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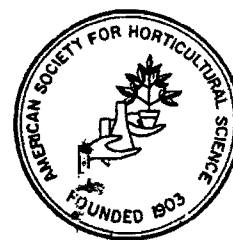
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THE VALUE OF CULTIVATING THE BAOBAB AND OTHER RARE EXOTIC TREES IN THE CARIBBEAN

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ABSTRACT

The baobab of Africa is one of the world's most unusual trees. In the literature it is described as 'rare' in the Caribbean, although it is far more common than is generally recognized. This paper examines the current uses of the baobab in the Caribbean and suggests several reasons why an effort should be made to encourage the cultivation of this and other rare exotic trees on a wider scale.

RESUMEN

El baobab de Africa es uno de los árboles más raros del mundo. En la literatura, se lo describe como siendo 'raro' en el Caribe, aunque en realidad, es mucho más corriente que se imagine. Este trabajo examina los usos corrientes del baobab en el Caribe. Además, sugiere varias razones porque se debe favorecer el cultivo de éste y de otros árboles exóticos en una escala más generalizada.

One of the world's most unusual trees is the African baobab. This spectacular tree never fails to attract attention wherever it grows because of the striking appearance of its very large, swollen, bottle-shaped trunk¹ topped by rapidly tapering branches that remain leafless for much of the year. Little has been written about the history and cultural significance of the baobab in the Caribbean.² This paper presents an initial exploration of the uses of the baobab in the region and suggests several reasons why this remarkable tree should be more widely cultivated. It is also written with the hope that it will stimulate those with a knowledge of the baobab in the Caribbean to share their interest through publication, presentation or personal communication.

The scientific name of the African baobab is *Adansonia digitata* and some nine species of the genus are only known to occur naturally in Madagascar and Australia. It is generally believed that the African baobab was taken to India, Sri Lanka and Java (Backer and Van Den Brink, 1963) in association with Arab trade and military activities. In 1874 Stewart and Brandis (1874) reported baobabs were "cultivated in many places in the Peninsula, Bengal, and central India." Baobabs have been reported for Mauritius at least since 1816 (Armstrong, 1977) and more recently, occasional specimens have been reported for the Philippines (Maheshwari, 1971; Armstrong, 1977) and Hawaii (Neal, 1965).

The baobab has also been introduced into the tropics and subtropics of the New World. Owen (1970) reports their existence in South America and without great effort, I have identified over 20 trees in Florida and I suspect that there are many more.

In the literature the baobab is described as rare in the Caribbean region but it is far more common than is generally recognized. It has been reported for Cuba, Puerto Rico, Haiti, the U.S. Virgin Islands of St. Thomas and St. Croix, Antigua, St. Kitts-Nevis, Dominica, Barbados, Trinidad and Tobago, St. Vincent, and the Dutch West Indian Islands of Curacao, St. Eustatius, Saba and St. Martin.² Baobabs were also reported for Jamaica at the end of the eighteenth century and for the Bahamas within the past 30 years, but as far as I know they no longer exist in these places.

Arguments for a more widespread cultivation of baobabs in particular places and throughout the tropics generally are not new. In their 1874 study of the forest flora of northwest and central India, Stewart and Brandis (1874) described the baobab as a "useful tree" and suggested that "its cultivation should be encouraged." Dr. J.K. Maheshwari (1971) of the National Botanic Garden in Lucknow, India, went one step further suggesting that "an effort should surely be made towards the possible reintroduction and rehabilitation of baobabs over larger areas of the tropics." In his conclusion (p. 60) he wrote:

"With its imposing place in the landscape and its usefulness to Man and wild animals, the Baobab Tree has some merits and deserves intensive study ... We have at present only sketchy information concerning the life-history of Baobabs from the time when their seeds germinate until they finally die. It would, therefore, be of considerable interest to launch a programme of sound conservation practices and build up Baobab National Monuments in suitable natural areas for the pursuit of basic scientific research and for preservation of this Goliath among trees."

While some scholars have not specifically called for the cultivation of the baobab on a wider scale, they have expressed concern for its survival. This is especially true for those who have studied the baobab in Africa. Until 1941, efforts were made in South Africa (as they were in Mozambique, Senegal, and elsewhere) to exploit the baobab commercially in

1. Baobabs come in several basic shapes of which the bottle-shaped baobabs and the baobab with three or four main trunks branching close to the ground are two common examples.

