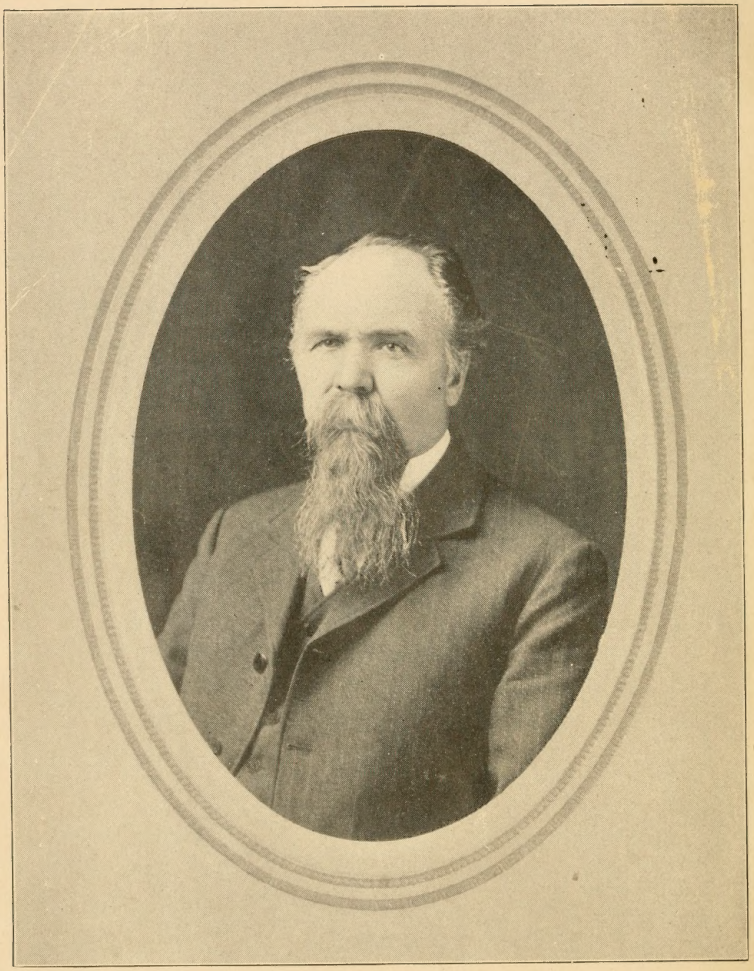

F. H. KING.

FARMERS

OF

FORTY CENTURIES

OR

PERMANENT AGRICULTURE IN CHINA, KOREA AND JAPAN

By

F. H. KING, D. Sc.

Formerly Professor of Agricultural Physics in the University of Wisconsin
and
Chief of Division of Soil Management, U. S. Department of Agriculture

Author of "The Soil"; "Irrigation and Drainage"; "Physics of Agriculture" and "Ventilation for Dwellings, Rural Schools and Stables."

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PREFACE

By Dr. L. H. Bailey.

We have not yet gathered up the experience of mankind in the tilling of the earth; yet the tilling of the earth is the bottom condition of civilization. If we are to assemble all the forces and agencies that make for the final conquest of the planet, we must assuredly know how it is that all the peoples in all the places have met the problem of producing their sustenance out of the soil.

We have had few great agricultural travelers and few books that describe the real and significant rural conditions. Of natural history travel we have had very much; and of accounts of sights and events perhaps we have had too many. There are, to be sure, famous books of study and travel in rural regions, and some of them, as Arthur Young's "Travels in France," have touched social and political history; but for the most part, authorship of agricultural travel is yet undeveloped. The spirit of scientific inquiry must now be taken into this field, and all earth-conquest must be compared and the results be given to the people that work.

This was the point of view in which I read Professor King's manuscript. It is the writing of a well-trained observer who went forth not to find diversion or to depict scenery and common wonders, but to study the actual conditions of life of agricultural peoples. We in North America are wont to think that we may instruct all the world in agriculture, because our agricultural wealth is great and our exports to less favored peoples have been heavy; but this wealth is great because our soil is fertile

and new, and in large acreage for every person. We have really only begun to farm well. The first condition of farming is to maintain fertility. This condition the oriental peoples have met, and they have solved it in their way. We may never adopt particular methods, but we can profit vastly by their experience. With the increase of personal wants in recent time, the newer countries may never reach such density of population as have Japan and China; but we must nevertheless learn the first lesson in the conservation of natural resources, which are the resources of the land. This is the message that Professor King brought home from the East.

This book on agriculture should have good effect in establishing understanding between the West and the East. If there could be such an interchange of courtesies and inquiries on these themes as is suggested by Professor King, as well as the interchange of athletics and diplomacy and commerce, the common productive people on both sides should gain much that they could use; and the results in amity should be incalculable.

It is a misfortune that Professor King could not have lived to write the concluding "Message of China and Japan to the World." It would have been a careful and forceful summary of his study of eastern conditions. At the moment when the work was going to the printer, he was called suddenly to the endless journey and his travel here was left incomplete. But he bequeathed us a new piece of literature, to add to his standard writings on soils and on the applications of physics and devices to agriculture. Whatever he touched he illuminated.

L. H. Bailey.

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INTRODUCTION.

A word of introduction is needed to place the reader at the best view point from which to consider what is said in the following pages regarding the agricultural practices and customs of China, Korea and Japan. It should be borne in mind that the great factors which today characterize, dominate and determine the agricultural and other industrial operations of western nations were physical impossibilities to them one hundred years ago, and until then had been so to all people.

