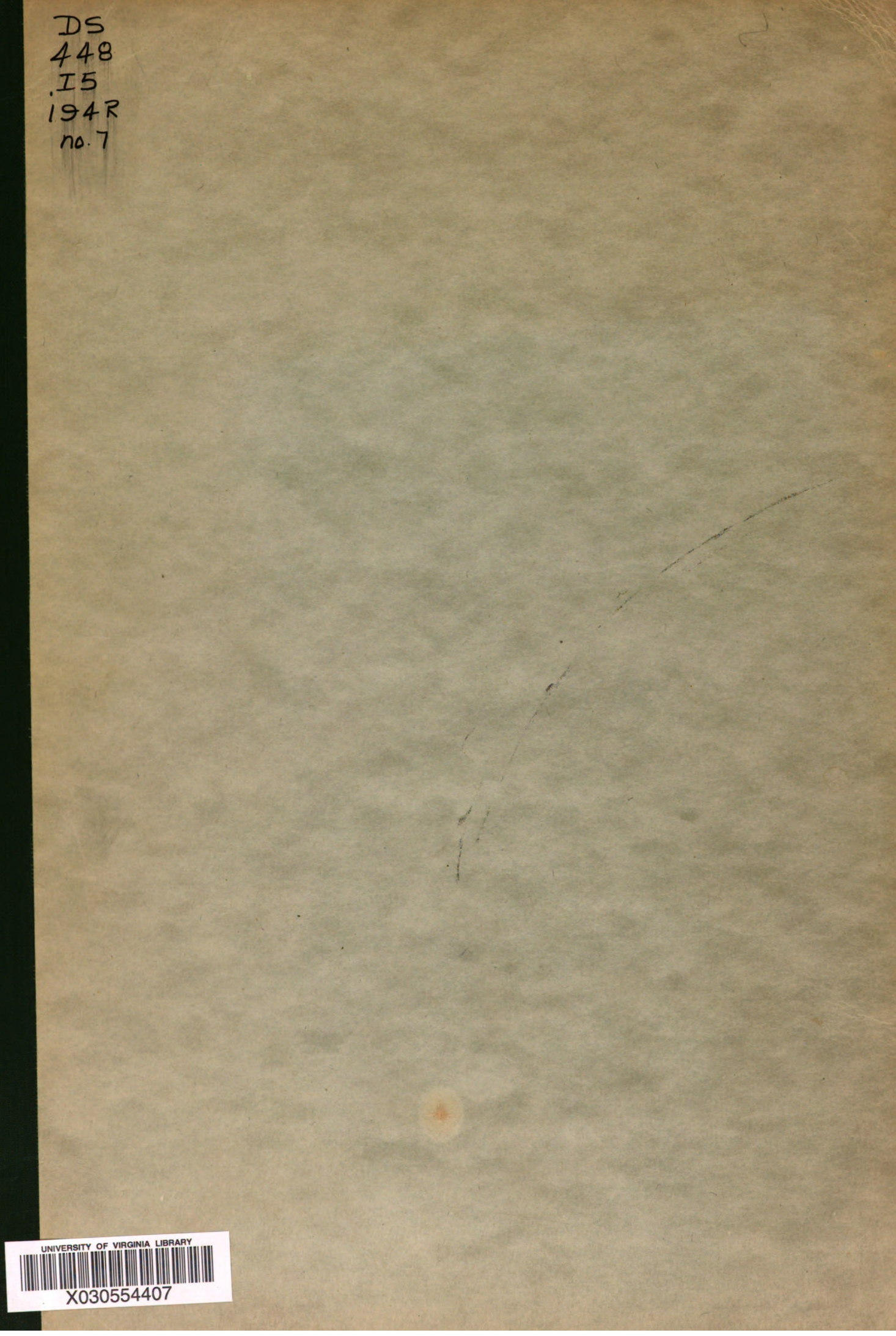

INDIA'S AGRICULTURAL PROBLEMS

By

Sam Higginbottom

Agricultural Institute, Allahabad, U. P.

Eighth Conference of the
Institute of Pacific Relations
Mont Tremblant; Quebec, Canada
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Indian Paper No. 7

INTERNATIONAL SECRETARIAT
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This paper is submitted as a document for the Eighth Conference of the Institute of Pacific Relations to be held in December 1942. The author alone is responsible for all statements of facts or opinions expressed in the paper.

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INDIA'S AGRICULTURAL ASSETS

Love of the Land

India is usually spoken of as an agricultural country. Some say that as many as 80 or 83 per cent of the people are engaged in agriculture; some put the figure as low as 65 per cent. In either case, of all those gainfully employed in India, a majority are engaged in agriculture. As an agricultural country India has certain great advantages. Perhaps the greatest of all is the love that the villager has for his land. This is much deeper than the feeling of the American or the British farmer toward the land. It is part of his life and enters into all his thoughts and acts. It is a love for the land as man's source of sustenance even though he does not always make the best use of it.

India is a land of over 700,000 villages. It is claimed that over 80 per cent of her 390 million folk live in villages of less than two thousand people, and that less than 10 per cent live in cities and towns of over 50,000. What this means may be seen by contrasting the Indian village with the American village. The American village has its post office, general store, sometimes a bank, a schoolhouse with a playground; its houses are arranged in some order, with streets laid out. Most of the villagers serve those who come in from the surrounding farms to trade. Many of the residents are retired farmers. There is road connection with the outside world; there is transportation service of some kind; and there are some public utilities. But the Indian village may not have a single store of any kind. What needs to be bought must be secured from a weekly fair or bazaar, held at some convenient center. Most of the villagers are farmers. They do not build houses on their farms. The low-caste folk - scavenger, barber, washerman, leather worker - may also cultivate a small lot to eke out the income from their main occupation. The houses are usually built with little regard for planning. Many a village has no road wide enough for a cart to enter, has no public utilities, no post office and no school.

Love of Cattle

The Indian farmer has a great love for cattle. He likes to have it around. He often keeps cattle for company. He may even sing hymns extolling its virtues. Yet, the cattle is often half-starved. Sometimes the tails of oxen and cows are twisted and so badly disjointed that it is difficult for them to swing their tails. They are sometimes made to work with raw wounds from the yoke, and with bruises from being hit with heavy bamboo sticks rather than a whiplash. Indian farmers are not, of course,

conscious of being cruel to animals. They are treating the cattle as they treat the land and as they treat themselves - with regard only to established custom. They may overwork a badly nourished ox; but nothing will cause a village fight more quickly than if someone does or says anything to the disparagement of its cows. The farmer's love for his cattle does not reflect the degree of his knowledge of cattle or that of his understanding as to what is involved in the domestication of animals. He loves his oxen because they produce power, he loves his cows because they produce milk. From early childhood he has been taught to venerate them.(1)

Long Growing Season

A great advantage which most of India below the Himalayas enjoys, as compared with Great Britain or Canada or the Northern United States of America, is that it has a growing season of twelve months in the year. The seasons are such that if there is irrigation water and an adequate supply of manure the land can be kept in crop during practically the whole twelve months: the day one crop is harvested, the ploughs can be in the field to get the land ready for the next crop which can be sown as soon as the seed-bed is prepared. During the hot, dry weather in Allahabad, when there is irrigation water, and during the rains, we can grow many of the tropical and sub-tropical plants. Then during our cold weather - with a temperature which seldom drops below 30°F - we can grow the crops that belong to the temperate climate: wheat, barley, flax, potatoes, cabbage, cauliflower, beets, and others. It is true, the yield per acre of rice and wheat is seldom as great in India as it is in America. But when you consider that in some parts of India, you can have on the same land one crop of rice, one crop of wheat and one crop of maize - all in the same twelve months - and add up the total yield

(1)When I was in the Phillipine Islands, a year or two ago, I noticed a very great contrast. There were few cows, although they had as good fodder grasses as there are anywhere in the world. There was plenty of fodder. Yet, when I asked various Phillipine people why they were importing tinned milk, and why in Manila it was almost impossible to get fresh milk that was sanitary, the excuse given usually was that there were no proper grasses for Phillipine cattle. After talking about this at the Agricultural College with a good many Filipinos, I came to the conclusion that the ordinary Filipino farmer is not "cow-minded." The very thought of drinking milk is nauseating to him. If the doctor prescribes milk it has to be cooked, and the flavour has to be disguised so that the patient will not know that he is drinking milk. To the Indian, as to the ancient Hebrew, a truly delectable land is one that flows with milk. For most of them cows' milk provides the only animal protein they get.

of grain and fodder for the three crops, the total yield will compare very favourably with that anywhere in the world.(2)

Variety of Crops

Another great advantage which India has as an agricultural country is the great variety of crops grown and the total amount of the crops that are grown. The cultivated area of India varies from year to year between about 225 and 245 million acres. A favourable season will induce a larger acreage, a poor season will tend to lower the figure. Within this cultivated area is the largest sugar-cane acreage of any country in the world: more than one-half of the world's sugar-cane land is in India. India also leads the world in the amount of groundnuts (peanuts) grown; it leads the world in the production of tobacco and in the production of jute, in which she has almost a monopoly. It is second in the production of cotton, with nearly half as large an annual yield as the United States. Rice takes up one out of every three cultivated acres, with a variety suited for each varying condition: over four thousand distinct varieties are recognized. India leads the world in the number of cattle - 215,000,000. Though these represent an economic drain, India undoubtedly has among her many breeds the best tropical cattle the world knows. Wherever breeders wish to improve tropical cattle, they come to India for the foundation stock. India also has the largest goat population of any country in the world: 54,000,000. Talking of goats reminds me of the Persian proverb: he had no troubles, so he bought a goat. In India they call the goat the poor man's cow. One reason is that the goat owner usually can feed it at his neighbours' expense. India has 44,000,000 sheep. It produces large quantities

