

THE RELATIONSHIPS BETWEEN THE INDIAN BOTANIC GARDEN, HOWRAH AND THE ROYAL BOTANIC GARDENS, KEW IN ECONOMIC BOTANY

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ABSTRACT

The Indian Botanic Garden, Howrah and the Royal Botanic Gardens, Kew are very much involved chiefly on the study and distribution of economic plants though they were not founded for the same purpose. The paper deals with relationship of the two gardens for the last two centuries in undertaking plant introductions of useful exotic species in particular.

On the occasion of the bicentenary of the Indian Botanic Garden, Howrah, it is interesting to look back on the last 200 years and consider the Garden's long history of involvement with the Royal Botanic Gardens, Kew, with particular emphasis on the study and distribution of economic plants. The two Gardens have much in common. Both have developed into national centres for botanical research, both were founded in the latter half of the eighteenth century and both are situated on the banks of major rivers that run through important cities: Howrah by the site of the Hooghly close to Calcutta, and Kew on the banks of the Thames in west London. The two Gardens were not founded with the same purposes in mind but both owe their origins to the enterprise of a particular individual.

Land at Kew had been owned by Royalty since the time of Henry I but 1759 is generally regarded as the starting year for the present Royal Botanic Gardens. It was in 1759 that Princess Augusta, with the help of the Earl of Bute as her Botanical

Adviser, created a physic garden of about nine acres and employed William Aiton to take charge of it. The garden was planted with many novel and ornamental trees and shrubs, some of which still survive, most notably the fine Maidenhair tree (*Ginkgo biloba*) which remains an attractive sight in the north end of the Gardens. As early as 1766, Peter Collinson, a leading plant introducer of the day, was describing Kew as 'the Paradise of our world, where all plants are found, that money or interest can procure'

The inspiration for the Indian Botanic Garden came from an army officer, Lt. Col. Robert Kyd, who was an ardent horticulturist with a private garden at Shalimar in which he grew numerous exotic plants. In June 1786 he put forward a scheme for founding a botanic garden to the Governor-General, Sir John Macpherson, who took it up warmly. The idea was passed on to the Court of Directors of the East India Company which governed India at this time. Kyd's proposals rested firmly on economic lines. He was not interested in

the cultivation of 'rare plants as things of mere curiosity' but envisaged the growing of plants that might benefit the peoples of both India and Great Britain. The plan was of great interest to the East India Company who were willing to support the establishment of a centre for the distribution of economic plants throughout their territories. It also offered them the opportunity to try and cultivate plants which had hitherto been confined to lands owned by foreign powers.

At Kew the directorship had changed in an important manner some time before Kyd first offered his proposals. Princess Augusta had died in 1772 and George III, her son, had inherited her garden which he united with the adjacent property formerly owned by Queen Caroline, wife of George III. Lord Bute had never been entirely popular and George III had replaced him as Botanical Adviser with Joseph Banks, a young man who had recently returned from the round the world voyage

of the 'Endeavour' with Captain Cook. Banks became a most influential man in scientific and horticultural affairs, who stood as President of the Royal Society for 42 years from 1778 until his death. The 'Endeavour' voyage had given him a specialist knowledge of tropical plants and he had become a great believer in the transplanting of species from one part of the world to another. He developed strong links with Government, and contracts throughout the scientific world, so that the East India Company came to rely considerably on his freely available services and advice.

The Company's desire for increased trade and wealth, coupled with Banks' ideas on plant introduction, led to the climate that favoured Kyd's proposals for the botanic garden at Calcutta. The Court of Directors duly gave their approval to Kyd's plan in a letter dated July 31, 1787. Right from the inception of the botanic garden at Calcutta there were therefore links with Kew, in the form of Banks' influence, and in the field of economic botany.

It is interesting to note that, between 1786 and 1791, Botanic gardens were also established in Company possessions at Madras, Bombay and St. Helena, with the principal aims of collecting and propagating useful plants. In the cases of Calcutta and St. Helena it was also hoped that the gardens might assist local people in cultivating crops for food.

