In almost all the countries, the agriculture stage precedes all other stages and occupations, and almost all the countries in the world have either experienced or are experiencing this particular stage.

But then, there is a difference between the already developed countries and the developing countries which are undergoing this stage presently. Let us take the case of developing countries say, especially the Asian countries, where most of them are now on the threshold of economic development. In the days gone by, most of them were exploited by their European masters, who depended on these countries for their requirements of raw materials for their own industries, and at the same time discouraged industrial development in these countries so that they would also get a ready market for their finished products. The small and inefficient export sector in these less developed countries was nowhere in comparison to a vast sea of primitive small scale and over-populated agriculture. The result was that even after these countries had achieved their independence, their per capita income was far lower than what the developed countries had, when they had started towards their economic development.
Of these countries, India is one, a large country almost a continent. Indian agriculture comprises of a set of industries extending from the general farming operation to such specialised occupations as horticulture, poultry, cattle raising, dairying, etc. Broadly speaking, it is a country, where agriculture is a low level occupation of a mixed type. The predominant motive of these cultivators is to raise sufficient food and fodder for survival.1

We have a traditional system of family farming in India which absorbs all the family members of the cultivators, this also results in creation of disguised unemployment, which reduces the share of net earnings per individual and also lowers investment for further production. The Indian farmer by and large uses centuries old implements which are not capable of efficient agricultural operations. The Indian plough cannot break the soil effectively. It can only scratch the surface, so naturally the output is bound to be low.

With the low level of production, productivity and income, the farmers consumption savings and investment for further expansion is also very low. The result is that production remains more or less constant or it even decreases. No wonder there are no new methods and no technical changes as most of them require a good deal of investment which an Indian farmer cannot afford. In other words, this is also

what is known as 'vicious circle of poverty' in Indian agriculture.

The main objective of economic development is to make the low ambition farmers desire the good things of life, which he can enjoy only if he has a higher income. This implies that production should be increased and this is possible only with the help of improved techniques. An increase in the production will also increase his income. He can then start purchasing not only kerosene oil, matches, and mill articles as he used to purchase earlier, but all other articles also, which only people from the urban areas had access to till now. As the rural population is far greater than the urban population this will also mean that the increased incomes will generate increased demand, which in its turn will lead to increase in production of articles and create more employment opportunities, so that all those people who are displaced because of the introduction of new technology will get a chance to get re-employed elsewhere.

The existing farm production pattern has been evolved through an unending process of the trial and error method in traditional agriculture. Many farmers, if asked to adopt a new set of practices refrain from adopting them because of the uncertain conditions, lack of guarantee about the minimum returns, etc. But really speaking the stakes involved in the adoption of a new practice are as high as the existing methods and the cushions against risks are almost absent in both.
The loan incurring ability of the farmers is very low, especially in the case of small farmers who are always under the fear of getting into more debt, as they are already neck deep in debt.

Since the adoption of innovations also often involves borrowing of outside resources, its repayments make it necessary for even the smallest subsistence farmer to put up at least a part of his additional production for sale in the market where he is left at the mercy of the blind forces of prices.

Thus the whole future of our economy depends upon how quickly we can get out of the illusion associated with cowdung, and the bullock-cart economy. According to the Energy Service Committee, bullock power is nine times costlier than electricity (at the present rate). The irrigation cost per hectare crop of paddy is Rs. 1230 with bullocks, compared to Rs. 205 with diesel engine pump and Rs. 38 with an electric pump.\(^2\)

This gives us a clue to the low productivity of the agricultural system. The Indian farmer uses cattle for all agricultural purposes such as ploughing, lifting water from well, threshing, carrying produce to the market and many more. In fact, the Indian farmer depends on cattle to carry on all the agricultural operations.

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As far as the bullock is concerned, most of the farmers maintain either a pair or more than one pair of bullocks, depending on the size of their holding and the irrigation facilities available. All farmers generally wish to own their own bullocks. Because of the poor quality of the bullocks in most regions, it is difficult to do any deep ploughing with just one pair of bullocks. This is the reason why he has to hire bullocks from others, though most of the other agricultural operations can be carried out by a single pair. As ploughing is generally carried on by all the farmers around the same time it becomes difficult for him to depend on others for hiring the bullocks because during this period when agricultural operations are at peak, bullocks are not so easily available on hire. The functions of the bullocks are seasonal and for the greater part of the year bullock power is idle except only where perennial irrigation is available.

Bullocks, in addition to agricultural operations, provide the farmer with manure for their farms and cowdung cakes for their household purposes. Cowdung is also widely used in the farmers' homes for plastering the floors and the walls and binding the dust by mixing it with water and sprinkling it in the front yards. Charred cowdung is used in many places as tooth-powder.

