

KR̥ṢI-PARĀŚARA\*

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*Kṛṣi-Parāśara*, edited by G.P. Majumdar and S. C. Banerjee (Asiatic Society, Calcutta, 1960), is a small book. Its size can be judged by the fact that it contains about 520 lines of written matter, covering 243 verses. The book gives elaborate description of rituals that were to be performed throughout the year. Every agricultural operation was perhaps initiated after consulting an astrologer who would decide on an auspicious day for it, after calculating the position of the sun and the moon and other planets. After reaping the harvest, *Puṣya-yātrā* was celebrated with feast and music on a grand scale.

Leaving aside rituals and ceremonies, the book contains some basic information on agricultural science. The subjects of discussion have been dealt with under rather too many headings. I have, therefore, selected six important headings, such as Agriculture and weather, Cultivation of crop plants, Agricultural implements, Protective measures, Storage of produce, and Animal husbandry, based on information in different verses dealing with these subjects. As far as possible, all the relevant information has been included in the 'critical account of the text'. Some of this information must have been gathered after considerable experience and shrewd observations. Although scientific disciplines such as ecology and plant physiology were not known then, yet Parāśara gives sound advice and clear instructions which are at present considered the salient features of these disciplines.

INTRODUCTION

Remains of crop plants from excavation of prehistoric and protohistoric sites have led archaeologists to believe that agricultural practices were in vogue as early as 8,000 BC. In fact, considerable research has been going on, for more than a quarter of a century now, to recognise the wild plants which were domesticated by early man, and the way it led him to create an improved economic life in those days. Later, this was instrumental in bringing about the evolution of present-day agriculture. Although much has been achieved in this respect, yet evidence of the methods of cultivation used by those people is rather scanty. The oldest direct evidence on the method of cultivation of crop plants in India is from Kalibangan<sup>1</sup>, in the State of Rajasthan. The age is pre-harappan — a period when writing was not known. A fairly extensive patch of open land with furrow-marks was discovered between mounds I and II. This implies use of plough which presumably was made of wood<sup>2</sup>.

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As for the written information on early agriculture and its practices, we have to fall back upon the Vedic literature, which, according to Sankalia<sup>3</sup>, “was until the beginning of the Christian era unwritten and known only orally”. He also holds the view “that the Vedic literature coincides, if not wholly, at least towards its later part with the protohistoric period, c. 1500 BC.”. Even here, agriculture is not dealt with as a separate subject. The treatment was a general one in connection with other activities of the inhabitants of that time. In other words, agriculture did not have such an importance as it has today; it was one of the many activities in the primitive way of life. Since then much has happened and a time came when agriculture attained an important place in the life of the people of early medieval period, and a book dealing specifically with agriculture was written by Parāśara.

### *The author and the date of composition*

About a decade back, Majumdar and Banerji published an English version of *Kṛṣi-Parāśara*<sup>4</sup> in the series *Bibliotheca Indica* of the Asiatic Society of Bengal, Calcutta. After consulting the primary sources available at that times, they tried to remove some of the confusion that centred round the book and the author. They were convinced that the book was written by a person whose name was Parāśara. The question then arose which Parāśara was this? It so happens that there were more than one Parāśara, who wrote about plants in general and agriculture in particular. Some scholars have suggested that *Kṛṣi-Parāśara* might have been written by the author who wrote *Parāśara-Smṛti*<sup>5</sup>. If both the books had been written by the same author, one would expect some reference as to which one was written first. No such mention has been made in either of these books. Under these circumstances, one would be led to think that perhaps the authors were different persons. Let us now see in what other respect these books differ. The *Smṛti* deals with animal husbandry and gives the merits and demerits of bulls, used for ploughing. Defective bulls, enumerated below, were not recommended for use.

- |                     |             |
|---------------------|-------------|
| (a) <i>Binanga</i>  | (deformed)  |
| (b) <i>Vyādhita</i> | (diseased)  |
| (c) <i>Kliva</i>    | (important) |
| (d) <i>Kṣudhita</i> | (hungry)    |
| (e) <i>Trṣita</i>   | (Thirsty)   |
| (f) <i>Śrānta</i>   | (fatigued)  |

But *Kṛṣi-Parāśara* does not say a word on such defective bulls; it gives importance to the colour of the animals as a criterion for their choice as draught animals. Thus, in *Smṛti*, the defects specified can be understood, while in *Kṛṣi-Parāśara* the defects mentioned are based on some mysterious reason. If both the books were written by the same author, one would hardly expect such a marked difference in the treatment of the same subject.

Again, the manner in which the subject of caste system has been dealt with in *Parāśara-smṛti* and *Kṛṣi-Parāśara* indicates a time gap between the writing up of these

two books. In the former, considerable space is allotted to the caste system, prescribing agriculture for the non-Brahmins. Very little is said about the importance of agriculture in daily life, giving one an impression that the Brahmins, the highest caste in the social system of that time, were not directly involved in agriculture. On the other hand, *Kṛṣi-Parāśara* writes about the importance of agriculture even to the Brahmins, who, however, must follow certain rules for obtaining better crops and maintaining good health of the draught animals.

In considering the authorship of these books, we should also not neglect the language and the style of Sanskrit used. The *Smṛti* is written in an old Sanskrit style, while the *Kṛṣi-Parāśara* gives the impression that it was written many hundred years later<sup>6</sup>. The *Smṛti* is believed to have been written when *Dharmaśāstra* was being composed. In that case it must have been written earlier than Eighth century AD.

Another aspirant for the authorship of *Kṛṣi-Parāśara* is the Parāśara who wrote *Vṛkṣāyurveda*<sup>7</sup>. This author lived sometime between the first century BC and first century AD. He was a learned person who dealt with plant science in general, and rather deep for that time. His classification of plants was based on their utility. His morphological classification was meant for helping pharmaceutical studies. There is, however, nothing common between this author and the author of *Kṛṣi-Parāśara*, except the name. Who then was the author of this book which dealt entirely with agriculture? Evidently, he was not so well known as the other Parāśaras. When did he live? Let us see whether the references given by him throw some light on the time when he wrote the book. He cites from the mythical Manu and this does not help us to fix the date of its composition. Then he refers to Gargya. Here also the date is uncertain.