It should be observed, too, that the United States as yet is a nation of but few people widely scattered over a broad virgin land with more than twenty acres to the support of every man, woman and child, while the people whose practices are to be considered are toiling in fields tilled more than three thousand years and who have barely one acre per capita, more than one-half of which is uncultivable mountain land.

Again, the great movement of cargoes of feeding stuffs and mineral fertilizers to western Europe and to the eastern United States began less than a century ago and has never been possible as a means of maintaining soil fertility in China, Korea or Japan, nor can it be continued indefinitely in either Europe or America. These importations are for the time making tolerable the waste of plant food materials through our modern systems of sewage disposal and other faulty practices; but the Mongolian races have held all such wastes, both urban and rural, and many others which we ignore, sacred to agriculture, applying them to their fields.

We are to consider some of the practices of a virile race of some five hundred millions of people who have an unimpaired inheritance moving with the momentum acquired through four thousand years; a people morally and intellectually strong, mechanically capable, who are awakening to a utilization of all the possibilities which science and invention during recent years have brought to western nations; and a people who have long dearly loved peace but who can and will fight in self defense if compelled to do so.

We had long desired to stand face to face with Chinese and Japanese farmers; to walk through their fields and to learn by seeing some of their methods, appliances and practices which centuries of stress and experience have led these oldest farmers in the world to adopt. We desired to learn how it is possible, after twenty and perhaps thirty or even forty centuries, for their soils to be made to produce sufficiently for the maintenance of such dense populations as are living now in these three countries. We have now had this opportunity and almost every day we were instructed, surprised and amazed at the conditions and practices which confronted us whichever way we turned; instructed in the ways and extent to which these nations for centuries have been and are conserving and utilizing their natural resources, surprised at the magnitude of the returns they are getting from their fields, and amazed at the amount of efficient human labor cheerfully given for a daily wage of five cents and their food, or for fifteen cents, United States currency, without food.

The three main islands of Japan in 1907 had a population of 46,977,003 maintained on 20,000 square miles of cultivated field. This is at the rate of more than three people to each acre, and of 2,349 to each square mile; and yet the total agricultural imports into Japan in 1907 exceeded the agricultural exports by less than one dollar per capita. If the cultivated land of Holland is estimated at but one-third of her total area, the density of her population in 1905 was, on this basis, less than one-third that of Japan in her three main islands. At the same time Japan

is feeding 69 horses and 56 cattle, nearly all laboring animals, to each square mile of cultivated field, while we were feeding in 1900 but 30 horses and mules per same area, these being our laboring animals.

As coarse food transformers Japan was maintaining 16,500,000 domestic fowl, 825 per square mile, but only one for almost three of her people. We were maintaining, in 1900, 250,600,000 poultry, but only 387 per square mile of cultivated field and yet more than three for each person. Japan's coarse food transformers in the form of swine, goats and sheep aggregated but 13 to the square mile and provided but one of these units for each 180 of her people; while in the United States in 1900 there were being maintained, as transformers of grass and coarse grain into meat and milk, 95 cattle, 99 sheep and 72 swine per each square mile of improved farms. In this reckoning each of the cattle should be counted as the equivalent of perhaps five of the sheep and swine, for the transforming power of the dairy cow is high. On this basis we are maintaining at the rate of more than 646 of the Japanese units per square mile, and more than five of these to every man, woman and child, instead of one to every 180 of the population, as is the case in Japan.

Correspondingly accurate statistics are not accessible for China but in the Shantung province we talked with a farmer having 12 in his family and who kept one donkey, one cow, both exclusively laboring animals, and two pigs on 2.5 acres of cultivated land where he grew wheat, millet, sweet potatoes and beans. Here is a density of population equal to 3,072 people, 256 donkeys, 256 cattle and 512 swine per square mile. In another instance where the holding was one and two-thirds acres the farmer had 10 in his family and was maintaining one donkey and one pig, giving to this farm land a maintenance capacity of 3,840 people, 384 donkeys and 384 pigs to the square mile, or 240 people, 24 donkeys and 24 pigs to one of our forty-acre farms which our farmers regard too small for a single family. The average of seven Chinese holdings which we

visited and where we obtained similar data indicates a maintenance capacity for those lands of 1,783 people, 212 cattle or donkeys and 399 swine,—1,995 consumers and 399 rough food transformers per square mile of farm land. These statements for China represent strictly rural populations. The rural population of the United States in 1900 was placed at the rate of 61 per square mile of improved farm land and there were 30 horses and mules. In Japan the rural population had a density in 1907 of 1,922 per square mile, and of horses and cattle together 125.

The population of the large island of Chungming in the mouth of the Yangtse river, having an area of 270 square miles, possessed, according to the official census of 1902, a density of 3,700 per square mile and yet there was but one large city on the island, hence the population is largely rural.

It could not be other than a matter of the highest industrial, educational and social importance to all nations if there might be brought to them a full and accurate account of all those conditions which have made it possible for such dense populations to be maintained so largely upon the products of Chinese, Korean and Japanese soils. Many of the steps, phases and practices through which this evolution has passed are irrevocably buried in the past but such remarkable maintenance efficiency attained centuries ago and projected into the present with little apparent decadence merits the most profound study and the time is fully ripe when it should be made. Living as we are in the morning of a century of transition from isolated to cosmopolitan national life when profound readjustments, industrial, educational and social, must result, such an investigation cannot be made too soon. It is high time for each nation to study the others and by mutual agreement and co-operative effort, the results of such studies should become available to all concerned, made so in the spirit that each should become coordinate and mutually helpful component factors in the world's progress.