A farmer is generally not concerned about growing fodder as a special crop as the major crops grown in India provide for both human and animal consumption. Fodder is a by-product
of foodgrain production particularly when he grows jowar (sorghum), while other foodgrain crops also provide the same but to a lesser extent. Very few grow fodder especially for their cattle. For the greater part of the year, cattle are let loose on the common grazing land where grass and leaves provide supplementary nutrition to them. The better off farmers feed their bullocks oil cakes and cotton seed especially when the demand on bullock power is heavy.

The number of bullocks owned by a farmer determines his social and economic status in the village. The bullocks also determine the daily time schedule of the farmers.

The bullock power economy requires the services of the carpenter for the wooden ploughs and other equipment and also for bullock-carts. An important source of income of the blacksmith is derived from the bullock owners. A specialized trade in preparing leather bags to draw water from wells flourishes where bullock power is used.3

Agricultural Implements (Maharashtra)

Agricultural implements can be divided into two broad categories: (1) Primary and (2) Secondary. Primary implements are those which are most important or, are indispensable to the cultivator, because they are used by all the farmers at the same time. No farmer can afford to lend, even to his own

neighbour, unless he has more than what he requires from his own fields. The implements that come under this classification are the (a) Plough, (b) Harrow, (c) Seed drill and (d) A pair of interculturing implements, etc.

These implements are made from the wood of the babul tree which is grown and found in plenty in the jungles surrounding the villages. Only the wood of babul trees of considerable age is durable. This wood is said to be free of insects. All parts of the implements are made from babul wood, with the exception of one or two parts which are made of iron, when any of them is to be put into operation in the soil, they are put together by means of either leather or hemp ropes. The simple digging stick is still in existence in India among the primitive tribes like the Mal Paharias of Bihar, the Garos of Assam and Kurumbas of South India. So also the Todas in the North use the two pointed wooden staff.

The digging sticks, bent sticks, hoes and spades were evolved according to the functional needs of the people, which was somehow hybridised into plough. The plough was used even as early as 3000 B.C. in Egypt, Babylon and also in the Indus valley area. 4

The whole set of Primary Implements can last for a period of about five to ten years or possibly more. A prudent

cultivator takes the greatest care of his implements. As soon as he has finished using any implements, for the season or for the particular crop for which it is required, the parts are detached, cleaned and stored in his hut, either suspended or placed on a sort of a rack, in order to avoid any attack by white ants or any accidental breakage.

Secondary Implements

The list of Secondary Implements is a long one. Most of these are used usually by the womenfolk and even quite often by the menfolk. Most of them are made in the village. The following is the list of important Secondary Implements: (1) Weeding fork, (2) A small sickle, (3) An axe, (4) A pick, (5) A shovel, (6) A pick axe, (7) An iron or crow bar and (8) An iron basket (Ghamela), etc.

Tillage

Of all the agricultural operations the most important is Tillage which means the breaking up and turning over of the ground in order to loosen the soil and to raise lower layers of the soil to the surface. The reasons for doing is that the deeper one digs the soil, the more food is available with useful minerals and constituents, necessary for the growth of plants. Broadly speaking, tillage comprises of the following operations: (1) Ploughing once or twice crossways; (2) Application of manure; (3) Harrowing once or more; (4) Seed drilling; (5) Interculturing twice or often; and Hand weeding.
Ploughing alone, if properly and efficiently performed, gives the following benefits to the farmers:

(a) It exposes the broken soil to the tropical heat of the sun and thereby brings about a decomposition of the organic matter in the soil and it assimilates inorganic matter with the soil.

(b) Ploughing destroys weeds and their roots.

(c) The soil is made loose so as to let the whole amount of rain water soak into it and make the soil conserve moisture for a longer period.

(d) Ploughing helps to raise the level of the underground water and thereby increase the supply of water in nearby wells.

(e) A well ploughed soil offers easy passage of other implements because of the reduced surface tension and friction.

Lighter soils are ploughed every year to a depth of 15 to 22 cm. Ploughing is done soon after the monsoons. The first showers in June soften the soil and it is also carried out after the harvest of a crop. If the land is free of weeds, fewer ploughings are necessary. There is a tendency of farmer to go in for too many ploughings even when the land is clear of weeds. Another undesirable feature is that he does not frequently plough the land in the same direction as the slope, which therefore increases erosion.

