per year, much of it as food for human beings who do not now get enough to eat. They do not know any more to-day how to utilize it as a human food than they did fifty years ago. All the known preparations of corn should be prepared, put on show, and distributed as samples free of charge to visitors.

#### AMERICAN CORN IN GERMANY.

My transfer, under your orders, from Great Britain to Germany has, to a certain extent, interrupted the progress of my work in the former country. At the same time, I think I may safely assert that the subject of Indian corn and its products for use as a human food has been sufficiently well introduced through the various channels which I have already indicated to insure progress in the work, for in these cooking schools and among the various representatives of charitable or other public institutions, and leaders in philanthropic work, the value of American corn in this respect has at last begun to be understood. In a word, then, though my work may be temporarily interrupted, I feel satisfied that I have left it in a condition to be made available by the individual energy of our dealers in Indian corn and its products. Indeed, I may confess to a little disappointment that my efforts heretofore have not elicited a more energetic coöperation on the part of persons so directly interested in the development of this industry, and I deem it to be my duty in closing the report upon the work which I have done in Great Britain under your direction up to the present time to emphasize the fact that, thanks to the encouragement given by you to this work and as a result of my own humble efforts, the good seed has been thoroughly well sown, and it remains for individual enterprise, in which, certainly, our American people have never yet been found wanting, to cultivate the field and reap the harvest.

In regard to the work in Germany, it is only possible at this writing to sketch the outlook, and this, I am glad to say, is very flattering. While so far I do not find, perhaps, as many channels through which to reach the people at large as in Great Britain, I am happy to say that I find a disposition on the part of Government officers to cordially coöperate

in my work, and I need hardly say that in this country the countenance of the Government counts for a great deal. That I have been able so promptly to present my work to the consideration of influential personages here is largely due to the cordial manner in which my mission has been welcomed by United States Minister Phelps, who has shown much interest in the work, and has afforded me every opportunity in his power to push it in influential quarters. It gives me pleasure to take this opportunity to state, however, that the action of the United States minister here is fully in accord with the general disposition of those of our diplomatic representatives abroad with whom I have been brought in contact in the prosecution of the work intrusted to me. I am also in receipt of letters from individuals asking for information, and showing much interest in the work. The condition of things on the continent is favorable to the introduction of a new cereal food and a new source of supply. I am, moreover, extremely hopeful of securing favorable consideration on the part of the army officials of a bread to be composed half of corn meal and half of rye meal, for use as army rations in place of a bread made of rye exclusively. I have already caused several loaves of such bread to be baked, and have submitted them to various persons, among them some Government officials, and I may state that in every case where tested this bread has received the highest commendation. Its cost will be much less than a bread consisting of rye exclusively, and I am satisfied that high medical authorities will substantiate its great value as a food.

Respectfully submitted.

C. J. MURPHY,  
*Special Agent in Europe of the U. S. Department  
of Agriculture, in the Interest of Indian Corn.*

BERLIN, *October 1, 1891.*

## THE FOOD VALUE OF MAIZE.

By Dr. H. W. WILEY, *Chief Chemist.*

The value of maize as food can best be determined by actual use. A fair idea of its character, however, can be obtained by a comparison of its chemical composition with that of other cereals used as food. The vast extent of country over which maize can be grown and the immense quantities of it which are produced render an accurate idea of its food value of the greatest interest. In the United States there is perhaps no other great staple crop of which it can be said that it can be produced abundantly and profitably in every State and Territory of our Union. Indian corn grows well in Florida; it is also one of the abundant crops of Minnesota. Along the Atlantic and Pacific coasts it can be found in great luxuriance. It is true that there are certain parts of the Missouri, Mississippi, and Ohio valleys, known as the great corn belt of the Northwest, in which the greater portion of the crop of maize is produced. It is nevertheless true that it is a valuable and indispensable crop in every part of our country.

Maize is also used as food in many other countries, but in the great cereal-consuming countries of Europe its value is little appreciated. In these countries rye, oats, barley, and wheat still form the great supply of cereal food for the consumption of the people. A proper understanding of the value of maize would at once place it in near competition with the other cereals mentioned as a supply for the inhabitants of the continent of Europe. As a further means of appreciating the position of maize as a food, it would perhaps be proper to call attention to the particular value of each of its constituents in the nourishment of the human body. Food, to be perfect, must give to the body all the necessary constituents to supply tissues for its growth and to take the place of the waste of tissue which is a necessary attendant on the functions of life. That article of food which is best calculated to supply the wants above mentioned would be, of necessity, the most valuable for food purposes. In general, we may say of foods that they should be fat-producers, muscle-producers, bone-producers, and most of all blood-producers, since it is through the blood that the tissues of the body are nourished. The food should also supply to the body the necessary materials which, by consumption within the body, supply

animal heat. A proper balance between all these functions of food is necessary to constitute any one article preëminently a food. It would be improper in this place to go into any extended discussion of the physiological action of digestion, therefore only a mere allusion will be made to these aspects of the subject.

As fat-producers are generally reckoned the starches and sugars which the food contains. The albuminoids which are taken in food are supposed to serve chiefly for the nourishment of the muscular tissues and to supply the nitrogenous principles of the blood. In the ash constituents of food are found those mineral substances which are necessary to supply the tissues of bone, such as phosphoric acid and lime, which are its chief constituents. The fats of food are supposed to be preëminently the source of animal heat, furnishing the same by their combustion in the different parts of the body under the action of the oxygen of the air.

In cereal foods, together with starch, may be reckoned the entire content of such foods in carbohydrates; that is, including starch, dextrine, and sugars in general, together with the fiber of the grain, which is composed almost exclusively of carbohydrates, a large part of which is digestible. The albuminoids of cereals contain various substances, all being related to each other and containing approximately the same percentage of nitrogen. This nitrogen content is the chief characteristic of the albuminoid foods. In wheat, for instance, one of the chief albuminoid substances is gluten, while in maize the content of gluten is not so large and other forms of albuminoids predominate. With these preliminary observations we may proceed to make a short study of maize as a food in comparison with the other cereals.

The Department of Agriculture has carried on extensive investigations in regard to the composition of American cereals. In regard to the maize of the United States the following analytical data have been determined and are recorded in Bulletin No. 1 of the Chemical Division of the Department of Agriculture. The average composition of maize for the whole country is shown in the following table:

	Per cent.
Water .....	10.04
Ash .....	1.52
Fat.....	5.20
Carbohydrates exclusive of indigestible fiber.....	70.69
Carbohydrates as indigestible fiber.....	2.09
Albuminoids.....	10.46

The highest albuminoids found in maize was 13.65 per cent and the lowest 7 per cent. There are slight variations found in maize grown in different parts of the country, but these variations are not large enough to materially affect the data given above.