One very appropriate and immensely helpful means for attacking this problem, and which should prove mutually helpful to citizen and state, would be for the higher educational institutions of all nations, instead of exchanging courtesies through their baseball teams, to send select bodies of their best students under competent leadership and by international agreement, both east and west, organizing therefrom investigating bodies each containing components of the eastern and western civilization and whose purpose it should be to study specifically set problems. Such a movement well conceived and directed, manned by the most capable young men, should create an international acquaintance and spread broadcast a body of important knowledge which would develop as the young men mature and contribute immensely toward world peace and world progress. If some broad plan of international effort such as is here suggested were organized the expense of maintenance might well be met by diverting so much as is needful from the large sums set aside for the expansion of navies, for such steps as these, taken in the interests of world uplift and world peace, could not fail to be more efficacious and less expensive than increase in fighting equipment. It would cultivate the spirit of pulling together and of a square deal rather than one of holding aloof and of striving to gain unneighborly advantage.

Many factors and conditions conspire to give to the farms and farmers of the Far East their high maintenance efficiency and some of these may be succinctly stated. The portions of China, Korea and Japan where dense populations have developed and are being maintained occupy exceptionally favorable geographic positions so far as these influence agricultural production. Canton in the south of China has the latitude of Havana, Cuba, while Mukden in Manchuria, and northern Honshu in Japan are only as far north as New York city, Chicago and northern California. The United States lies mainly between 50 degrees and 30 degrees of latitude while these three countries lie between 40 degrees and 20 degrees, some seven hundred miles

further south. This difference of position, giving them longer seasons, has made it possible for them to devise systems of agriculture whereby they grow two, three and even four crops on the same piece of ground each year. In southern China, in Formosa and in parts of Japan two crops of rice are grown; in the Chekiang province there may be a crop of rape, of wheat or barley or of windsor beans or clover which is followed in midsummer by another of cotton or of rice. In the Shantung province wheat or barley in the winter and spring may be followed in summer by large or small millet, sweet potatoes, soy beans or peanuts. At Tientsin, 39° north, in the latitude of Cincinnati, Indianapolis, and Springfield, Illinois, we talked with a farmer who followed his crop of wheat on his small holding with one of onions and the onions with cabbage, realizing from the three crops at the rate of $163, gold, per acre; and with another who planted Irish potatoes at the earliest opportunity in the spring, marketing them when small, and following these with radishes, the radishes with cabbage, realizing from the three crops at the rate of $203 per acre.

Nearly 500,000,000 people are being maintained, chiefly upon the products of an area smaller than the improved farm lands of the United States. Complete a square on the lines drawn from Chicago southward to the Gulf and westward across Kansas, and there will be enclosed an area greater than the cultivated fields of China, Korea and Japan and from which five times our present population are fed.

The rainfall in these countries is not only larger than that even in our Atlantic and Gulf states, but it falls more exclusively during the summer season when its efficiency in crop production may be highest. South China has a rainfall of some 80 inches with little of it during the winter, while in our southern states the rainfall is nearer 60 inches with less than one-half of it between June and September. Along a line drawn from Lake Superior through central Texas the yearly precipitation is about 30 inches

but only 16 inches of this falls during the months May to September; while in the Shantung province, China, with an annual rainfall of little more than 24 inches, 17 of these fall during the months designated and most of this in July and August. When it is stated that under the best tillage and with no loss of water through percolation, most of our agricultural crops require 300 to 600 tons of water for each ton of dry substance brought to maturity, it can be readily understood that the right amount of available moisture, coming at the proper time, must be one of the prime factors of a high maintenance capacity for any soil, and hence that in the Far East, with their intensive methods, it is possible to make their soils yield large returns.

The selection of rice and of the millets as the great staple food crops of these three nations, and the systems of agriculture they have evolved to realize the most from them, are to us remarkable and indicate a grasp of essentials and principles which may well cause western nations to pause and reflect.

Notwithstanding the large and favorable rainfall of these countries, each of the nations have selected the one crop which permits them to utilize not only practically the entire amount of rain which falls upon their fields, but in addition enormous volumes of the run-off from adjacent uncultivable mountain country. Wherever paddy fields are practicable there rice is grown. In the three main islands of Japan 56 per cent of the cultivated fields, 11,000 square miles, is laid out for rice growing and is maintained under water from transplanting to near harvest time, after which the land is allowed to dry, to be devoted to dry land crops during the balance of the year, where the season permits.

To anyone who studies the agricultural methods of the Far East in the field it is evident that these people, centuries ago, came to appreciate the value of water in crop production as no other nations have. They have adapted conditions to crops and crops to conditions until with rice they have a cereal which permits the most intense fertili-

zation and at the same time the ensuring of maximum yields against both drought and flood. With the practice of western nations in all humid climates, no matter how completely and highly we fertilize, in more years than not yields are reduced by a deficiency or an excess of water.

It is difficult to convey, by word or map, an adequate conception of the magnitude of the systems of canalization which contribute primarily to rice culture. A conservative estimate would place the miles of canals in China at fully 200,000 and there are probably more miles of canal in China, Korea and Japan than there are miles of railroad in the United States. China alone has as many acres in rice each year as the United States has in wheat and her annual product is more than double and probably threefold our annual wheat crop, and yet the whole of the rice area produces at least one and sometimes two other crops each year.

The selection of the quick-maturing, drought-resisting millets as the great staple food crops to be grown wherever water is not available for irrigation, and the almost universal planting in hills or drills, permitting intertillage, thus adopting centuries ago the utilization of earth mulches in conserving soil moisture, has enabled these people to secure maximum returns in seasons of drought and where the rainfall is small. The millets thrive in the hot summer climates; they survive when the available soil moisture is reduced to a low limit, and they grow vigorously when the heavy rains come. Thus we find in the Far East, with more rainfall and a better distribution of it than occurs in the United States, and with warmer, longer seasons, that these people have with rare wisdom combined both irrigation and dry farming methods to an extent and with an intensity far beyond anything our people have ever dreamed, in order that they might maintain their dense populations.

