

## Beginning of Agricultural Life in India

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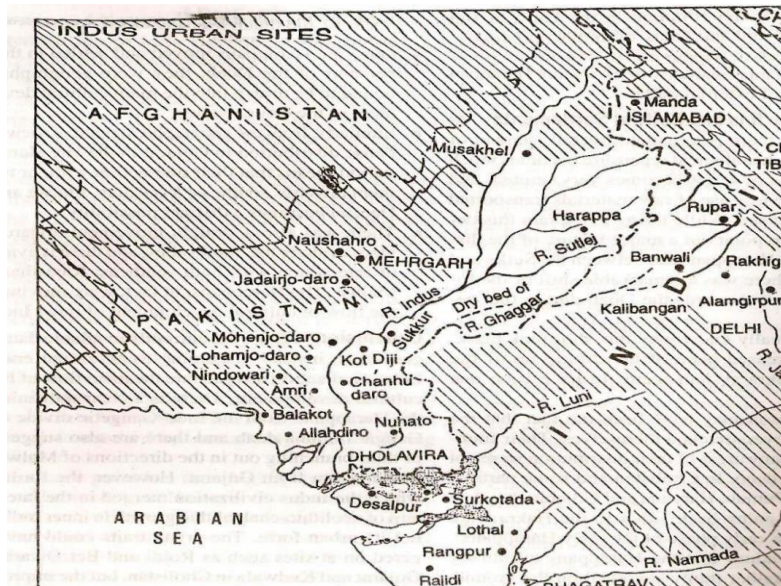
| Geological Ages   | Archaeological Ages            |        | Modes of Living                       | Life Styles   |
|---|--------------------------------|--------|---------------------------------------|---|
| Pleistocene Age (Ice Age) From 1.64 to 0.01 million years ago | Paleolithic Age                | Lower  | Hunting-food gathering                | Nomadic or migratory life   |
|   |                                | Middle |                                       |   |
|   |                                | Upper  |                                       |   |
| Holocene Age (Ice-free Age) From 10,000 BCE                   | Mesolithic Age                 |        | Cattle-keeping                        | Settled or sedentary life; transformed the nomadic hunter-gatherers into a sedentary farmer, which led to the beginning of village settlement |
|   | Neolithic Age or New Stone Age |        | Agriculture, Domestication of animals |   |
|   | Chalcolithic Age               |        |                                       |   |

### Earliest Agrarian Settlements: Mehrgarh

The evidence of agriculture for the first time is found in the later part of the Neolithic period. The early Neolithic people were primarily cattle-herders and had a pastoral economy, but the later Neolithic settlers gradually became agriculturists. They cultivated different crops and used to live in circular or rectangular houses made of mud and reed. The earliest known agrarian settlements in the Indian subcontinent, however, come from the west of the Indus system. Mehrgarh, in the northeastern Baluchistan was the first village to witness the beginning of agriculture in India in the 5<sup>th</sup> millennium BCE. The village of Mehrgarh was the first to witness the transition from the Neolithic to the Chalcolithic phase. The presence of agriculture at Mehrgarh is attested by finds of seeds like naked six-row barley, different types of wheats etc.

Agriculture seems to have given an impetus to animal domestication. During the next two millennia i.e. from c. 5000 BCE to c. 3000 BCE north-western India witnessed not only the transition from Neolithic to the Chalcolithic stage but also a great expansion of agrarian settlements. From Mehrgarh settlements gradually agricultural settlements radiated to all the neighbouring areas, including the Indus Valley. Mehrgarh practically witnessed every phase of the Neolithic Revolution. It had the **'first farmers'** of Indian subcontinent. **(Habib, Prehistory, p.55)** It is with the agriculture that Neolithic communities began to produce surplus.