In regard to the comparison of the analyses of maize by the Department of Agriculture and that given by other analyses, the following table will give all the necessary information:

*Average of American corn compared with averages of foreign investigations.*

	Department of Agriculture.	König.	Wolff.
Water.....	10.04	13.12	14.40
Ash.....	1.52	1.51	1.50
Oil.....	5.20	4.62	6.50
Carbohydrates.....	70.69	68.41	62.10
Fiber.....	2.09	2.49	5.59
Albuminoids.....	10.46	9.85	10.00
	100.00	100.00	100.00

In regard to this comparison of analyses Mr. Clifford Richardson, who conducted the investigations at the Department of Agriculture, makes the following observations:

There is no marked difference between the averages, except in the matter of water, where, as in the case of wheat, our maize is much drier. The American is rather better than the foreign article, if anything.

In the averages for different sections of the country another fact is discovered, which, after our experience with wheat, is still more surprising than the result of the comparison of American and foreign corns.

There is apparently the same average amount of ash, oil, and albuminoids wherever it grows, with the exception of the Pacific slope, where, as with wheat, there seems to be no faculty for obtaining or assimilating nitrogen.

The amount of water is variable, but, as has been said, many of the samples had been on exhibition for a considerable time, and were consequently dried out.

The increase in fiber from east to west is not paralleled in the wheat, but, as we have seen, is often a feature of increased vigor.

In regard to the composition of the ash of maize the following table will give the necessary data:

	Per cent.
Phosphoric acid.....	39.65
Magnesia.....	15.44
Silica.....	2.09
Oxide of iron.....	.60
Soda.....	7.54
Lime.....	1.59
Sulphuric acid.....	5.54
Potash.....	26.63
Loss.....	.92
	100.00

It is now necessary to bring together in a comparative table the chemical composition of the leading cereals in order to determine, by inspection, their relative value as foods, based upon the proportions of digestible matter which they contain.

	Hulled oats.	Wheat.	Rye.	Barley.	Maize.
Water.....	6.93	10.27	8.67	6.53	10.04
Ash.....	2.15	1.84	2.09	2.89	1.52
Oil or fat.....	8.14	2.16	1.94	2.68	5.20
Digestible carbohydrates.....	67.09	71.98	74.52	72.77	70.69
Crude carbohydrates.....	1.38	1.80	1.46	3.80	2.09
Albuminoids.....	14.31	11.95	11.32	11.33	10.46

The above results are based upon results obtained at the Department of Agriculture, in the Chemical Division, in an extensive series of analyses of American cereals extending over several years, beginning in 1882 and ending in 1886. It will be of interest to make a comparison of these results with the mean data collected by European analysts in regard to the composition of the chief cereals.

In the following table, taken from Koenig, are given the data referred to above:

*Mean composition of cereals.*

[From Koenig. Compilation.]

	Moisture.	Crude protein.	Crude fat.	Nitrogen free extract.*	Crude fiber.	Ash.
Mean of 948 analyses of wheat from all countries .....	13.37	12.04	1.85	68.65	2.31	1.78
Mean composition of rice .....	12.58	6.73	0.88	78.48	0.51	0.82
Mean composition of rye .....	13.37	10.81	1.77	70.21	1.78	2.06
Mean composition of millet .....	11.79	10.51	4.26	68.16	2.48	2.80
Mean composition of barley .....	14.05	9.66	1.93	66.99	4.95	2.42
Mean composition of buckwheat .....	12.68	10.18	1.90	71.73	1.65	1.86
Mean composition of oats .....	12.11	10.66	4.99	58.37	10.58	3.29
Mean composition of maize from all countries .....	13.35	9.45	4.29	69.33	2.29	1.29

From the above data it is possible to form a correct idea of the comparative food value of maize as compared with the other leading cereals, viz, wheat, oats, rye, and barley. First of all, it will be seen that in the water content of maize there is a striking resemblance to wheat. It has slightly less water than wheat, and considerably more than hulled oats, rye, or barley. In regard to the ash, it is as low or lower than that of any other cereal. It approaches more nearly that of wheat than that of hulled oats, rye, or barley. It is hardly fair, however, to make a comparison with hulled oats alone, inasmuch as when oats are used for food they are ground with the husk on. Especially is this true when used for animal food.

In regard to the oil or fat, maize takes distinctively the first place, with the exception of hulled oats. It contains more than twice as much oil as wheat, three times as much as rye, twice as much as barley, and two-thirds as much as hulled oats. In respect to the digestible carbohydrates, meaning by this term sugar, starch, dextrine, and digestible fiber, we find that maize takes its place along with the other cereals. It has more digestible carbohydrates than hulled oats, almost the same as wheat, and slightly less than rye or barley.

Concerning the quantity of indigestible carbohydrates, meaning by this term the indigestible fiber contained in the cereal, it is found that maize occupies a mean position in the list. It has not as large a percentage of indigestible fiber as hulled oats, a slightly larger quantity than wheat or rye, and a considerable less quantity than barley.

\* Digestible carbohydrates.



In regard to the matters containing nitrogen, which are grouped under the general head of albuminoids, it is seen by the table that the first place must be awarded to hulled oats. Compared with the other cereals maize has only a slightly lower percentage of these valuable constituents. Concerning the digestible matters in general, indicated in the above table, it may be said that the most important of the list are the digestible carbohydrates. Next in importance must be placed the bodies containing nitrogen, viz, the albuminoids. The third class in value will contain the oils or fats. The ash must also not be left out of consideration, since it is from this portion of the plant that the tissues of the bones especially are nourished. Water may be left out of account as of no food value, although it is indispensable to the nourishment of the human body. Its lack of commercial value renders its occurrence in foods in large quantities objectionable when their food value is considered pound for pound.

As indicated by the above analyses maize is fully equal in value as a food to any of the cereals, making up in its content of fat any deficiency which may be noticed in its nitrogenous matters and digestible carbohydrates. This conclusion, however, as to the food value of maize, does not rest alone upon the comparison of analytical data. The long years of use of this article by man and beast have shown its high character. Whether to be used as food for producing muscle for labor or as a means of fattening animals, it has been found to be of superior value to any of the other cereals produced in the United States. It feeds a large portion of the laboring men of the country, especially in the South. It is the almost universal food for fattening hogs, but in every function in which it has been used it has been found to bear out equally well the high place accorded to it from a study of its chemical composition.



# THE INDIAN CORN INDUSTRY IN THE UNITED STATES.

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Prepared by B. W. SNOW, *Assistant Statistician*, under the direction of  
J. R. DODGE, *Statistician*.