Notwithstanding the fact that in each of these countries the soils are naturally more than ordinarily deep, inherently fertile and enduring, judicious and rational meth-

ods of fertilization are everywhere practiced; but not until recent years, and only in Japan, have mineral commercial fertilizers been used. For centuries, however, all cultivated lands, including adjacent hill and mountain sides, the canals, streams and the sea have been made to contribute what they could toward the fertilization of cultivated fields and these contributions in the aggregate have been large. In China, in Korea and in Japan all but the inaccessible portions of their vast extent of mountain and hill lands have long been taxed to their full capacity for fuel, lumber and herbage for green manure and compost material; and the ash of practically all of the fuel and of all of the lumber used at home finds its way ultimately to the fields as fertilizer.

In China enormous quantities of canal mud are applied to the fields, sometimes at the rate of even 70 and more tons per acre. So, too, where there are no canals, both soil and subsoil are carried into the villages and there between the intervals when needed they are, at the expense of great labor, composted with organic refuse and often afterwards dried and pulverized before being carried back and used on the fields as home-made fertilizers. Manure of all kinds, human and animal, is religiously saved and applied to the fields in a manner which secures an efficiency far above our own practices. Statistics obtained through the Bureau of Agriculture, Japan, place the amount of human waste in that country in 1908 at 23,950,295 tons, or 1.75 tons per acre of her cultivated land. The International Concession of the city of Shanghai, in 1908, sold to a Chinese contractor the privilege of entering residences and public places early in the morning of each day in the year and removing the night soil, receiving therefor more than $31,000, gold, for 78,000 tons of waste. All of this we not only throw away but expend much larger sums in doing so.

Japan's production of fertilizing material, regularly prepared and applied to the land annually, amounts to more than 4.5 tons per acre of cultivated field exclusive of

the commercial fertilizers purchased. Between Shanhaikwan and Mukden in Manchuria we passed, on June 18th, thousands of tons of the dry highly nitrified compost soil recently carried into the fields and laid down in piles where it was waiting to be "fed to the crops."

It was not until 1888, and then after a prolonged war of more than thirty years, generaled by the best scientists of all Europe, that it was finally conceded as demonstrated that leguminous plants acting as hosts for lower organisms living on their roots are largely responsible for the maintenance of soil nitrogen, drawing it directly from the air to which it is returned through the processes of decay. But centuries of practice had taught the Far East farmers that the culture and use of these crops are essential to enduring fertility, and so in each of the three countries the growing of legumes in rotation with other crops very extensively for the express purpose of fertilizing the soil is one of their old, fixed practices.

Just before, or immediately after the rice crop is harvested, fields are often sowed to "clover" (*Astragalus sinicus*) which is allowed to grow until near the next transplanting time when it is either turned under directly, or more often stacked along the canals and saturated while doing so with soft mud dipped from the bottom of the canal. After fermenting twenty or thirty days it is applied to the field. And so it is literally true that these old world farmers whom we regard as ignorant, perhaps because they do not ride sulky plows as we do, have long included legumes in their crop rotation, regarding them as indispensable.

Time is a function of every life process as it is of every physical, chemical and mental reaction. The husbandman is an industrial biologist and as such is compelled to shape his operations so as to conform with the time requirements of his crops. The oriental farmer is a time economizer beyond all others. He utilizes the first and last minute and all that are between. The foreigner accuses the Chinaman of being always long on time, never in a fret, never in a

hurry. This is quite true and made possible for the reason that they are a people who definitely set their faces toward the future and lead time by the forelock. They have long realized that much time is required to transform organic matter into forms available for plant food and although they are the heaviest users in the world, the largest portion of this organic matter is predigested with soil or subsoil before it is applied to their fields, and at an enormous cost of human time and labor, but it practically lengthens their growing season and enables them to adopt a system of multiple cropping which would not otherwise be possible. By planting in hills and rows with intertillage it is very common to see three crops growing upon the same field at one time, but in different stages of maturity, one nearly ready to harvest; one just coming up, and the other at the stage when it is drawing most heavily upon the soil. By such practice, with heavy fertilization, and by supplemental irrigation when needful, the soil is made to do full duty throughout the growing season.

Then, notwithstanding the enormous acreage of rice planted each year in these countries, it is all set in hills and every spear is transplanted. Doing this, they save in many ways except in the matter of human labor, which is the one thing they have in excess. By thoroughly preparing the seed bed, fertilizing highly and giving the most careful attention, they are able to grow on one acre, during 30 to 50 days, enough plants to occupy ten acres and in the mean time on the other nine acres crops are maturing, being harvested and the fields being fitted to receive the rice when it is ready for transplanting, and in effect this interval of time is added to their growing season.

Silk culture is a great and, in some ways, one of the most remarkable industries of the Orient. Remarkable for its magnitude; for having had its birthplace apparently in oldest China at least 2700 years B. C.; for having been laid on the domestication of a wild insect of the woods; and for having lived through more than 4000 years, expanding until a million-dollar cargo of the product has

been laid down on our western coast and rushed by special fast express to the east for the Christmas trade.

A low estimate of China's production of raw silk would be 120,000,000 pounds annually, and this with the output of Japan, Korea and a small area of southern Manchuria, would probably exceed 150,000,000 pounds annually, representing a total value of perhaps $700,000,000, quite equalling in value the wheat crop of the United States, but produced on less than one-eighth the area of our wheat fields.