Kyd had already found a suitable area of land not far from Calcutta, part of it adjoining his private garden, and he set to work with 109 labourers to enclose the site with a ditch and a fence. His plans included growing teak for ship-building, various spices (such as cinnamon, cardamom, cloves, black and white pepper and nutmeg) for sale in Europe, and other articles of commerce such as cotton, tobacco, indigo, coffee, camphor, gum-yielding plants and tea. The Directors of



Col. Robert Kyd, Honorary Superintendent at Calcutta from 1787 to 1793 (Courtesy of Royal Botanic Gardens, Kew)

the East India Company were especially hopeful about cultivating cinnamon and other spices in Bengal, as the Dutch grew these plants in the Moluccas and held the world monopoly in their trade. With what might now be regarded as an over optimistic outlook, Kyd set to the task of acquiring and cultivating this great range of plants. While the extent of his involvement with Kyd is not fully known, it is clear that Joseph Banks frequently acted as an organising and collecting agent for the Calcutta and Madras botanic gardens. By 1770 Kyd had stocks of cinnamon, coffee, black pepper, breadfruit and the cochineal plant, nopal (*Opuntia cochinillifer*) and he was planning to propagate sago and date palm. Unfortunately it transpired that the Bengal climate was completely unsuitable for the cultivation of a whole range of tropical spices, fruits and other plants. Kyd even attempted to grow some of the temperate fruits of Europe but with a similar lack of success. A large part of his plans had therefore fallen through, perhaps because of some lack of botanical training and expertise, but his experiments with such a range of plants have often been regarded as an important stage in the development of Indian agriculture.

In the case of tea we know that Banks had some involvement. The Company sought to introduce tea to Calcutta to save a great deal of silver bullion that was annually being paid to China. In 1788 Lord Hawkesbury approached Banks about the feasibility of growing tea in northern India. Banks suggested that success might come if some Honanese familiar with tea production were tempted to Calcutta along with some varieties of the plant. In the Botanic Garden he felt that 'the able and indefatigable superintendent' could attempt to cultivate the plant under the guidance of the Chinese. Small consignments of tea were duly sent from Canton to Calcutta in 1789 and 1790, there being great difficulty



Sir Joseph Banks, unofficial director at Kew from 1772 to 1820 (Courtesy of Royal Botanic Gardens, Kew)

in procuring more. Though the plants grew well and were of good quality, it remained a considerable problem to interest local growers in the crop. In the end it was not until the nineteenth century that commercial progress was made, following the discovery of an indigenous variety of tea.

Colonel Kyd died in 1793, having been in charge at Calcutta for an eventful period of just six years. He was succeeded by Dr William Roxburgh who had previously been the Company's Botanist at Madras. Roxburgh began the scientific study and cataloguing of Indian plants that has been central to the work at Calcutta ever since, and he justly earned the title of the 'Father of Indian Botany'. It would seem that this work did not comply with the original intentions of the East India Company, who were paying Roxburgh's salary, but it appears that the Company's control in India had started to decline as the influence of the British Government increased. At the same time Roxburgh continued the work on economic plants that had been started by Kyd and he established his own