Raghuṇandana, one of the critics of *Kṛṣi-Parāśara*, has pointed out that some of its verses have been copied from a book called *Rājamārtanda*. Let us now find out when *Rājamārtanda* was written. According to Kane, the well known scholar on the history of *Dharmaśāstra*<sup>8</sup>, *Rājamārtanda* was written by King Bhoja of Dhārā— a scion of the Pratihārās. The date of compilation of this book has been fixed by Kane as 1000-1050 AD. Now, the question arises whether *Kṛṣi-Parāśara* was written first and Bhoja copied verses from it for his book or it was the other way round. If the former, the date of compilation of *Kṛṣi-Parāśara* would go back by another 50 years or so. Taking into consideration both the possibilities, the date of compilation of *Kṛṣi-Parāśara* can safely be put between 950 and 1100 AD.

### *Area covered*

It is important to know whether this first book on Indian agriculture covers the entire sub-continent or only a portion of it. One way of finding this out would be to examine critically the crops that have been mentioned in the book, and ascertain whether any of them gives a clue to a particular part of India where it is now cultivated exclusively. The author writes mostly about rice (*Oryza sativa* L.) and mentions casually barley (*Hordeum vulgare* L.) and tila (*Sesamum indicum* DC.).

Of all the cereals grown in India, rice is believed to be the oldest. The latest archaeological record of rice cultivation is from Atranjikhhera, a place in the Ganga-Yamuna Doab. The age is c. 2000 BC<sup>9</sup>. From this, one must not jump to the conclusion that rice cultivation was first started in the north and then spread to other parts. Researches by systematic botanists<sup>10</sup> and plant-breeders<sup>11</sup> have led them to conclude that rice was probably cultivated for the first time in one of the countries of the southeast Asia. Support for this hypothesis has recently been brought forward by Solheim<sup>12</sup> and Gorman<sup>13</sup> based on their excavations in north-west Thailand. They put the date of early rice cultivation as c. 3500 BC. Thus, it will be seen that rice cultivation in India was probably a diffusion of agricultural method which entered into the sub-continent from the neighbouring south-east Asia.

The story of origin of barley cultivation is, however, entirely different. Convincing evidence has led to the conclusion that barley was first domesticated in west Asia. From there, it gradually spread eastwards to India and China, and westwards to Egypt and eastern Europe<sup>14</sup>. The oldest record of barley cultivation in India is from the Indus Valley Civilization, sometime between 2500 and 1750 BC<sup>15</sup>. It is generally believed that from here its cultivation spread to the rest of the sub-continent.

At present, the oldest record of *Sesamum* cultivation in India is from Harappa<sup>16</sup> in the Indus Valley in c. 2000 BC. When this crop was introduced into India, and how it spread all over the country is not yet clearly understood. According to some scholars<sup>17</sup>, its original home is Africa.

Mention of only three crops in *Kṛṣi-Parāśara* would lead one to think that these were economically important enough to be given places of honour in the first book on agriculture. However, the past and the present records of cultivation of these crops in the sub-continent do not help us in locating the particular area for which the book was written.

Let us now see whether there is any other clue which would help us to solve this problem. The language used for different agricultural operations might throw some light on the region where the author lived and worked. Here, there are a number of words which appear to be useful. For instance, the word *Kattanā* has been used for thinning of paddy seedling in the months of *Aṣāḍha* (June-July) and *Śrāvāṇa* (July-August). According to some scholars<sup>18</sup>, *Kattanā* has been derived from the Sanskrit word *Kartanam*, and is still being used in some parts of Bengal for the same agricultural operation.

There is another word *Madika* which stands for a ladder-like contraption used for covering seeds uniformly with soil after broadcasting operation. According to Majumdar and Banerji<sup>18</sup>, this word has now been changed into *Mai* in Bengal.

The book also mentions a ceremony, *Medhi-ropana*, to be performed in the month of *Agrahāyana* (November-December) in preparation for the coming threshing

operation. This practice is still observed in eastern India, though the time mentioned does not always fall in the month of *Agrahāyana*.

Another ceremony called *Puṣya-yātrā* is given in considerable detail in *Kṛṣi-Parāśara*. This ceremony is celebrated with a feast, accompanied by pomp and show even today in the eastern region of the country. The bill of fare at the feast includes "rice, curries, meat and fish", and many other eatables. This is something interesting. For, among the caste Hindus of India only limited groups are known to have fish and meat as their daily diet. Typical examples are the Assamese, Bengalis, Oryas and Kashmiris. It has been suggested that non-vegetarian food is eaten only in those locations in India where sufficient vegetables are not available throughout the year, due to climatic condition prevalent there. Whatever might be the reason for it, the Bengalis, the Assamese and the Oryas are the only people in the eastern region who are non-vegetarian. From these facts, one would be inclined to draw the conclusion that *Kṛṣi-Parāśara* was probably written in that part of the eastern region which is now known as Assam, Bengal and Orissa.

While dealing with draught animals for ploughing, *Kṛṣi-Parāśara* mentions only bulls and not buffaloes, nor horses. This also indicates that the author was concerned with the practices of agricultural operation in the eastern part of the country.

In this context, mention of cauterizing some organs of bulls and cutting their tail-hair in autumn or winter is not without significance. Some 50 years back in the eastern region, cauterizing gums and hooves of cattle used to be carried out almost religiously as a prophylactic method against "foot and mouth" disease. All these indirect evidences would, therefore, lead one to conclude that the area covered by the book was the eastern region and not the entire country.

#### *State of the country during Parāśara's time*

Having come to the conclusion that *Kṛṣi-Parāśara* was written sometime between 950 and 1100 AD, it would be desirable, at this stage, to give some idea about the political and social organization of that time. This may help us to understand the context of the book in a much better way than by simply indicating its merits and demerits. After all, no writer of a book can avoid the influence of the environment in which he lives and works.

The period between 300 and 700 AD is considered by some historians as the "Classical Age"<sup>19</sup> of ancient India. The administration had reached a stage when the centralized system worked to a great extent in a way similar to that of the Mauryas. Life was comfortable for well-to-do people, and there was considerable leisure to cultivate music, drama and painting. There was also advancement in the judicial system, the king being the highest court of appeal.