The cultivation of tea in China and Japan is another of the great industries of these nations, taking rank with that of sericulture if not above it in the important part it plays in the welfare of the people. There is little reason to doubt that this industry has its foundation in the need of something to render boiled water palatable for drinking purposes. The drinking of boiled water is universally adopted in these countries as an individually available and thoroughly efficient safeguard against that class of deadly disease germs which thus far it has been impossible to exclude from the drinking water of any densely peopled country.

Judged by the success of the most thorough sanitary measures thus far instituted, and taking into consideration the inherent difficulties which must increase enormously with increasing populations, it appears inevitable that modern methods must ultimately fail in sanitary efficiency and that absolute safety can be secured only in some manner having the equivalent effect of boiling drinking water, long ago adopted by the Mongolian races.

In the year 1907 Japan had 124,482 acres of land in tea plantations, producing 60,877,975 pounds of cured tea. In China the volume annually produced is much larger than that of Japan, 40,000,000 pounds going annually to Tibet alone from the Szechwan province; and the direct export to foreign countries was, in 1905, 176,027,255 pounds, and in 1906 it was 180,271,000, so that their annual export must exceed 200,000,000 pounds with a total annual output more than double this amount of cured tea.

But above any other factor, and perhaps greater than all of them combined in contributing to the high maintenance efficiency attained in these countries must be placed the standard of living to which the industrial classes have been compelled to adjust themselves, combined with their remarkable industry and with the most intense economy they practice along every line of effort and of living.

Almost every foot of land is made to contribute material for food, fuel or fabric. Everything which can be made edible serves as food for man or domestic animals. Whatever cannot be eaten or worn is used for fuel. The wastes of the body, of fuel and of fabric worn beyond other use are taken back to the field; before doing so they are housed against waste from weather, compounded with intelligence and forethought and patiently labored with through one, three or even six months, to bring them into the most efficient form to serve as manure for the soil or as feed for the crop. It seems to be a golden rule with these industrial classes, or if not golden, then an inviolable one, that whenever an extra hour or day of labor can promise even a little larger return then that shall be given, and neither a rainy day nor the hottest sunshine shall be permitted to cancel the obligation or defer its execution.

I.

FIRST GLIMPSES OF JAPAN.

We left the United States from Seattle for Shanghai, China, sailing by the northern route, at one P. M. February second, reaching Yokohama February 19th and Shanghai, March 1st. It was our aim throughout the journey to keep in close contact with the field and crop problems and to converse personally, through interpreters or otherwise, with the farmers, gardeners and fruit growers themselves; and we have taken pains in many cases to visit the same fields or the same region two, three or more times at different intervals during the season in order to observe different phases of the same cultural or fertilization methods as these changed or varied with the season.

Our first near view of Japan came in the early morning of February 19th when passing some three miles off the point where the Pacific passenger steamer Dakota was beached and wrecked in broad daylight without loss of life two years ago. The high rounded hills were clothed neither in the dense dark forest green of Washington and Vancouver, left sixteen days before, nor yet in the brilliant emerald such as Ireland's hills in June fling in unparalleled greeting to passengers surfeited with the dull grey of the rolling ocean. This lack of strong forest growth and even of shrubs and heavy herbage on hills covered with deep soil, neither cultivated nor suffering from serious erosion, yet surrounded by favorable climatic conditions, was our first great surprise.

To the southward around the point, after turning northward into the deep bay, similar conditions prevailed, and at ten o'clock we stood off Uraga where Commodore Perry anchored on July 8th, 1853, bearing to the Shogun President Fillmore's letter which opened the doors of Japan to the commerce of the world and, it is to be hoped brought to her people, with their habits of frugality and industry so indelibly fixed by centuries of inheritance, better opportunities for development along those higher lines destined to make life still more worth living.

As the Tosa Maru drew alongside the pier at Yokohama it was raining hard and this had attired an army after the manner of Robinson Crusoe, dressed as seen in Fig. 1, ready to carry you and yours to the Customs house and beyond for one, two, three or five cents. Strong was the contrast when the journey was reversed and we descended the gang plank at Seattle, where no one sought the opportunity of moving baggage.

Through the kindness of Captain Harrison of the Tosa Maru in calling an interpreter by wireless to meet the steamer, it was possible to utilize the entire interval of stop in Yokohama to the best advantage in the fields and gardens spread over the eighteen miles of plain extending to Tokyo, traversed by both electric tram and railway lines, each running many trains making frequent stops; so that this wonderfully fertile and highly tilled district could be readily and easily reached at almost any point.

We had left home in a memorable storm of snow, sleet and rain which cut out of service telegraph and telephone lines over a large part of the United States; we had sighted the Aleutian Islands, seeing and feeling nothing on the way which could suggest a warm soil and green fields, hence our surprise was great to find the jinricksha men with bare feet and legs naked to the thighs, and greater still when we found, before we were outside the city limits, that the electric tram was running between fields and gardens green with wheat, barley, onions, carrots, cabbage and other vegetables. We were rushing through the Orient

Fig. 1.—Rainy weather costume, as worn in Japan and typical of those used under similar conditions in both Korea and China. The picture shows a group of Japanese rice field laborers with their most common tools.

with everything outside the car so strange and different from home that the shock came like a bolt of lightning out of a clear sky.