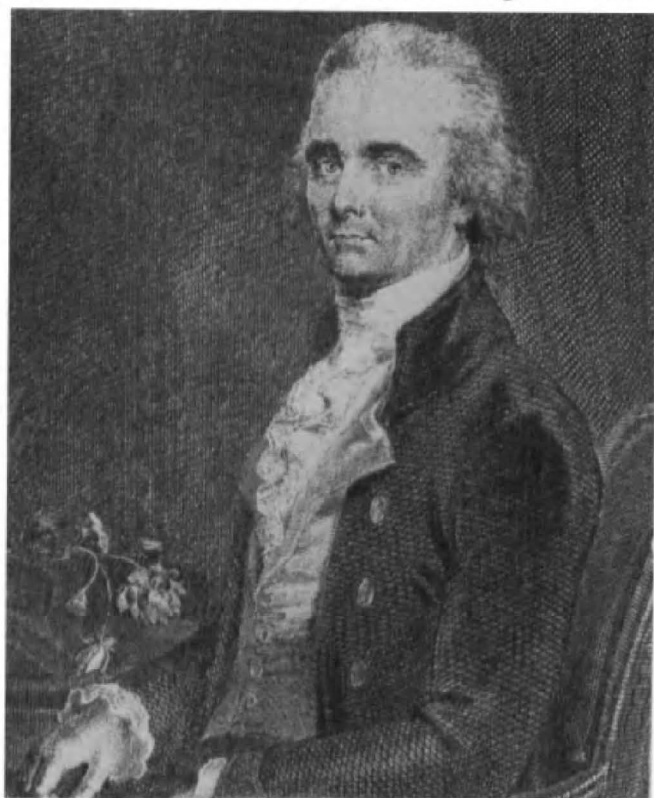
correspondence with Banks.

The interchange between these two prominent figures was not confined to plants and letters but extended to personnel. Soon after Roxburgh had been appointed at Calcutta he acquired the services of a new gardener called Christopher Smith. Smith had been on the staff at Kew and had been sent by Banks to travel on William Bligh's second voyage for the breadfruit (the first voyage being the occasion of the mutiny on the 'Bounty'). The voyage was successful in transporting the breadfruit to Jamaica and Smith returned to Kew with an exceptionally large shipment of plants that had been collected in the Pacific, St. Vincent and Jamaica. Soon after his return, he was recommended by Banks as a gardener for Calcutta and no sooner had he arrived there than Roxburgh sent him off to collect plants in Malacca and the Spice Islands. Some of these plants reached Kew in 1796 in a shipment noted by Banks as the second largest ever

received there. It is likely that some of these eastern plants travelled on to Jamaica, for in 1798 Roxburgh directed via Kew a shipment of a valuable grass (botanical name unrecorded) which he thought should be introduced to the West Indies.

It seems clear that there was considerable interchange at this time between the botanic gardens at Kew and Calcutta and the Liguanea garden in Jamaica that had been founded by Hinton East. There are no detailed records of what was shipped but the subsequent plant lists published by the three gardens show an interesting degree of overlap. A good example of an economic plant travelling between the three is provided by the African food plant *Blighia sapida*, which was introduced to Jamaica by slave ships prior to 1778 and which became known as 'akee'. This plant is listed for Jamaica, with a full Latin description but no Latin name, in the first edition of *Hortus Eastensis* (1793). John Koenig published a further description complete with the Latin name, in 1806, having studied material in the collection of Banks. Finally the plant appears in Roxburgh's *Hortus Bengalensis* in 1814; in fact Roxburgh had recorded in 1813 that a young plant of *Blighia sapida* had been received into the Calcutta Garden from Sir Joseph Banks in 1807.

The West Indian mahogany tree, *Swietenia mahagoni*, was also introduced from Jamaica to Calcutta, for the sake of its valuable timber. It grew very well in the north Indian climate and became widely distributed over Bengal by means of seeds and cuttings. The extent of interchange between the two gardens is suggested by the presence of 68 West Indian plants in *Hortus Bengalensis* and 104 East Indian species, together with others from Ceylon, in *Hortus Eastensis*. The combined forces of Roxburgh and Smith were surely responsible for the collection and transportation



Dr William Roxburgh, first salaried Superintendent at Calcutta, from 1793 to 1814 (Courtesy of Royal Botanic Gardens, Kew)



Blighia sapida Koenig, an African food plant that travelled from Jamaica to Calcutta via Kew. (Courtesy of Royal Botanic Gardens, Kew)

of a good proportion of the latter plants, and Banks at Kew no doubt often acted as an intermediary. It is a pity that so little is preserved of the correspondence between Banks and Roxburgh.