This was followed by a period between 700 and 1200 AD, in which much fighting took place among the three important kingdoms of north India, each trying to gain

supremacy over the other. The ultimate result was the downfall of all. According to Tarachand<sup>20</sup> “about the middle of the eighth century, the first king of Pālā dynasty, Gopala, established rule over east Bengal and south Bihar”. The Pālās were enlightened rulers and encouraged artistic and intellectual activities, without neglecting development of industries. In fact, the industries were so well developed that after meeting the internal demand for products, there was surplus to export to many countries of the southeast Asia. During the ninth and tenth centuries, the Rashtrākūtās and the Pratihārās were fighting hard in the north-western region to gain control over Kanauj. It weakened them so much that the Pālās, from the east, came and took possession of Kanauj. This, however, did not lead to peace; fighting between the Pālās, the Rāshtrakūtās and the Pratihārās brought about simultaneous downfall of all the three major kingdoms. What was the result? The small states, which started their independent outlook during the fight of the major kingdoms, asserted their right and became independent. Repercussion of this was disastrous. There was some tendency “reflected in the cultural life of the period”<sup>21</sup>. Local culture received much more attention than the culture of the country. Things did not end here. There was also a manifestation in writing and cult to give emphasis on local activities over the past history embedded in the Vedic literature and other publications of earlier period.

Some scholars of *Kṛṣi-Parāśara* have shown their astonishment at the absence of many items of agriculture and animal husbandry known to have been developed prior to the tenth century AD. Literature of the Vedic period and classical period<sup>22</sup> dealt at length with subjects like rotation of crops, irrigation, soil classification and agricultural implements, but *Kṛṣi-Parāśara* is either silent on some of these items or deals with them rather cursorily. Considering the tendency prevalent, during the tenth and eleventh century AD, among the small states in north India to exaggerate the local practices in agricultural operations and to ignore the past experience of centuries, it is no wonder that *Kṛṣi-Parāśara* fails to give a complete list of all advancement made in agriculture since man in India took to settled life.

#### A CRITICAL ACCOUNT OF THE TEXT

By taking to agriculture alone can one become a monarch of the world? People having surplus gold, silver, jewels and garments are compelled to beseech cultivators for rice, which is the staple food. Even Brahmins, who are said to be wise, because they are versed in four Vedas and recite Sastras but are not in possession of food, have to humiliate themselves by asking for food from those who are agriculturists (non-Brahmins). You cannot entertain a guest without food, and indeed, he is the best among men by whom a guest is entertained.

Food gives vitality and vigour to life, and is, therefore, the most desirable in the life of a man. Gods, demons and human beings all subsist on food. To get food, you must take to agriculture. There is no doubt that agriculture is blessed and holy, and also the staff of life.

A farmer who is anxious to prosper in his pursuit must himself supervise the fields regularly; otherwise, he is destined to be in want. He must also work hard, possess good

cows (bulls) for ploughing and good seeds for sowing and know all about the weather. Food is produced from paddy, and paddy is not available without agriculture. Therefore, give up all else and take to agriculture.

### *Agriculture and weather*

All agriculture depends on weather. It is, therefore, necessary to acquire at the outset knowledge of rainfall, if you wish to succeed in agriculture. Rainfall can be estimated from the cloud. Four types of clouds are recognised. *Avartā* cloud produces local rains, while *Samvartā* brings rain everywhere. *Puṣkarā* does not produce sufficient rain and is in fact an indication of draught. *Drouṇā* cloud produces abundant water all over the land.

A wise man should observe and find out all about rainfall from the beginning of *Pauṣa* (December-January). The direction of wind is an indication of rain<sup>23</sup>; wind from the north and the west means rainfall, and that from the south and the east, drought. Absence of wind foretells absence of rainfall; irregular wind means erratic rainfall. Attach a flag to a post and observe the direction of wind (weather-vane) day and night.

In the month of *Pauṣa* (December-January), when a clear sky, during the waxing morn, is associated with white clouds and lightning in the western sky, there is sure to be profuse rainfall. In the month of *Māgha* (January-February), a violent wind and shower with lightning will make earth full of crops. *Phālguna* (February-March) is an uncertain month in which there may be variation from scanty to abundant rain. So is the month of *Caitra* (March-April). Rains start in *Vaiśākha* (April-May).

To ascertain the probable quantity of rainfall<sup>24</sup> in the month of *Vaiśākha* (April-May), fix a pole in the bed of a flowing river in the early part of the night, during the first day of the waxing moon. And get up early in the morning to find out whether there has been an increase or decrease in the flow of water during the night. If the water is on a level with the mark on the pole, it means rainfall and flood will be the same as in the preceding year. If there is a rise, there will be more rain and flood. If there is a fall in the depth of water, the rainfall will be less and so will be the flood.

When there is plenty of rain in *Jyaiṣṭha* (May-June), there will be abundant crop. The quantity of rainfall in *Aṣāḍha* (June-July) is very critical for the crop. Less rain means less crop and more rains will bring about plentiful crop. There should also be occasional rain in *Śrāvāṇa* (July-August). If not, all the labour of cultivators will be wasted.

The following signs indicate immediate rainfall:

- (a) White ants with wings rushing out of their holes.
- (b) Dancing of peacock.
- (c) Sudden croaking of frogs.
- (d) Snakes coming out of their holes and taking shelter on a tree.

- (e) Water fowls drying their wings in the sun.
- (f) Rheumatic people beginning to have aches and pains all over their body.

### *Cultivation of crop plants*

*Paddy*: Collect seeds in the month of *Māgha* (January-February) or *Phālguna* (February-March), and dry them well in the sun. Do not keep them on the ground<sup>25</sup>. Make a small packet and remove all the chaff. Seeds mixed with chaff when sown will produce weeds galore<sup>26</sup>. Seeds of the same kind produce abundant crop. Therefore, collect seeds of identical shape and size<sup>27</sup>. Do not store seeds in a cow-shed or an ant-hill or where there is a likelihood of their getting infected with diseases. Avoid ghee, oil, butter-milk and salt.

