Journal of Plantation Crops 21(1): 1-7 *June,* 1993

Presidential Address

ORIGIN AND INTRODUCTION OF PLANTATION CROPS

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It had been my good fortune to be associated with the activities of the Indian Society for Plantation Crops from 1972 onwards, first as a member and then as the Editor of the Journal of Plantation Crops from 1981 to 1988. I also have the privilege of being the elected President of the Society for two terms from 1988 to 1992. I would like to re-emphasise that the objective of the Society is to advance the cause of plantation crops and crop science in all their aspects through various activities.

The Society has been constantly endeavouring for bringing together the scientists, extension workers and farmers concerned with plantation crops ever since its establishment. One of the major achievements of the Society has been to bring together all these people under one umbrella through the Plantation Crops Symposia (PLACROSYM). This unique venture has helped to foster better interaction and understanding among the community of research and extension scientists, farmers and planters involved in research, development and cultivation of these crops. True to the mandate of the Society, it has organised or co-sponsored two International Symposia on Coconut Research and Development, one on Cashew and several National Symposia on Plantation Crops. The recently concluded International Symposium on Coconut Research and Development had the unique opportunity of bringing together more than 250 coconut workers from 17 countries and resulted in crystalizing programmes and policies on coconut on research and development on co-operative basis at the international level.

As a cytogeneticist by qualification it will be appropriate for me to discuss on the origin and evolution of plantation crops in general and introduction of these crops to this country in particular.

A subject of interest to man from time immemorial has been the origin of agriculture. Most ancient literature reveals consensus that before the origin of agriculture people did not farm but gathered their food from wild. Subsequently, from primitive, wild, uncivilized and lawless, society the crafts of agriculture, and arts of civilization, religion and law slowly developed (Harlan, 1989). The remarkable botanical knowledge of hunter-gatherers has now been accepted by many studies. Many of these hunter-gatherers had their folk classification and nomenclature and they were clear about useful or dangerous plants, detoxification of poisons food sources, medicinal properties etc. (Coon, 1971).

According to Harlan (1975) the concept of centres of origin becomes nebulous because the process of domestication and evolution of agriculture are diffused in time and space. At the present time, the Near East appears to be the more likely centre of origin than any other region. This seems to be a nuclear area in which agriculture evolved and spread to other areas. De Candolle, in his 'Geographic Botanique Raisonnee' published in 1855 dealt extensively on the origin of cultivated plants. Though subsequently it was known that this publication contained some errors, the work has endured the test of time. However, an authoritative

reference on the origin of cultivated plants was available with the publication of 'Studies on the origin of cultivated plants' by Vavilov in 1926. In his 1926 essay, eight centres of origin were described, which all of us are very familiar viz., (1) China, (2) Indian centre, (3) Central Asia, (4) Near East, (5) Mediterranean, (6) Abyssinia, (7) South-Mexican and Central America, (8) Peruvian-Ecuadorian Bolivian Centre, (8a) Chiloe Centre (8b) Brazilian-Paraguayan Centre.

Vavilov's theories of major centres of origin soon ran into problem. Some crops had more than one centre e.g., Near East, Ethiopia and China. To overcome these problems Vavilov put forth the concept of primary and secondary centres of origin. Primary centres are characterised by the occurrence of wild progenitors and presence of primitive traits and dominant alleles, whereas secondary centres have cultivated forms and recessive alleles. But now we know that the centres of origin are not the same as centres of diversity.

However, subsequently Harlan (1971), based on his investigations into the georgaphy of origin of cultivated plants suggested the 'non-centres' of origin. The concept of non-centre, he suggested based on the evidence that only a handful of the crops Vavilov listed originated in Ethiopia. So Harlan (1971) called the vast region from the Atlantic to Indian Ocean in Africa as a non-centre. The centres and non-centres suggested by Harlan are Near Eastern centre (A1) with African noncentre (A2); Chinese Centre (b1) with South-eastern Asian and South Pacific noncentre (B2); Central American centre (C1) with South American non-centre (C2).

DISTRIBUTION OF PLANTS

Major revolution in the distribution of plants occurred with the discovery of American by Columbus (Seigler, 1989). Many American plants were taken to the Old World and many Old World plants were brought to America. This resulted in a drastic and radical change in the composition of cultivated plants during the next 100 years. This massive transfer of cultivated plants which occurred then and continues to occur is enigmatic to scholars to determine the original ranges of some of the cultivated plants.