(2) The Agricultural Institute normally provides fodder on an area of 500 cultivated acres for about four hundred head of cattle, 150 sheep, 150 goats, half a dozen ponies, and several hundred fowls; and it sells about a thousand tons of green fodder in the city. We grow one fodder grass, Napier, which is cut about six times in the year and gives a yield of about 100 long tons per acre per year. If it is properly irrigated and manured it will, as far as we can see, go on indefinitely. We have had these yields for ten years running on the same land. Alfalfa we can cut from ten to fourteen times in the year, depending upon the seasons, averaging four tons of green alfalfa per acre per cutting. Sorghum for silage purposes - planted with the first rain in July and put into the silo in September or October - will frequently yield around twenty-five or thirty tons per acre. If it could be treated in the same way, almost any of the land in the Ganges Valley might produce similar results.

of sorghum, maize, and millet. It leads the world in the production of oilseed. The combined yields of mustard, rape, linseed, castor, cocoa-nut, til or sesamum, groundnuts and others make her the greatest producer of vegetable oil seeds in the world.(3) India grows legumes in greater variety and quantity than any other country in the world. She is one of the largest producers of tea - 417,160,000 lbs for Northern India in 1941.(4) She grows her own coffee. From time immemorial her spices have been an important vegetable product. India grows the tropical fruits and vegetables as well as the sub-tropical and those more commonly found in the temperate zone. She grows many of the vegetable drugs that enter world trade. At the same time, food products that are not to be seen in America or Europe are displayed in almost any village bazaar. India's forest products are many, varied, and valuable.

Rich Soil

Another advantage which agriculture has over most of India's cultivable area is a naturally rich soil - a soil so rich that much of it has been continuously cropped for many centuries with the addition of little or no manure. The farmer can rely on a minimum yield below which the soil will not go. Much of the Indian soil has arrived at this minimum. Irrigation, manure, better implements, better methods could double theyields from much of this land in a short time.

The rotations followed by the Indian farmers often have in them a legume which is deep-rooted and opens up the lower soil. As most of the Ganges Valley soil has been carried down by the rivers as silt, there is no permanent top-soil, to be preserved as is usually the case elsewhere. The top can be taken off some of these soils

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(3)

AGRICULTURAL PRODUCTION, 1940-41

Crop	Acreage	Yield (Long tons)
Sugar cane	4,598,000	5,794,000
Groundnuts	8,516,000	3,473,000
Jute	5,663,750	13,136,450 bales
Cotton	22,775,000	5,638,000 " of 400 lbs
Wheat	34,562,000	1,000,500 tons
Rice	73,059,000	22,150,000
Rape & mustard	6,218,000	1,103,000
Linseed	3,619,000	434,000
Sesamum	4,097,000	433,000
Castor	1,021,000	105,000

(4) Figures for Southern India are not available, but the output there amounts to several million pounds.

to the depth of several feet, but if proper steps are taken it will be as productive as ever in a year or two.

Irrigation

India has the largest area under flow irrigation of any country in the world. The Himalayas provide an inexhaustible reservoir, independent of the amount of rain or snow for any given year. As spring advances into summer, the snow melts and the irrigation channels run full of the water of life in a literal sense. This water goes to rainless deserts which spring into life. "The wilderness and the solitary place shall be glad for them; and the desert shall rejoice and blossom as the rose ..... and the parched ground shall become a pool, and the thirsty land springs of water."

India has cheap canal irrigation water. Sugar cane which takes six to eight waterings pays five dollars in water fees for each acre of matured crop. Wheat pays about a dollar and a half per acre of matured crop. If because of failing or insufficient supply of irrigation water there is a partial or total failure of the crop there is a corresponding reduction in the charges for water.

In areas where it is not possible to bring canal water, thousands of tube wells have been sunk to a depth of two or four hundred feet. Water is pumped by hydroelectric power. This water may actually cost the farmer less than canal water. In the case of the canal, a schedule is drawn up, and each branch gets water at regular intervals, and the farmers must take the water wherever the canal runs in their branch; but when there has been a good winter rain, the farmer may not need the canal water; he still has to take it. On the other hand, in the case of tube well irrigation, the farmer asks for it and pays for it only when he needs it; also the water is metered, so that he pays according to the meter. This leads to economy in the use of water. Each tube well commands on the average two thousand acres. There are about four thousand of these tube wells. Thus about eight million acres with a water supply formerly insecure and precarious now have an assured supply, and this means, in nine years out of ten, a good crop.

India has millions of ordinary wells supplying from five to twenty-five acres each. This water is raised mostly by oxen or camels, with the aid of either leathern buckets or Persian wheels.

In many parts of the hilly or rolling country it is possible to put in a dam to catch and hold rain water for irrigation. Several million acres are irrigated in this way.

The Government canal irrigation system is divided into two parts, a productive and a protective one. The productive system has gone mostly into areas where the rainfall is insufficient to mature a crop. Without irrigation this would be mostly desert. While providing cheap water for the farmer, it pays about ten per cent on the investment. On land which without canal water was worth less than a dollar an acre, crops are now grown each year to a value equal to the capital cost of the canal installation. Hundreds of thousands of India's most prosperous peasants live on what, less than fifty years ago, was a desert with a nomad population about one to the square mile. The protective system has gone mostly into the central parts of the country, beyond the reach of Himalayan water, where with a normal rainfall (thirty to sixty inches a year) irrigation water is not needed. But when there is a partial or total failure of rains, then this area suffers. It was in such areas in the old days that people died literally by the hundred thousand when the rains failed. The loss of water by surface evaporation is from ten to twelve feet. Hence it is necessary to choose a deep valley, and to put in a comparatively high dam, i.e. one from seventy-five to one hundred and fifty feet high. With a normal rainfall the artificial lake formed behind the dam fills in the first year. Some of these lakes are from fifteen to forty square miles in extent. The largest is capable of irrigating over a million acres. When there is a normal rainfall, there is little demand for this water, but when the rainfall is low or fails, then there is great demand for this water which saves the peasantry from the terrible effects of famine. This is why the system is called protective. Other great gains to the farmer in this area are that he can now be sure of a fair yield every year, and that he can grow more profitable crops than before water was stored. But above all, he now has a sense of security, unknown before; he has been rid of one of life's worst hazards. At present less than one third of India's cultivated acres is under irrigation, and at least another third is within the range of irrigation schemes. But the work could be greatly hastened.(5)

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(5) On the Institute farm we cultivate five hundred acres, only one hundred of which are under irrigation. The one hundred irrigated acres produce more than the four hundred unirrigated acres. If some such proportion could be shown to be true for most of India, what an incentive that would be to increase irrigation facilities!

II

INDIA'S AGRICULTURAL LIABILITIES

The Social Setting

More than most other countries in the world (though this is also very true of the southern states of America) India should have as one objective for every farmer the growing of all the food the farmer needs for his family and for his livestock. Seldom, however, does the Indian farmer who grows ordinary field crops have either an orchard or a garden. In many parts of India, ordinary farming is carried on by one caste, while vegetable and fruit growing is carried on by another. The market-gardening caste is considered to be lower than the ordinary farmer castes. In no place in the world can a greater variety of food crops, fruits, vegetables be grown than in most parts of India; so if the ordinary farmer were not handicapped by caste which prevents him from growing fruits and vegetables, he could grow enough food with sufficient variety to maintain himself and his family in good health. One may often see a man carry a head load of fodder to market and return with a cabbage, cauliflower, cucumber or turnip which he should have grown himself. Indian public health officers have published the fact that 30 per cent of India's ill health is caused by malnutrition - not necessarily an insufficient amount of food but an unbalanced ration; more fruit and leafy green vegetables are required.

If the village farmer were to use as manure what he now wastes, and were not handicapped by caste, he could grow all the fruits and fresh vegetables as well as the grains that he needs to maintain himself and his family in bodily strength and vigour. Once he had got rid of the preventable diseases from lack of proper food and malnutrition, he would be much more efficient as a workman. One thing that seems to be forgotten in India is that physical poverty and malnutrition inevitably lead to inefficiency and inertia. The mental attitude induced by his adherence to age-old social customs makes it difficult for the Indian farmer to appreciate the findings of modern agricultural science.

