Kautilya's Arthasasthra - Sangam literature - rainfall prediction – ITK -Tamil Almanac.

Agriculture in Arthasasthra

Kautilya (also known as Vishnu Gupta or Chanakya) (321-296 BC) was a great scholar of time. He wrote a treatise titled, Arthasasthra, which deals with the management of resources. During Kautilya's time agriculture, cattle breeding and trade were grouped into a science called 'Varta'. Kautilya gave great importance to agriculture and suggested a separate post of head of agriculture and named as 'Sitadhakashya'. Agriculture today receives prime importance, by policy and administrative support from government officials. eg. i) Supply of good seeds and other inputs, ii) Provision of irrigation water, iii) prediction of rainfall by IMD, iv) Assistance in purchase of machineries, v) Marketing and safe storage. All the important aspects are mentioned by Kautilya in his book. He suggested many important aspects in agriculture which are highly relevant today.

1. The superintendent of agriculture should be a person who is knowledgeable in agriculture and horticulture. There was a provision to appoint a person who was not an expert but he was assisted by other knowledgeable person.
2. Anticipation of labours by land owners before sowing. Slaves and prisoners were organised to sow the seeds in time. He also emphasized that ploughing provides good soil texture required for a particular crop.
3. Timely sowing is very important for high yield particularly for rainfed sowing for which, all the implements and accessories have to be kept ready. Any delay in these arrangements received punitive action.
4. Kautilya suggested that for getting good yield of rainfed crop, a rainfall of 16 dronas (One drona = 40 mm to 50 mm; so totally 600-800 mm) was essential and 40 dronas rainfall (1600-200 mm) is sufficient for rice. It is very significant to note that rain gauge was used during Kautilya's period. It was apparently a circular vessel (20 fingers width, 8 fingers depth) and the unit to measure rain was adhaka (1 adhaka=12 mm approx.)
5. He also stressed the optimum distribution of rainfall during crop growing season. One third of the required quantity of rainfall must fall both in the commencement (July/August) and closing months (October-December) of rainy season; and 2/3 of rainfall in the middle (August-October) is considered as very even.
6. The crops should be sown according to the the season. E.g. *Sali* (transplant rice), *Virlu* (direct sown rice), *Till* (Sesame) and millets should be sown at the commencement of rain. Pulses to be sown in the middle of season. Safflower, linseed, mustard, barley and wheat to be sown later.
7. He also stressed that rice crop require less labour expense, vegetables are intermediate and sugarcane is worst as it requires more attention and expenditure.
8. The crops like cucurbits are well suited to banks of rivers, Long-peper, sugarcane and grapes do well where the soil profile is well charged with water. Vegetable require frequent irrigation, borders of field suited for cultivation of medicinal plants.
9. Some of the bio-control practices suggested by Kautilya has got relevance. They are:
   a) Practice of exposing seeds to mist and heat for seven nights. These practices are followed even now in wheat to prevent smut diseases.
   b) Cut ends of sugarcane are plastered with the mixture of honey, ghee and cow-dung. Recently evidences proved that honey has widely an antimicrobial property. Ghee could seal off the cut ends prevent loss of moisture and cow-dung facilitated bio-control of potential pathogens.

10. He also suggested that harvesting should be done at proper time and nothing should be left in the field not even chaff. The harvested produce should be properly processed and safely stored. The above ground crop residues were also removed from fields and fed to cattle.

Agriculture in the Sangam literature

During the Sangam period (200 BC to 100 AD), the main profession of the population of the Tamil region (now Tamil Nadu) was agriculture. The region extended from Cape Comorin (Kanniyakumari) in the South to Tirupati (in Andhra Pradesh) in the North, parts of present Kerala and Karnataka in the West. The methods of cultivation practised during this ancient period were revealed by several proverbs, village songs and literature of the period which are available even today. It is rather surprising that the people had good knowledge about agriculture (seed varieties, seed selection, seed storage, ploughing, manuring, irrigation, weeding, crop protection, pests, and botanical pesticides).