*(Located at the foot of the Bolan Pass, Mehrgarh is about 150 miles to the north-west of Mohenjodaro. Although it is administratively part of Baluchistan, it is hydrologically a part of the Indus system. Excavations here provide us with the earliest evidence yet available for settled agriculture in the Indian subcontinent. The site of Mehrgarh is about 1000 yards in diameter and contains, as seen already, six mounds with different strata of early settlements.)*



**Figure 1: Mehrgarh**

**Chalcolithic Period/ Bronze-Copper Age (IndusValley Cvilization)**

The Bronze-copper age or the Chalcolithic culture is otherwise known as the Indus valley civilization or the Harappan culture. The people of this period used copper and bronze to make a range of utilitarian tools. They also make efforts in the field of agriculture. The Indus valley people indeed had a well developed agrarian system. Agriculture was their main occupation. The discovery of graneries at Harappa and Mohenjodaro clearly suggest that cereals were produced in such quantities that not only were all immediate needs of the people duly met with, but there was also a surplus to face any future emergency. The main crops of the Indus Valley people were **wheat and barley**. It is believed that they cultivated two varieties of wheat, i.e. the club wheat and the Indian dwarf wheat. Both at Harappa and Mohenjodaro the evidence of barley, of a small-seeded, six-rowed variety is also found. It is believed that **sugarcane** was also cultivated in the Indus valley civilization though no excavation has yet revealed evidence of sugarcane. Other crops included **dates, mustard, sesamum, cotton and varieties of leguminous plants such as field peas**. Indus people were the first to produce **cotton** in the world. Evidence for the cultivation of **rice** comes only from Lothal and Rangpur in Gujarat, Rangpur near Ahmedabad is the only Harappan site from where rice husk has been discovered.

The main crops namely wheat and barley were cultivated as *rabi* (winter) crops, that is, sown at the end of the inundation of land by the rivers and reaped in March or April. Other crops were cultivated as *kharif* (summer) crops, that is, sown at the beginning of inundation and harvested at its close. The agricultural fields of the Indus people were mainly lay along the bank of the rivers.

### **Method of Cultivation:**

Initially fields were not ploughed but dug up with a light toothed instrument. But gradually with the passage of time they ploughed the land for the purpose of agriculture. For tilling fields, a wooden plough, with perhaps a

sharp-ended copper bar attached to its end, seems to have been used. In addition to the evidence of a ploughed field at Kalibangan, Banawali has now yielded a complete terracotta model of plough. These ploughs were drawn by bullocks that constituted a sizable part of the cattle wealth of the Harappans. Interesting evidence from Kalibanga where a field surface was uncovered still retained the marks of furrows laid out in two directions at right angles to each other. This mark suggests that a wooden plough was employed.

Historians believe that the Indus Valley civilization agriculture must have been highly productive. It was capable of generating surpluses sufficient to support tens of thousands of urban residents who were not primarily engaged in agriculture. It relied on the considerable technological achievements of the pre-Harappan culture, including the plough. Still, very little is known about the farmers who supported the cities or their agricultural methods. Some of them undoubtedly made use of the fertile alluvial soil left by rivers after the flood season, but this simple method of agriculture is not thought to be productive enough to support cities.

It has been suggested that the Harappans practiced canal irrigation, but the evidence is rather meager. However, it is believed that Harappan agriculture was largely dependent on lift irrigation rather than on canal irrigation and therefore, was highly labour-intensive. However, there is no evidence of kings, slaves, or forced mobilization of labor.

It is often assumed that intensive agricultural production requires dams and canals. This assumption is easily refuted. Instead of building canals, Indus civilization people may have built water diversion schemes, which-like terrace agriculture-can be elaborated by generations of small-scale labor investments. In addition, it is known that Indus civilization people practiced rainfall harvesting, a powerful technology that was brought to fruition by classical Indian civilization. It should be remembered that Indus civilization people, like all peoples in South Asia, built their lives around the monsoon, a weather

pattern in which the bulk of a year's rainfall occurs in a four-month period. At a recently discovered Indus civilization city in western India, archaeologists discovered a series of massive reservoirs, hewn from solid rock and designed to collect rainfall, that would have been capable of meeting the city's needs during the dry season.