Because of his great respect or veneration for all life, he makes little effort to kill the pests which so greatly reduce his crop yields or prevent him from growing more desirable crops. Just to drive off crows and green-parrots from his fields for a few minutes means that they are driven on to the neighbour's field; at other times the neighbour drives his crows and parrots back on his own. This activity is a waste of time for both and a cause of serious crop losses. It is the same story with wild pigs, monkeys, porcupines, rats, deer, squirrels and jackals. If the farmer grows fruit parrots, crows and squirrels will deprive him of the product of his labor by day, and flying

foxes by night. If he were not handicapped by a mistaken interpretation - as it must seem to us - of the sacredness of all life and the wrong done in taking life, most of the animal pests of India could be wiped out within a relatively short time - perhaps within a year or so. India has yet to learn the lesson which the ancient Hebrew learned: that if man does not have dominion over the animals and birds, then these birds and animals will have dominion over man. Professor Dubey of the Allahabad University and the late Sir Ganga Ram of the Panjab, working independently, arrived at the conclusion that the rats of India destroy at least one tenth of the country's grain or approximately ten million long tons a year, enough to give a population of 6.2 millions a pound of grain a day per year. There is not only this direct economic loss, amounting to millions of dollars a year, but the indirect loss is probably even greater, because the pests prevent the growing of many of the most profitable crops. To withstand all the insect, bird and animal pests, a food crop needs many characters that are undesirable from the standpoint of maximum or most profitable yield.

Literacy among village farmers is probably not more than two per cent. This leaves the average tiller of the soil a prey to the demagogue, to dishonest folk who take his money and give him a worthless receipt or even an I.O.U. instead of a receipt. It shuts him off from the literature designed to help him. But he has not yet been convinced that book learning has a money value for him.(1) He has little or no reading matter in his home or in his village. The Government has done much to encourage a desire for learning, but the resistance to these efforts remains almost unbroken.

Climate

One of the main problems of India's agriculture arises from the weather - the day-to-day conditions of humidity, temperature, sunshine, and their seasonal and yearly variations. Anybody familiar with India knows the common saying that its government is a gamble in rain. In Northern India there are three well defined seasons, The agricultural year begins with the rains in the Kharif season, in the GangesValley, this means anywhere from the middle of June to early July, and lasts to the beginning of

(1) One of the most pathetic things I know in India is the lapse into illiteracy of village children who have spent several years in school. I have known of cases in which, five years after leaving school, the young people did not know which way up to hold the book in order to read.

October. Normally nine-tenths of the year's rain falls in these three months. This is when the tropical and sub-tropical fruits and vegetables, fodder crops, grain crops and rice are grown. The second season, the Rabi, begins at the end of the rains, and is that of cold weather which lasts till March. During this season are grown the grains and vegetables of the temperate zone, the wheat, barley, flax, peas, potatoes, cabbage, cauliflower, onions, beets, gram, and leafy vegetables. Thus potatoes sown in early October are harvested in the latter part of December and early January. Hill potatoes sown in November are harvested in March. If they remain in the ground until April they are usually ruined by the heat. The October-sown gram is ready by the end of February, barley a little later, wheat any time after the 20 th of March. The hot weather is usually well begun by the 1st of April and lasts till the monsoon arrives, during which hardly any crop can be grown without irrigation. An extremely hot weather such as that of 1942, when temperatures as high as 123° F were recorded in Allahabad and Lucknow, is hard on vegetation. Many of the trees died, and even from those that did not die, much of the fruit dropped off - mangoes for instance. If the temperature stays below 118°F and there is not an excess of the hot, dry west wind, the loo, most of the trees will survive. In the Ganges Valley the rainfall varies from about 100 inches near the Bay of Bengal to less than 20 on the edge of the desert - say between Agra and Delhi. In South India the monsoon lasts about twice as long as in North India.

If the rainfall during the rainy period were regular and well distributed, the farmer's task would be relatively easy. He could know on what to count. But unfortunately the rainfall comes at irregular intervals, with breaks between showers of anywhere from ten days to two weeks. This invariably makes trouble.

Torrential downfalls are another difficulty.(2) If a field has just been seeded and gets one of these heavy downpours, the seed is almost invariably washed away or buried and the field must be resown. In such concentrated deluges any loose soil is liable to be washed away, erosion is serious.(3) Again, while one part of India during the

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(2) I have measured at Allahabad over four inches of rain in forty minutes. An inch in ten minutes is not uncommon. In September of 1938 we had 12½ inches of rain in ten hours.
(3) The year 1942 has been one of the best monsoon years for a long time at Allahabad. We have most of our farm sown and crops doing well, but on one area we have entirely missed a crop, because after each of four successive sowings we had heavy rain.

monsoon may get more than its share of rain, and have destructive floods, another part may be getting very little, so that its crops wither and die.(4) Almost invariably, some part of India has too much rain during the monsoon, some too little; seldom is it just right, with well distributed showers and bright sunshine in between, over the larger part of the country. Heavy rainfall may cause the rivers to rise and cause great damage by flood. A few years ago along part of the Himalaya hills, the rivers from which drain into the United Provinces, an area of something like fifty thousand square miles, had twenty-four inches of rain in twenty-four hours. The result was that Lucknow was flooded, and great areas of crops were utterly destroyed.(5)

In parts of India where they have clay or gumbo soils, the farmer with his little wooden iron-tipped plough cannot get on to his fields before the rains, and after each rain he must wait a certain number of days for them to be dried out enough to plow. But I have known seasons when showers fell every day for the earlier part of the monsoon, with the result that the village farmer could not get on his land to prepare the seed-bed. Thus he lost his fooder crop for that year. Sorghum is usually the fodder crop on heavy land, grown mixed with some legumes. Even if he has been lucky enough to plant his seed early in the monsoon, continuous rainy weather makes weeding impossible. Many crops are reduced in amount because of the damage done by the weeds. As far as I know, there is little that either the Government or the people can do entirely to offset the irregularity of the rainfall. If we got one of the long breaks in the rains, one of ten to fourteen days, Indian corn or maize cannot withstand so much drought. The result is, in this part of India, that if the farmer were sure of the monsoon, maize would be much more profitable than sorghum, but experience has taught him that maize is too much of a gamble, so he usually grows the less profitable sorghum.

Most Indian seasonable crops have to grow within a short time, climate being the limiting factor. For instance, Allahabad is near the southern limit of profitable wheat growing. The seed may not be planted until the ground is sufficiently cool, usually after November 1. If the

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(4) While we have had more rain at Allahabad so far this year from the 1st of June than we had all last year, one of our group who lives about six hundred miles away says that his family had great difficulty in getting enough water for drinking, and the crops are burned up.

(5) This year, at Allahabad, the Jumna river rose higher than at any time during the last eight years. The result was we lost forty acres of our best fodder, which should have given us twenty-five tons per acre had we been able to cut it for silage. Consequently we are going to have very great difficulty to find fodder enough for the five hundred odd head of livestock we have to feed.

wheat is sown before the ground is cool it germinates quickly, then is attacked by a little hopper and dies. The field has to be re-seeded. It is seldom safe to plant wheat before the first of November, and sometimes it is not planted until after the middle of November. This wheat must be ready for harvesting any time after the 20th of March, as after that date a strong, dry west wind, the 'loo', blows and shrivels the wheat.(6)

There is another climatic danger. In the winter, in addition to cloudy weather bringing rust, there is sometimes heavy hail.(7) Few things are more destructive for the Indian farmer than these sudden hail storms. The people live in terror of them. Fortunately, they seldom cover a large area in any one year but usually are local. In this part of the Ganges Valley there has officially never been a killing frost; unofficially frost that damages crops can be expected every second or third year, but is usually only one or two degrees and does little harm except to sensitive things like tomatoes and pigeon pea.(8)

Indian weather and climate are blamed for many things for which they are not responsible, that is, malnutrition, and all sorts of preventable diseases. The remedies for these are known, and any physical deficiency caused by malnutrition or insanitation could be overcome if the proved

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(6) Last year, which was a very bad monsoon year, less than half the normal, we had great difficulty in planting our winter crops as there was not sufficient moisture for germination. There is a local tradition of Christmas rains. If anywhere from one-half to one-and-a-half inches of rain falls between the middle of December and the middle of January, we usually can count on a good harvest. But if there is hardly enough moisture to germinate the seed, and then the winter rains are delayed, as they were last year, to the last week of January when two inches fell and after a month three inches more rain with a lot of cloud in between, a bad harvest ensues. Because of the cloud the wheat was badly attacked by rust, then the hot dry wind in the first week of March instead of the last week further hurt the crop. As a result, we got only 40 per cent of our normal harvest. These unfavourable conditions fortunately were local. In the west of the United Provinces and the Panjab, the greatest wheat growing area of India, the return was above the normal. I am merely giving this instance to show what the weather can do.

(7) One year, early in March, it looked as though we were going to have the best harvest we had ever had. A sudden thunder storm arose and was of twenty-minutes' duration, with hail-stones bigger than golf balls. The fruit on the trees, like papaya, guavas, grapefruit, was all bruised and most of it knocked off. Our wheat, barley, flax and every crop we had - cauliflowers, cabbages, potatoes - were beaten and smashed. The ruin was complete. We did not get one-tenth of a normal harvest.