On the care of seeds, Gargya says: Wealth of harvest depends on seeds. Seeds that have come in contact with lamp (oil from lamp), fire, smoke and have been damaged by rain or are full of holes (due to insect attack) should always be rejected. Never sow seeds that have been stored underground and have lost their viability. When seeds are not viable, it matters little even if the cultivator is industrious, bulls are healthy, field is fertile and there is plenty of rain. This rule will apply to paddy, sesame and barley.

The best time for sowing seeds is from *Vaiśākha* up to the middle of *Jyaiṣṭha* (April-June). Sowing of seeds in *Āṣāḍha* (June-July) is bad; if done in *Śrāvaṇa* (July-August), it will be a total failure.

There are two ways of sowing seeds. In one, the seeds are sown and left to grow and produce the crop. The other way is to grow seeds for transplantation. Usually crop grown in the former way is free from disease, while that grown in the latter way succumbs to many infections. After sowing seeds, one must use *Mayika*; otherwise, the distribution of seeds would be uneven. Transplantation is to be done in *Śrāvaṇa* (July-August), when plants are sown 45 cm. apart. If sown in *Bhādra* (August-September), distance should be reduced to half. If sown in *Āśvina* (September-October), the distance between seedlings should be only 10 cm.

*Kattana*, i.e. thinning, should be done in *Aṣāḍah* or *Śrāvaṇa* (June to August) to get plentiful harvest. If this is done in *Bhādra* (August-September), the crop is reduced to half; if in *Āśvina* (September-October), the plants will not bear fruits. Weeding, i.e. removal of grasses, should be done twice in *Śrāvaṇa* and *Bhādra*. This brings two-fold crop. If this is done in *Āśvina*, the grains will be small and perhaps will never ripen.

One must remove excess of water in *Bhādra* (August-September). In this month, there should be just enough water to cover the roots of paddy. If water is in excess in *Bhādra*, there will be many diseases resulting in reduction of harvest.

Water drained out in *Bhādra* must be stored and preserved for use in the months of *Āśvina* and *Kārtika* (September to November), when there is normally not enough rainfall. Those who do not attend to this, are fools.



On the *Kārtika-saṃkrānti* day<sup>28</sup>, the cultivator having become ritually pure, should plant *Nala*, a group of small trees (grove) with leaves on, in the north-east corner of the field, and perform a prayer ceremony along with offerings, for the preservation of the crop.

In *Agrahāyana* (November-December), the *Medhi ropana* ceremony should be performed. At first a piece of level ground should be selected and then smeared with cow-dung. The plants to be used for *Medhi* are *Nyagrodha* (*Ficus indica* Linn.), *Saptaparna* (*Alastonia scholaris* R. Brown), *Gambhari* (*Gmelina arborea* Linn.), *Śālmalī* (*Salmalia malabarica* D.C. Schott and Endl.), *Udumbara* (*Ficus glomerata* Roxb.) and any other with milky juice.

After planting the *Medhi*, it should be decorated with *neem* (*Azadirachta indica* Juss.) and sesame (*Brassica campestris* L.). All these are in preparation of the coming threshing operation (See Pl. III, b). Under no circumstances should *Medhi* be planted in *Śrāvaṇa* (July-August).

In the month of *Pauṣa* (December-January), a religious ceremony called *Puṣya-yātrā* should be performed, so that a good harvest may result. It is to be done before the crop is harvested. The aim of the first stage<sup>29</sup> is to treat all the neighbours, old and young, with sumptuous food of rice, curries, fish meat, vegetables, sweets with thickened milk, fruits and cakes. After the feed, distribute sandal-paste and perfumes among the guests, and finish up with betel-leaves and camphor. Then enjoy music—vocal and instrumental— and dance.

When all these are over, perform a general prayer for a good harvest. A wise man harvests his paddy in the month of *Pauṣa* and gets the corn threshed and weighed with *Āḍhaka*<sup>30</sup>.

Cowdung should receive special veneration because of its importance to the production of rice. Without cowdung manure, paddy plants grow up bereft of fruits. Carefully collect all cowdung on an auspicious day and make into heaps. Worship these heaps in the month of *Māgha* (January-February). Break them into small pieces and dry them in the hot sun of *Phālguna* (February-March). Then make a pit in every field and

fill it up with dung. At the time of preparation of land for sowing seeds, make lavish use of this manure.

### *Agricultural implements*

The principal agricultural implements are *hala* (plough), *Madika* (ladder) and *Viddhaka* (harrow). The *hala* is made up of the following parts:

*Iṣā* (pole) is 8 cubit long, i.e. 3.60 m.

*Niryola* (portion of the plough exclusive of the pole and the share) is 0.90 m. in length.

*Pasika* (rope of *niryola*) is 0.30 m. long.

*Phalaka* (plough-share) is about 0.30 m. in length.

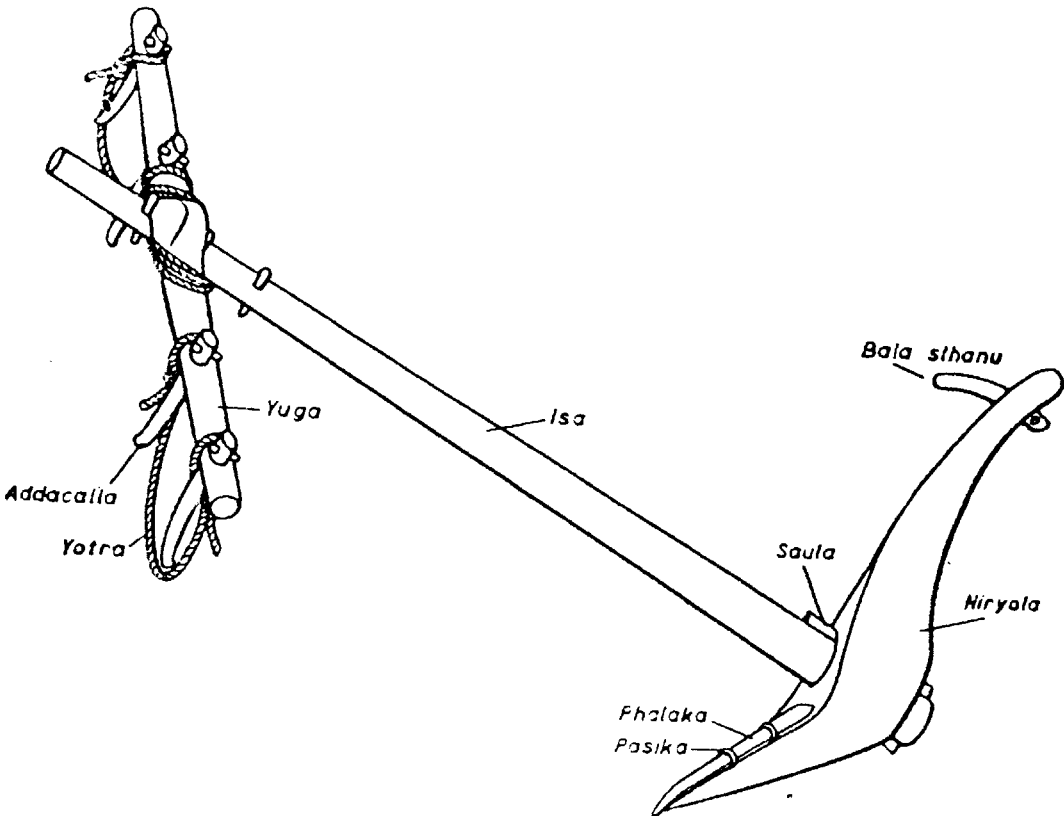
*Yoga* (yoke) is about 1.35 m. long.