2. Work is now in progress to determine the distribution of baobabs in the Caribbean and to understand something about their history and cultural significance.

ways that could have proven disastrous for the species. Owen (1974) tells us that:

"Fortunately, the authorities (in South Africa) concerned soon realized that the destruction of this most interesting tree for the production of a cheap product (paper, ceiling boards) which could readily have been made from other raw materials was not justified. Now, as a result of the Forest Act of 1941, the baobab has been declared a reserved tree in South Africa and is not allowed to be felled without the permission of the Minister. Its conservation has, therefore, been assured for posterity."³

This paper supports the point of view of those who would like to see the baobab more widely cultivated throughout the tropics. It also supports those who would like to ensure the preservation of the species although there is not at present any imminent threat to its survival. The suggestion that is being made here is that the Caribbean region should be (as Maheshwari (1971) has phrased it) an area of "Baobab National Monuments . . . for the pursuit of basic scientific research and for preservation of this Goliath among trees." Beyond scientific research and preservation, however, there are other reasons for cultivating the baobab in the region. Some of these reasons involve extending the current uses of the tree in the Caribbean and others relate to exploring potential uses that are worth considering.

Uses of the baobab in the Caribbean

In the Caribbean the baobab is useful as a garden curiosity, a garden specimen, a shade tree, a source of commercial products and a food tree.

Garden curiosity

It is quite clear that the baobab is of limited commercial value in the Caribbean and will probably remain so in the foreseeable future. This is not the plant that we ought to be considering if our only concerns were pressing "food problems" and problems of "foreign exchange." I am in full agreement with Hollis (1963), however, who wrote that she was "one of those who felt that this admirable tree justifies its existence by its mere appearance." If the only reasons for cultivating the baobab in the Caribbean was the fact that it is a rare exotic tree of intriguing appearance, I would still suggest that this tree be cultivated on a wider basis in the region. African legend tells us that the tree was planted "upside down." This points to the fact that its stumpy, irregularly shaped branches resemble roots thrusting into the air. The distinctly odd appearance of the baobab makes it an easily recognized feature of the landscape wherever it grows. Many writers have described this striking tree as "ludicrous," "monstrous," "bizarre," "grotesque" and "ugly" (Emboden, 1974). I would suggest, therefore, that its cultivation be extended in the

Caribbean not as an "ornamental" but as a fascinating garden curiosity suitable for very dry places. It seems many of the baobabs planted in India, Hawaii, Florida and the Caribbean were planted as garden curiosities in yards, parks and public grounds of various types, and as garden specimens in experimental stations and botanic gardens (Everett, 1980). This is especially true of young trees planted in St. Croix. In Jamaica on the other hand there are no baobabs in the botanic gardens nor in any of the other public gardens or parks.

As a garden curiosity, a greater effort should be made to grow baobabs in school grounds, parks and along roadsides. This is very important, for I believe this impressive tree would awaken an interest in young people to seek a greater understanding of the world of plants and their importance in both economic and spiritual life.

Baobabs are already a factor to be considered in our efforts to understand Caribbean culture. The cotton tree (*Ceiba pentandra*) is a "spiritual" – some would say "sacred" – tree to the people of African descent throughout the Caribbean. One of the explanations offered for this fact is that the traditional ideas associated with the baobab in Africa were transferred to the cotton tree in the New World (Wilkinson, 1984). While there are many problems with this explanation it does point out the need to understand the baobab as an aspect of explaining cultural tradition in the Caribbean.

The baobab is also relevant to Caribbean people of East Indian background. The tree is now to be found in many parts of India where it provides useful products and is regarded as a "spiritual" or "sacred" tree (Hooker 1872; Stewart and Brandis, 1874; Cowen 1952; Prain, 1963; Burton-Page, 1969; Henry, 1973; Maheshwari, 1971).

Beyond the uses of the baobab in the cultures of Africa, India and the Caribbean, however, the tree is noteworthy for what it can tell us about the past. It seems reasonable to assume that this native of the African grassland has been closely associated with the human species over the long course of our evolutionary history. As Owen (1970) has pointed out, the baobab has been a "silent chronicler of events down the centuries" and we are beginning to realize that anthropologists (including archaeologists, physical anthropologists and cultural anthropologists), ecologists, historians and folklorists can learn a great deal from studying this tree (Hobley, 1922; Allison 1962; Harland, 1976; Shaw, 1976). The baobab has been mentioned in several discussions concerned with the origin of agriculture (Harlan, 1975; Rindos, 1984) and the tree is frequently mentioned in association with settlement patterns in Africa (Hobley, 1922; Allison, 1962; Shaw, 1976).