A useful plant link confined to Britain and India at this time is provided by hemp, *Cannabis sativa*. In the late eighteenth century Britain was at war with France and was dependent on Baltic supplies of hemp. From 1796 serious attempts were made to foster a hemp industry in Bengal. Roxburgh cultivated several varieties at Calcutta and the East India Company sent a botanist, George Sinclair, to begin a hemp plantation. Banks played an important role in starting these enterprises and he continued to oversee their progress. In 1800 he testified before the Board of Trade on the future of an Indian hemp industry and in 1801 he sent large quantities of hemp seed to India. Ultimately, though, these hemp experiments were not a success.

Dr Roxburgh was Superintendent at Calcutta until 1814, when ill health forced him to retire to the Cape. He soon moved

on to England and died there in 1815. In 1820 came the deaths of both Sir Joseph Banks and George III, following which Kew fell into a period of decline that lasted just over two decades. It was noticeable that the loss of Banks also produced a decline in those tropical botanic gardens previously nurtured by his interest and support. The death of Banks marked the end of an era. In spite of his efforts and those of the East India Company, together with the work of Kyd and Roxburgh, there had been no short term success in alleviating famine in India by the introduction of new food crops. Nor had spices proved suitable for cultivation in India; they never became a source of great profit to the Company and generally declined in value as imports to Europe. However, Banks' encouragement of plant exploration and his entrepreneurial skills clearly had a lasting effect. It has been calculated, for instance, that during the reign of George III about 7,000 new plant species were introduced into Britain. This was a period of considerable discovery and transportation of plants throughout the world and the links between Kew and Calcutta clearly played an important part.

The most notable superintendent at Calcutta soon after Roxburgh was Dr Nathaniel Wallich, who served from 1817 to 1846. Dr Wallich was a most able and energetic botanist, who organised collecting expeditions over a large part of the Indian Empire. He was extremely generous in distributing herbarium specimens so that his successor, Dr W. Griffith, was forced to bemoan the absence from Calcutta of much that had been collected in the first fifty years of the Garden's existence. There was much less activity at Kew at this time so that by the end of the reign of William IV it was doubtful whether the Gardens would be maintained. Fortunately a Commission set up shortly after the accession of Queen Victoria decided to establish the

Gardens as a National Institution. In 1841 the Royal Botanic Gardens, Kew, came



Sir William Hooker, first official Director at Kew, from 1841 to 1865 (Courtesy of Royal Botanic Gardens, Kew)

into existence as the centre for botanical enterprise and research for the Empire, and Sir William Jackson Hooker was appointed the first Director.

William Hooker continued the development of the Gardens on the lines established by Sir Joseph Banks and George III, and greatly extended their influence and value. He was concerned with the economic importance of plant products and set up the first museum of economic botany in England, in a building at Kew which had been the Royal fruit store. In 1850 his son, Joseph Hooker, spent 7½ months collecting in India with Dr Thomas Thompson. Their spoil amounted to the loads of 200 men and there was much emphasis on economic plants and their products to go on show in the new museum at Kew. They reached Calcutta on 28 January 1851 and eventually arrived back in England on 5 March. Their herbarium

material was distributed all over the world and the great quantity sent to Calcutta did much to fill the gaps created by Wallich's generosity.

In 1861 Dr Thomas Anderson became the Superintendent at Calcutta and the Botanic Garden once again moved forward to play an important part in the economic botany of India. One of the most notable events of Anderson's reign was the introduction of *Cinchona* trees into India. Earlier in the century it had been noted that bark removal from *Cinchona* species in their native range was so heavily exploited and poorly managed that the supply was likely to become exhausted. In 1853 Dr Forbes Royle had already recommended the introduction of *Cinchona* into India, pointing out the Nilgiri Hills as a suitable place for experiment. He arranged for Robert Fortune to take six plants of *Cinchona calisaya*, some obtained from Kew, to the Calcutta Botanic Garden. The plants did



Cinchona calisaya Wedd., the species involved in an early attempt at introducing Cinchona to India. (Courtesy of Royal Botanic Gardens, Kew)

poorly there and were sent on to Darjeeling, where they all died in the winter cold.