### **Agriculture during the Rig Vedic Period**

The Aryans started their civilization and culture in India around c. 1500 BCE. Initially, though they were pastoralist, and domestication of animals was their main occupation, gradually with the passage of time they adopted agriculture as their main occupation. Agriculture, thus, further developed during the Vedic period. The Vedic Aryans cleared forests and started tilling the land after making it cultivable. Generally all the members of the family, male and female, worked in the fields which were often extensive in area.

Earlier the land was a common property of the whole village and the villagers had the common right over it. But with the passage of time it was divided into two parts, i.e. *urvara* and *khilya*. The *urvara* was a cultivable land and was owned by a particular family while *khilya* was common grassland of the village which was used as pasture for grazing of cattle by all the agriculturists. (Cultivated lands were called *kshetra* and fertile ones *urvara*.)

Cultivation was done with plough and a pair of oxen. There are references in the Vedic literature regarding use of bulls to draw the plough (*sira*), sowing seeds in the furrows (*sita*), cutting of the corn with the sickle (*datra*) and use of sieve (*titau*) as well as winnowing fans (*supra*). Fire was used to burn the forest cover and shifting agriculture was practised. There are evidences which suggest that manure was used to make the land more fertile. For irrigation the agriculturists usually depended upon rain but its deficiency was made good with the wells, lakes and small streams. As a result of extensive

agriculture the Vedic Aryans started producing considerable surplus which paved way for the development of crafts and trade.

Wheat (*godhuma*) and barley (*yava*) were the principal crops of the Vedic Aryans, and to a small extent, rice also. Cotton and oil-seeds were also cultivated. Beans, millets and pulses were other crops produced by the Rig Vedic aryaans. There are a large number of hymns in the *Rig Veda* in which the Aryans invoked the blessings of their gods for plenty of crops and rain.

### **Agriculture during the Later Vedic Period**

Agriculture was the main occupation of the people during the Later Vedic period. The people had made a lot of progress in the field of agriculture. It was mainly due to the fact that they had settled in large numbers in the fertile Ganga-Yamuna plains. It was during this period that the people used iron. As a result of the enormous use of iron and iron implements in this period, there were tremendous changes in the field of agriculture. The people now used more effective and bigger ploughs. Some of the ploughs were driven by 6,8,12 and even 24 oxen/ bulls. However, it should not be assumed that all the people had started using big ploughs. The common people still used the ploughs of earlier size driven by a pair of oxen/ bulls. But one thing is evident that the ploughs of this period were far better and more effective for cultivation than the earlier ones. Wooden ploughs were provided with iron ploughshares. This improvement helped the Aryans to cultivate the virgin land resulting to greater mastery over food production.

There was also good improvement in the field of use of manure. The use of manure was commonly done to increase fertility of the soil. Dung and dry cow-dung were generally used as manure. As a result there was considerable increase in the production of barley, wheat, rice etc. in this period. Besides these grains, oil-seeds, beans, sesame (*til*), cotton etc. were the other important crops grown during this period.

To increase the production of grains and protect the crops from disease, hymns were recited and magic practices were also resorted to. The *Atharva Veda* contains many hymns in which prayers are offered for ploughing, sowing, growth of corns, rain, and protection of crops from pests and wild animals. The *Satapatha Brahmana* also describes the various stages of agriculture such as ploughing, sowing, reaping and threshing. There were large pastures where animals used to graze. Pasture lands were carefully looked after and were commonly used for cattle and animals.

## **Epic Period**

During the epic period, i.e the period of the *Ramayana* and *Mahabharata* agriculture was also the main occupation of the people. The chief crops grown by the agriculturists were wheat, barley, rice, cotton, oil-seeds, vegetables and fruits. From the analysis of both *Rig Vedic* and *Later Vedic* periods including the epic periods it gleans that during that period agriculture was the main occupation of the most of the villagers. It was during this period that iron which was called *shyama* or *krishna* of which agricultural implements were made was extensively used which remarkably improved the methods of agriculture. In the *Ramayana* we have the reference to the fact that how maharaja Janaka got Sita while he was tilling the soil.