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Indian corn or maize occupies the leading position in the agriculture of the United States, both as regards aggregate volume of the annual product and the area under cultivation. It is also the most widely distributed crop, being grown to more or less extent in every State and Territory, and almost in every county in which agriculture is carried on. In actual breadth cultivated it each year exceeds the aggregate area devoted to all other cereals and potatoes, is about double the breadth cut for hay, and is grown upon an area greater than that devoted to wheat, oats, and cotton together. With an acreage of 78,000,000 acres it is the largest arable crop grown in any country, and our capabilities of extension in its production are hardly appreciated. It is a prominent if not the leading crop in every State except in some of the Rocky Mountain districts, where the elevation is too great for the best results, and on the Pacific coast, where it is a minor crop simply because farmers have had more profitable crops to which they have turned their attention. Its overshadowing importance in our agriculture is shown by the fact that the area devoted to its culture in many districts exceeds that given to the special crop for which that district is famous. Taking the eleven cotton States as a whole, they devote a larger area of their cultivated land to corn than to their snowy staple. In this respect corn is greater than cotton in the very dominion of the kingly plant. The great wheat belt of the Ohio and Missouri valleys gives maize a more prominent position than that occupied by wheat itself. The acreage now planted in a single year is greater than the total surface area of New England, New York, and New Jersey combined; greater than the whole area of the United Kingdom, or of Belgium, Holland, Switzerland, Denmark, Portugal, and Greece combined. It more than equals in extent the total cultivated land in France, or Germany, or Austria-Hungary, and is three-fourths as large as the aggregate acreage sown to wheat in all the countries of Europe together. In measured quantity our crop of a single year has exceeded the wheat crop of the civilized world, and no other grain crop approaches it in volume.

The growing of maize is not only the most important branch of our arable agriculture, but the product itself is again the foundation

upon which rests a large part of our wonderful rural development. About 96 per cent of our crop is annually consumed in this country, and more than 80 per cent never crosses the lines of the county in which it is grown—is virtually consumed on the farm where grown. It is the great American crop. On the farm it feeds the working animals, fattens the beeves and hogs, is an important constituent in butter and cheese production, and forms part of the family ration. It appears upon the table in American homes both as meat and bread, and again in the form of tempting and appetizing delicacies skillfully prepared from some of its many products. The forage which its blades furnish makes up a large portion of the winter feed of farm animals in many sections of the country where it supplements and sometimes takes the place of hay. This is especially true in the South where grasses for hay have not generally been successfully cultivated, and in the dairying districts where the use of the green plant entire in the form of ensilage is a common practice.

#### INDIAN CORN AS AN ARTICLE OF EXPORT.

Occupying as it does the first place in American agriculture, corn might naturally be expected to figure largely in our annual exports of agricultural products. The farmer's contributions to our foreign commerce have always been large, the results of his labor furnishing 75 per cent of the total value of our shipments abroad. Maize, however, has never been an important export item, the average annual shipment during the period, 1870 to 1890 inclusive, being but 56,000,000 bushels, and the heaviest shipment in a single year amounted to only 103,000,000 bushels. Less than 4 per cent of the production of the period has been sold abroad and 6.5 per cent is the largest proportion for any year of the two decades. The foreign demand has been almost entirely for use as animal food, and it is wanted in competition with oats, roots, and the ordinary European provender for work animals. The volume demanded depends upon the price at home, as it is only wanted when cheaper than other articles with which it can be used interconvertibly. The domestic price regulates the Liverpool price and determines the volume of shipment, an examination of trade returns showing that exports have been large when prices were low and small when better values ruled in this country.

Very little effort has ever been made by the people of this country to extend their foreign shipments in corn, and the Government itself has lent little or no aid in what has been done. There are abundant reasons why our Government should interest itself in inaugurating a foreign trade in this product. It is the greatest arable crop which we grow, occupies the largest portion of our cultivated area, and is suited for cultivation in almost every section of our domain. On account of the superior quality of American corn, due to the exceptional soil and climatic conditions which we possess, whatever demand for this cereal is created

throughout the world must largely be supplied from our own fields. Under present conditions, the corn crop of the world is greater in aggregate measured volume than that of wheat, and we grow at least three-fourths of all, and the area devoted to its cultivation in the United States is still susceptible of great extension. During the past fifty years our population has increased less than fourfold, while our production of this staple is now five times as great as it was in 1840, and if the demand existed our farmers might easily double their present acreage and product. Whatever competition might be met in its production would be a competition among our own people, and one which we ourselves could satisfactorily regulate.

No private agency exists which can be depended upon to make the effort to enlighten foreign people upon the merits of our great crop, or to push its exportation upon lines any broader than those which have been laid down by the commerce of the present day. In the case of wheat, a demand already exists which private firms are ready to supply, but if the demand did not exist, private individuals would interest themselves but very little in pushing the introduction of a product not already an article of commerce. In addition to the demand for our wheat, we have our great mills which are able and ready to push the introduction abroad of the flour which they produce, and in the case of our meat production, our packing houses may be trusted to take advantage of every possible opportunity for enlargement of their foreign trade. In the case of maize, however, there are no individuals or associations that can be relied upon to enter into the work of educating the tastes of the people of other countries. While all of our own people, especially those who are engaged in tilling the soil, are interested in anything tending to enlarge the trade in maize and its products, none of them have such a special interest as would result in their organizing an effort upon the proper lines. If such a systematic and organized effort is to be made, it must therefore naturally be made by the Government. The part which the Government has to play, however, will of course properly end when the people of foreign countries have been taught to appreciate the merits of maize as a food product, and a demand for our surplus has been created.

As a matter of course, the interest of this Government in the inauguration and extension of such a trade ends with the advantages and benefits which our own people are to derive from it. There is, however, another point of view which might be termed the philanthropic side of the question. Under present conditions, there is but little variety in the breadstuffs which form the daily rations of the populous empires of China, Japan, and British India. In the oriental countries, where the struggle for existence is most fierce, and where the search is continually for the cheapest material with nutritious value sufficient for the support of human life, it seems as if there might be a wide field for the introduction of our product. Certain it is that in China and Japan

the native population among the lower classes are hard pressed by the wants of nature, and if they could be taught that our maize furnishes a food stuff of exceptional value, cheap and in regular supply, a demand of enormous proportions might be created. In Europe the kind of grain used marks in a distinct manner the differences between the upper or wealthy class and the more numerous poorer classes. Wheat is the aristocratic and rye the plebeian grain, and there is but little gradation between these extremes of breadstuffs. The introduction of maize and its products might well give a welcome addition to the dietary of all classes—those who dine upon the dainty white loaf, as well as those whose subsistence is largely upon the coarse and cheaper breads from rye and other grains. To the first will be offered numerous toothsome dishes, maizenas, starches, and other preparations, while for those occupying less favored stations in life, a cheap grain capable of indefinite variations in preparation, both nourishing and healthful, will give more variety to the daily food supply, and bring additional comfort and contentment into the lives of the great mass of the Old World's population. From a hygienic standpoint, the introduction of a new food giving additional variety is desirable, and in this case on account of the valuable qualities of corn the extension is doubly desirable.