The exchange of planting materials within the Old World and within the New World before and after discovery of American had greatly affected the course of agriculture on a global basis (Seigler, 1989) in the last five centuries and indeed the course of history of many countries including India.

ORIGIN OF PLANTATION CROPS

Except for coconut, pepper and cardamom, and probably arecanut, most of the plantation crops were introduced into India.

Origin and Evolution

(a) **Coconut** : (*Cocos nucifera*)

According to Mayuranathan (1938), Indian classics such as Mahabharata, Ramayana and Markhandeya Purana have references to coconut. Cosmos Indicopleustes, an Egyptian monk described coconut as the 'great nut of India' after he visited Western India and Sri Lanka in 545 AD (Rosengarten, 1984). Marco Polo described coconut growing in Sumatra, Madras and Malabar in 1218 AD and called as 'nux indica' or 'Indian nuts' (Rosengarten, 1984).

The generic name, *Cocos*, presumed to have derived from Spanish word 'coco' literally meaning 'monkey face' which resembles after husking, referring to the three scars on the base of the shell. Some confusion persists among words 'coco', 'cocoa' and 'cocoa' which are used

in the dictionary (Rosengarten, 1984). According to Baker (1978) the Sanskrit word *Khorpara* has become 'copra' in modern times.

Though the origin of coconut was placed on the West Coast of Central America near the Isthmus of Panama by Martius (1850), on the basis of evidence of the cultivation of coconut in Sri Lanka (about BC 300), as well as discovery of fossil *Cocos* in New Zealand (Hill, 1929) and in the deserts of Rajasthan (Kaul, 1951), the Central American origin and the claim that coconut was discovered by early Spanish explorers have been disputed. Introduction of coconut in Western Mexico appears to be around 1540 AD from where it spread to Mexico towards the end of 16th Century (Bruman, 1945). The available evidence points to the domestication of coconut in the Indo-Pacific area (de Candolle, 1886; Beccari, 1917; Vavilov, 1951; Corner, 1966, 1974).

Though about 20 other species were placed in the genus *Cocos* at one time or other from the New World, the recent taxonomic revisions have recognised that these are distantly related to *Cocos nucifera* and hence the monospecific status of *Cocos nucifera* (Baker, 1978). The distribution of coconut crab (*Birgus latro*) in the Indian and Pacific Islands gives an approximate estimation of the range of the coconut before the intervention of man. The crab is found in Indian Ocean, Madagascar and a number of Islands in the Pacific Ocean (Baker, 1978). From the available evidence, the most widely accepted theory seems to be the origin of coconut in the South East Asia or Pacific Islands, from where it might have been transported to other regions either by early explorers or by sea currents. The fact that coconut is capable of germinating even after floating for a period 110 days in the sea, and with this period, it is capable of travelling upto 4900 kilometers gives evidence to the natural dissemination by sea currents.

Thus, the coconuts have a long history of use in Asia especially in India and its use is wide-spread in the Western and Pacific Islands, Malaysia and parts of India Ocean. Coconuts were also used by medieval Arabs. The fact that the coconut is found only on the Pacific side of Panama and was seldom used by the American-Indians strongly suggests that it was introduced to the Americas in recent years (Seigler, 1989).

(b) **Arecanut :** (*Areca catechu*)

The antiquity of arecanut in India is evident from the earliest references in the Sanskrit literature *Anjana Charitra* by Sisu Mayana (BC-1300) where references are made to groups of arecanut palms full of inflorescences and branches presenting a nice appearance. Magha (probably in BC-650) in his *Sisupala Vadha* referred an arecanut gardens mixed with coconut. Arecanut palm used as support for the betel vine is referred by Kalidasa in 4th Century AD in his *Raghuvamsa.* The popularity of arecanut during the 6th Century AD is evident by a number of synonyms mentioned by Amara Simha in his dictionary - *Amara Kosha.*

The possibility of generic name being coined by Linnaeus based on a popular Malayalam name 'adaka' or a Kannada name 'adike' mentioned by Bavappa (1964). Mc Currach (1960) presumed that the name *Areca* was derived from Malayan word meaning 'cluster of nuts'. Considerable speculation exists on the origin of arecanut palm. It is considered to be a native of Cochin China, as referred by Watt (1989). It is also considered to be a native of East India (Indonesia) and Cochin China by Thomas Green (Gode, 1961). Malay peninsula, Thailand and the neighbouring Islands have been considered to be the natural habitat of arecanut palm by Blume (1836). Blatter (1926), Martius (1850) and De Candolle (1886) have however, agreed

that the exact place of origin of arecanut palm is uncertain as it was extensively cultivated from time immemorial in coastal India and East Indies. The centre of maximum variation seems to be the Indonesian group of Islands in view of the maximum diversity of arecanut species reported from there (Bavappa, 1963).