## **Iron and the Agriculture**

Iron for the first time came to use only after c. 1000 BCE (Later Vedic period) in the Indian subcontinent. Diffusion of iron and iron technology brought significant changes in the field of agriculture and led to the development of a more advanced type of agriculture. In the words of K.M.Srimali (**The Age of Iron and the Religious Revolution, p.1**) “ Iron did not simply substitute for copper, stone and bone in many tools; it brought into being new forms of tools and multiplied their number, so that the ‘Iron Age’ represents a new stage in the progress of agricultural and craft production.”

In the later Vedic texts (c. 1000–500 BCE), there are repeated references to iron. From the literary and archaeological sources it is known that iron technology have diffused rapidly across northern India and the Indian peninsula after c. 700 BCE. The discovery of axes, ploughshares, hoes, sickles, spades, etc., from different sites belonging to this period attest the use of iron implements in agricultural operations. Erdosy (Srimali, p.18) recognises the importanc of iron in the colonizing of the Ganga plains and the spread of agriculture. He attributes the production of larger surplus to the intensive use of iron tools.

The following are

- i. Iron was extensively used during the period from c. 800 BCE to c. 700 BCE.
- ii. Iron helped tremendously to clear the jungles and forests for agriculture.
- iii. Revolutionary potential of iron technology led to the development of agriculture.
- iv. Iron technoly brought drastic changes in the method of cultivation, ploughing as well as harvesting.
- v. Iron led to the development of settled agriculture.
- vi. Extensive use of iron tools greatly increased the production and led to surplus.
- vii. Iron immensely increased the efficiency of tools.

### **Post Vedic Period, c 6<sup>th</sup> to 4<sup>th</sup> century BCE**

The Buddhist and Jain literary texts gives us considerable information regarding the agriculture, agricultural productions and the technology applied in the field of agriculture of this period. The Buddhist text *Vinaya Pitaka* says that the peasants had considerable knowledge about different crops. The



*Chullavagga*, another Buddhist work demarcates clearly the various stages of the peasants' activities such as *kasi* (ploughing), *vapitam* (sowing), *udakam abhinetabham* (irrigation), *niddhapetabbam* (weeding out of undesirable plants), *lavapetabbam* (reaping) and *opunapetabbam* (winnowing). This text besides plough and sickle also mentioned about other agricultural implements such as *kudala* (spade), and digging tools such as *khanitti* and *nikkhadana*. The Pali texts referred to agricultural crops, both cereals and pulses, such as varieties of paddy (*vihi*, *sali*), wheat (*godhuma*), barley (*yava*), millet (*kangu*), beans (*varaka*), rye (*kudrusaka*), oats (*vilanga*), lintels (*mugga* and *masa*) and sesame (*tila*). Sugarcane is put in the *phalabija* class of plants, i.e. those propagated from joints. *Phanita* (treacle or molasses) is said to be a product prepared out of it. The Pali texts also mentioned varieties of oil which include among others *tilatela* (sesame oil), *sasapatela* (mustard oil) and *erandatela* (castor oil). *Kappasa* and *tula* or cotton, *khoma* or flax, and *bhanga* or hemp are among the fibres mention about which is made in the Pali literatures. *Manjittha* (madder) and *nili* (indigo) come under dyes. It was clearly understood that most of the dyes were prepared from the roots, leaves, flowers and fruits of various plants. *Pippali* (long pepper), *maricha* (round pepper), *bhanjanaka* (probably beetroot), *palandu* (onion), *haliddi* (turmeric), *sigivera* (ginger), and *lasuna* or *ativisa* or *magadhaka* (garlic) come under spices and edible roots.