Prior to the effort which is now being made by this Department, this Government has never taken any organized or systematic means of calling attention of either foreign people or foreign governments to the advantages which might follow a more general consumption of maize and its products. The failure to take any such steps has sometimes been so marked as to savor of neglect. In the exhibition of the products of this country, which have been prepared for foreign expositions during the last decade, but little attention has been paid to a showing of corn and its products. The opportunity which the gathering together of millions of the most intelligent people of the different European countries has offered for an extension of knowledge upon this subject has heretofore been disregarded. The foreign exhibitions which we have made have usually been vastly creditable both to the genius of our people and to the energy of our Government, but they have been usually prepared with a view to showing what we are doing and what we are capable of doing in the way of supplying demands which already exist. Maize, making but a small showing in our foreign trade, has been given but small space, whereas a new trade might have been created had special effort been made in its behalf.

The governments of the principal countries of Europe are already favorable to the importation of our corn, leaving the prejudice of their people against its use as food the only obstacle to be overcome. The importation is free of duty in the United Kingdom, France, Belgium, Holland, and Denmark, and only a moderate rate of duty is imposed in Germany and Spain. It seems that it might be possible to accomplish

much in the work now in hand by an intelligent effort to interest government officials in the question. One of the greatest problems confronting the statesmen of Europe to-day is the question of maintaining the present enormous military establishment, imposed upon each country by existing conditions, at the highest point of possible efficiency with the lowest charge upon the tax-burdened citizen. The ration to be issued is a serious question; the necessity from a hygienic point of view of supplying a diet concentrated, highly nutritious, and at the same time varied enough to meet the requirements of modern dietary demands, is in direct conflict with the necessity for an economical administration of the commissary department. Maize makes a concentrated food stuff, palatable and nourishing when properly prepared, and is especially valuable for use where muscle and hard labor are required. This is pointedly shown by the fact that in the United States it is the principal breadstuff of the colored workers of the South, where long hours of arduous labor in the cotton fields under conditions severely testing the endurance of workers are required.

Its value as part of the soldier's food is appreciated in this country, where the rations established by the military authorities include for bread "18 ounces of soft bread or flour, or 16 ounces of hard bread, or 1 pound and 4 ounces of corn meal." The value of corn meal as a constituent of the army ration was demonstrated practically during the war of the rebellion. The larger portion of the bread used by the Southern armies was made from corn, while at the same time it furnished a large part of the food supply of the Federal forces. Its value here received the most crucial test which could possibly be applied, and the wonderful strength and endurance shown by combatants on both sides is sufficient evidence of its value. It is apparent that its adoption as part of the army ration in European countries would be highly desirable, looking at the question from all points of view. The advantage to the governments would be in the fact that it would give as a part of the ration a grain cheaper than any other in first money cost, and a supply certain and abundant, not subject to such fluctuations in production as wheat or rye, being better adapted than most other crops to withstand our climatic disabilities, drought especially. The joint benefit to the government and to the individuals making up the military establishments would be the addition of a food to the ordinary supply rich in fat and muscle-producing qualities, full of the properties producing animal heat, and giving additional powers of endurance. This means increased military efficiency for the whole body, as well as increased comfort for the individuals making up the service.

A properly directed effort, setting forth the manifest and manifold advantages which would result from its adoption as part of army rations, might be eminently successful, and would be especially appropriate at the present time in view of the fact that the regular breadstuffs now dealt out are deficient in supply and high in price, two

conditions which it might be pointed out could hardly obtain were maize depended upon. Experiments will undoubtedly be carried on in different countries to determine whether any other bread, and, if any, what bread, can be used this year to take the place of or supplement the use of rye in the rations issued to the armies of Eastern Europe. An opportunity for presenting the advantages of corn is given this year which may not be had again for years, and our Government has been prompt in taking advantage of it. The special agent in Europe is now working on this line with evidences of ultimate success. Should corn be adopted as part of the army food it would at once create a very large and new demand for our surplus grain, giving an impetus to our agricultural interests which would be felt throughout the length and breadth of the land. Tremendous, however, as is the military establishment of Europe, and enormous as is the volume of corn which might be demanded to supply it alone, a still greater advantage would accrue to us were the various Governments to merely recognize and indorse corn as a food for man. It would result in breaking down the barriers of prejudice which the ignorance of centuries has erected against its use in the minds of the common people. Not only would the example of the Government in its recognition be a powerful agent in securing it a foothold, but the thousands of soldiers who while in service had acquired a taste for the preparations of corn would become, when they left the service to return to civil life, agents in spreading the knowledge of its virtues in all walks of life.

#### CANNED CORN.

During recent years a very important industry has grown up in this country which has resulted in making a very desirable addition to our American daily food supply. The canning of green sweet corn has become in many sections a very large interest, and the product enters into the channels of trade in all sections of the country, is found in every grocery store, and reaches the family table of a large portion of our American homes. The roasting ear, or green corn upon the cob, during the season in which it may be obtained, is recognized as not only a seasonal luxury, but a standard article of food, and it appears and is appreciated both upon the table of the farmer and of that of the urban citizen.

In this form corn has been an article of diet in this country from the earliest times. It is only, however, within comparatively recent years that methods have been followed in preparing it for use outside of its regular season of growth. The canning industry is now a very large and flourishing one, and factories for preserving fruits and vegetables of different kinds are found in every State and in almost every large agricultural district. In 1890 the pack of canned corn amounted to 1,588,860 cases of 2 dozen tin cans each, and in 1888, the largest year



on record, to 3,491,474 cases. The reputation of this class of our industrial product is attested by the steady and rapid increase of consumption in our domestic markets. Our people are particular, even fastidious, as to their diet, and the popular taste for delicacies and appetizing preparations of standard articles of food requires an intelligent study of methods by packers that insures a constant elevation of the standard of quality.

The question of cheapness is second to that of quality of product, and commercial records show that during the past few seasons there has been demand for superior articles at remunerative prices, and inferior grades have been a drug on the market at low values. Our packers appreciate this, and by the law of the survival of the fittest, the struggle to maintain place in the market has constantly tended toward educating and elevating the public taste to a still higher standard. The present should be an auspicious time for a permanent and valuable enlargement of our foreign trade in this branch of corn products. American canned meats are known in every portion of the civilized world, and are exported from this country directly to almost every nation upon the globe. With proper effort, intelligently and systematically directed, it should be possible to build up a similar trade in our canned vegetables, and especially in corn, in the production of which it is not probable that we shall ever meet any competitor worthy of the name in any foreign market. A careful investigation of methods used by canners and packers shows that the most scientific practices prevail, that all the latest improvements are adopted, and that there is a constant striving to attain perfection in method of packing and quality of goods.

The development of a large trade in canned corn would be particularly valuable to this country. Not only would there be an increased planting of sweet corn and other varieties used by packers, which would benefit farmers in the way of a direct cash return, but the offal resulting from the preparation of the product would remain at home. An examination of the system followed at a number of large packing houses shows that the offal in the way of soft cobs, nubbins, tips of ears, etc., is returned to the farmers growing the stock, by them hauled back to the farm and used as forage for different classes of farm animals, and when it has accumulated in excess of immediate requirements cured for future use. In some districts it has been extensively used in the form of ensilage.

The following note, received from the manager of a large packing house in Syracuse, N. Y., is typical of the state of facts which have been found to exist quite extensively throughout the districts where corn canning is largely carried on.