(c) **Cashew** (*Anacardium occidentale*)

Cashew is a native of South-Eastern Brazil and was probably the first fruit from post-Columbian period introduced from New World and subsequently naturalized in the tropics of Old world. Though more than twenty species of *Anacardium* are reported to be occurring within Central and South America, *Anacardium occidentale* is the only species introduced to the Old World. The first illustrated description of cashew has been given by a French naturalist, Thevet, in 1558 AD. The native Tapi Indians of Brazil called cashew as *Acaju* which subsequently became *Caju* in Portuguese. Most of the names used for cashew in Indian languages are subsequently derived from this word *caju*. Occurrence of cashew on the Malabar Coast was first recorded by de Costa (1578), and subsequently it was described in Goa by Linschoten (1598). Johnson (1973) has made an exhaustive study on the origin and spread of cashew and suggested that the cashew dispersal centre must have been around Cochin on the West Coast. From India it was carried eastwards to Indonesia (Rumphius, 1062) and further dispersal in South-east Asia appears to have been carried by birds, monkeys and man (Johnson, 1972). Cashew has been described in other South-East Asian countries only after the 16th Century which lends to support the theory of Indian Centre of dispersal of cashew in the Old World (de Costa, 1578; Ridley, 1930). Cashewnut of commerce found favours among the consumers beginning with the 20th Century and until then only the apple was considered useful by them.

(d) **Black Pepper** (*Piper nigrum*)

Black pepper, the oldest spice known to man, is a native of the Western Ghats in India where it is still found in its wild habitat. The generic name *Piper* is probably derived from Sanskrit word Pippali, which is in fact the long pepper *Piper longum* (Purseglove *et al.* 1981). Pepper was the first species introduced to Europe from the centre of origin since it was in cultivation in India from time immemorial. A Greek monk Cosmas Indicopleustes, in 548 AD recorded the cultivation of pepper in India for the first time. Though trade between India and Rome was established as early as 40 AD after the discovery of monsoons by Hippalus, the discovery of America by Columbus was attributed to the demand for pepper in European countries and Vasco da Gama sailed towards the east, Circumnavigating Africa and reached Calicut in 1498 in quest of pepper. This, in turn led to a series of events of voyages by the Portuguese and Dutch and finally resulted in colonization of India by the British.

(e) **Cardamom** (*Elettaria cardamomum*)

Cardamom was reported to be an article of Greek trade even as early as 4th century BC (Rosengarten, 1969) and by First Century AD Rome was reported to have imported a large quantity of cardamom from India. The earliest record of cardamom in India is in an Ayurvedic medical treatise compiled in BC 1000. In the Tamil Classic *Chilappathikaram* (4th Century AD) a mention of cardamom plant is made. Barbosa, a Portuguese traveller in 1514 AD described the present trade of cardamom from Malabar Coast. The genus *Elettaria* has seven species occurring in India, Sri Lanka, Malaysia, Sumatra and Borneo (Holttum, 1950; Willis, 1966). *Elettaria cardamomum* Maton, occurs both in wild and cultivated conditions even in the forests of Idukki and Wynad in Kerala and Kodagu in

Karnataka.

(f) **Tea** (*Camellia sinensis*)

Camellia sinensis (L) O. Kuntze (*syn. Thea sinensis* L.) has been known as a beverage since BC 3000. As early as BC 2000 Chinese literature mentions about the use of tea as a drink. It is widely believed that the banks of the Irrawady river is the probable centre of origin of tea from where is spread to South-eastern China, Indo-China and northeastern regions of Assam (Purseglove, 1968). Tea was discovered in wild stages in Assam by Major Robert Bruce in 1923. It is also reported to occur in wild state in upper Burma and Indo-China. The possibility of these plants being escapes from cultivation has been suggested by Purseglove (1968). Some consider Irrawady river area as a secondary centre of origin of tea, the primary centre being located somewhere near Tibetan mountains. Wellensieek (1938) presumes that the large leaved Assam tea has originated from small leaved Chinese plants. The first experimental planting of tea in India was made during the early half of 19th Century from seeds obtained from China. However, the commercial plantings were made with local types from 1835 onwards after the discovery of tea in Assam. Within few years of these, plantations were established in Brahmaputra Valley of Assam, Darjeeling, the Nilgiris and High Ranges of Travancore. Today tea grows from the Kangra valley in the north west of the country to the Ponmudi Hills in the extreme south.

