

## Chronology of Agricultural technology development in India

Agriculture in India is broadly classified in to five different periods before India's independence.

1. Early history (Before 15000 BCE)
2. Vedic period – Post Maha Janapadas period (1500 BCE – 200 CE)
3. Early Common Era – High Middle Ages (200–1200 CE)
4. Late Middle Ages – Early Modern Era (1200–1757 CE)
5. Colonial British Era (1757–1947 CE)

[Note: BCE - short for "Before the Common Era", "Before the Christian Era", or "Before the Current Era". CE - Common Era, Current Era (Christian Era is, however, also abbreviated AD, for *Anno Domini*)]

Indian agriculture began by 9000 BCE as a result of early cultivation of plants and domestication of crops and animals. Settled life soon followed with implements and techniques being developed for agriculture. Double monsoons led to two harvests being reaped in one year. Indian products soon reached the world via existing trading networks and foreign crops were introduced to India. Plants and animals; considered essential to their survival by the Indians, came to be worshiped and venerated.

The middle ages saw irrigation channels reach a new level of sophistication in India and Indian crops affecting the economies of other regions of the world under Islamic patronage. Land and water management systems were developed with an aim of providing uniform growth. Despite some stagnation during the later modern era the independent Republic of India was able to develop a comprehensive agricultural program.

### 1. Early history (Before 1500 BCE)

- **9000 BCE:** Wheat and barley were domesticated in the Indian subcontinent. Domestication of horse, sheep and goat soon followed. This period also saw the first domestication of the elephant.
- **8000-6000 BCE:** Barley and wheat cultivation, along with the domestication of cattle, primarily sheep and goat—was visible in Mehrgarh (Balochistan, now in Pakistan). Agro pastoralism in India included threshing, planting crops in rows—either of two or of six—and storing grain in granaries.
- **5000 BCE:** Agricultural communities became widespread in Kashmir.
- **5000-4000 BCE:** Cotton was cultivated. The Indus cotton industry was well developed and some methods used in cotton spinning and fabrication continued to be practiced till the modern Industrialization of India. A variety of tropical fruit such as mango and muskmelon are native to the Indian sub-continent. The Indians also domesticated hemp, which they used for a number of applications including making narcotics, fibre and oil. The farmers of the Indus Valley grew peas, sesame, and dates. Sugarcane was originally from tropical South Asia and Southeast Asia. Different species likely originated in different locations with *S. barberi* originating in India and *S. edule* and *S. officinarum* coming from New Guinea.
- **5440 BCE:** Wild *Oryza* rice appeared in the Belan and Ganges valley regions of northern India. Rice was cultivated in the Indus Valley civilization.
- **4500 BCE:** Irrigation was developed in the Indus Valley Civilization. The size and prosperity of the Indus civilization grew as a result of this innovation, which eventually led to more planned settlements making use of drainage.

- **3000 BCE:** Sophisticated irrigation and water storage systems were developed by the Indus Valley civilization, including artificial reservoirs at Girnar.
- **2600 BCE:** An early canal irrigation system from Circa.
- **2500 BCE:** Archeological evidence of an animal-drawn plough in the Indus Valley civilization
- **2000 BCE:** Agricultural activity included rice cultivation in the Kashmir and Harrappan regions.

## 2. Vedic period-Post Maha Janapadas period (1500 BCE–200 CE)

- Gupta (2004) finds it likely that summer monsoons may have been longer and may have contained moisture in excess than required for normal food production. One effect of this excessive moisture would have been to aid the winter monsoon rainfall required for winter crops.
- In India, both wheat and barley are held to be *Rabi* (winter) crops and—like other parts of the world—would have largely depended on winter monsoons before the irrigation became widespread. The growth of the *Kharif* crops would have probably suffered as a result of excessive moisture.
- Jute was first cultivated in India, where it was used to make ropes and cordage.
- Some animals—thought by the Indians as being vital to their survival—came to be worshiped.
- Trees were also domesticated, worshiped, and venerated—*Pipal* and *Banyan* in particular.
- Others came to be known for their medicinal uses and found mention in the holistic medical system *Ayurveda*.
- **1000–500 BCE:** There are repeated references to iron. Cultivation of a wide range of cereals, vegetables and fruits is described. Meat and milk products were part of the diet; animal husbandry was important. The soil was ploughed several times. Seeds were broadcasted. Fallowing and a certain sequence of cropping were recommended. Cow dung provided the manure. Irrigation was practiced.
- **322–185 BCE:** The Mauryan Empire 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.
- **300 BCE:** The Greek diplomat Megasthenes, in his book *Indika*— provides a secular eyewitness account of Indian agriculture.