Farmers, as fast as they bring the corn picked from the stalk in wagonloads and unloading same at our factory, are quite anxious and ready to wait their turn, if necessary, to load back with the fresh cobs and husks, which of course we have in large quantities. By this means they remove our offal as fast as it accumulates.

We understand that it is taken to their pastures, as a rule, and fed to milch cows, as nearly all the farmers who raise crops for us are dairymen. They have found by experience that there is no food that they can give their cows that gives the same return as this fresh offal. Foremen in charge of creameries have told us that they can always tell when a canning factory has been started by the increase in amount and quality of milk received by them. We presume that we could make a considerable profit from this material were we to preserve it in the form of ensilage for sale later in the season. It has, however, become one of the conditions of farmers planting corn for us that they should have their share of this offal in return.

An increase in this form of manufacture necessarily carries with it an increase in the amount and quality of food for farm animals, and returns directly to the soil upon which the corn is grown the valuable constituent elements withdrawn by the crop. By this means fertility is maintained and the heritage of future generations preserved intact.

#### INDIAN CORN STATISTICS.

In connection with the report upon the possibility of extending corn consumption for food in foreign countries a number of statements have been compiled, which will be interesting as a showing of the progress of corn production in this country, its geographical distribution, the foreign movement from the earliest period, and prices under different conditions. In the statement first presented there is a showing of the aggregate volume of production as returned by five decennial censuses, beginning with 1840 and coming up to 1889; the figures for the census of 1890 have not yet been made public. As enumerations are made too early in the season to include crop returns for the census year, the crop of each preceding year is reported, as appears in the table.

In 1839 the total crop amounted to 377,531,875 bushels, while forty years later it was nearly five times as great. In the first year the production per capita amounted to 22 bushels, and in 1879 to 35 bushels, showing that production has considerably more than kept pace with the increase in population.

An interesting feature in this table is the showing which is made of the continued westward movement of corn production. In 1839 the center of production had already moved to the west of the Alleghany Mountains, and Tennessee, with 44,986,188 bushels, was the first in rank, closely followed by the sturdy, growing Commonwealths of the Ohio Valley. Ten years later, in 1849, the center of production had moved north and westward, and Ohio, with 59,000,000 bushels, stood first, closely followed by Kentucky with 58,000,000 and Illinois with 57,000,000. The returns for 1859 bear evidence of the magnificent development of the agricultural districts of the central West, and the center of production had shifted to the rich prairie soil of Illinois, where it remained for three decades. In 1879 Illinois still kept first place, but during the ten years which have since elapsed the scepter has crossed the Mississippi River, and Iowa now ranks as the greatest corn producing State in the country. It must not be assumed that in the move-

ment of corn production westward the areas which have at one time held first rank in production and then fallen back to positions of less prominence have been left with depleted fertility, or that corn-growing has been abandoned upon them. Such has not been the case. The yield per acre in New York and Pennsylvania, and again in the Ohio Valley, is not less now than it was in the days of primitive fertility, but, on the contrary, has grown larger with the application of better methods of husbandry and a more lively appreciation of the advantages of soil and climate which have come with additional experience. The decline in relative position of the older States results from the immense areas developed in newer regions. Tennessee, which ranked first in 1839, now produces nearly double the volume of that year, but in 1889 stood only ninth in the rank of production.

*Indian corn production in the United States according to decennial census returns.*

States and Territories.	1839.	1849.	1859.	1869.	1879.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Maine.....	950, 528	1, 750, 056	1, 546, 071	1, 089, 888	960, 633
New Hampshire.....	1, 162, 572	1, 573, 670	1, 414, 628	1, 277, 768	1, 356, 248
Vermont.....	1, 119, 678	2, 032, 396	1, 525, 411	1, 699, 882	2, 014, 271
Massachusetts.....	1, 809, 192	2, 345, 490	2, 157, 063	1, 397, 807	1, 797, 768
Rhode Island.....	450, 498	539, 201	461, 497	311, 957	372, 967
Connecticut.....	1, 500, 441	1, 935, 043	2, 059, 835	1, 570, 364	1, 880, 421
New York.....	10, 972, 286	17, 858, 400	20, 061, 049	16, 462, 825	25, 690, 156
New Jersey.....	4, 361, 975	8, 759, 704	9, 723, 336	8, 745, 384	11, 159, 705
Pennsylvania.....	14, 240, 022	19, 835, 214	28, 196, 821	34, 702, 006	45, 821, 531
Delaware.....	2, 099, 359	3, 145, 542	3, 892, 337	3, 010, 390	3, 894, 264
Maryland.....	8, 233, 086	10, 749, 858	13, 444, 922	11, 701, 817	15, 968, 533
Virginia.....	34, 577, 591	35, 254, 319	38, 319, 999	17, 649, 304	29, 119, 761
North Carolina.....	23, 893, 763	27, 941, 051	30, 078, 564	18, 454, 215	28, 019, 839
South Carolina.....	14, 722, 805	16, 271, 454	15, 065, 666	7, 614, 207	11, 767, 099
Georgia.....	20, 905, 122	30, 080, 099	30, 776, 293	17, 646, 459	23, 202, 018
Florida.....	898, 974	1, 996, 809	2, 834, 391	2, 225, 056	3, 174, 234
Alabama.....	20, 947, 004	28, 754, 048	33, 226, 282	16, 977, 948	25, 451, 278
Mississippi.....	13, 161, 237	22, 446, 552	29, 057, 682	15, 637, 316	21, 340, 800
Louisiana.....	5, 952, 912	10, 266, 373	16, 853, 745	7, 596, 628	9, 889, 689
Texas.....	.....	6, 028, 876	16, 500, 702	20, 554, 538	29, 065, 172
Arkansas.....	4, 846, 632	8, 893, 939	17, 823, 588	13, 382, 145	24, 156, 417
Tennessee.....	44, 986, 188	52, 276, 223	52, 089, 926	41, 343, 614	62, 704, 429
West Virginia.....	.....	.....	.....	8, 197, 865	14, 090, 609
Kentucky.....	39, 847, 120	58, 672, 591	64, 043, 633	50, 091, 096	72, 852, 263
Ohio.....	33, 698, 144	59, 078, 695	73, 543, 190	67, 501, 144	111, 877, 124
Michigan.....	2, 277, 039	5, 641, 420	12, 444, 676	14, 086, 238	32, 461, 452
Indiana.....	28, 155, 887	52, 964, 363	71, 588, 919	51, 094, 538	115, 482, 300
Illinois.....	22, 634, 211	57, 646, 984	115, 174, 777	129, 921, 395	325, 792, 481
Wisconsin.....	379, 359	1, 988, 979	7, 517, 300	15, 033, 998	34, 230, 579
Minnesota.....	.....	16, 725	2, 941, 952	4, 743, 117	14, 831, 741
Iowa.....	1, 406, 241	8, 656, 799	42, 410, 686	68, 935, 065	275, 014, 247
Missouri.....	17, 332, 524	36, 214, 537	72, 892, 157	66, 034, 075	202, 414, 413
Kansas.....	.....	.....	6, 150, 727	17, 025, 525	105, 729, 325
Nebraska.....	.....	.....	1, 482, 080	4, 736, 710	65, 450, 135
California.....	.....	12, 236	510, 708	1, 221, 222	1, 993, 325
Oregon.....	.....	2, 918	76, 122	72, 138	126, 862
Nevada.....	.....	.....	460	9, 660	12, 891
Colorado.....	.....	.....	.....	231, 903	455, 968
Arizona.....	.....	.....	.....	32, 041	34, 746
Dakota.....	.....	.....	20, 269	133, 140	2, 000, 864
Idaho.....	.....	.....	.....	5, 750	16, 408
Montana.....	.....	.....	.....	320	5, 649
New Mexico.....	.....	365, 411	709, 304	640, 823	633, 786
Utah.....	.....	9, 899	90, 482	95, 557	163, 342
Washington.....	.....	.....	4, 712	21, 781	39, 183
District of Columbia.....	39, 485	65, 230	80, 840	28, 020	29, 750
Total.....	377, 531, 875	592, 071, 104	838, 792, 742	760, 944, 549	1, 754, 591, 676