In the car every man except myself and one other was smoking tobacco and that other was inhaling camphor through an ivory mouthpiece resembling a cigar holder closed at the end. Several women, tiring of sitting foreign style, slipped off—I cannot say out of—their shoes and sat facing the windows, with toes crossed behind them on the seat. The streets were muddy from the rain and everybody Japanese was on rainy-day wooden shoes, the soles carried three to four inches above the ground by two cross blocks, in the manner seen in Fig. 2. A mother, with baby on her back and a daughter of sixteen years came into the car. Notwithstanding her high shoes the mother had dipped one toe into the mud. Seated, she slipped her foot off. Without evident instructions the pretty black-eyed, glossy-haired, red-lipped lass, with cheeks made rosy, picked up the shoe, withdrew a piece of white tissue paper from the great pocket in her sleeve, deftly cleaned the otherwise spotless white cloth sock and then the shoe, threw the paper on the floor, looked to see that her fingers were not soiled, then set the shoe at her mother's foot, which found its place without effort or glance.

Everything here was strange and the scenes shifted with the speed of the wildest dream. Now it was driving piles for the foundation of a bridge. A tripod of poles was erected above the pile and from it hung a pulley. Over the pulley passed a rope from the driving weight and from its end at the pulley ten cords extended to the ground. In a circle at the foot of the tripod stood ten agile Japanese women. They were the hoisting engine. They chanted in perfect rhythm, hauled and stepped, dropped the weight and hoisted again, making up for heavier hammer and higher drop by more blows per minute. When we reached Shanghai we saw the pile driver being worked from above. Fourteen Chinese men stood upon a raised staging, each with a separate cord passing direct from the hand to the

weight below. A concerted, half-musical chant, modulated to relieve monotony, kept all hands together. What did the operation of this machine cost? Thirteen cents, gold,

Fig. 2.—Girl on rainy-day wooden shoes, carrying and entertaining child in the way most common in Japan.

per man per day, which covered fuel and lubricant, both automatically served. Two additional men managed the piles, two directed the hammer, eighteen manned the outfit. Two dollars and thirty-four cents per day covered fuel, superintendence and repairs. There was almost no

capital invested in machinery. Men were plenty and to spare. Rice was the fuel, cooked without salt, boiled stiff, reenforced with a bit of pork or fish, appetized with salted cabbage or turnip and perhaps two or three of forty and more other vegetable relishes. And are these men strong and happy? They certainly were strong. They are steadily increasing their millions, and as one stood and watched them at their work their faces were often wreathed in smiles and wore what seemed a look of satisfaction and contentment.

Among the most common sights on our rides from Yokohama to Tokyo, both within the city and along the roads leading to the fields, starting early in the morning, were the loads of night soil carried on the shoulders of men and on the backs of animals, but most commonly on strong carts drawn by men, bearing six to ten tightly covered wooden containers holding forty, sixty or more pounds each. Strange as it may seem, there are not today and apparently never have been, even in the largest and oldest cities of Japan, China or Korea, anything corresponding to the hydraulic systems of sewage disposal used now by western nations. Provision is made for the removal of storm waters but when I asked my interpreter if it was not the custom of the city during the winter months to discharge its night soil into the sea, as a quicker and cheaper mode of disposal, his reply came quick and sharp, "No, that would be waste. We throw nothing away. It is worth too much money." In such public places as railway stations provision is made for saving, not for wasting, and even along the country roads screens invite the traveler to stop, primarily for profit to the owner, more than for personal convenience.

Between Yokohama and Tokyo, along the electric car line and not far distant from the seashore, there were to be seen in February very many long, fence-high screens extending east and west, strongly inclined to the north, and built out of rice straw,closely tied together and supported on bamboo poles carried upon posts of wood set in the ground. These

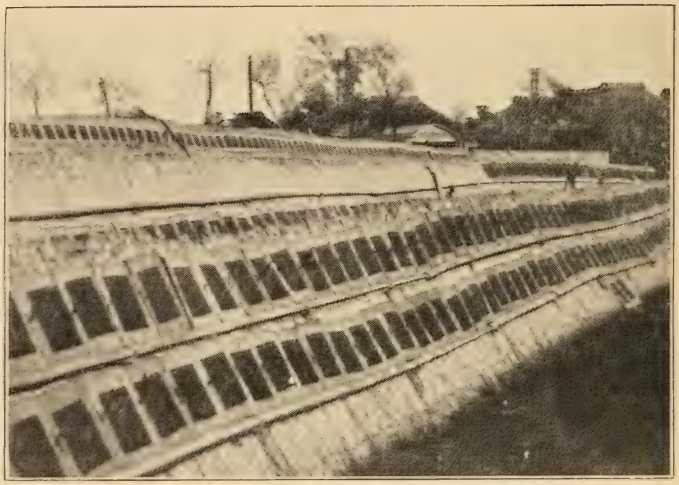

Fig. 3.—Method of drying seaweed used for food. The small black squares on the larger light ones are the seaweed. The skewers seen pin the squares of matting against the long screens, six of which are shown in parallel series.

Fig. 4.—Section of shallow sea bottom planted to brushwood on which the edible seaweeds attach themselves and grow.

screens, set in parallel series of five to ten or more in number and several hundred feet long, were used for the purpose of drying varieties of delicate seaweed, these being spread out in the manner shown in Fig. 3.

The seaweed is first spread upon separate ten by twelve inch straw mats, forming a thin layer seven by eight inches. These mats are held by means of wooden skewers forced through the body of the screen, exposing the seaweed to the direct sunshine. After becoming dry the rectangles of seaweed are piled in bundles an inch thick, cut once in two, forming packages four by seven inches, which are neatly tied and thus exposed for sale as soup stock and for other purposes.

To obtain this seaweed from the ocean small shrubs and the limbs of trees are set up in the bottom of shallow water, as seen in Fig. 4. To these limbs the seaweeds become attached, grow to maturity and are then gathered by hand. By this method of culture large amounts of important food stuff are grown for the support of the people on areas otherwise wholly unproductive.