In 1860 Clements Markham was appointed by the India Office to take charge of *Cinchona* collecting in south America. At the wish of Sir Charles Wood (Secretary of State) a forcing house was built at Kew for the cultivation of plants sent from south America. It was the function of the Gardens at Kew to receive and transmit large crops of seedlings, to nurse the young stock in case those despatched to India should fail, and to recommend competent gardeners to take charge of the plantations in India. The first attempts at introduction were not successful. A batch of plants reached Bombay on 27 September 1860. They were then sent on to Ootacamund, chief station in the Nilgiri Hills, but all had died by December.

In February 1861, Thomas Anderson personally took a collection of *Cinchona* seed from Kew to Calcutta, having received them from William Hooker. The seeds germinated well so that by the end of May there were 120 young plants at Calcutta. Further plants were sent out to Ootacamund from Kew, which at one stage in 1861 had 2,170 seedlings in cultivation. This time the cultivation of *Cinchona* at Ootacamund proved successful, under the supervision of Mr Melvor who had been trained at Kew. The Calcutta Botanic Garden continued to grow a stock of various *Cinchona* species so that by February 1862 there were 289 young plants there. These consisted of 31 plants that remained from the batch of seeds brought by Anderson from Kew, 193 plants received from Ootacamund and 65 plants obtained by Anderson from the Dutch in Java. In March 1862 Anderson travelled to Darjeeling and began the cultivation of *Cinchona* in the Sikkim Himalaya, where later in the year he was responsible for 2,000 plants. Good progress was made with *Cinchona* from then on, so that by

the 1870s the plants were a well established introduction in India.

The administration of the *Cinchona* plantations remained the responsibility of the Superintendent of the Calcutta Botanic Garden. The Government wished that the people of India could be supplied with quinine at a nominal cost. This was finally effected in 1893, when a dose of five grains of quinine became available at every local post office for a pice, or about a farthing. By 1947 several thousand pounds of anti-malarial febrifuge were distributed at reduced prices every year and several thousand more were given free.

Early in 1866, George King brought to Calcutta a plant of *Cephaelis ipecacuanha* which had originally come from Brazil. The dried roots and rhizomes of this species are the source of Ipecac which is used as an emetic and to treat amoebic dysentery. The emetic properties are due to the presence of the alkaloids emetine, cephaeline and psychotrine. In Brazil there was a valuable trade in Ipecacuanha, with an annual produce of about 15,000 kg, and there were hopes that the plant might be introduced to India. Unfortunately there proved to be difficulties with both the climate and with the propagation of the plant. The original specimen at Calcutta was increased by cuttings to nine plants in 1868. Progress remained slow so that by 1871 there were just seven plants at Calcutta and five in Sikkim, where the climate was more suitable. The plant seemed to be dogged by ill fortune, with matters having reached almost ludicrous proportions in 1870, when all seven cuttings at Sikkim were destroyed by a drunken washerman felling through the glass frame in which they were kept. However, later in 1871 it was discovered that stock could be increased dramatically by means of root cuttings. By 31 March 1873 there were 6,719 plants in Sikkim. There were also about 500 in Calcutta,

obtained by cuttings from 128 plants brought out from the Gardens at Kew and Edinburgh in December 1872. While there remained further problems with low temperatures at night in Sikkim, the cultivation of *Ipecacuanha* in India continued so that by 1916 there were about 48,000 plants in stock.



Cephaelis ipecacuanha (Brot.) A. Rich., a medicinal plant introduced to India in 1866. (Courtesy of Royal Botanic Gardens, Kew)

Sir William Hooker had died in 1865 and his place as Director of Kew was taken over by his son, Joseph Hooker. Joseph had visited Calcutta Botanic Garden in the past and he seems to have maintained regular interest and contact throughout his twenty years at Kew. In 1870 he gave some seed of 'the finest sort of Latakia and Havanna tobacco' to C.B. Clarke, then Officiating Superintendent at Calcutta. The seed germinated well and produced flouri-

shing patches of plants so that Clarke referred to it as 'the most successful of the economic cultivations attempted in the botanic garden' at that time. The plants yielded more than 22 kg of seed which were supplied, as previously arranged, to H. Rivett-Carnac, Esq.