(8) See next page.

remedies were used. But when all is said and done, the climate tries one physically and mentally. Few people feel like exerting much physical activity with a shade temperature above the nineties going up to 120°F. Part of this time there is extreme dryness in Northern India; then when there is a sudden change to high temperatures and extreme humidity, just to live and keep going for eight months of the year is quite an achievement. To attempt to do serious mental work in a room with a temperature ranging from 95 to 105° makes demands upon one which few are able to meet. I have often thought thatGod gave to India the Himalaya mountains not only as the greatest storage of good, clean, abundant irrigation water, but also as a place of escape from the debilitating atmosphere of the plains. One of the best things that could happen to India during the hot weather would be for all dwellers on the plains to spend at least one month above 5000 ft. high. The Indian who is able to do this returns to the pla ins full of energy. One is struck by the way in which those who have endured the burden and heat of the plains seem either unable or unwilling to respond to the stimulus of a bicycle bell or a motor horn. They seem just too worn out to change direction. These extremely hot months are responsible, then, not only for physical inertia but also for mental slackening. It is a matter of historical record that this hot weather has an irritating effect: people become impatient and short-tempered. Air conditioning for homes, schools, mills, factories, railway carriages would not be a luxury in India. But India lacks the capital to invest in this comfort-increasing device.

Implements

Another serious problem is that the Indian farmer does not normally have the efficient tools which he needs to enable him to take advantage of all the differences in soil and weather conditions. His iron-tipped wooden plough will not break up the hard ground during the hot weather. An Indian proverb says plowing at this time is golden; but his plow hardly permits this.

Almost every time that any large area of India suffers from a shortage of rain, people say that Government should find drought-resistant plants; but when the rainfall is normal, the drought-resistant plants are drowned out. The trouble with the Indian climate is that during each twelve months there is extreme wet with a humidity way up in the nineties, and there is also extreme dryness and heat with a humidity frequently below ten per cent. In the winter or Rabi season you get one of the finest climates

(8) The most damaging frost 28°F I have ever seen in this part of the Ganges Valley came after the middle of February when all the crops had headed out. The damage was enormous and famine ensued.

in the world, if only the killing frost, the cloud that brings rust and the destructive hail stay away. So the tool which is adapted to the moist earth and the rains is of little use when the ground is baked almost as hard as cement. During this hot dry season, the Indian farmer, if he could only break up his soil, would prevent the loss by wind erosion of the surface organic matter which the soil needs so much, and if he could plough during the hot dry weather his land would be ready for the seed with the first rain, most of which would soak in with little run-off. Observation shows that, in nine years out of ten, if the sorghum can be sown with the first rain, the farmer can get a good crop, but if he has to wait a week or two before planting his seed, he is likely to get much less or to lose the whole crop. Cultivation is limited to what the farmer can do with his crude implements, and this greatly reduces crop yields. Government and private bodies are well aware of the handicap of ineffective tools and are seeking to find a remedy. The problem is complicated. There is one thing to be said for the Indian plow, it is perhaps the best tool for the Indian farmer if he can have only one tool.

Along with the question of tools goes that of the methods of cultivation used by the Indian farmer. He usually divides his farm area - which may consist of several widely scattered, small fields - into two equal parts. In one part he plans to grow the rainy-weather crops, and in the other the cold-weather crops. When the rains break, his main business is to harvest his rainy-weather crop. After that is done, he proceeds to prepare the seed-bed for the ensuing winter crop. By the time he gets around to begin to cultivate this land for the winter crop, it has a good crop of weeds. If they could only be left until about the end of the rains, he would then not lose so much of his topsoil by water erosion. The practice followed is to plow as often as he can get on to the land. But his clean cultivation during the rains means that he establishes conditions for the maximum run off by surface erosion of the best soil.

The problem of erosion is now engaging the attention of all the Government Agricultural Departments. The loss by erosion is perhaps the greatest economic loss from which India suffers. It has been estimated that the Ganges carries down every year eight times as much silt as the Mississippi, though the Mississippi is three times as long and has a catchment area six times as large. If the farmer had the right kind of soil-inversion plough, he could then leave his weeds, or plant a legume which would act as a cover crop as well as a green manure crop. This legume ploughed in toward the end of the rains, when there would be little danger from erosion yet time for it to disintegrate, would greatly increase the fertility of the soil. But with his one little plough he dare not leave weeds to grow, he cannot work them into the soil but must attempt clean cultivation.

In America and Britain it has been taught that clean cultivation is the best thing. Where rain falls gently this may, indeed, be the best thing to do. The Indian farmer has known this for untold centuries, but it now looks as though he will have to learn to change this age-old method, because of the serious erosion losses which it entails. As far as soil conservation during the rains in India is concerned, it is true to say that any weed is better than no weed. But during the winter and dry season weeds are among the farmer's worst enemies. His plow does not cut or uproot many of them.

Insect, Bird, and Animal Pests

Another serious problem of agricultural India is the control of insect, bird and animal pests. India is now deeply concerned with the locust menace. A group of countries - Egypt, the Sudan, Turkey, Arabia, Palestine, Syria, Iraq, and Iran - are united in an effort to control this very serious pest.(9)

There are other insect pests which damage India's crops amounting to millions of dollars every year; almost every plant has its special insect pest. Stem borers of sugar-cane and sorghum, citrus moths, boll worm, are among some of the best known. Little effort at control is exercised by the village farmer.

Birds are pests of maize by the day, but by night it is the jackals and the porcupines.(10) In many parts of India wild pig are numerous enough to be a nuisance. It is useless to plant sugar-cane, sweet potato, Irish potato, cabbage, cauliflower, peanut and many other crops if wild pig have access to them. The monkeys of India make commercial orcharding and market gardening practically impossible in many areas because they attack the fruits and vegetables. The result is that in many parts well adapted to growing fruits and vegetables little is done.

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(9) I have been in an Indian village near Agra after a locust invasion. More complete destruction of agricultural products the mind of man could not imagine. Locust swarms have been reported in Sind this season.

(10) The worst bird pests we have near Allahabad are the green-parrots and the crows. I have known a flock of green-parrots to take 80 per cent of the ears from a six-acre field of wheat. The Institute this year, seeing that there was such a food shortage, has planted about twenty-five acres of maize. In spite of having watchmen day and night, if we were to get enough maize to pay expenses, we had to harvest the crop before it was ready. Even then nine-tenths of the ears were damaged by the crows and the green-parrots.

Two Indian students of the subject have estimated that the rats of India destroy one-tenth of the grain of India, i.e. rice, wheat and barley. I think this estimate is conservative. In some parts of India there are herds of nilgai (blue cow). This animal is about as big as a moose. Because it has been called "blue cow" it is considered sacred, and few are willing to destroy it. In addition there are many other deer, like the black buck, which in some parts make the farmer question whether it is of any use even to attempt to grow crops.

The remedy for the insect, bird and animal pests, almost involves a change of religious belief on the part of the majority of the population. Growing out of the doctrine of transmigration is the belief in the oneness and sacredness of all life. Many of my neighbours speak of the killing of insect, bird and animal pests as murder. They will be no party to the taking life. When I urge my neighbours to take direct action, they reply, "God made them as much as He made us. Are they not entitled to their share," A rural population as closely packed as that of India, given the will, could reduce the animal pests to harmless proportions in a year.

The Cattle Problem

Under "animal pests" there is needed a chapter, or rather many volumes, on the problem, already mentioned in passing, of India's surplus and inefficient cattle.

Mr.Gandhi says, "I hold to the veneration of the cow." He has written and spoken of this in both Young India and the Harijan. He is freely quoted in a very interesting volume, The Romance of the Cow, published by the Bombay Humanitarian Society. This volume brings out clearly the regard, amounting to veneration and worship for the cow among a majority of the people of India. The cow is not considered primarily as an economic or domesticated animal, but as one to be venerated. In Asia, August 1938, I wrote an article which was immediately followed by an article putting forth the orthodox Hindu view regarding the veneration of the cow. Sleeman, writing one hundred and twenty-five years ago when he toured from Jubbulpore in the Central Provinces to Delhi and talked with the people, has recorded that in several places the existing troubles of India were attributed, by many of those he met, to the killing of cows. In one of the hill stations this last summer, I was talking to a shrewd and successful Indian merchant who stocks American cloth and all kinds of American tinned goods and toilet articles. We were discussing the present disturbed conditions in India, and at last he said, "all that India is now suffering from is in punishment for her disregard of the cow. If India would only prevent the murder of the cow, then God would bless India and remove all her troubles."

What are the facts regarding Indian cattle? India has about 215 million cattle, nearly one-third of the world's cattle population. India comprises about one-fortieth of the habitable area of the earth's surface. Remember also that India now has a human population of about 390 million. This gives her a density of population six times greater than that of the United States of America. In addition to this tremendous cattle population, she has the largest goat population in the world, one of 54 million. She also has 43¼ million sheep, over 4½ million horses, several million domesticated pigs, also donkeys and mules. She has about 240 million head of poultry and something over one million camels. In addition there are enormous herds of wild pig, deer, monkeys, jackals, porcupines, squirrels, rats. I do not believe it would be difficult to prove that India supports as much life per acre as any country in the world.