Another rural feature, best shown by photograph taken in February, is the method of training pear orchards in Japan, with their limbs tied down upon horizontal overhead trellises at a hight under which a man can readily walk erect and easily reach the fruit with the hand while standing upon the ground. Pear orchards thus form arbors of greater or less size, the trees being set in quincunx order about twelve feet apart in and between the rows. Bamboo poles are used overhead and these carried on posts of the same material 1.5 to 2.5 inches in diameter, to which they are tied. Such a pear orchard is shown in Fig. 5.

The limbs of the pear trees are trained strictly in one plane, tying them down and pruning out those not desired. As a result the ground beneath is completely shaded and every pear is within reach, which is a great convenience when it becomes desirable to protect the fruit

Fig. 5.—Looking down upon an extensive pear orchard whose limbs are trained horizontally, forming an arbor completely shading the ground when in leaf, and placing all of the fruit within reach of the hand from beneath.

Fig. 6.—Pear trees at Akashi Experiment Station, Japan. Pears protected by paper bags. Special form of pruning advised by Prof. Ono, standing on the left, with Prof. Tokito. The trees branch below rather than at the level of the trellis.

from insects, by tying paper bags over every pear as seen in Figs. 6 and 7. The orchard ground is kept free from weeds and not infrequently is covered with a layer of rice or other straw, extensively used in Japan as a ground cover with various crops and when so used is carefully laid in handfuls from bundles, the straws being kept parallel as when harvested.

Fig. 7.—Low branching pear orchard with pears protected by paper bags, at Akashi Experiment Station, Japan.

To one from a country of 160-acre farms, with roads four rods wide; of cities with broad streets and residences with green lawns and ample back yards; and where the cemeteries are large and beautiful parks, the first days of travel in these old countries force the over-crowding upon the attention as nothing else can. One feels that the cities are greatly over-crowded with houses and shops, and these with people and wares; that the country is over-crowded with fields and the fields with crops; and that in Japan the over-crowding is greatest of all in the cemeteries,

Fig. 8.—Street in a Hakone country village. The general absence of old forest growth on the hills recently cut over is characteristic of much of Japan.

gravestones almost touching and markers for families literally in bundles at a grave, while round about there may be no free country whatever, dwellings, gardens or rice paddies contesting the tiny allotted areas too closely to leave even foot-paths between.

Unless recently modified through foreign influence the streets of villages and cities are narrow, as seen in Fig. 8, where however the street is unusually broad. This is a village in the Hakone district on a beautiful lake of the same name, where stands an Imperial summer palace, seen near the center of the view on a hill across the lake. The roofs of the houses here are typical of the neat, careful thatching with rice straw, very generally adopted in place of tile for the country villages throughout much of Japan. The shops and stores, open full width directly upon the street, are filled to overflowing, as seen in Fig. 9 and in Fig. 22.

Fig. 9.—Small store full to overflowing; entire front opening flush with the street.

Fig. 10.—Chinese country village lining both sides of a canal. Section one-third of a mile long between two bridges, where in three rows of houses live 240 families.

In the canalized regions of China the country villages crowd both banks of a canal, as is the case in Fig. 10. Here, too, often is a single street and it very narrow, very crowded and very busy. Stone steps lead from the houses down into the water where clothing, vegetables, rice and what not are conveniently washed. In this particular village two rows of houses stand on one side of the canal separated by a very narrow street, and a single row on the other. Between the bridge where the camera was exposed and one barely discernible in the background, crossing the canal a third of a mile distant, we counted upon one side, walking along the narrow street, eighty houses each with its family, usually of three generations and often of four. Thus in the narrow strip, 154 feet broad, including 16 feet of street and 30 feet of canal, with its three lines of houses, lived no less than 240 families and more than 1200 and probably nearer 2000 people.

When we turn to the crowding of fields in the country nothing except seeing can tell so forcibly the fact as such landscapes as those of Figs. 11, 12 and 13, one in Japan, one in Korea and one in China, not far from Nanking, looking from the hills across the fields to the broad Yangtse kiang, barely discernible as a band of light along the horizon.

The average area of the rice field in Japan is less than five square rods and that of her upland fields only about twenty. In the case of the rice fields the small size is necessitated partly by the requirement of holding water on the sloping sides of the valley, as seen in Fig. 11. These small areas do not represent the amount of land worked by one family, the average for Japan being more nearly 2.5 acres. But the lands worked by one family are seldom contiguous, they may even be widely scattered and very often rented.

The people generally live in villages, going often considerable distances to their work. Recognizing the great disadvantage of scattered holdings broken into such small areas, the Japanese Government has passed laws for the adjust-