Sir George King became Superintendent at the Royal Botanic Garden, Calcutta in 1871. (The epithet 'Royal' had come to be applied after the Queen's Proclamation of 1858). King is particularly remembered for the great horticultural designs that he introduced at Calcutta, where work was certainly needed after the disastrous cyclone of 1864. In 1873 King was in England and Joseph Hooker gave him six plants of Para rubber tree (*Hevea brasiliensis*) which he took back to Calcutta in November. This is an example of the good relationships that existed between Kew and Calcutta, extending at a personal level

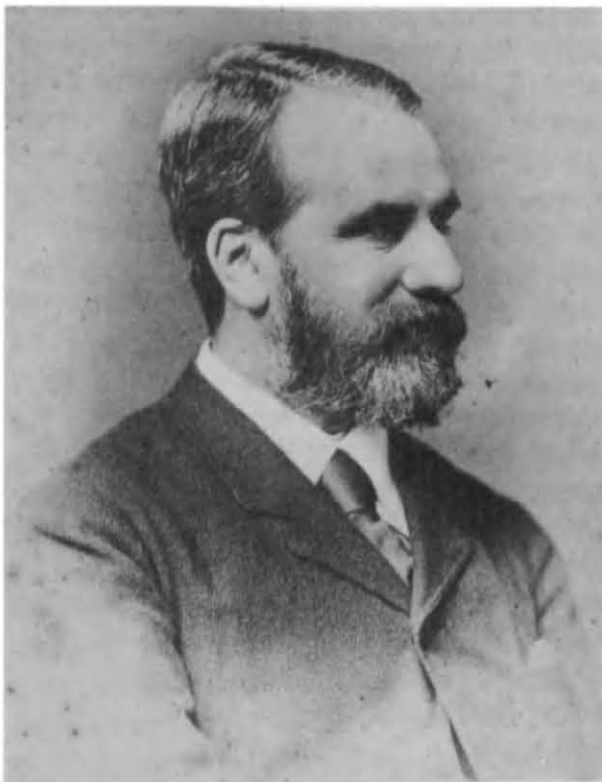


Sir Joseph Hooker, Director at Kew from 1865 to 1885. (Courtesy of Royal Botanic Gardens, Kew)

to the heads of the two Gardens. In India it was felt that the rubber yielding figs (*Ficus elastica*) of Assam could suffer early exhaustion. At first there was some optimism about propagating *Hevea* at Calcutta but by 1875 it had transpired that the climate was unsuitable for this tropical forest tree. Attempts were made to grow *Hevea* in the *Cinchona* plantation in Sikkim but they hardly fared better there, so it was decided to use Ceylon as a staging post for future young plants. In spite of this Calcutta was again involved in 1877, when Hooker sent a Wardian case of *Hevea* seedlings, most of which King then distributed to Assam and Burma. Fourteen seedlings were kept at Calcutta but these were only 6ft high by 1879 and the cultivation of *Hevea* in the Gardens was then abandoned.

Another rubber-yielding plant that made the journey from Kew to Calcutta was the

Ceara rubber plant, *Manihot glaziovii*, which is native to north-eastern Brazil. Here again we see the use of Kew as a staging post between the New World and southern Asia. The first plants were collected by John Cross, who had been one of the collectors of *Hevea* seeds and plants in 1860. Cross brought seeds and cuttings of Ceara rubber to Kew on 21 November 1876 and eventually a stock of 55 plants was obtained. These had increased to 300 plants by 15 September 1877, at which point 50 were sent to Dr King at Calcutta and 50 to Dr Thwaites in Ceylon. At first the plants were grown in sheltered conditions at Calcutta but it became apparent that they preferred full exposure to sun and rain. King referred to it as a "wonderfully hardy plant" and it was also easy to propagate. By 1881 the trees were producing seed and young plants. Joseph