The experts tell us that India can produce about only half as much fodder as is needed to supply her cattle. This entirely ignores the requirements of her other domesticated animals. As Dr. Lowdermilk of the U.S. Conservation Service has pointed out, many of the worst desert areas of the world today were formerly highly cultivated, but overgrazing has converted these areas into deserts. The deserts of India are extending year by year.(11)

Because the cattle of India has so outrun the food supplies, they have deteriorated in quality. Except in agricultural colleges and military dairy farms and the farms of a few well trained Indians, there is practically no control of the breeding of cattle. In fact, frequently the male that is not good enough for draught purposes is released for breeding purposes. Few people in India recognize that domestication of animals implies an agreement between animal and man. The man agrees to care for the animal, and in return the animal gives to the man certain things it produces, which he wants. The man takes the

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(11) In this part of India the evening or twilight or sunset is known as "cow dust", as these herds of cattle wend their way to the village a cloud of dust arises. For the eight dry months of the year the cattle are turned out on what looks absolutely barren desert. No blade of grass or edible weed gets a chance to grow. The feet of the animals pulverise this land, and especially during the hot weather after the cold weather crop has been reaped, the cattle is turned on to glean the stubble. All stubble is pulverised. This then is picked up by this hot west wind, and for days on end the sky is so dust-laden that the sun is seen through a haze. Usually the first heavy rain catches so much airborne dust that to be caught out in it is not getting a clean shower but rather getting a mud bath.

animal from the wild state and relieves it of the necessity of fending for itself. Domestication of animals implies that man will control the breeding, and thus control the numbers, so that they shall not outrun the fodder supply. The absence of any control over the breeding of cattle in India has made it literally true that, even though half starved, the cattle is eating India out of house and home. The surplus cattle cost India each year more than the Imperial Government raises by taxation under all heads. The Hindus have laid this heavy additional burden upon themselves. While it is true that Moslems and Christians and some low-caste people eat beef, the people who under ordinary circumstances would eat beef, refrain from doing so in many parts of India, so as not to hurt the religious susceptibilities of the Hindus. The number of cattle slaughtered in India for food purposes, while in the aggregate it may seem large in proportion to the number of people who eat beef, yet in proportion to the number of cattle in India is not enough to make any appreciable impression upon the number of cattle. What is needed is a change of attitude on the part of the orthodox Hindus so that they will prevent the indiscriminate multiplication of cattle: what is needed is birth control for cows.

If the people of India would only breed from the best and restrict the numbers of cattle to the available food supplies, Indian agriculture would be greatly improved. Much land which ought to be devoted to growing food crops is now left for grazing purposes. The cattle gets less food from the so-called grazing land than if the grazing land were put into food crops, where the cattle would get the leaves and stalks, and human beings the grains. There is no other way to solve this problem of India's cattle than to find a way, without hurting the religious susceptibilities of the Hindus, to restrict the number of cattle in each district. Possibly when India gets its own government this will be one of the first things taken up.(12)

The average annual milk yield of an Indian cow is estimated to be six hundred pounds, or less than a quart a day for three hundred days. Most Indian village cattle are dry for as long a period as they are in milk. The value of the milk produced plus the offspring plus the manure does not pay for the cost of feed and care for the cow. If one compares the average yield of cows in dairy

(12) Some of my colleagues visited Mr. Gandhi a few years ago. One of them asked what Mr. Gandhi thought of India's cattle wealth. He remarked that India had no cattle wealth, India had a cattle burden.

countries with that of Indian cows, one cannot but be struck with the great difference. India has yet to learn that low-producing cows produce dear milk, and that high-producing cows produce cheap milk. It is now possible to get one Indian improved cow that can give six thousand pounds of milk a year. Such a cow gives a good profit, but keeping ten cows giving what the average Indian cow gives, results in heavy loss which goes a long way to impoverish the owner. They are a debit not an asset. In no country in the world is cheap milk more to be desired than in a vegetarian country like India. Milk and its products are the only sources of animal protein for millions of people. It may be only a coincidence, there may be no causal relationship, yet it is a fact that of the milk consuming peoples those which consume the most milk have the highest expectancy of life, and those that consume the least milk have the lowest expectancy of life. India needs to increase her milk production at least six-fold to meet the food requirements of her people. But she cannot do it by multiplying her cows six-fold, that would only further complicate the fodder problem. She must reduce the number of cattle while increasing the milk yield.

With narrow limits, the quantity and the quality of milk that a cow can give, are inherited characters. If the cow has an inheritance of a small yield of milk of poor quality, no feeding can cause her to change her inheritance and increase her yield or its cream content. What often happens in India is that the cow is so underfed that she cannot give up her inheritance. Scientific breeding and care can increase both quantity and quality of milk.

One important fact must not be overlooked. It is this: India has the best tropical cattle to be found anywhere in the world. Wherever in the tropics it is desired to improve local cattle they always come to India for the foundation stock. Indian animals have improved stock in Texas and Florida. Many people not familiar with Indian cattle have an idea that there is only one breed of cattle in India, whereas there are more breeds of cattle in that country than in Europe and America put together. In India a breed seems to have developed for each climatic and soil condition. Indian cattle have three very valuable characters:
1. ability to stand the climate. Cows continue to give milk when high temperatures would incapacitate most American cattle.
2. high digestive ability, which enables it to thrive on coarse grasses, and in amounts that would not maintain the body weight of American cattle. This is a good example of the survival of the fittest.
3. immunity to disease. As long as animal power is used by the Indian farmer, the ox will be needed. The Indian ox can work and thrive in a mean temperature eight to ten degrees hotter than the horse can stand.

Means of Communication

Another of the major problems of Indian agriculture is the lack of communications. Anyone looking at the map will see that India is comparatively well off as far as railroads are concerned, that is, with something over 42,000 miles of railroad opened. There are also trunk roads which are gradually being improved - with bridges or ramps - so that more of them are becoming all-weather roads. Readers of Kim will recall the Grand Trunk Road. But apart from these railroads and trunk roads, there is a lamentable lack of ordinary roads, which are needed to criss-cross the country and to provide short cuts, suitable for cart traffic at all times of the year. This lack of usable roads costs the Indian farmer much more than the interest would be on the capital used to build good roads.

The value of the railroads to the Indian farmer is very great; yet it is lessened by the fact that there are five railroad gauges, only one of which, the broad gauge, is permitted to enter an Indian port. It has been stated some years ago in a railway magazine that it costs 30 per cent more to transport goods over the Indian broad gauge 5' 6" than over the meter gauge or the American or European gauge. If this is correct then the broad gauge of the Indian railways is a serious handicap to agriculture. Indian agricultural products are called upon to pay higher rates because of the broad gauge than if they had one of the narrower standard gauges. But this is not all. Some of the narrow-gauge railways of India serve some of its richest agricultural areas. These have exportable surpluses that must be transported from the area where they are grown to where their market is, in India or beyond. This frequently involves at least one transhipment, sometimes more, before the commodity reaches its destination. As Indian markets differ in nothing from other markets, there is only one price in a market, at one time, for any one agricultural product, irrespective of the cost of getting the product to market. What the excessive railroad charges plus the cost of transhipment means, is that all this extra cost has to be borne by the farmer. This reduces the amount left to him. There are a number of areas in India where the soil is rich and where almost any of the common, transportable non-perishable crops can be well grown, yet hundreds of thousands of acres lie idle because by the time the farmer has grown a crop the expenses of getting it to market cause him to lose, and he does not recover the cost of production. Were communications adequate these areas would become more prosperous.

Unfortunately most of the railroads of India are now owned and managed by the Government. This means that they are more expensively and inefficiently run than would be the case under a commercial company. It is practically impossible to discharge an inefficient government official. The Government could easily own the railroads and rent them

to companies who would run them on commercial lines. The inefficient workers would then soon be weeded out, but now the inefficient railway men receive their pay and promotion in good time. The public pays for their mistakes.

Moreover, because the railroads of India are practically a government monopoly, motor transport by road has been, and is, severely handicapped and restricted, both by the very high import duty - around 30 per cent on all motor cars and accessories - and by the heavy and unreasonable tax on gasoline or petrol - twenty to twenty-four cents a gallon - also by the fact that comparatively few miles of road have been built for motor traffic. The Government still considers the motor car a luxury and taxes it as such. The dusty roads of India are among the greatest motoring hazards I know. I know of no more shortsighted policy of any government than that of the Central and Provincial Governments of India with regard to the development of motor traffic. No country in the world is more suitable for motoring. India possesses some of the finest road-building material to be found anywhere in the world. It can make as good cement as is made anywhere, as cheap as is made anywhere; but the cement makers have been able to get protection which enables them to enrich themselves at the expense of the general public. Cement could be manufactured in India especially for road-making purposes and sold at a lower price than for other objects; and the companies could still secure a reasonable profit, for a reduced price would make possible the extension of the road system of India. The cement makers of India need to learn Henry Ford's lesson, "how much for how little, not how little for how much".

Through lack of feeder roads or any kind of cart road other than a bridle path, the agricultural products of many villages in India, during the rains, are cut off from their outside markets except for head-loads and pack animals. Carts cannot be used. While the human head is capable of doing a great many things, it is the most expensive of all the means of transport now in use. Even in the dry weather the dirt roads, often gullied, with deep sand, make even bullock carts uneconomical. They can carry from one third to one fourth of what they could carry if there were a hard surfaced road from every village. These village roads should connect with the main arteries leading to the markets.

The lack of roads is one reason why so many Indian cities have such a low per capita consumption of fruit, fresh vegetables and milk. It is the time, not the distance, that is the determining factor in getting supplies of perishable products to market in good condition. Four miles by head-load or pack animal is farther away from market than twenty or thirty miles by motor bus. Good roads greatly increase the area of supply, and a larger quantity of perishable farm products reduces the

price. (The amount of such produce carried to market by railroads is very small.) In other words, in so far as the lack of roads raises the cost of production, it also raises the price to the consumer and thus lessens demand. Most fruits, vegetables and milk in India are as dear or dearer than the same commodities are in America or Great Britain. There is probably no heavier handicap upon Indian agriculture than the lack of adequate communications. Government would be justified in borrowing money to build roads and in increasing the taxation of the people wherever the roads are put in. The increase in the value of the land and its products is ample justification. Furthermore, a good road with bus and lorry facilities transports ideas which will emancipate backward areas from their isolation and ignorance. A really good road is as valuable to India as many a high school or university.