## 3. Early Common Era – High middle ages (200–1200 CE)

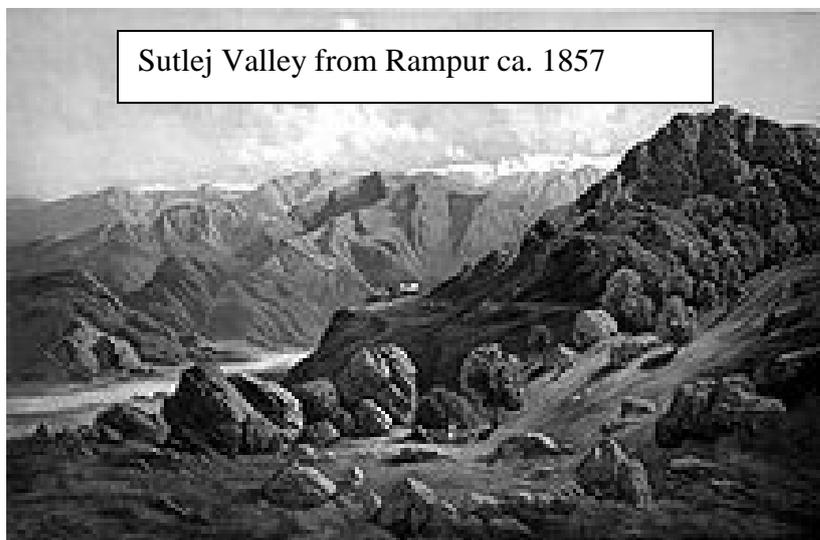
- The Tamil people cultivated a wide range of crops such as rice, sugarcane, millets, black pepper, various grains, coconuts, beans, cotton, plantain, tamarind and sandalwood. Jackfruit, coconut, palm, areca and plantain trees were also known.
- Systematic ploughing, manuring, weeding, irrigation and crop protection was practiced for sustained agriculture. Water storage systems were designed during this period.
- Kallanai (1<sup>st</sup>-2<sup>nd</sup> 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.

- **320-550 CE:** Crystallized sugar was discovered by the time of the Guptas and the earliest reference of candied sugar come from India.
- **647 CE:** Chinese documents confirm at least two missions to India, initiated in, for obtaining technology for sugar-refining.
- **875-1279 CE :** Noboru Karashima's research of the agrarian society in South India during the Chola Empire 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.

#### 4. Late middle ages – Early modern era (1200–1757 CE)

- 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 irrigation systems 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.
- The Encyclopædia Britannica details the many crops introduced to India during this period of extensive global discourse.
- **1556-1605 CE:** Land management was particularly strong during the regime of Akbar the Great under whom scholar-bureaucrat Todarmal formulated and implemented elaborated methods for agricultural management on a rational basis.
- Indian crops—such as cotton, sugar, and citric fruits—spread visibly throughout North Africa, Islamic Spain, and the Middle East.
- Though they may have been in cultivation prior to the solidification of Islam in India, their production was further improved as a result of this recent wave, which led to far-reaching economic outcomes for the regions involved.<sup>[9]</sup>

#### 5. Colonial British Era (1757–1947 CE)



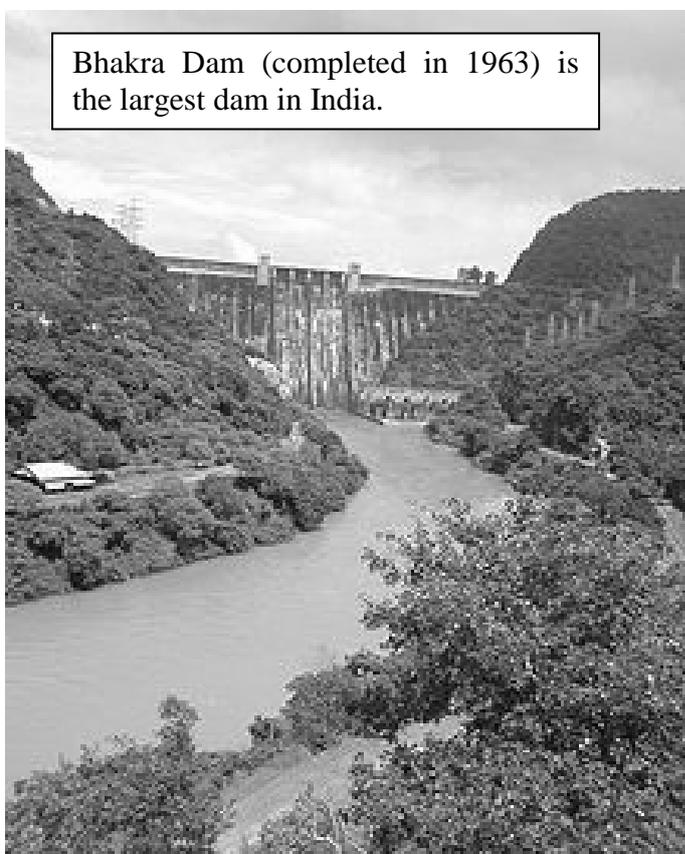
- A number of irrigation canals are located on the Sutlej river.
- Few Indian commercial crops—such as Cotton, indigo, opium, and rice—made it to the global market under the British Raj in India.
- The second half