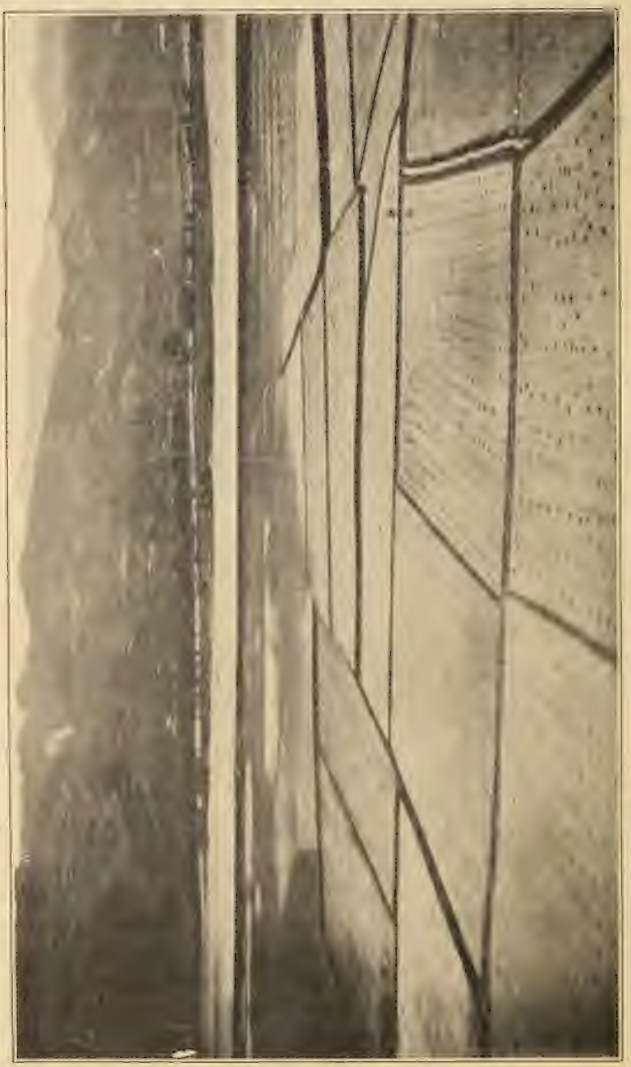

Fig. 11.—Closely crowded fields of rice in Japan, each rice paddy filled with water and recently transplanted.

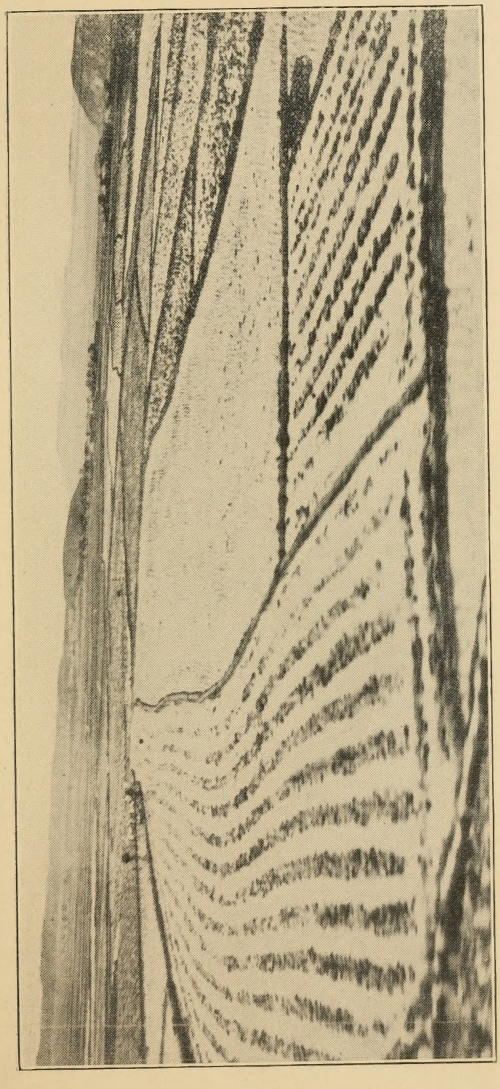

Fig. 12.—Landscape in Korea, showing subdivision of the valley surface into small irregular fields separated only by narrow, low ridges of earth scarcely more than a foot wide and high. The center field is planted to rice, fields on the right are plowed and watered but not fitted, the ridged field on the left is watered but not plowed.

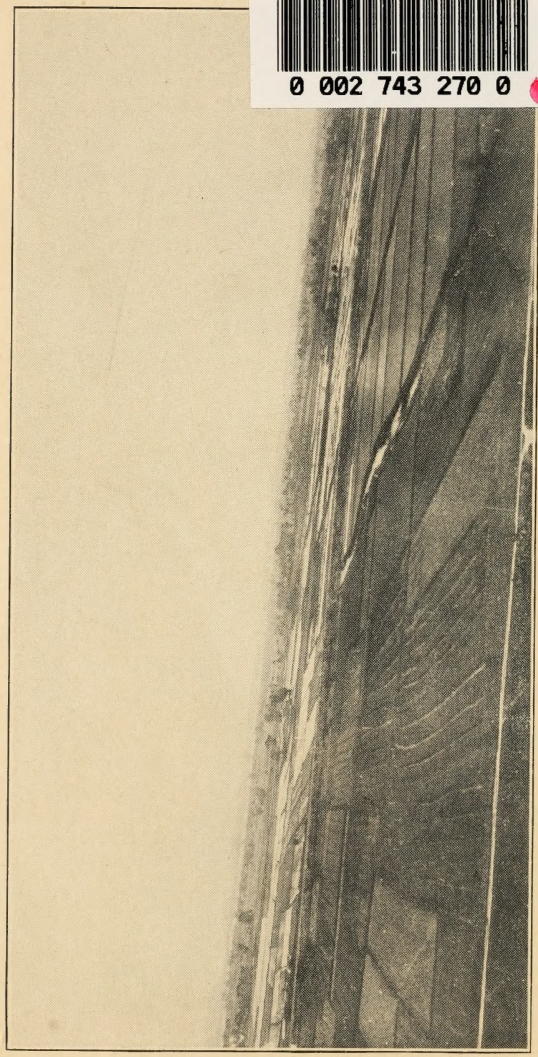

Fig. 13.—Landscape of rice fields in China. Fields in the foreground still covered with winter crops, but when harvested, to be planted to rice. White areas flooded with water and fitting for rice. Yangtse river near horizon.