The Buddhist texts compare agriculture (*kasi*) with trading (*vanijja*). In the *Majjhima Nikaya* (Srimali, 23) it has been mentioned that "Agriculture is an occupation where there is a great deal to do; agriculture requires constant care and supervision and is full of uncertainties and problems, many duties, large administration and great problems, which, if succeeded in, yields great profit. On the other hand, trading involves far fewer duties, administration and problems; and yet a successful venture brings in great profit."

The Jain *agamas* considered agricultural land as the most important material possession. According to it land was of two types i.e. *setu* (meaning dam), which required irrigation and *ketu* which totally depended on rainfall.

References to dams (*setu*) also occur in the *Dharmashastras*. The *Uvasagadasao* informs us about Ananda, a rich merchant and an agriculturist, who in order to put a check on his external possessions, limited his cultivable land to five hundred ploughs, each one ploughing one hundred *niyattanas* of land!. The *Nayadhammakahao* mentions transplantation (of rice) being done twice or thrice in order to get a good yield. **(Srimali, p13)**

The *Brihatkalpa Bhashya* informs us about different methods of water source or irrigation adopted in different parts of ancient India. It tells us that in *Lata desha* i.e. Gujrat and western India, rainfall was the main source of water supply; in *Sindhu* or northwestern India, fields were irrigated from rivers; in the southern India or in the Dravidian territory lands were irrigated from ponds while in the *Uttarapatha* or northern India lands were irrigated from wells. Besides these, in some places flood waters were also utilized.

Harvested corn was stored with great care in *kotthagaras* (granaries). The *kotthagaras* or granaries were made of straw, bamboo, grasses, etc and were located on an elevated platform or on the upper storey of the house. The *kotthagara* was covered with cowdung on all sides, closed and completely sealed up with mud so that the grain might be long preserved. The *Bhagavati* sutra informs us that such storage period could range from one to seven years. According to it cereal seeds could be kept for three years, seeds of pulses for five years and oilseeds such as *alsi* (linseed) and *sarshapa* (mustard) for seven years. The Jain texts also mentioned several varieties of rice, pulses, wheat, millet, oilseeds, fibre crops, spices, fruits, bamboos, vegetables, and other crops like sugarcane, and gram etc. Besides being grown in orchards, fruits were also gathered from jungles and carried to cities for sale.

The *Satapatha Brahmana* (c. 700 BCE) mention regarding the *plashuka* variety of *vrihi* or paddy which seems to be a transplanted variety which ripens quickly. In the post-Vedic texts, the transplanted variety are generally refers to as *shali*. The Pali and Prakrit texts also prominently refer to paddy

transplantation. Paddy normally ripened after ten months, but after transplantation it took only six months to ripen. **(Srimali, p.14)** The *Grihasutra* mentioned numerous agricultural rites such as ploughing, sowing and reaping rituals etc. (Srimali, p.35) It has mentioned that the ploughing ceremony requires the cooking of sacrificial food (sthalipaka), and sacrificing to Indra, the Maruts, Parjanya (rain), Ashani (Lightning), Bhaga (good fortune), sita (furrow), etc. The deities also receive similar offerings at the furrow sacrifice, the threshing-floor sacrifice, at the sowing and reaping of the crop, and at the putting of the crop in to the barn. **(Srimali, p.35)**