Standard Weights, Measures, and Market Charges

Another place where the Indian farmer suffers much, that when he takes his products to the weekly or bi-weekly market, or sells to the village merchant, he confronts a difference in weights and measures. In the Allahabab bazaar, potatoes, wheat, all commodities brought in by the farmers, are bought by the agents, middle men, and merchants at a maund which weighs a hundred and ten pounds, but these same commodities are sold to the public at the government standard maund which is only 82.27 pounds.

The only thing standard about weights and measures is the name. The amount or measure varies from district to district and from region to region. And I have yet to hear of a variation of weight or measure in favour of the farmer.

Again all sorts of charges, most of them unjustified, in that no service is rendered for them, are imposed upon the farmer when he brings his produce to market. In many places a bag of wheat of about 200 lbs. pays from twenty to thirty cents in market charges. Then the dealer usually takes a dockage of several pounds of wheat in addition. Most Indian municipalities have the octroi system to raise the municipal budget. Every responsible individual or group that has studied the octroi system condemns it, because of its failure to secure the municipal revenue at a reasonable cost. The octroi system lends itself to all kinds of dishonesty and corruption and makes it exceedingly difficult for an honest man to do business. Some cynic familiar with Indian municipal octroi systems has said that he presumes that the cotroi system will persist in Indian municipalities until some other system capable of more graft and corruption can be discovered.

Small and Scattered Holdings

Other problems for agriculture arise from size of holdings, the relations between landlord and tenant, and the systems of land tenure. There is the question of small and scattered holdings. A book dealing with Indian agriculture almost invariably makes much mention of this. It has been stated that in the United Provinces the size of the average holding in the case of a tenant farmer is 3¼ acres, in the case of a landowner 4½ acres. Either holding is too small when the land has no irrigation facilities and when extensive agriculture is practised, properly to support a family. If you take the number of cultivated acres in an Indian province and divide it by the number of cultivators, either owners or tenants, who are on the government records, it looks as though the average thus arrived at should tell what the situation is. But a little reflection and observation will show that such an average can obscure the facts. These holdings should be divided somewhat as follows: first, holdings of those owners or tenants whose only means of livelihood is agriculture; secondly, the holdings of cultivators near the cities, towns and larger villages where the family may have one or two acres but most of the members work in the town nearby. Again there are many holdings away from cities where the men of the family work in the mines, the mills, and in construction work of all kinds. They may be away from their village for eight months out of the year, being home only for seed time and harvest. In both cases, the largest part of the income may come from the wages earned and not from the land.

Again in most Indian villages there are a group of people, usually of low-caste origin, who serve the village in various capacities, each restricted to his caste occupation, and who live mostly on the support given by the ordinary villager - the sweeper or village scavenger, the dhobi or washerman, the barber, the chamar or cobbler (who removes the dead animals and does the leather work), the lohar or village blacksmith, the kuar or potter, and some others. Each of these is usually paid in kind, a sheaf or a few pounds of grain at harvest, or the right to weed and glean. But in many villages this professional work is not enough to enable the family to live. So the family is frequently given the right to cultivate a small area of land, from one-fourth of an acre up to two or three acres. The main business of these village servants is not the cultivation of land. If the government statistics could take account of the fact that holdings are of different categories, a picture might be presented of the size of the holdings of those whose sole means of living is from the land.

One of my colleagues has ventured the suggestion, which has more to commend it than most of the written reasons I have seen, that the determining factor regarding the size

of holding of the farmer whose sole means of livelihood is his 'land' is the amount of land which the cultivator can manage with his one or more pairs of bullocks. One pair of oxen under given soil and irrigation facilities can cultivate a given area of land. If the cultivator's own holding is larger or smaller than his bullocks can cultivate he so arranges matters that he gets as nearly as possible the area required to utilize his oxen. If he has more land than his bullocks can cultivate he will sub-let part of his holding. If he has less land than his bullocks can cultivate he will rent additional land. But when every allowance has been made, the small and scattered holdings are a serious handicap to economic crop production. The fact that India has so few fences; the fact that the fields are so small and would demand such an enormous amount of fencing with so many gates; the fact that the crops have so many enemies - not only the insects, birds and animals already mentioned but also, as perhaps the most destructive of all, the human thieves who steal the crops - all make farming on a small holding very expensive per unit of produce fit for sale. These dangers demand that some member of the family guard the crop night and day; and even then there are serious losses. This cost of watching is a drain on the farmer's time.(13)

Most Indian farmers do not have their farm houses on their own land, but the farmers come together to a special site where all those farming in a given area live. Usually the farms are divided into a number of small, widely scattered fields, and it would be difficult for the farmer to live on one of these small pieces. Again, the farmer has to think of protection against wild animals which roam in many parts of India - tigers, leopards, panthers, wolves, hyenas, jackals, wild dogs and bears. There are also organized bands of dacoits to be guarded against. Wells for drinking water in many places are deep and expensive, and if the farmer had to provide his own well, much greater investment than he can make would be necessary. In many villages today there is only one well to provide the drinking water for men and beasts throughout the year.

Again, while the small holding lends itself admirably to intensive agriculture, yet the fear of the farmer that after he has done his best to grow a good crop, he will not be permitted to enjoy the fruits of his labour, is one of the most serious hindrances to greater crop production. So most of the small holdings are farmed

(13) This year, in spite of paid watchmen, we lost over fifty bushels of wheat from a twenty-acre field, the ears were cut, leaving the stalks. In our orchard certain fruit trees were laden with fruit, but we did not get a single fruit, all were stolen. At least half a ton of grass is stolen daily in spite of our watchmen.

extensively. The small farmer must give to the village servants the customary part of his harvest in payment for their services. Then there is the landlord or his agent. If he were satisfied with the legal rent all would be well.

Tenancy System

I know of no country in the world with better tenancy laws than the tenancy laws of the United Provinces. In general there are two classes of tenants:

One class has the right to cultivate the land in perpetuity, so long as the rent is paid, and so long as there is a legal heir. The legal heir, if he pays the rent, can go on cultivating the land. Only when the family dies out do the cultivating rights revert to the landlord. This kind of tenant is not a land owner, because his right though inheritable is not saleable. His rent has been fixed for a period of thirty to forty years by a specially trained government officer. The rent cannot be raised by the landlord without recourse to a court of law. The instructions in the Act to the trying magistrate are that the tenant must always be given the benefit of the doubt, he must receive first consideration. So this class of tenant has security of tenure and fixity of rent for a sufficiently long period to encourage him to improve the land and get as much out of it as possible.

The second class of tenant, until 1927, was the tenant-at-will who was rack-rented and had to change land at least once in two years. His was a miserable existence. The Act of 1927 gave any man cultivating a piece of land on a given date in the year 1927 a life interest in that piece of land, and for five years after his death, his heirs could cultivate it. Only then did it revert to the land owner. In spite of these excellent tenancy laws, the landlord and his agents, the moneylender and his agents, petty government officials - including those who record the village fields and crops, irrigation subordinates, police, all seem to feel that they have a right to exact something from the village farmer.

It has been the custom in India that the various officials should tour in the districts, going to the villages and meeting the farmers and villagers at first hand. This has its good side, but it can also in the case of a greedy official - or of a good official with greedy servants - be as bad as a blight or a plague. Frequently the servants of the touring official take food and fuel without payment.

All this drives the farmer to ask: why should I work hard and do my best, and get a good crop, when the result of it all is that they leave me barely enough to keep body and soul together, Nothing that I know of in India would do more to increase crop production, than for

the farmer to know that extra work in his fields would lead to a certain and sure reward for his extra toil. "Work without hope is dead." Work with assurance of a fair return puts faith and hope and courage into the farmer.

The present relation between landlord and tenant also is a serious handicap to agriculture. Many landlords hold that they have a right to all they can exact legally or illegally from their tenants. Few tenants make use of the law which is there to protect them against the rapaciousness of the landlord, nor do they have the resources to fight the landlord who engages in illegal practices. If they do, the landlord may engage false witnesses and bring a trumped up false charge which the farmer does not have the money to fight; or he may engage professional gangsters, goondas, to beat the farmer or set fire to his crop on the threshing floor (a common way of paying off old scores in Northern India), or to set fire to his thatched roof, or to molest his wife and daughters. Many apparently peaceful and quiet Indian villages are reeking with intrigue, with jealousy, with irremovable injustice, with murder, arson, false witness. Fear is the dominant note in Indian village life.

Both landlord and tenant need to learn the great truth that their interests coincide, that they are not contradictory or mutually opposed. Both derive their support from the land. Both should strive to increase the yield from the land. Only as yield is increased will there be more to share between them. The landlord should see that it is to his interest to make permanent improvements on the land, so as to increase the yield and to reduce the expenses of production. The landlord should see to it that the cultivator's share is enough to maintain the cultivator in physical and mental fitness. And it is necessary to remind the tenant that he, too, has responsibilities and obligations. The ordinary landlord is no more anxious to cheat and exploit the tenant than the ordinary tenant is to cheat and exploit the landlord. It is the atmosphere of mutual suspicion, lack of faith, and the widespread refusal to believe that anything better is possible, which hinders production.