*Addacalla* (pin of the yoke) is 0.30 m. in length.

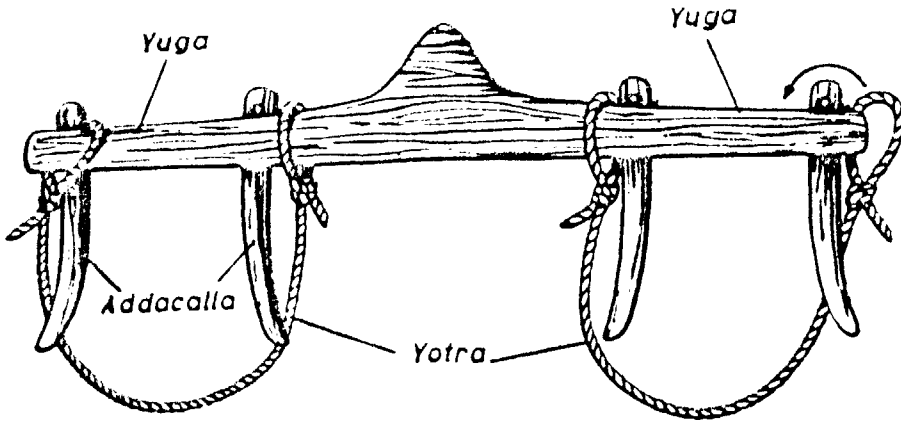
*Paccanika* (goad for driving bull) is about 0.45 m. long.

*Yotra* (chord for fastening the *yoga* to the neck of the bull) is 1.20-1.60 m. in length.

The accessories should be of specific length, width and shape, so that the bulls pulling the plough are not in any way inconvenienced or uncomfortable. All parts should be strongly built and properly fitted; otherwise, there will be impediments to ploughing<sup>31</sup> (see Pl. I, II b)



Pl. I. A Modern Version of Parāśara's Plough. 1 : 18.



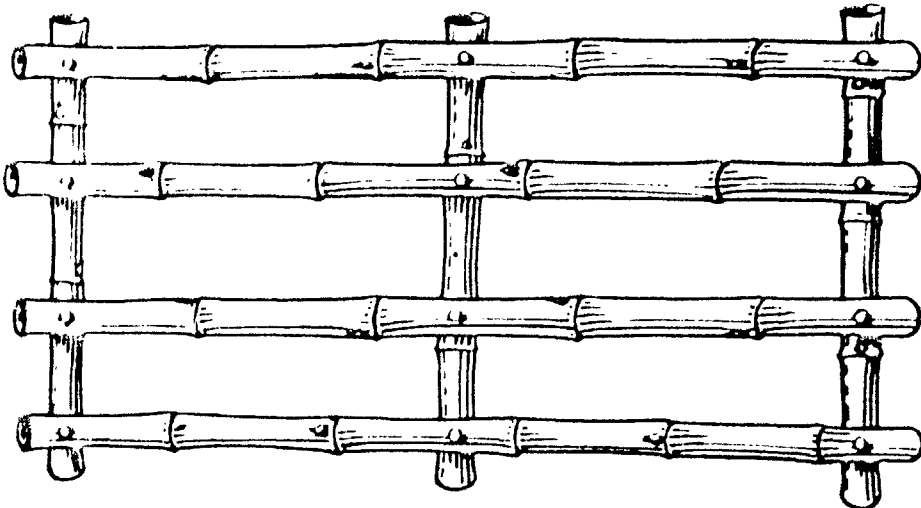
Pl. II, a. Yoke as used in North India. 1 : 9.

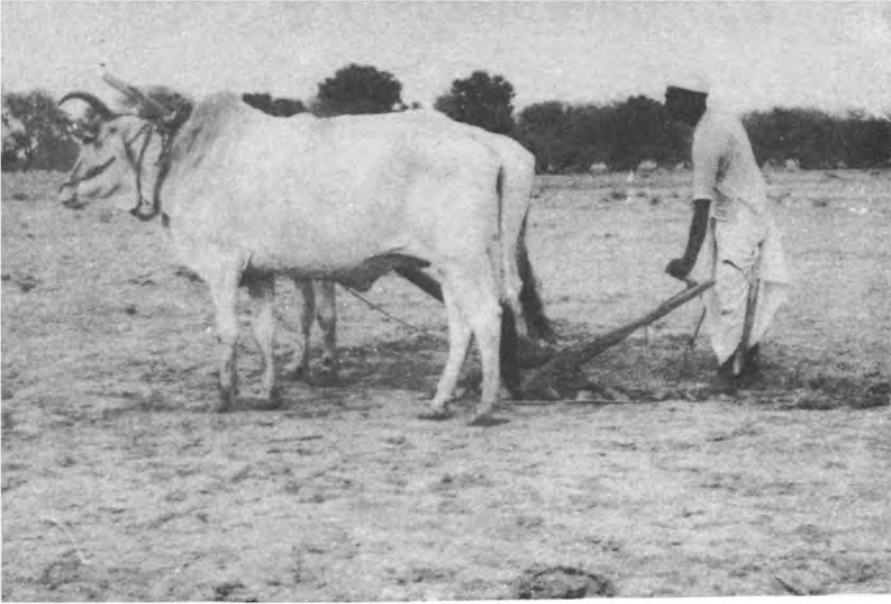
*Madika* is a ladder-shaped contrivance for levelling the top soil. It is also used for bringing about even distribution of seeds after they have been broadcast (Pl. II, b).