The Sangam period literature covers wide aspects of the people's life, such as epics, ethics, social life and religion. Several poems composed during this period have been passed on from generation to generation through memorizing and chanting and later through manuscripts written on *Palmyara* leaves. With the advent of paper and printing machinary, Shri Swaminatha Iyer who is popularly called 'Tamill grandfather' painstakingly collected them and brought them out as printed books. Two peoms of the Sangam period, viz., Tholkappiyam and Thirukural, gives us a vivid picture of agricultural practices in that period.

Tholkappiyam

The poem Tholkapiyam was written by the poet Tholkappier during 200 BC. It gives descriptions of various agricultural aspects and these are enumerated below.

Land classification

Land was classified into five (but, cultivable land in to four) groups, viz., *Mullai* (forest), *Kurinji* (hills), *Marudham* (cultivable lands), and *Neithal* (coastal areas). *Palai* land was not brought under cultivation and left as fallow.

Seasons

Six seasons are mentioned: Early spring, late spring, cloudy, rainy, early winter, and late winter.

Cultivated crops

There are references to rice, millets, sugarcane, banana, cardamom, pepper, cotton, sesame, coconut and nut. Farmers were aware that rice could be grown as rainfed crops. Banana and sugarcane were ratooned. Plants were considered as living beings and endowed with sensitivity. Tholkappier also mentioned about monocots and dicots.

Importance of agriculture

Kings considered agricultural development as their primary duty. They felt that soil fertility and irrigation facilities should be the country's assets. Increased agricultural production was considered a yardstick of prosperity of the country. The stability of a kingdom was ensured not by army but by agriculture and sufficient crop production. Failure of monsoon rains and reduction in grain yield were attributed to the king's sins.

Irrigation

Kings dug-out tanks at locations where water flow from rains was plentiful. Semicircular bunds were raised adjacent to small hillocks and water reservoirs akin to present day dams were raised and constructed. It indicates awareness of water harvesting. The king 'Karikal Cholan' brought 1000 slaves from a conquered country and raised the bunds of river Cauvery. The stone

dam constructed across the river Cauvery centuries ago is considered a master piece of engineering even today. River water was diverted to tanks through canals. It is mentioned that irrigation should be given both in early morning or late evening, and not during hot mid-day.

Agricultural implements

Buffaloes were used for ploughing with a wooden plough. Deep ploughing was considered superior to shallow ploughing. A labour saving tool called *Parambu* was used for leveling paddy fields. Tools such as *Amiry*, *Keilar*, and *Yettam* were used to lift water from wells, tanks, and rivers. Tools called *Thattai* and *Kavan* were used for scaring birds in millet fields. Traps were used to catch wild boars in millet fields.

Seeds

Seed was selected from those earheads that first matured. The selected seed was stored for sowing only and never used as food grain. It was believed that such a diversion would destroy the family.

Crop rotation

Crop rotation was practised by raising black gram (urd) after rice. This indicates that farmers were aware of the benefits to the following rice crop which we now know is due to the nitrogen fixation in the root nodules of urd. They also practised mixed cropping; e.g., foxtail millet with lablab or cotton.

Threshing

A tool called *Senyam* was used for harvesting rice. Threshing of rice was done by hand with the help of a buffalo (and in large holdings by elephants). Hand winnowing was done to remove chaff. One sixth of the produce was paid as tax to the king. Farm labourers were paid in kind.

The land was immediately ploughed after harvest or water was allowed to the field to facilitate rooting of stubbles. Operations requiring hard work such as ploughing were done by men while women attended to light work such as transplanting, weeding, bird scaring, harvesting and winnowing. In Kandapuranam, it is mentioned that Valli, daughter of a king, was sent for bird scaring in millet fields where Lord Muruga (son of Lord Shiva) courted her and married.