Census data for the crop of the year 1889 not being available, a statement made up from the estimates of this office, showing acreage, prod-

uct, and farm value by States is presented. This statement is practically a continuation of the preceding table, and rounds off a showing of the progress of corn production during the last half century. It presents the largest crop ever grown in this country and the largest cereal crop ever grown in any country, with a volume larger than the aggregate wheat crop of the civilized world for that year.

*Indian corn crop in the United States, 1889.*

States and Territories.	Bushels.	Acres.	Value.
Maine.....	1,034,000	28,717	\$589,273
New Hampshire.....	1,311,000	35,924	734,287
Vermont.....	2,044,000	58,397	1,124,142
Massachusetts.....	1,997,000	58,209	1,078,147
Rhode Island.....	393,000	12,558	229,116
Connecticut.....	1,766,000	56,977	953,795
New York.....	20,475,000	698,800	10,032,672
New Jersey.....	10,792,000	357,342	5,395,864
Pennsylvania.....	41,225,000	1,383,377	18,963,332
Delaware.....	3,905,000	223,136	1,640,050
Maryland.....	15,105,000	733,239	6,495,031
Virginia.....	34,231,000	2,152,911	15,061,765
North Carolina.....	33,050,000	2,754,127	17,516,248
South Carolina.....	18,310,000	1,592,152	9,887,264
Georgia.....	33,730,000	3,011,602	18,551,468
Florida.....	5,206,000	486,562	3,019,604
Alabama.....	33,944,000	2,514,370	17,311,437
Mississippi.....	29,474,000	1,991,481	14,736,960
Louisiana.....	18,949,000	1,082,826	9,664,222
Texas.....	83,698,000	4,573,645	29,294,196
Arkansas.....	42,608,000	2,130,399	18,321,431
Tennessee.....	80,831,000	3,674,140	29,907,500
West Virginia.....	15,199,000	678,518	6,079,521
Kentucky.....	75,382,000	2,844,601	25,629,855
Ohio.....	88,953,000	3,005,184	27,575,568
Michigan.....	22,737,000	967,513	8,412,526
Indiana.....	106,656,000	3,677,808	28,797,237
Illinois.....	259,125,000	8,022,454	62,190,063
Wisconsin.....	28,415,000	1,080,414	8,240,318
Minnesota.....	21,263,000	746,067	5,740,986
Iowa.....	349,966,000	8,859,898	66,493,534
Missouri.....	218,841,000	6,796,318	50,333,531
Kansas.....	240,508,000	6,813,251	43,291,397
Nebraska.....	149,543,000	4,097,067	25,422,301
California.....	4,464,000	158,288	2,544,322
Oregon.....	157,000	7,854	102,102
Colorado.....	1,092,000	42,993	633,373
Dakota.....	14,743,000	819,068	4,865,264
New Mexico.....	1,126,000	56,289	675,468
Utah.....	644,000	35,175	392,659
Total.....	2,112,892,000	78,319,651	597,918,829

As an epitome of the statistics of production, a table is presented showing the aggregate production by years from 1880 to 1890, inclusive, with the acreage and value of the crop, the value per unit of quantity, the yield per acre, and value per acre for each year, and for the period as compared with the average production of the preceding decade.

As the year 1890 was a disastrous one in the history of the crop, an average in the period 1880 to 1889, inclusive, is also presented. This table shows an increase of nearly 50 per cent in the average annual production for the period 1880 to 1889 as compared with the period 1870 to 1879. The increase in volume has naturally resulted in a decrease in the average farm price, but not in proportion. The very small decline in average price shows that production has not been unduly stimulated,

and that consumption has practically kept pace with it. It must not be assumed that because the average yield per acre for the first decade was returned 3 bushels larger than that of the second, that there has been any permanent impairment of fertility or that corn lands have been exhausted by continued cropping. The difference in meteorological conditions of different seasons accounts for the decline. The first period included a large number of years in which the most favorable conditions prevailed, while the latter period includes an unusual number in which drought or early frosts seriously interfered with crop results. That the possibilities of our soil are fully as great now as in earlier years is demonstrated by the fact that during the present season, 1891, not wholly favorable to corn-growing, the yield per acre is less than one-half of 1 bushel below the average of the period 1870 to 1879.

*Indian corn crop in the United States, 1880-1890.*

Years.	Total production.	Total area of crop.	Total value of crop.	Average value per bushel.	Average yield per acre.	Average value per acre.
	<i>Bushels.</i>	<i>Acres.</i>		<i>Cents.</i>	<i>Bushels.</i>	
1880.....	1,717,434,543	62,317,842	\$679,714,499	39.6	27.6	\$10.91
1881.....	1,194,916,000	64,262,025	759,482,170	63.6	18.6	11.82
1882.....	1,617,025,100	65,659,545	783,867,175	48.5	24.6	11.94
1883.....	1,551,066,895	68,301,889	658,051,485	42.4	22.7	9.63
1884.....	1,795,528,000	69,683,780	640,735,560	35.7	25.8	9.19
1885.....	1,936,176,000	73,130,150	635,674,630	32.8	26.5	8.69
1886.....	1,665,441,000	75,694,208	610,311,000	36.6	22.0	8.06
1887.....	1,456,161,000	72,392,720	646,106,770	44.4	20.1	8.93
1888.....	1,987,790,000	75,672,763	677,561,580	34.1	26.3	8.95
1889.....	2,112,892,000	78,319,651	597,918,829	28.3	27.0	7.64
1890.....	1,489,970,000	71,970,763	754,433,451	50.6	20.7	10.48
Total.....	18,524,400,538	777,405,336	7,443,857,149	.....	.....	.....
Average, 11 years, 1880 to 1890.....	1,684,036,413	70,673,212	676,714,286	40.2	23.8	9.58
Average, 10 years, 1880 to 1889.....	1,703,443,054	70,543,457	668,942,370	39.3	24.1	9.48
Average, 10 years, 1870 to 1879.....	1,184,486,954	43,741,331	504,571,048	42.6	27.1	11.54

In connection with the showing of aggregate production and distribution of the crop by States, which is given in the preceding tables, a showing of the distribution of the crop in comparison with the total surface area of the States is presented. This shows that there are ten States which devote more than 10 per cent of their total surface area, including land both in and out of farms, to the cultivation of this one crop. The great agricultural State of Iowa gives up 25 per cent, while in Illinois the proportion is but little less. The smallest proportion is naturally in the Rocky Mountain region, where the elevation is too great for a full development of the cereal, and to New England, where with small farms and intensive culture other crops are found more profitable.