*Viddaka* is used for hoeing. Its size varies, depending on the strength of the bull and the texture of the soil. It must, however, have 21 spikes.

#### *Protective measures*

Not many protective measures against natural calamities are given in the book. Only the *Nala-ropana* ceremony is recommended. This is to be performed on the *Kārtika-samkrānti* day. Considering the time of its performance and its effect on the crop, one would be led to conclude that the entire device was meant to frighten away

Pl. II, b. *Madika* as used in eastern region. 1 : 14.



Pl. III, a. Ploughing Operation (North India)



Pl. III, b. A Modern version of Threshing Operation as given by Parāśara.

and keep out the predatory birds and animals. Fungi and insects, which are the main destroyers of crops now-a-days, do not receive any attention of the author.

### *Storage of produce*

Mention has already been made of *Ādhaka* (a wooden receptacle) for measuring grains before storing. Its length, breadth and depth are given as 0.30 m. Curiously enough, much importance is given to the timbers that were to be used for making the *Ādhaka*. The timbers recommended are *Ślesmantaka* (*Cordia mixa* Linn.), mango (*Mangifera indica* Linn.), *Punnaga* (*Calophyllum inophyllum* Linn.), but not *Kapiṭa* (*Feronia elephantum* Correa), *Parkati* (*Ficus infectoria* Roxb.) and *neem* (*Azadiracta indica* Juss.). The timbers not recommended are said to be inauspicious. This advice appears to be based on experience of agriculturists. The timbers recommended do not change their shape in the process of drying or seasoning, while those regarded inauspicious lose their shape and thereby cause discrepancy while the grain is measured.

### *Animal husbandry*

Under no circumstances should the draught animals be treated cruelly. When they are inside the cowshed, they should be fed with molasses, fodder and other nourishing food. In the mornings and evenings, they should be taken out in the field for grazing.

The cowshed should be strongly built. It has to be spacious—at least three metres square. There should be regular practice of smoking it to drive out mosquitoes and other insects. The shed should not be used for keeping odd things like mortar and pestle and cast-off from cotton seeds. Water for drinking should always be fresh and given in a vessel of bell-metal. Never allow water, after washing fish, to be given to cows for drinking. The cowshed should be clean of dung and urine of animals.

A plough should be drawn by eight bulls in order to have a good crop. Six is not bad, but two bulls will bring nothing but disaster to the cultivator. Wealth comes to a man who uses ten bulls. Only then can he entertain guests. In the month of *Kārtika* (October-November), festival of cows should be celebrated. Body of the animal should be smeared with saffron and sandal paste or turmeric mixed with oil. The cowherd will then take the bulls round the village with vocal and instrumental music.

It is in this month that a piece of hot iron should be put to the bodies of cows and the hair from the tail trimmed off. This operation makes the cows healthy and saves the animals from diseases for a year.

Cowdung stored for use should be worshipped in the month of *Māgha* (January-February). In the next month, i.e. *Phālguna* (February-March), after having been powdered and dried in the sun, cowdung should be scattered evenly throughout the paddy field. Without manure paddy plants grow bereft of fruits.

AGRICULTURAL PRACTICES GIVEN IN *KṚṢI-PARĀŚARA* IN THE LIGHT OF PRESENT-DAY KNOWLEDGE

Agriculture is an applied science, now called technology, in which principles of physics, chemistry and biology are utilized with a view to getting a profitable return from land. Progress in agricultural practices is, therefore, dependent on the state of human knowledge in these basic sciences. In an attempt to evaluate the practices given in *KṚṣi-Parāśara*, the state of knowledge in physics, chemistry and biology, about a thousand years back, has, therefore, to be kept in view. At that time, many modern sciences were not even born. Those which had established themselves were more or less at an elementary stage and much of the depth that these subjects have now acquired was then absent.

Broadly speaking, the present “green revolution” has been brought about by means of three measures: selection of suitable seeds, which are mostly obtained from hybrid plants; application of specific chemical manures at different times when the crop can utilize them most effectively; and finally, supply of water by a well arranged irrigation system, at a time when the crop needs it most.

All these measures have been emphasised in *KṚṣi-Parāśara* too. Instruction has been given to collect pure seeds from plants which have produced plentiful crop. This would appear to be based on the knowledge that seeds from healthy plants were likely to produce again healthy plants, which would ultimately bear plentiful fruits. There was thus the underlying philosophy that to obtain a profitable crop, one must use good seeds from healthy plants. Incidentally, this knowledge was originally acquired by the neolithic man before he took to settled life. By the time *KṚṣi-Parāśara* was written, this philosophy was well ingrained in the agricultural community.

It must have been known at that time that cultivation of a piece of land year after year impoverishes the soil, for *KṚṣi-Parāśara* prescribes the use of cowdung as a remedial measure for the improvement of land. Agriculturists would appear to have reached a stage when they knew that cowdung was a good manure. They also knew that fresh cowdung was not as good as old cowdung. Specific instructions have been given to apply only dry cowdung after it has been reduced to powder. Since information on the chemical and biological background on the the use of cowdung was not known at that time, the practice must have been brought about by experiments and observations.

Irrigation is not mentioned in the book, but availability of water during different seasons of the year is dealt with in considerable detail. Mention is also made of agricultural operations that have to be carried out in each month. When water is plentiful in *Bhādra* (August-September), instruction has been laid down for its storage with a view to utilizing it later in the season when usually rainfall is scanty.

In dealing with the sowing of rice, two methods have been prescribed—broadcasting and transplantation. Seeds for broadcasting are sown once for all and the

plants allowed to grow to maturity. But seeds for transplantation are first grown in seed beds and then removed and planted in a bigger field. Clear instruction has been given to carry out transplantation operation when the seedlings are young. This indicates some knowledge of the capability of young seedlings to take roots much better than those that are somewhat overgrown. Again, emphasis has been laid on the spacing of the transplanting seedlings. Young seedlings should have more space in between than the old seedlings. All these instructions would indicate that agriculturists, one thousand years back, had some vague idea about root competition for nutrients among the crop plants.