Sir George King, Superintendent at Calcutta from 1871 to 1897 (Courtesy of Royal Botanic Gardens, Kew)



Manihot glaziovii Muell. Arg., introduced to India in 1877 as a possible rubber-yielding alternative to *Hevea*. (Courtesy of Royal Botanic Gardens, Kew)

Hooker had recommended Calcutta as the best site to receive further supplies of young plants from Kew, and King distributed many seedlings to tea-planters in Assam, Chittagong and elsewhere. Ultimately though, Ceara rubber did not prove to be successful as a commercial source of rubber, for the yield is rather small and the tree does not tolerate repeated tapping.

The links between Kew and Calcutta over the supply of mahogany (*Swietenia mahagoni*) seed lasted for many years. Mahogany from the West Indies was first introduced into the Calcutta Botanic Garden towards the close of the eighteenth century and from there it was widely distributed by means of seeds and cuttings over Bengal and to other parts of India. The trees grew very successfully at Calcutta so that several hundred were present before the cyclone of 1864 blew down many of the larger trees. From 1865 onwards consignments of seed from the West Indies became more frequent but they were still unequal to the demand. The situation improved considerably in 1878 when Sir Joseph Hooker arranged for an annual supply to be sent from Jamaica to Kew and thence to Calcutta. Demand remained high, for the Forest Department in India had just commenced mahogany cultivation in Chittagong. In 1885 an unusually large consignment of seed was sent from Kew; much of this was distributed and the remainder germinated so successfully that there became ready for issue about 20,000 healthy seedlings. The supply from Kew later settled down to two barrels of seed which were sent to Calcutta every year until at least 1932.

One final example of interchange between Kew and Calcutta in the nineteenth century is provided by Sisal, *Agave sisalana*. In June 1891 Kew received a consignment of plants from Florida and cared for them until they were strong enough to stand

the voyage to Calcutta. The boxes reached Calcutta on 29 October 1891; unfortunately a considerable proportion had died on the way out but the survivors recovered sufficiently to be distributed. As usual the Agri-Horticultural Society of India assisted the Garden authorities in bringing the plant to the notice of the public. Many plants had been distributed by 1893 and the introduction was soon recognised as a success. The species did not grow equally well throughout India though and it was felt by the 1900s that other *Agave* species already naturalised might also be worth encouraging.

The co-operation between Kew and Calcutta in the nineteenth century was considerable. Between 1874 and 1901, for example, Kew sent to Calcutta no less than 8,032 living plants, in boxes and Wardian cases, and 1,185 parcels and packets of seeds. At the same time Calcutta sent to Kew 6,779 plants and an impressive total of 6,022 parcels and packets of seeds. There was also much interchange of herbarium material. In 1887 George King, then Superintendent at Calcutta, wrote 'Constant communication and interchange of specimens have been kept up for the last fifty years with the great national collection at Kew; and to the distinguished Directors of that institution, Sir William Hooker and his son and successor Sir Joseph, the Calcutta Herbarium is indebted for invaluable contributions' In 1894 King stated that the chief contributor to the Herbarium 'has, as usual, been the Director of the Royal Garden, Kew (Mr W.T. Thiselton Dyer) from whom no less than 5,854 named specimens were received' in the period 1 April 1893 to 31 March 1894. Joseph Hooker and Thiselton-Dyer were also generous in giving various books and pamphlets to Calcutta and George King regarded the former as a 'warm friend' to the Garden. The presence of an Indian Officer at Kew was also an advantage to

staff at Calcutta, who could ask him to consult the larger herbarium at Kew on particularly awkward taxonomic problems.