(g) **Coffee** (*Coffea arabica*)

Most authorities are of the view that the coffee originated in Ethiopia, possibly in the province of Kaffa. It is certain that use of coffee was discovered and developed by man in Arabia during 15th and 16th centuries from where the habit of drinking coffee spread to Egypt and Middle-east by about AD 1510. According to Purseglove, in Ethiopia dried coffee berries were used as masticatory since ancient times. Coffee spread in Arabia through Middle-east reaching Cairo and Constantinople in about 1550 AD. It is believed that the first drink from coffee was made by fermenting the seed pulp of the fruit and a drink from dried coffee pulp is prepared in Arabia even today. Coffee was first introduced in France from Turkey in 1644 and in England in 1650. Though coffee was introduced in Java by the Dutch in 1696, the plants were destroyed by earthquake and flood in 1699. Coffee is believed to have been brought to India by a Muslim pilgrim Baba Budan in the 17th Century (Eden, 1976). It was planted in Chickmagalore in Karnataka and by 1900 coffee was being cultivated in Mysore, Coorg, Nilgiris, Shevaroy and Palani hills and in Travancore. The organized plantations in South India began only around 1890.

(h) **Rubber** (*Hevea brasiliensis*)

Hevea brasiliensis is a wild tropical rain forest tree of Amazon region domesticated only a century ago. La Condamine reported the use of rubber in Ecuador in 1736, probably obtained from *Castilla ulei* Wardb, and according to Purseglove, 1968), Aublet used the local name *Hevea* to give the generic name. Considerable interest was aroused after samples of rubber were brought to Europe from the New World by several voyagers soon after the discovery of uses of latex from *Hevea.* A British Chemist, Priestley, discovered accidentally in 1770 that it would rub out pencil mark and hence the name rubber. Gradually the other uses of rubber were developed and export of rubber began from Brazil in the form of small articles like balls, bottles and toy figures. The rubber tubing was made for the first time in 1791 after the French chemists discovered solvents of rubber such as turpentine, ether and rectified petroleum. The demand of

raw rubber began after the discovery of vulcanization by Goodyear and Hancock in 1839. This subsequntly led to the establishment of rubber plantations. Hancock in 1824 suggested growing rubber in plantations and later in 1870 Sir Clements Markham of British India Office suggested the establishment of rubber plantations in Asia in order to maintain the world supply.

In 1874 through the efforts of Sir Joseph Hooker few seeds of rubber were collected by Farris in Brazil and sent to Kew (Purseglove, 1968). Sir Joseph Hooker, as the Director of Royal Botanic Gardens, Kew, commissioned H.A. Wickham to collect *Hevea* seeds from Brazil. All the rubber plantations of the Far East are presumed to have been derived from the first batch of seeds collected by Wickham. The first batch of germinated seeds from Kew garden was shipped to the Botanic Garden, Sri Lanka. From the original Wickham collections, 22 seedlings were sent to Singapore Botanic Garden in 1877 and the clonal cuttings from these were shipped to India, Thailand, Indonesia and other countries (Kochhar, 1989). Currently rubber is grown on plantation scale in Indonesia, Malaysia, Thailand, China, India, Sri Lanka, Liberia, Nigeria, Indo-China, Zaire, Ivory Coast, Cameroon, the Philippines, Burma and many other countries.

CONCLUSIONS

From the available information on the origin and distribution of plantation crops we can make the following conclusions with a fair degree of certainty. Coconut seems to have originated in the South East Asia or Pacific Ocean Islands, from where it might have been transported by early explorers and sea currents to other regions.

The exact centre of origin of arecanut is uncertain, but it was extensively cultivated in coastal India and East Indies from time immemorial and Hindustan Centre seems to be the most likely centre of origin. Authentic evidences are available for the origin of black pepper and cardamom in the evergreen forests of Western Ghats. There is no controversy on the origin of tea on the banks of Irrawady river in China. Most authorities are of the view that coffee originated in Ethiopia. The Brazilian Centre of origin of rubber and cashew is undisputed.

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