In summing up, it may be said that Indian agriculturists, about a thousand years back, had a clear knowledge of the measures essential for the production of profitable crops. These were based on the standard of knowledge on the basic sciences available at that times. In other words, they were on the right track even in that early medieval age.

#### CONTEMPORARY AGRICULTURAL PRACTICES IN COUNTRIES OTHER THAN INDIA

There is now little doubt that some form of primitive agriculture was practised by the Neolithic man. Since then, there has been a constant struggle by him to produce more food under the environmental conditions in which he lives. By the time *Kṛṣi-Parāśara* was written, i.e., by the tenth century AD, from all accounts, considerable improvement in the cultivation of food crops had been made by people living in different parts of the Old World. Agriculture was extensively practised to feed the growing population that resulted from the settled life of the so-called civilized man. About this time, one of his pre-occupations was religion, in whatever form it might have been. This led to the establishment of religious centres – - monasteries, convents, *mandirs* and *masjids*. In all these places, there was a free atmosphere for discussion on theological and philosophical thoughts. Soon these centres took up study of natural history along with medicine. In his “*Short History of Botany in Sweden*”, Fries says “The first literary works on natural science in Sweden also come from the monasteries. Monastery libraries naturally contained mostly MSS dealing with theological and philosophical subjects, but also odd treatises on natural history and medicine”. In some of these manuscripts, one finds information on plants and animals that they had domesticated at that time. Treatment of science in this literature was more or less of general nature, without special emphasis on any particular discipline of science. This trend was there not only in Sweden but also in other countries of Europe. Existence of a book on purely agricultural practices of that time is, therefore, hard to find in these western countries.

In the east, China is known to have had a long past history of culture and philosophy. It cannot, however, be pushed back beyond c. 1500 BC<sup>32</sup>. Cultivation of wheat has been reported during Shang Kingdom (c. 1520-1030 BC). The source of seeds is said to have been from Central Asia and Middle East<sup>33</sup>. Again, literature of early Chou dynasty (c. 1030-722 BC) mentions cultivation of wet-rice<sup>34</sup>. Here, no source of seed is given. Besides this information, there does not appear to be any written record of the agricultural practices that existed in China during the early

medieval period. In this connection, the following remarks of Needham<sup>35</sup> are rather revealing: "illustrations in certain editions of the *Ta-Kuan Ching Shih Cheng Lei Pen Tshas* of the 12th and 13th centuries were better than those of European botanical books of the +15th and +16th, particularly characteristic of the period; however, there are numerous botanical and zoological monographs, of which Han Yen-Chih's *Chu Lu* (Orange Record) of +1178 may be considered a type-specimen; it deals in detail with all aspects of citrus horticulture, and was the first book on the subject in any language; besides this, there are monographs on bamboos, *lichis*, aromatic plants, cucurbits and flowering trees as well as Crustacea, birds and fishes".

It is of some interest to point out here that in most of the countries of the Old World, the authorship of this literature on science was mostly confined to people living in monasteries and temples, etc., but not so in China. Here, considerable contribution was made by scholars in government service. This gave the Chinese literature a somewhat practical bias.

#### CONCLUSION

*Kṛṣi-Parāśara* is believed to be one of the oldest books on Indian agriculture. It was written in Sanskrit. The exact date of its publication is not known. The book, however, contains significant quotations and references, which would lead one to say that it was written sometime between c. 950 and 1100 AD.

Nothing is mentioned in the book as to whether it was meant to cover the agricultural practices of the entire country or only a portion of it. In fact, critics have already pointed out that the book does not give many advancements in agriculture that are known to have been made long before the tenth century AD. These earlier developments are well recorded in the Vedic literature and the literature of the Classical Age. A critical analysis of the written matter shows a strong bias for those practices which are still in existence in the eastern and southeastern regions of the sub-continent.

Historians have pointed out that in the development of the Indian sub-continent, its frontiers, namely, northwestern and northeastern, have played an important part<sup>36</sup>. The establishment of Harappan Civilization was due to the impact of the immigrants who came to this country through the northwestern frontier. There is also little doubt that many immigrants came through the eastern and southeastern frontiers, although their presence did not result in the establishment of such conspicuous centres of civilization as Mohenjo-daro and Harappa.

The main crop mentioned by Parāśara is paddy or rice. There is also a casual mention of barley and sesamum. As far as rice is concerned, it is believed to have been cultivated for the first time in one of the countries of southeast Asia. The latest archaeological date for this operation goes back to c. 3500 BC in northern Thailand<sup>37</sup>. We are, therefore, justified in saying that moist tropical climate with other favourable conditions of the eastern region of the sub-continent was best suited for the cultivation of rice. Although the agro-techniques of barley and sesame cultivation had reached the



eastern region, as reported by Parāśara, yet the natives had the intelligence to limit their cultivation in preference to rice. All these facts lend support to the view that the inhabitants of this region were well up in their agricultural practices.

Finally, a word of caution may not be out of place here. It would be presumptuous on the part of anybody to say that *Kṛṣi-Parāśara* gives the last word on the history of agriculture in the Indian sub-continent during the tenth and eleventh centuries AD. To get a clear idea of the advancements made then, much more research, covering the entire country, will be necessary.

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#### ABBREVIATIONS

AI	...	Ancient India
Amara	...	Amarkoṣa
BI	...	Bibliotheca Indica
BNISI	...	Bulletin of National Institute of Sciences of India
Brh. S	...	Bṛhatsamhita
C.F.	...	Cultural Forum
IAR	...	Indian Archaeology Review
ICAR	...	Indian Council of Agricultural Research
IJHR	...	Indian Journal of History of Science
JASB	...	Journal of Asiatic Society of Bengal
JRAS	...	Journal of Royal Asiatic Society
JUG	...	Journal of University of Gauhati
Kr. P	...	<i>Kṛṣi-Parāśara</i>
NISI	...	National Institute of Sciences of India
Rv.	...	R̥gveda
SC	...	Science and Culture

#### GLOSSARY

<i>Addacalla</i>	Pin for yoke.
<i>Āḍhaka</i>	Term for measuring things.
<i>Agrahāyana</i>	Lunar month falling within November-December.
<i>Āṣāḍha</i>	Lunar month falling within June-July.
<i>Āśvina</i>	Lunar month falling within September-October.
<i>Avarta</i>	Cloud that causes local rain.
<i>Bhādra</i>	Lunar month falling within August-September.