In the following statement the country is divided into five groups according to the proportion of total surface area given up to corn in 1889, the first group including all having more than 100 acres and the

last group having less than 20. The general average for the whole country is 42.2 acres for each 1,000 acres of land surface, exclusive of Alaska:

100 AND OVER.		West Virginia .....		43
Delaware.....	178	21 TO 40.		
Maryland.....	116	New York .....	23	
Tennessee.....	138	Louisiana .....	37	
Kentucky.....	111	Texas .....	27	
Ohio.....	115	Michigan .....	26	
Indiana.....	160	Wisconsin .....	31	
Illinois.....	224	20 AND UNDER.		
Iowa.....	250	Maine.....	2	
Missouri.....	155	New Hampshire.....	6	
Kansas.....	130	Vermont.....	10	
71 TO 100.		Massachusetts.....	11	
New Jersey.....	75	Rhode Island.....	18	
Virginia.....	84	Connecticut.....	18	
North Carolina.....	89	Florida.....	14	
South Carolina.....	83	Minnesota.....	15	
Georgia.....	80	California.....	2	
Alabama.....	76	Oregon.....	1—	
Nebraska.....	84	Colorado.....	1—	
41 TO 70.		Dakota.....	9	
Pennsylvania.....	48	Utah.....	1—	
Mississippi.....	67	New Mexico.....	1—	
Arkansas.....	63	General average.....	42.2	

We have had a limited foreign trade in corn and its products from very early times, but the demand for consumption in foreign countries has never been great enough to make it a prominent feature in our agricultural exports. As far back as 1821, we exported a little more than 1,000,000 bushels, and it was more than twenty years from that date before the amount had doubled. The quantity sent abroad yearly in the earlier history of the trade was remarkably uniform.

In the table presented there is a showing of the exports of corn and meal, and the total in the form of corn by five year periods from 1821 to 1880, and yearly from that time until the present, the figures being for the fiscal years ending on June 30 of the years named since 1842; prior to that date the fiscal year ended on September 30.

In 1890, following the magnificent crop of 1889, and as a result of the low price which prevailed throughout this country, the hundred million bushel mark was reached for the first time. The fact that our foreign importation depends upon the price at home is well illustrated by the record of the year following, when, with a short crop and high prices, we had less than one-third as much.

## Exports of Indian corn and meal from the United States.

Years.	Corn.		Corn meal.		Total corn.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	<i>Bushels.</i>	<i>Dollars.</i>	<i>Barrels.</i>	<i>Dollars.</i>	<i>Bushels.</i>	<i>Dollars.</i>
1821-25.....	702, 870	374, 044	152, 281	435, 424	1, 311, 905	810, 368
1826-30.....	706, 142	403, 985	156, 682	480, 874	1, 332, 868	884, 859
1831-35.....	513, 789	360, 942	163, 477	546, 215	1, 167, 696	907, 157
1836-40.....	236, 995	174, 621	168, 786	694, 243	912, 139	868, 864
1841-45.....	694, 822	351, 120	226, 550	607, 404	1, 601, 021	958, 524
1846-50.....	8, 764, 431	6, 255, 584	498, 740	1, 796, 850	10, 759, 391	8, 052, 434
1851-55.....	4, 781, 039	3, 542, 540	224, 291	829, 464	5, 678, 204	4, 372, 004
1856-60.....	5, 519, 579	3, 957, 836	258, 268	983, 503	6, 552, 653	4, 941, 339
1861-65.....	10, 522, 406	6, 980, 673	235, 321	1, 064, 654	11, 463, 691	8, 045, 327
1866-70.....	9, 598, 655	9, 428, 763	271, 005	1, 469, 090	10, 682, 674	10, 897, 853
1871-75.....	29, 230, 583	20, 892, 989	320, 811	1, 292, 318	30, 513, 825	22, 185, 307
1876-80.....	78, 056, 356	43, 374, 050	396, 535	1, 237, 192	79, 642, 495	44, 611, 242
1881.....	91, 908, 175	50, 702, 669	434, 993	1, 270, 200	93, 648, 147	51, 972, 869
1882.....	43, 184, 915	28, 845, 830	288, 942	994, 201	44, 340, 683	29, 840, 031
1883.....	40, 586, 825	27, 756, 082	267, 207	980, 798	41, 655, 653	28, 736, 880
1884.....	45, 247, 490	27, 648, 044	252, 779	818, 739	46, 258, 606	28, 466, 783
1885.....	51, 834, 416	28, 003, 863	200, 510	816, 459	52, 876, 456	28, 820, 322
1886.....	63, 655, 433	31, 730, 922	293, 546	858, 370	64, 829, 617	32, 589, 292
1887.....	40, 307, 252	19, 347, 361	265, 333	705, 343	41, 368, 584	20, 052, 704
1888.....	24, 278, 417	13, 355, 950	270, 613	765, 036	25, 360, 869	14, 126, 986
1889.....	69, 592, 929	32, 982, 277	312, 186	870, 485	70, 841, 673	33, 852, 762
1890.....	101, 973, 717	42, 658, 015	361, 248	896, 879	103, 418, 709	43, 554, 894
1891.....	30, 768, 213	17, 652, 687	318, 329	946, 977	32, 041, 529	18, 599, 664

The insignificance of the consumption of our corn abroad as compared with the consumption at home has already been shown, but in the following table the estimated annual production each year from 1870 to 1890, with the amount which has been shipped abroad from each crop, is presented, in order that a showing of the proportion of each crop sent abroad may be made. From this it appears that less than 4 per cent of the average crop of the last twenty-one years has been shipped, and that the largest proportion sold abroad was only 6.5 per cent in 1877, ranging from that to 1 per cent in 1870.

It should be stated, perhaps, that in this table the figures referring to production relate to calendar years, while those referring to exports relate to fiscal years, beginning with July 1 of the year which is mentioned. The object of this arrangement is to show as accurately as possible what proportion of a given crop is exported.