Taxonomy obviously plays an important part in understanding the distribution and usage of economic plants. An appropriate example here is provided by the dye-yielding *Indigofera* species. Suggestions had been made that East African Indigo, *I. arrecta*, might be introduced into India but the objection had been raised that this alien species would not succeed as well as the native species, *I. tinctoria*. In 1901 examples of *Indigofera* cultivated in Asia were compared with material preserved at Kew and Geneva. It was unexpectedly discovered that the widespread species on the Gangetic Plain was not *I. tinctoria* but was the introduced [Malaysian] Indigo, *I. sumatrana*. Furthermore there was clear evidence that the latter species was the second widespread introduction on the Plain, having ousted the Egyptian Indigo, *I. articulata*. *Indigofera arrecta* had already been introduced to Java and was displacing other American and Asian species there, so there now seemed to be no reason why it might not succeed over *I. sumatrana* in India. In due course *I. arrecta* was introduced to northern India and it did displace *I. sumatrana*, bringing the advantages of heavier yield and earlier maturation. This is a good example of taxonomic work, here carried out at Calcutta and Kew, clarifying a situation and emphasising new economic possibilities.

The co-operation between Calcutta and Kew has lasted well into this century and a few more examples of economic plants will probably suffice to illustrate this. As described above, the Ceara rubber tree, *Manihot glaziovii*, was introduced into India but did not prove suitable for widespread utilisation. In 1908 or 1909, Kew sent a large consignment of seeds of *Manihot dichotoma* and *Manihot piauhyensis* to Calcutta. Like *M. glaziovii*, these two species

are natives of north-east Brazil but they have less hard bark and give a much higher yield of good quality rubber. Both were already in cultivation in Brazil and were found to give annual rubber yields of 100-200g per tree of *M. dichotoma* and 500-1000g in the case of *M. piauhyensis*. A good deal of seed was sown at Calcutta and the rest was distributed to various parts of India. It was hoped that Calcutta would have a good stock of well established plants to distribute a few years later, but the experiment did not proceed much further and these two species of *Manihot* are today only to be seen in botanic gardens in India.

In 1930 and 1931 Kew sent large consignments of seed of the tung oil plant, *Aleurites fordii*, to Calcutta. This Chinese species was being widely grown in the southern USA, tung oil being greatly in demand as a quick drying oil for the paint trade. The tea gardens of Assam were especially interested in its importation into India and many Indian firms wished to give it germination trials. Seed was widely distributed from Calcutta and the related species *Aleurites montana* was also introduced to India. Plantations of the trees were quite successful but did not develop into large scale undertakings.

Of course, not all the notable plants that travelled from Kew to Calcutta were of potential value as crops. Ornamental species might also be regarded as economic plants and a prime example is the South American *Bougainvillea*, a common sight in Indian gardens which was introduced from Kew in the early part of this century.

While available details have often concerned the shipment of economic plants from Kew to Calcutta, there has naturally been much movement in the opposite direction. In 1912, for example, a large consignment of *Hedychium* plants was sent to Kew for experiments on paper making. In May 1930 two boxes of rhizomes of

Gigantochloa verticillata, a tall bamboo whose buds can be eaten as a vegetable, were sent via Kew to Trinidad and Tobago. Such a journey recalls those made by plants in the Banks and Roxburgh era. Later in 1930 Calcutta sent Kew material of *Crotalaria paniculata*, an Indonesian food plant, for tests as a source of insecticide. In 1953 and 1954 some root stocks and seed of *Cephaelis ipecacuanha* were sent by Dr K. Biswas to Sir Edward Salisbury at Kew who had asked for some planting material. As it may be recalled, this species had first come to India from Kew in the 1860s.

In the 200 years of its existence the Indian Botanic Garden has played an

enormously important part in developing the economic botany of India, as well as other parts of the world. Throughout the Garden's history there have been numerous and varied contacts with the Royal Botanic Gardens, Kew. Many of these have involved economic plants and the two Gardens have regularly played vital roles in the introduction of new crop plants to India, as well as promoting the interchange of economic plants around the world. It is to be hoped that the Indian Botanic Garden will continue to hold its high position in the scientific world and that relationships with the Royal Botanic Gardens, Kew will continue to be warm and profitable in the development and distribution of economic plants.

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