Marketing

Products were exchanged by weight. In Madurai (the headquarters of Sangam poets), there was a food grain bazaar where 18 kinds of cereals, millets and pulses were sold. Each shop had a banner hoisted high so that it could be seen from a distance indicating that the grains are sold here. Customs duty was collected on imports and exports.

Thirukural

The poem was composed by a gifted poet named *Thiruvalluvar* during 70 BC. It consists of 1330 couplets (133 topics each having 10 couplets). It is the pride of Sangam Tamil literature and its greatness can be realized from the fact that it has been translated into English and several other languages. It devotes one topic (10 couplets) for agriculture under the chapter politics. This clearly reveals the recognition that the prime duty of a king is to ensure agricultural production.

Importance of agriculture

‘World spins around many industries. All such industries spin around agriculture’

‘Farmers alone live an independent life; others worship them and are second to them’

‘If farmers stop cultivation, even rishis (sages) cannot survive’

Ploughing

‘If land is ploughed deep and soil allowed drying to one fourth weight, even manuring is not necessary’

Manuring

‘Manuring is more important than ploughing: crop protection is more important than

irrigation'. Green leaf manuring, farmyard manure, and sheep penning were in vogue though farmers were not aware that they supplied nitrogen to the crop. One is amazed at the depth of agricultural knowledge our ancestors possessed.

Irrigation

Bed method was followed as an efficient method of water management.

Weeding

'Just like the farmer pulls out weeds with the root system, so the king should eliminate criminals from society'.

Care of crops

'If the farmer does not regularly visit his field, the crop will not grow'

The foregoing account of agriculture from ancient Tamil literature clearly indicates the agricultural knowledge of our forefathers. By following their footsteps, the present generation of agricultural scientists has used the advanced technologies and has tried to stabilize agricultural production in our country to meet our food requirements.

Rainfall prediction

- Large number of fireflies seen at night on the forest trees is a sign that the monsoon will start early (Farmers in Maharashtra).
- If there is rain, accompanied with lightning and mild thunder on the second day of Jayastha month (May – June), there will be no rain for the next 72 days (Farmers Gujarat)

Indigenous Technical Knowledge (ITK)

ITK is defined as the sum total of knowledge and practices which are based on people's accumulated experience in dealing with situations and problems in various aspects of life and such knowledge and practices are special to a particular culture.

When the farmers continuously practicing indigenous knowledge, it will be also relevant to enquire why they do so. In other words, what are the advantages of such practices as perceived by farmers? Understanding the rational of such practices from farmers' point of view, may also help researchers to look into the valid factors while they research to farmers need and help extension workers to select appropriate technologies based on few criteria

- Summer ploughing conserves moisture, eradicates weeds, consolidates soil erosion and minimizes the number of ploughings at the time of sowing.
- Due to cowdung coating for cotton seeds, the easy dibbling of seeds to remove fuzz, good germination, no cost and pest-reduction were the advantages.
- Soaking sorghum seeds in cow urine before sowing increase the drought tolerance and the seeds had germination with minimum rain and it was considered as no cost practice.
- Soaking Bengal gram in water **a**s found with the previous practice, farmers had resorted to the practice of soaking bengal gram in water before sowing because it considered as no cost and withstanding water stress.
- Cotton seeds treated with red soils facilitate easy dibbling of seeds and it favours good germination.
- Cattle penning practices improve the soil fertility owing to organic manure.
- Sorghum mixed with lab-lab given additional yield owing to mixed cropping and it enhances nitrogen fixation by leguminous lab-lab.
- Use of cow dung cake as burrow fumigant is economical in controlling rats.

- Raising castor as a border crop in cotton field is used as trap crop for the cotton pest and it also provided additional income.
- Easy removal of pest, easy separation of kernels, longer shelf life and higher economics are advantages of coating red gram with red soil.
- Mixing green gram with ash was one of the post harvest indigenous practice and it had certain advantages like pest reduction and cheaper method.