## Production and export of corn.

Years.	Production.	Exports.	Exportation.	Years.	Production.	Exports.	Exportation.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Per cent.</i>		<i>Bushels.</i>	<i>Bushels.</i>	<i>Per cent.</i>
1870.....	1, 094, 255, 000	10, 673, 553	1. 0	1882.....	1, 617, 025, 100	41, 655, 653	2. 6
1871.....	991, 898, 000	35, 727, 010	3. 6	1883.....	1, 551, 066, 895	46, 258, 606	3. 0
1872.....	1, 062, 719, 000	40, 154, 374	3. 7	1884.....	1, 795, 528, 000	52, 876, 456	2. 9
1873.....	932, 274, 000	35, 985, 834	3. 7	1885.....	1, 936, 176, 000	64, 829, 617	3. 3
1874.....	850, 148, 500	30, 025, 036	3. 5	1886.....	1, 665, 441, 000	41, 368, 584	2. 5
1875.....	1, 321, 069, 000	50, 910, 532	3. 9	1887.....	1, 456, 161, 000	25, 360, 869	1. 7
1876.....	1, 283, 827, 500	72, 652, 611	5. 7	1888.....	1, 987, 790, 000	70, 841, 673	3. 6
1877.....	1, 342, 558, 000	87, 192, 110	6. 5	1889.....	2, 112, 892, 000	103, 418, 709	4. 9
1878.....	1, 388, 218, 750	87, 884, 892	6. 3	1890.....	1, 489, 970, 000	32, 041, 529	2. 2
1879.....	1, 754, 591, 676	99, 572, 329	5. 7				
1880.....	1, 717, 434, 543	93, 648, 147	5. 5				
1881.....	1, 194, 916, 000	44, 340, 683	3. 7				
				Annual average.	1, 455, 998, 094	55, 591, 372	3. 8

In the showing of average prices of corn for a long series of years Chicago has been selected as being near the center of the great surplus region. Three dates in each year since 1871 have been selected upon which to present the cash price of No. 2 corn, the standard commercial grade; and in connection with this a showing of the farm price in December of each year, as returned to the Statistician of the Department of Agriculture by its corps of county correspondents, is given. The export price for each fiscal year during the same period is also shown. In making comparisons of these various prices it must be remembered that Chicago, being in the surplus district where the transportation charges from the field to the warehouse are small, shows at times a lower commercial price than the average farm price for the country. The farm price represents the value in the hands of growers, either upon the farm where grown or at local purchasing points, while the export price is the value at the seaboard after the product has borne the cost of transportation, commissions of middlemen, and general handlers.

[Cents per bushel.]

Years.	Chicago prices on the first Saturday of the month.			Farm price, Decem-ber.	Export price, fiscal year follow-ing.
	January.	May.	September.		
1871 .....	43 $\frac{1}{2}$ -44 $\frac{1}{2}$	54 -56	43 $\frac{1}{2}$ -46	48.2	69.6
1872 .....	40 $\frac{1}{2}$ -41 $\frac{1}{2}$	42 $\frac{1}{2}$ -44 $\frac{1}{2}$	35 $\frac{1}{2}$ -39 $\frac{1}{2}$	39.8	61.7
1873 .....	30 $\frac{1}{2}$ -31	37 -38 $\frac{1}{2}$	39 $\frac{1}{2}$ -42 $\frac{1}{2}$	48.0	71.9
1874 .....	49 -54 $\frac{1}{2}$	64 -65 $\frac{1}{2}$	66 $\frac{1}{2}$ -73 $\frac{1}{2}$	64.7	84.7
1875 .....	64 $\frac{1}{2}$ -69	71 -76 $\frac{1}{2}$	61 -63 $\frac{1}{2}$	42.0	67.2
1876 .....	43 -45	44 $\frac{1}{2}$ -46	41 $\frac{1}{2}$ -43 $\frac{1}{2}$	37.0	58.7
1877 .....	43 $\frac{1}{2}$ -44 $\frac{1}{2}$	50 $\frac{1}{2}$ -57 $\frac{1}{2}$	41 $\frac{1}{2}$ -43 $\frac{1}{2}$	35.8	56.2
1878 .....	42 $\frac{1}{2}$ -43 $\frac{1}{2}$	39 $\frac{1}{2}$ -41 $\frac{1}{2}$	35 $\frac{1}{2}$ -37 $\frac{1}{2}$	31.8	47.1
1879 .....	29 $\frac{1}{2}$ -30	33 $\frac{1}{2}$ -34 $\frac{1}{2}$	32 $\frac{1}{2}$ -33 $\frac{1}{2}$	37.5	54.3
1880 .....	39 $\frac{1}{2}$ -40 $\frac{1}{2}$	36 -36 $\frac{1}{2}$	38 $\frac{1}{2}$ -40 $\frac{1}{2}$	59.6	55.0
1881 .....	36 -37 $\frac{1}{2}$	42 $\frac{1}{2}$ -43 $\frac{1}{2}$	60 $\frac{1}{2}$ -63 $\frac{1}{2}$	63.6	67.0
1882 .....	60 $\frac{1}{2}$ -63 $\frac{1}{2}$	73 $\frac{1}{2}$ -75 $\frac{1}{2}$	72 $\frac{1}{2}$ -76 $\frac{1}{2}$	48.5	68.0
1883 .....	49 $\frac{1}{2}$ -51 $\frac{1}{2}$	54 -56	49 -51 $\frac{1}{2}$	42.4	61.0
1884 .....	54 $\frac{1}{2}$ -57 $\frac{1}{2}$	52 $\frac{1}{2}$ -56	51 $\frac{1}{2}$ -58 $\frac{1}{2}$	35.7	54.0
1885 .....	34 $\frac{1}{2}$ -34 $\frac{1}{2}$	46 $\frac{1}{2}$ -49	43 -44	32.8	50.0
1886 .....	36 $\frac{1}{2}$ -36 $\frac{1}{2}$	36 $\frac{1}{2}$ -37	40 -42	36.6	48.0
1887 .....	36 $\frac{1}{2}$ -37 $\frac{1}{2}$	37 $\frac{1}{2}$ -38 $\frac{1}{2}$	40 $\frac{1}{2}$ -41 $\frac{1}{2}$	44.4	55.0
1888 .....	48 $\frac{1}{2}$ -49 $\frac{1}{2}$	57 $\frac{1}{2}$ -57 $\frac{1}{2}$	44 $\frac{1}{2}$ -44 $\frac{1}{2}$	34.1	47.0
1889 .....	33 $\frac{1}{2}$ -33 $\frac{1}{2}$	34	33 $\frac{1}{2}$ -33 $\frac{1}{2}$	28.3	49.0
1890 .....	29 $\frac{1}{2}$ -29 $\frac{1}{2}$	33 $\frac{1}{2}$ -34	43 $\frac{1}{2}$ -45 $\frac{1}{2}$	50.6	57.4
1891 .....	49 $\frac{1}{2}$	68 -68 $\frac{1}{2}$	65 -67 $\frac{1}{2}$	.....	.....





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