of the 19<sup>th</sup> century saw some increase in land under cultivation and agricultural production expanded at an average rate of about 1% per year by the later 19<sup>th</sup> century.

- Due to extensive irrigation by canal networks Punjab, Narmada valley, and Andhra Pradesh became centers of agrarian reforms.
- The British regime in India did supply the irrigation works but rarely on the scale required.
- Community effort and private investment soared as market for irrigation developed.
- Agricultural prices of some commodities rose to about three times between 1870-1920.
- A rich source of the state of Indian agriculture in the early British era is a report prepared by a British engineer, Thomas Barnard, and his Indian guide, Raja Chengalvaraya Mudaliar, around 1774. This report contains data of agricultural production in about 800 villages in the area around Chennai in the years 1762 to 1766. This report is available in Tamil in the form of palm leaf manuscripts at Thanjavur Tamil University, and in English in the Tamil Nadu State Archives.
- 1871: Government of India created Department of Revenue, Agriculture and Commerce which formed as base for Initiation of Agriculture in India.
- 1880: Famine Commission Report was submitted which was base for inception of Agricultural Department.
- 1881: Separate Department of Agriculture at Centre for Famine relief operations
- 1890 : Dr. J.A. Voelcker appointed as a consulting chemist from Royal Agricultural Society (England) - Laid foundation for agricultural research in India.
- 1892 – 1903 - Appointment of Imperial Agricultural Chemist, Imperial Mycologist and Imperial Entomologist – Base for Beginning of inducting the scientist in Agriculture.
- 1901-05: To enhance agricultural education, Establishment of Agricultural Colleges at Pune, Kanpur, Sabour, Nagpur, Coimbatore and Lyallpur (Now in Pakistan).
- 1905: Establishment of Imperial Agricultural Research Institute (IARI) at Pusa (Bihar)
- 1929: Based on Royal Commission on Agriculture's recommendation (1928), Imperial Council of Agricultural Research (ICAR) was establishment to conduct comprehensive research.
- 1931-47: Indian Lac Cess Committee, Indian Central Tobacco Committee, Indian Central Oilseeds Committee were formed to improve research in various crops.

#### **Republic of India (1947 CE onwards)**

- Special programs were undertaken to improve food and cash crops supply.



Bhakra Dam (completed in 1963) is the largest dam in India.

- The Grow More Food Campaign (1940s) and the Integrated Production Programme (1950s) focused on food and cash crops supply respectively.
- 1957 : All India Coordinated Maize Improvement Project was initiated (First coordinated project) to exploit maize research (Specifically heterosis).
- Five-year plans of India—oriented towards agricultural development—soon followed.
- 1963: Introduction of semi dwarf wheat varieties from

CIMMYT, Mexico Formed basis for green revolution.

- 1966: Introduced semi-dwarf rice varieties TN1 & IR 8 from Taiwan and Philippines respectively is formed as base for green revolution.
- Land reclamation, land development, mechanization, electrification, use of chemicals—fertilizers in particular, and development of agriculture oriented 'package approach' of taking a set of actions instead of promoting single aspect soon followed under government supervision.
- The many 'production revolutions' initiated from 1960s onwards included Green Revolution in India, Yellow Revolution (oilseed: 1986-1990), Operation Flood (dairy: 1970-1996), and Blue Revolution (fishing: 1973-2002) etc.
- 1979: National Agricultural Research Project (NARP) was launched to strengthen the research capabilities of SAUs
- Following the economic reforms of 1991, significant growth was registered in the agricultural sector, which was by now benefiting from the earlier reforms and the newer innovations of Agro-processing and Biotechnology.
- 1998: National Agricultural Technology Project (NATP) was initiated Strengthen the research on location specific problems Contract farming—which requires the farmers to produce crops for a company under contract—and high value agricultural product increased.
- 2006: National Agricultural Innovative Project (NAIP) was launched for End to end approach for solving problems