Archaeological findings also corroborate to the aforementioned literary texts. From archaeological data it is known that from c. 1500 BCE onwards, the main crops, both *rabi* and *kharif* ( among the *rabi* crops are wheat, barley, oats, gram, lentil, pea, grass-pea, bean, linseed and mustard and among the *kharif* crops are rice, green gram, cheena, jowar, ragi, bajra, little millet, foxtail or Italian millet, horse-gram, cow-pea, cotton and sesame) were known in several parts of the mid-Gangetic basin. The spadework at Narhan (a site in east Uttar Pradesh) reveals that in the tenth-eighth centuries BCE the people of that area were cultivating rice, barley, three forms of wheat, pea, green gram, chick pea, sesame and khesari. **(Srimali, p.14)**. They also had knowledge about flax or alsi and mustard seeds. Jackfruit was also known to them. One Narhan trench shows the use of cultivated rice, barley, bread-wheat, black gram, gram, pea, khesari, kodo, millets and sesame in c. 500- c. 400 BCE. From the Khairadih excavation it is known that between 700 and 200 BCE people were cultivating rice, barley, wheat, green gram or mung, gram, chick pea, pea and ksheri. The significant feature of this period is that a large number of ploughshares and hoes made of iron have been found from various sites in the Indian subcontinent. The discovery of a large rain-fed reservoir of the NBPW period from Ropar suggests the use of irrigation tanks. Rearing of cattle and other animals continued to be a major accompaniment of agriculture.

## **Agriculture during the Mauryan period**

The Mauryan Empire (322–185 BCE) categorized soils and made meteorological observations for agricultural use. Other Mauryan facilitation included construction and maintenance of dams, and provision of horse-drawn chariots—quicker than traditional bullock carts. The Greek diplomat Megasthenes (c. 300 BC)—in his book *Indika*—provides a secular eyewitness account of Indian agriculture:

India has many huge mountains which abound in fruit-trees of every kind, and many vast plains of great fertility. . . The greater part of the soil, moreover, is under irrigation, and consequently bears two crops in the course of the year. . . In addition to cereals, there grows throughout India much millet . . . and much pulse of different sorts, and rice also, and what is called bosporum [Indian millet]. . . . Since there is a double rainfall [i.e., the two monsoons] in the course of each year . . . the inhabitants of India almost always gather in two harvests annually.

## **South India: Early Common Era – High Middle Ages (200–1200 CE)**

The Tamil people cultivated a wide range of crops such as rice, sugarcane, millets, black pepper, various grains, coconuts, beans, cotton, plantain, tamarind and sandalwood. Jackfruit, coconut, palm, areca and plantain trees were also known. Systematic ploughing, manuring, weeding, irrigation and crop protection was practiced for sustained agriculture. Water storage systems were designed during this period. Kallanai (1st-2nd century CE), a dam built on river Kaveri during this period, is considered the as one of the oldest water-regulation structures in the world still in use.

Spice trade involving spices native to India—including cinnamon and black pepper—gained momentum as India starts shipping spices to the Mediterranean. Roman trade with India followed as detailed by the archaeological record and the *Periplus of the Erythraean Sea*. Chinese sericulture attracted Indian sailors during the early centuries of the Common Era. Crystallized sugar was discovered by the time of the Guptas (320-550 CE), and the earliest reference of candied sugar come from India. The process was soon transmitted to China with traveling Buddhist monks. Chinese documents confirm at least two missions to India, initiated in 647 CE, for obtaining technology for sugar-refining. Each mission returned with results on refining sugar. Indian spice exports find mention in the works of Ibn Khurdadhbeh (850), al-Ghafiqi (1150), Ishak bin Imaran (907) and Al Kalkashandi (fourteenth century).

Noboru Karashima's research of the agrarian society in South India during the Chola Empire (875-1279) reveals that during the Chola rule land was transferred and collective holding of land by a group of people slowly gave way to individual plots of land, each with their own irrigation system. The growth of individual disposition of farming property may have led to a decrease in areas of dry cultivation. The Cholas also had bureaucrats which oversaw the distribution of water—particularly the distribution of water by tank-and-channel networks to the drier areas.

The construction of water works and aspects of water technology in India is described in Arabic and Persian works. The diffusion of Indian and Persian irrigation technologies gave rise to an irrigation system which brought about economic growth and growth of material culture. Agricultural 'zones' were broadly divided into those producing rice, wheat or millets. Rice production continued to dominate Gujarat and wheat dominated north and central India.