Manure

The cultivators have been accustomed for centuries to rely on indigenous manure. Most of them preserve and utilize
a limited quantity of farm yard manure for their garden crops. They very seldom make use of it in the case of dry land crops. The continued raising of crops in dryland would eventually exhaust the soil, so that in a few years a very low yield would be the result. The cultivator prepares manure locally from the dung of his cattle, rubbish sweepings, ashes and such other refuse matter of his household. The residue is collected from day to day in a dung heap by the cultivator separately in his own place. These heaps remain standing for fifteen to twenty months before they are actually applied as manure. Sometimes a flock of sheep, left to roam and graze during the day, is penned on the same land at night. The dung and urine of the sheep gets mixed with the soil. There are three principal methods of applying manure. They are: Top dressing, Mixing farm manure with the soil, and Ploughing in green crops known as green manuring.

The first and second may be combined with ploughing.

The farmer in Maharashtra is well aware of the necessity of manuring the land and as far as possible he prepares and conserves farmyard manure. Generally, the village bania who acquires lands from the farmers in various villages surrounding his own residential village manages to purchase farmyard manure by increasing the price per cart-load or by other means.

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majority of the villages, refuse heaps are found in the outskirts, each family claiming a certain spot for throwing the refuse from the cattle yard and the kitchen. Manure is brought to the field in bullock-carts and distributed in small heaps in the straight lines, ploughed. Later on it is spread over the field.

Next comes harrowing which is carried out frequently on a field. It is very important, next to ploughing. When ploughing has been either neglected or dispensed with, as it is generally the case with cultivators, harrowing is carried out as it forms a part of Tillage. It prevents the evaporation of moisture in the soil which is almost nil or very small when the upper layer of the earth is harrowed.

A single harrowing just before the rains or very soon after the rains is necessary prior to the sowing of seeds. By harrowing two or three inches of the upper surface the soil is loosened, stirred up and the plant food is raised, but generally grass and other vegetation may draw in this food without it being useful to any of the food crops. So in order to keep these weeds out harrowing is very often resorted to, unless the land is immediately sown with crops. Harrowing is needed even after sowing as grass also grows amidst the crops and consumes much of the plant food leaving behind a depleted supply for the crops. Sometimes a wooden plank known as 'Ma'ind' is used to break up the clods. Harrowing is done with a blade harrow known as Kukar or Vakhar. The use of the blade
harrow also helps in making the soil compact at a depth of a few centimetres, leaving behind a firm and a uniform seed bed.

**Seeds**

There are various types of seeds, which vary according to their requirements. One seed may demand more water than is available, another matures too easily, a third proves too attractive to insects and what does well in the north may wither in the hotter south.

Only the better class of cultivators makes it a point to select ears of corn here and there when the crops are threshed. The selection is generally left to womenfolk or adult striplings. The cultivators do not generally take care to watch the ears of corn and their development from their very conception. Mixed crops are raised both in the Kharif and the Rabi seasons. The mixed crops are commonly legume crops, which send their roots deep into the soil and thus bring up material or fertilizing elements from below up to the surface of the soil to nourish the principal crops such as Bajri, Jowar and wheat which may be sown either alone or mixed with others. Generally the cropping pattern depends on the season, climate, etc. In the Rabi season, Jowar is mixed with Kardi. Gram is mixed with Kardi and Jowar or both. Linseed is cultivated in rows along with Jowar.

**Sowing (Seed Drills)**

The common practice is to sow crops in line by drilling,
by means of wooden drills known as 'Pabhar'. They can be 2, 3 or 4 tubed. The distance between the types varies from 22 cms to 30 cms. In certain areas such as Kolhapur and Sangli dribbling of seeds is quite common. After drilling or dribbling of seed, a high harrow a light plank is drawn over the sown field to cover the seed and to press it lightly.

With the exception of a few farmers, the majority do not realise the importance of good seeds. For supply of seed they either use their own stored up grains or they depend on the village banias or some well-to-do cultivators who store grain, and sell it as seed at high prices during the sowing time. 6

Seeds rates for the different crops vary. There is a tendency on the part of the farmer to use too much seed for sowing. This is due to habit as well as to the feeling that he must obtain fodder or feeding material for his animals. The larger seed rates make allowance for all kinds of mortality in the seed beds. Sowing is the central operation in the whole system of tillage which culminates here. The implements and their several parts are skilfully designed for their purpose. The type used is usually the same throughout the large group of village but difference in designs are found in different tracts. They may have probably been developed to suit local conditions.

6 Jagalpure and Kale, op.cit., p. 34.
The first drilling of seed is immediately followed by a crosswise drilling, without delay as it is possible that the germinated seedling may be trampled down and loss is incurred.

Thinning and Interculture within 3 to 4 weeks of germination is necessary to thin out crops like Jowar and Bajri to obtain more even strands of plants. The practice is carried out more in Jowar growing areas.