<i>Caitra</i>	Lunar month falling within March-April.
<i>Drouṇa</i>	Cloud that causes abundant rain all over the land.
<i>Hala</i>	Plough.
<i>Jyaiṣṭha</i>	Lunar month falling within May-June.
<i>Kattana</i>	Thinning.
<i>Kārtika</i>	Lunar month falling within October-November.
<i>Kartikasam-krānti</i>	Change of orbit by planets in this month.
<i>Mādika</i>	Ladder-like contrivance used for levelling top soil in a field.
<i>Māgha</i>	Lunar month falling within January-February.
<i>Mayika</i>	Another name for <i>Madika</i>
<i>Medhi-ropana</i>	To plant a pole in preparation for threshing.
<i>Moi</i>	Another name for <i>Mādika</i>
<i>Nala</i>	Reeds.
<i>Pauṣa</i>	Lunar month falling within December-January.
<i>Phālguna</i>	Lunar month falling within February-March.
<i>Puṣkara</i>	Cloud which seldom causes rain.
<i>Puṣya-yātrā</i>	A ceremony in the month of <i>Pauṣa</i> .
<i>Samvarta</i>	Cloud which brings light rain all over.
<i>Sandal-paste</i>	Paste prepared by rubbing sandalwood on a hard stone.
<i>Śrāvaṇa</i>	Lunar month falling within July-August.
<i>Vaiśākha</i>	Lunar month falling within April-May.
<i>Vidhaka</i>	Harrow.

## NOTES AND REFERENCES\*

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11. Ghose, R.L.M., *et al.*
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13. Gorman, C., pp. 315-316.
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16. Vats, M.S. p. 466.
17. Darlington, C.D., p. 67.
18. Majumdar G.P. & Banerji, S.C.
19. Thapar, R., p. 136.
20. Tarachand, p. 91.
21. Thapar, R., p.224.
22. *Amara*. pp. 5-8. 10-13, *Brh. S.*, 55. 17-26.

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23. saumyavarūṇayor vṛstir avṛstih pūrvayāmyayoh/  
nirvāte vṛstihāṇih syāt samkule samkuḷam jalam//  
*Kṛṣiparāśara*, v. 31.
24. pravānyutanadyām tu dandam nyasya jale niśi /  
vaiśākhaśuklapratipattiṭhau vṛstim nirāpayet//  
*Kṛṣiparāśara*, v. 48.  
prātar utthāya sahasā tadanḱam tu nirūpayet/  
samam caivādhikam nyūnam bhaviṣyajjalakāṅksayā//  
*Kṛṣiparāśara*, v. 50.

gatavatsaravad vāri vanyā caiva same bhavet/  
hīne hīnam bhaved vāri bhaved vanyā ca tādrśī//  
*Kṛṣiparāśara*, v. 51

ankādhikye ca dviguṇā vṛstir vanyā ca jāyate/  
iti parāśarenoktam bhaviṣyadvṛstilakṣaṇam//  
*Kṛṣiparāśara*, v. 52.

25. māghe vā phālgune māsi sarvabījāni samharet/  
śoṣayed ātape samyak naivādho vinitdhāpayet//  
*Kṛṣiparāśara*, v. 157.
26. bijasya putikām kṛtvā vidhānya tatra śodhayet/  
bijam vidhānyasammīśram phalahānikaram param//  
*Kṛṣiparāśara*, v. 158.
27. ekarūpaṃ tu yad bījam phalam phalati nirbharam/  
ekarūpaṃ prayatnena tasmād bījam samācāret//  
*Kṛṣiparāśara*, v. 159.
28. atha kārtikasamkrāntyām kṣetre ca ropayen nalam/  
kedāreśānakone ca sapatram kṛsakah śucih//  
*Kṛṣiparāśara*, v. 198.
29. paramānnam ca tattraiva vyañjanair matsyamāmsakaiḥ/  
nirāmisais tathā divyaiḥ saṅgumaricānvitaiḥ//  
*Kṛṣiparāśara*, v. 222.

dadhibhiś ca tatha dugdhair ājyapāyasapānakaiḥ/  
nānāphalaiś ca mūlaiś ca miṣṭapīṣṭakavistaraiḥ//  
*Kṛṣiparāśara*, v. 223.

ebhiḥ sudhaukitam kṛtvā tad annam kadalīdale/  
bhojayeyuḥ janāḥ sarve yathāvṛddhapurāḥśarāḥ//  
*Kṛṣiparāśara*, v. 224.

ācamya ca tatas tatra candanaś ca catuḥsamaiḥ/  
anyonyam lepanam kuryus talaiḥ pakvaiḥ sugandhibhiḥ//  
*Kṛṣiparāśara*, v. 225

karpūravāsitam divyam tāmbūlam gandhapūritam/  
bhakṣayeyus tato 'nyonyam paridhāya navāmbaram//  
*Kṛṣiparāśara*, v. 226

puṣpair ābharaṇam kṛtvā namaskṛtya śacīpatim/  
gītaiḥ nṛtyaiś ca vādyaiś ca kuryus tatra mahotsavam//  
*Kṛṣiparāśara*, v. 227.

30. Instruction for agricultural operations given in the book, month by month, covers only eight months. This brings out the fact that land was to be under crop for 8-9 months and for 3-4 months it remained fallow. These would lead one to draw the conclusion that the practice was to grow only one crop in a year.
31. Improvement and modification since the time of Parasara have been made by agriculturist to suit the local conditions. These changes were necessary because of the state of the soil, the lie of the land and the type of bull available in a particular locality. As a result, ploughs now used in different parts of the sub-continent are not the same. Nevertheless, the main constituents of the plough are not dissimilar from those given in *Krsi-Parāśara*.
32. Needham & Wang, Vol. I. p. 98.
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