Land Revenue and Rent

In part of India the Government owns the land and rents it directly to the tenant. It appoints a rent-collector for every village, who collects the rent, remits it to the Government, and receives payment for his services. This is true chiefly of Madras; but in the United Provinces and Bengal the Government has repudiated the ownership of the land and has recognized land owners. It is true that under the Moslems there were no land owners. Rent collectors farmed the districts, got out of them as much as they

could, and remitted to the Government what it demanded. Under this system the rent collector took all the traffic would bear. But when the Government mistakenly recognized these men as the owners of the land, about one hundred and fifty years ago, it made tenants of those who, because of their virtue as fighting men, had lived as feudal vassals of the central power, paying a nominal share of their produce to the one who collected for the overlord. With increasing stability of government, there was a smaller demand for fighting men, who thus sank to the level of tenants. In the early days, the landlords created in this way by the British exacted all they could from the tenants. Then the Government stepped in and trained officers to appraise the value of the land, to take up one district at a time, and in the presence of the landlord and the tenant to fix the rental for the next generation - in practice, a period of from thirty to forty years. The tenant paid his rent, thus fixed, to the landlord. The landlord paid one-half of this rental to the Government as land revenue or land tax. About 8 to 10 per cent went in local rates. The result was that the landlord had 42 or 40 per cent of the rent as his own income. In the course of years, the percentage of the landlord's part has increased, and, the percentage he pays to the Government has decreased: instead of being 50 per cent, the Government's share is now less than 40 per cent.

The share which the Government gets from the land has sometimes been misrepresented in America. It has been said that the British Government takes one-half of the produce of the land as land tax, and it has been added that this is the greatest reason for the poverty of the people of India. But that is not a true statement of facts. What the Government does take is a certain percentage of the rent, now less than 40 per cent.

Some years ago I made a comparitive study of rents in different countries for land with approximately the same productivity. I came to the conclusion that India paid the smallest rents of any country in the world (except in the areas of tenants-at-will with consequent rack-renting), and that India was also the least taxed country in the world. I believe that any careful modern investigation will confirm these two statements. I know men who pay from fifty cents to two dollars an acre for rent. They may farm land which produces a crop of sugar cane or potatoes where the net profit made easily amounts to $50 per acre; so that the tenant is not over-burdened with rent nor the landlord overburdened with the legal exactions of the Government. The landlord gets two dollars an acre from the tenant, the Government gets about seventy-five cents out of the two-dollar rent.

Misuse of Organic Wastes

In most Indian towns and large villages there is an accumulation of street sweepings and various vegetable wastes which are collected at certain centres and then dumped by the municipality. In many places this material is used to fill up depressions, old tanks or abandoned brick kilns. If this material were trenched according to the system worked out by Major D.J. Meagher, who started the Allahabad Grass Farm, this waste matter would give a good return. This system has a trench a foot deep and three or four feet wide, as far as a man can throw dirt comfortably. This trench is then filled with this street sweepings and vegetable waste. It is covered up, not with the dirt which was taken out of the trench, but by the dirt which is thrown out of the next trench to be dug on top of this organic matter, thus opening a second trench which can then be filled. This process goes on until the field is trenched. I know of no other way in which these wastes can be made to give so large a return, nor do I know any other system of manuring which gives results that last so long in India! Fifteen or twenty years after, trenched land can be distinguished from adjoining untrenched land which may have had an equal amount of manure added to the surface.

In many parts of India the cattle manure is used for fuel, not applied to the land. The manure from the other animals is usually taboo because of caste, and is mostly wasted. The habit of most village people is to go to the fields to defecate. The land around the village site is usually richer therefore than that further away from the village, and there is a special name for this land thus fertilized. It pays a higher rent than the rest of the village land.

In most villages there are heaps of organic fuel, ashes, vegetable wastes of all kinds, as well as a certain amount of manure other than cowdung. These heaps usually breed flies which spread disease in the village. These village wastes usually have not been used. Mr. Brayne taught the villagers in the Punjab to put these village wastes into pits about twelve feet square six to eight feet deep and, at the right time, dig them out and carry them to their fields as manure. A few years ago I went through some of these villages. I saw that in the villages that had been used the pits for a number of years, the crops were much healthier in colour, much larger in amount, than those in adjoining villages that refused to conserve their wastes in pits. The organic matter which India now wastes in towns and villages would make any other country in the world agriculturally rich. In failing to use this organic matter, India wastes more wealth than she digs out of her gold mines!

Land Wasted as Grazing Land

A foreigner coming to India, who has heard of the alleged overpopulation of this country and the consequent pressure upon the land, must be surprised, as he travels from one end of India to the other, to see such enormous areas of land which for the greater part of the year look like a desert, or at least a wasteland, a non-productive land. But if he were to talk with the villagers whose village area this wasteland lay, he would be told that this is their grazing land. Because the cattle of India have at best only half as much food as they need, any land set aside for grazing is usually

so badly overgrazed that it produces only a fraction of what it would bear if there were some reasonable limitation on grazing. Much of this wasteland has now become practically barren. The only plants that live on it are either poisonous or so thorny that animals cannot destroy the foliage.

Most of the grass used to feed Indian animals in the stall is taken by the villager, either by weeding his own fields or by chiseling (cutting below the surface of the ground with a chisel) the grass from the road-sides or vacant lands during the rains. One from outside India who travels during the rains, when the land is green and beautiful and things grow very fast, sees that much of what appeared to be desert-like wasteland in the hot dry weather is now covered by vegetation. But a good proportion of the vegetation will be found to consist of non-edible weeds. The Indian villager as he chisels his grass will always carefully cut round the weed so that it is left to go to seed. This means that every year the area under edible plants is lessening, while the area under inedible weeds is increasing. Why is it, that, in spite of explanations, and offers of reward for cutting weeds, in spite of punishment for not cutting weeds even when the ground is soft so that it is easy to pull them out by the roots, the villager insists on leaving the weeds to occupy his lands? He does not realize that weeds are like sin, and that pruning them leads to larger growth while to uproot them is their sure death. The so-called pasture land of India has its animal food capacity reduced by more than half by these weeds. In most parts of America, once or twice during the grazing season, the farmer goes over his pastures with a mowing machine or a scythe and carefully cuts the weeds before they go to seed, so as to maintain the desirable grasses. India would have some of the best fodder grasses in the world if the land were treated properly.

Sanitation

The public health officers tell us that 30 per cent of India's disease is due to lack of sanitation in the villages. The habit of the people of using the fields for defecation spreads such diseases as typhoid, dysentry, hookworm. Little pools of stagnant water, or rain water caught in any vessel that will hold it, breed mosquitoes and bring malaria. Most of this 30 per cent of India's disease from lack of sanitation could be prevented if the people were to cover that which cometh from them, as Moses commanded his people to do when they were smitten with the terrible epidemic; and were to get rid of the stagnant water. A half-pint cup of water can breed enough mosquito larvae to infect the whole village, with serious economic loss.(14)

Some of the richest soil is in the Tarai. This land among the least populated in India is at the foot of the Himalayas. As a rule the water table is near the surface. The population is very scarce in many parts of the Tarai where much of the area is waterlogged. Because of this condition the area is very malarious, and most of the land lies idle. The people are too reduced by the disease to have much energy for work. Crops like sugar-cane, the water requirements of which are great, can be grown in this tarai land year after year without either manure or water. The natural grasses grow up to 8 or 10 feet in height. They die down each year and build up organic matter of great fertility - and have done so for hundreds of years. If this tarai could be drained and the malaria be driven away, the tarai might be a farmers' paradise.

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(14) Today, September 30, 1942, from 25 to 35 per cent of the neighboring villagers are off work suffering from malaria. This will result in planting seed in improperly prepared seed-beds and a consequent crop reduction.

One curious thing in India is that according to the government statistics one-third of its culturable land lies idle, not fallow. Land is said to lie fallow when it has had one crop and is given a rest in order to restore fertility for another crop. This cultivable land in many cases has never been cultivated, partly because the people insist on leaving large areas uncultivated to graze their cattle. In some parts of India large areas of good land lie uncultivated also because of bad government or because of the nature of the people - such as the so-called criminal tribes which resort to honest work only as punishment and which make so much trouble for the ordinary farmer that he runs away when they come near. And some of the wasteland is simple land that has not yet been tamed and improved.

A country which leaves one-third of its cultivable land untouched can hardly be said to be overpopulated. With modern methods of erosion prevention and soil reclamation, much of the so-called uncultivable waste of India can be brought into profitable cultivation. India is very rich in its forests and in the variety and abundance of its forest trees and products. But in the neighbourhood of most of the forests the villagers claim the right to go in and cut wood and to turn their cattle and sheep and goats into the woods to graze. This use soon destroys the forest. In parts of India villagers have in this way destroyed in a few years what it had taken the forest over a century to produce. There are thousands of square miles of land in India that have once been heavily forested with valuable timber; but the reckless misuse by the villagers, and especially overgrazing, has caused the forests to disappear, and now there little but bare rock remains, with little gaps along water courses where trees and other vegetation try to get a start. The over-burden of cattle and goats and sheep prevents the forest from re-establishing itself. One notable thing in India is that while the government has made strenuous efforts to preserve and develop the forest as a national asset of incalculable value, public opinion is almost invariably with the villager who claims the right to go and use it for his own purposes and destroys this part of the public heritage.