Tamil Almanac (*Panchangam*)

An annual publication including weather forecasts and other miscellaneous information arranged according to the calendar of a given year

The Tamil Almanac is used in Tamil Nadu and Puducherry in India, and by the Tamil population in Malaysia, Singapore and Sri Lanka. It is used today for cultural, religious and agricultural events, with the Gregorian calendar having largely supplanted it for official use both within and outside India. It is based on the classical Hindu solar calendar also used in Assam, Bengal, Kerala, Manipur, Nepal, Orissa and the Punjab.

There are several festivals based on the Tamil Hindu calendar. The Tamil New Year follows the *Nirayanam* vernal equinox and generally falls on April 13 or 14th of the Gregorian year. April 13 or 14th marks the first day of the traditional Tamil calendar and this remains a public holiday in both Tamil Nadu and Sri Lanka. Tropical vernal equinox fall around 22 March, and adding 23 degrees of trepidation or oscillation to it, we get the Hindu sidereal or *Nirayana Mesha Sankranti* (Sun's transition into *nirayana* Aries).

Hence, the Tamil calendar begins on the same date in April which is observed by most traditional calendars of the rest of India.

Week

The days of the Tamil calendar relate to the celestial bodies in the solar system: Sun, Moon, Mars, Mercury, Jupiter, Venus, and Saturn, in that order. The week starts with Sunday.
This list compiles the days of the week in the Tamil calendar:

No.	Weekday (Tamil)	Sanskrit name	Lord or Planet	Gregorian Calendar equivalent
01.	*Gnyaayitru-kizhamai*	Ravivaara	Sun	Sunday
02.	*Thingat-kizhamai*	Somavaara	Moon	Monday
03.	*Sevvaai-kizhamai*	Mangalavaara	Mars	Tuesday
04.	*Buthan-kizhamai*	Budhavaara	Mercury	Wednesday
05.	*Viyaazha-kizhamai*	Guruvaara	Jupiter	Thursday
06.	*Velli-kizhamai*	Sukravaara	Venus	Friday
07.	*Sani-kizhamai*	Shanivaara	Saturn	Saturday

Months

The number of days in a month varies between 29 and 32.
The following list compiles the months of the Tamil Calendar

No.	Month (Tamil)	Sanskrit Name	Gregorian Calendar equivalent
01.	*Cittirai*	*Chaitra*	mid-April to mid-May
02.	*Vaikaci*	*Vaisakha*	mid-May to mid-June

03.	*Aani*	*Jyaishtha*	mid-June to mid-July
04.	*Aadi*	*Ashadha*	mid-July to mid-August
05.	*Aavani*	*Shravana*	mid-August to mid-September
06.	*Puraṭṭaci*	*Bhadrapada*	mid-September to mid-October
07.	*Aippaci*/*Aippasi*	*Ashwina*	mid-October to mid-November
08.	*Karttikai*	*Karttika*	mid-November to mid-December
09.	*Markaḻi*	*Margashirsha*	mid-December to mid-January
10.	*Tai*	*Pausha*	mid-January to mid-February
11.	*Maci*	*Magha*	mid-February to mid-March
12.	*Pankuni*	*Phalguna*	mid-March to mid-April

Seasons

The Tamil year, in keeping with the old Indic calendar, is divided into six seasons, each of which lasts two months

Season name	English translation	Sanskrit Name	English equivalent	Months
Kar	Dark, rain	Varsha	Rainy	Aavani, Purataci
Kutir	Chill, wind	Sharada	Autumn	Aippaci, Kārthikai
Munpani	Early dew	Hemanta	Early winter	Markazhi, Tai
Pinpani	Late dew	Sishira	Late winter	Masi, Pankuni
Ilavenil	Young warmth	Vasanta	Spring	Chithirai, Vaikasi
Mutuvenil	Extreme warmth	Grishma	Summer	Aani, Aadi