As soon as the germination of the seed is noticed and the sprouts have sprung up to the height of about nine inches, the cultivator takes up the operation of interculturing so that the weeds and vegetation do not obstruct the growth of the crop or deprive it of the plant food. A small hoe (Kolpar, Kolapi) which is equal to half of the pabhar (equal to two bullocks) is worked in a very simple process.

**Hoe ('Kolapi')**

This implement is of two kinds - one with the blades, which work between the rows and another with a slant, so that the blades work on two sides of a row. Two hoes can be drawn by a pair of bullocks. The shorter bladed hoes are usually used in crops which are sown closer such as Bajri and Jowar. Longer bladed ones are used in intercultivating cotton, etc. But instead of one Kolpa (Hoe) the cultivator can place two kolpas in the unsown spaces between the row which are worked with the yoke of two bullocks. This saves the yoking of two extra bullocks. It is practised by experienced cultivators.
who have full control over their bullocks and who can watch
the iron blades of the two hoes working in different spaces
between the rows. Interculturing with kolpas can be carried
out at the most two or three times before the plants have
reached the stage of formation of joints, after which the use
of the kolpas can damage the crops by weakening the joints,
when the crop is young.

As against this hand weeding is costly, laborious and
slow where a group of women is set to work in a row or two
and they go on removing the weeds by means of their hoes or
Khurpas, which is an ordinary tool for weeding long weeds
and tangled grass which cannot be well dealt with by inter-
culture.

**The Well, Shot and Irrigation**

Most of the wells in village lands are circular (diameter varying from 10 to 20 feet) and are constructed of
dressed or undressed stones, with depths varying from 30 to
50 feet or more. Generally rock is reached as a foundation
or base on which the side walls are raised. The 'Shot' or
leather bucket is the most common method of lifting water
from wells. Two buckets are used at a time in drawing water
and each is pulled by a pair of bullocks on to the platform
on which the bullocks operate. This platform is inclined away
from the well. After the buckets empty water into the trough,
the animals are pulled backwards. In certain areas like
Sangli, Kolhapur iron mhots are also used. In Konkan area, Nahat (Persian Wheel) is more common than the mhot. In this area 'Okri' is also used. This is a primitive device which is worked normally on an iron bucket which is tied to a vertical pole that is hinged to a horizontal beam fixed across the well. We class the mhot as a secondary implement, since only those who possess a well for irrigation need keep a mhot with the apparatus and accessories required for working it.

**Harvesting**

Crops are harvested in a variety of ways. Cereal crops are usually cut with a sickle close to the ground. The harvested crop is laid out in rows in the field. After two or three days, they are tied in bundles for removal to the threshing yard. Pulses are removed in a similar way or uprooted.

For threshing, the ears are removed from the stalks in the case of Bajri and Jowar. They are spread in a circular fashion with a certain thickness, over which bullocks go on trampling in a circle to loosen the grain from the ear. Sometimes a bullock-cart is used for the purpose. In certain areas rolling stones are used, especially in the case of Jowar. Wheat is also threshed by spreading it on the threshing floor. Paddy is threshed by striking the bundles against a wooden stand.
The cultivator takes up a small portion of land which he encloses with a temporary thorny hedge in order to keep away stray cattle, petty thieves, etc. He takes pains to make the ground hard by ramming or other means. He gets it cleaned and cowdunged and then sets up his threshing apparatus on it. The stacks are then hedged around with Babul thorns, when ready and prepared the cultivator hires women folk as labourers to cut the heads of the Bajri or Jowar stalks. The ears of corn are generally spread over the whole surface of the threshing floor. The cultivator then fastens a long rope to a pole in the centre and from the other end yokes two to five pairs of bullocks in a line with their mouths muzzled to prevent the bullocks from eating any grain or corn and the bullocks are made to go around the pole. This process goes on till the whole of the crop is well trodden and separated grain by grain. This mixture of grain, husk and chaff is called 'Madan' when the ears have been converted into 'madan' the next operation of winnowing takes place. Threshed grain is poured from a height by a man standing on a stool while the man pours the threshed grain against the wind current, a woman removes the heavier chaff from the fallen heaps of grain and at the same time also keeps on supplying the man with basketfuls of threshed grain winnowing. Then the grain is collected in bag if it is to be sold away immediately or is stored in bins if not for immediate sale.

7 Ibid., p. 70.
We may conclude by saying that in the traditional pattern of agriculture, both the farmer and his wife work together, ploughing, preparing the land, planting the seeds, manuring, irrigating and harvesting. Much of the work of watching the crops is done by women. In harvesting also, they spend four times the time men take to carry on the operation. Except for the months of July, August and September, they spend considerable time in threshing and winnowing as well as ploughing.