Credit Facilities

The farmer's heavy indebtedness is one of the commonplaces in all discussions of Indian farming. Several Indian provincial state legislatures have in recent years introduced legislation to cancel the debts of farmers under certain conditions and to make it impossible for a land owner to mortgage his lands or at least when he has mortgaged his land, to lose its possession for purposes of cultivation because of the debt. Such legislation, designed to help the Indian farmer's credit, has really hurt it, because now when he needs money, people who have it are afraid to lend it to him: for, the debt may be cancelled by law, or they cannot get possession of his land if he has given that as security. In this matter as in many others, more than good intention is necessary; a knowledge of elementary economics would have helped.

The cooperative movement in India has helped to supply the farmers with credit. It is the most hopeful of all the remedies offered to relieve the farmer from his burden of debt. No other movement offers or promises so much; yet as one thinks of what has actually been accomplished, or as to what might have been accomplished, the results are disappointing. Some of the reasons for this comparative failure are that the landlord class (the well-to-do leisured class of India), which was supposed to come forward and give its services in managing the cooperative societies, have not done so, except in a few instances where such public-spirited men have great achievements to their credit. But the majority of the leisured well-to-do have practically left the matter alone. Nor has there been wanting dishonesty on the part of non-official officers of

the cooperative credit societies, and this has seriously hurt the reputation and usefulness of the movement. The result has been that the Government has had to put in its own officers to manage the cooperative movement.

Unfortunately, for the last few years the movements backed by Government have not been popular in India. The popular psychology is against a cooperative movement run by paid government officials. Apart from any of these disadvantages, where the movement has been efficiently and honestly run by good managers, difficulties have arisen from the inability of the borrowers to make repayments on time. There are probably two main reasons for this: a series of bad harvests and the world wide fall in the prices of agricultural products. When the prices of agricultural products were going up, it was of great benefit to the Indian farmer to be able to change his payments from payments in kind to payments in money. But when the prices of agricultural products fell to levels not seen for hundreds of years, to pay in money was much harder on the Indian farmer than to pay in kind. It took so much of the villager's produce measured in money to pay his rent and interest on what he had borrowed that very little was left for him to live on.

Just let us look for a moment at the ordinary Indian village farmer. Apart from his land possessions - household furniture, agricultural implements, wearing apparel, and cattle - may be worth anywhere from twenty to a hundred dollars. What he owns is not of much value to an ordinary bank as security for a loan. So there is no bank of the ordinary kind that would lend money to a person with so little, and security of so unsuitable a character. As a result he has had to resort to professional moneylenders who have to charge rates of interest sufficently high to cover the risk of loss of the capital lent, in the case of a large number of borrowers. Many of the professional village moneylenders are relatively poor men even though their rates of interest, measured by ordinary banking standards, are exorbitant. They lose so much of their capital through death and absconding that many have little left over at the end of the year.

It is for the debt-laden farmers that the cooperative movement in India is the best means of economic salvation. But the differences in the Indian villages in religion, in caste, in social strata, frequently make it impossible for people whose economic interests are common to get together to form a successful cooperative society. In spite of the great difficulties which the movement has had to overcome, and still has to overcome, nothing else offers so much of usefulness for the wellbeing of the Indian cultivator.

Not only has the Government encouraged the cooperative movement in every way it could, but before the cooperative movement got a start, it had arranged to grant to village farmers long-term loans, taquavi , for productive purposes. This system provides for three kinds of need: Where a man has no seed at the time of planting, the government will advance the seed to be repaid at harvest time with a return of one and a quarter times as much grain as has been given. This may seem a rather heavy rate of interest, and yet this barely covers the cost of distributing the seed and the loss from crop failures. The Government will advance money to buy oxen; in this case the interest and a proportion of the capital have to be paid each year for three or four years. The Government will advance money for the purposes of a well or irrigation facilities or drainage or other permanent improvements in the land; and in these cases the repayments may be spread over from ten to fifteen years. Furthermore, in all times of rural strain and stress this taquavi loan system is freely used to help the people.

One type of moneylender that should be banished by law from the Indian countryside is the Khan Pathan moneylender. These men have the countryside mapped into plots. They take cheap cloth or other desirable merchandise and urge the villager to buy on credit. If the villager refuses to buy, he is forced to do so. The price of the cloth is up to twice the bazaar price; upon this interest is charged at monthly rates which often work out at from 150 to 200 per cent per annum, and this interest is compounded. In case monthly payments are not made, strong-arm methods are used. The debtors live in terror of these bloodsuckers. Once a villager is in the hands of this group, only death provides release.

There is another cause of the villagers' indebtedness which is frequently said to have been exaggerated in its importance, but which for India as a whole is of the greatest economic consequence. I refer to the very large amounts of money that are borrowed for unproductive, or rather non-economic, objectives - weddings, funerals, pilgrimages, and the feeding of the caste brotherhood. Sometimes the total prospective income of the farmer for three or four years is spent on one wedding. All of a year's income may be spent on a feast to the brotherhood. But in India the villager says, if it is to be a wedding, let it be a wedding, let us forget what comes after, let us provide lavishly so that we may long remember this event. This is one of those things that make one of India's chief "agricultural problems," the farmer himself. The government has done a great deal to teach and illustrate the necessity for caution in personal unproductive expenditures.

A brief statement regarding the famine policy of the Government seems in order, because this, too, has a profound social and economic effect on the rural areas subject to that catastrophe. American illustrated papers from about 1890 to 1902 contain pictures of Indians starving from famine. Millions of dollars and shiploads of food were sent to relieve their suffering. One paper alone sent out over four million dollars. Why is it that for a generation India has not suffered as she used to suffer from famine? It is not due to a change of climate, nor to a succession of favourable seasons. It is due mainly to the famine policy of the Government.

Every year a certain percentage of Government revenues was put into a central Famine Fund until it reached a large sum, earmarked for famine relief which is available as soon as their is a crop shortage or failure. In the old days when famine came people wandered off with their livestock in search of food and water. Many died by the roadside. Large areas were depopulated and when rain fell there were no farmers to take advantage of it. One failure of rains often means the failure of at least two crops: no crop is grown for at least a year or a year and a half. Today, as soon as scarcity is imminent, before any wandering takes place, public works are started within reach of the people, for which they are paid daily wages. Grain stores are opened at cheap controlled prices. As a result, when the rain falls, the farmers are in good heart, continue to live in their own homes, and are all set to go to work on their own land. They have incurred no additional debt during this time. Moreover, the public works are permanent improvements - irrigation or drainage schemes, road building, and the like - so the money spent is not given in charity, but is an investment for the public good which gives a good return. Other contributing causes to the conquest of famine have been the increase in rail and road communications and the great extension of irrigation facilities. The famine code of India is one of the greatest achievements in social legislation the world has ever seen.

Change of Attitude

Lastly, a great agricultural problem is the poverty of the people. Poverty and lack of productivity constitute one of the worst vicious circles anywhere in the world. That agricultural India should be poor and have insufficient food and clothing and housing is a great tragedy precisely because most of the remedies for this poverty do not call for any impossible burden of capital expenditure or investment. The causes of poverty are removable by a change of attitude on the part of the farmer. This was the unanimous conclusion of the Royal Commission on Agriculture which made the most comprehensive and exhaustive factual study of Indian agriculture ever undertaken. The Commission was composed of men, British and Indian, who knew both India and agriculture. Their conclusion was that India could never realise to the full its great agricultural advantages until there was a change of attitude on the part of the Indian farmer. Mr. Moreland, one of the most thoughtful and scholarly members of the Indian Civil Service, who had an intimate knowledge of rural India in the United Provinces and love and respect for the villager, came to the same conclusion.

The Indian farmer is one of the most likeable people I know. When he has farming operations to perform he is industrious and hard-working. He also has a large amount of accumulated, accurate agricultural information. But he is handicapped by certain social-religious customs and beliefs which interfere with his conduct of profitable farming. One of the strongest handicaps is the prevailing fatalism: what happens must happen, God has willed it. it is useless to fight or struggle. No effort of his, the typical Indian farmer believes, can change what God has decreed. This belief robs him of his sense of responsibility and sometimes paralyses his effort. Like the farmer of other lands, he will endure a great amount of discomfort and suffering, but he blames it on somebody else. Failure often results from his not giving the last or extra ounce of care needed at the critical moment; but he says that it can make no difference: what is written is written. He fails to make the effort and so loses all.

Who or what can aid the people of India to bring about a change of attitude? It is beyond the power or province of the Government because it would have to deal with social customs which are age-old and deep-rooted, having almost the force of religion. Today India is looking forward to self-rule at an early date. India's people will control all their own affairs; and the British will withdraw from any position of dominating India in any way. It must be admitted that a people under foreign rule is handicapped; but most of the problems of Indian agriculture will remain when the British Government is only a memory. It will remain for India to work out her own agricultural economic salvation.