Shade

Although it does not produce heavy shade throughout the year as is typical of such evergreen tropical trees like the mango (*Mangifera indica*), Cassia (*Cassia siamea*) and fig (*Ficus* spp.), the shade of baobab is welcomed in the hot, dry places where it is usually to be found growing (Everett, 1980). We can see excellent examples of this in St. Thomas, St. Croix (especially at Grove Place), Barbados, Antigua and elsewhere.

3. The continuation of Owen's (1974) comments are worth citing here. He writes: "One would like to see an extension of this legislative protection to other parts of Africa, for example, to the West Coast where commercial enterprises such as phosphate mining in Togo are destroying groves of mature baobabs."

Food

As a food tree, the baobab is primarily valued in Africa for its leaves and shoots, and for the seeds and pulp of the fruit. The fruit of the baobab is a woody, gourd-like capsule that is oblong in shape. It contains some 30 or more brown, kidneyshaped seeds embedded in a white or creamy acidic pulp laced together in a mass of tough, stringy fibers. The fruit is eaten as a fresh fruit. The dry pulp is eaten in Barbados, Trinidad and St. Croix where it is also used to make a drink. Both Dr. Martin at the Mayaguez Experimental Station in Puerto Rico and Dr. Campbell at the Tropical Research and Education Center told me that their families eat the fruit, although as far as I can tell the fruit is not generally eaten in Puerto Rico (where I believe there is only one tree) or in Florida.

People in the Caribbean should be encouraged to eat not only the pulp of the fruit but the seeds as well as the shoots and leaves. Anything that increases food supply in the Caribbean should be welcomed (especially tree crops), even if this source of food is considered suitable only for children or for use during "hard times" (i.e., times of "seasonal scarcity" or times of disaster). School children in Jamaica eat a wide variety of fruits during the school days that includes the tropical almond (*Terminalia catappa*) in some places, especially the coastal areas of the island, guinep (*Melicoccus bijugatus*), tamarind (*Tamarindus indica*), Chinese ackee (*Pithecolobium unguis-cati*), mango (*Mangifera indica*), June plum (*Spondias dulcis*) and jujube or Coolie plum (*Ziziphus mauritiana*). There is no reason why the fruit of the baobab should not be added to this list. Charles Smith of the College of the Virgin Islands Extension Service said that as a child he ate the fruits of the baobab tree in Queens Park on his way to and from school. One of the advantages of the baobab as a food tree is that its fruits are available to be harvested during what is called "hard times" in Jamaica which is a period of seasonal scarcity associated with the winter dry season and much of the spring. At this time of year the pulp which is rich in ascorbic acid (Carr, 1955; Nicol, 1957) would be especially useful to people who live in the driest parts of the Caribbean where citrus are difficult to grow and expensive to buy.

Commercial products

I am aware of only two commercial uses of the baobab in the Caribbean although there are probably other commercial uses that have not yet been identified. In St. Croix the pulp of the fruit is used to make a refreshing drink as I have already mentioned, and this is sold in the Christiansted market. The other commercial value is the sale of the fruit which was reported in St. Croix, but this seems to be a very occasional practice.

In discussing the baobab with my colleagues they have argued that the baobab is not widespread throughout the Caribbean because of its limited commercial value. This seems to be a very simple point and yet it is not as simple as it would appear. I would argue that (with the exception of major export crops) there is no necessary relationship between the commercial value of a tree's product and the extent to which the tree is to be found in the environment. For example, if the commercial value of a tree's product

was always the decisive factor determining its distribution in the environment, we would expect that "special mangos" in Jamaica like the varieties called East Indian, Julie, Bombay and Haydens would be the most commonly distributed. The same would be true of the litchi tree in Jamaica which produces a very valuable crop and yet the tree has spread very slowly. I would argue that the ease or difficulty of cultivation has a great deal to do with the trees we find growing in the Caribbean. The baobab like the litchi and special mangos is not rare because of the lack of commercial value but because it is not easily propagated. If the seeds discarded from the fruit of the baobab were as successful as those of the tamarind (*Tamarindus indica*), ackee (*Blahea sapida*) or guinep (*Melicoccus bijugatus*), I suspect they would be more widely known and used by Caribbean people. It seems, however, that the baobab like the litchi and other exotic plants will have to be deliberately cultivated in the Caribbean if a large number of people are ever to acquire a taste for its fruit and in that way improve the prospect of its commercial value.

When we think of "Caribbean food crops" or more specifically of plants cultivated for commercial reasons, there is a tendency for our thoughts to go immediately to production for export and this is as it should be. This does not mean, however, that we should neglect plants that have only a local commercial value or useful plants that have no commercial value. Many plants that have no export value are important to small farmers, local traders and consumers. Many examples could be cited.

Additional reasons for cultivating baobabs in the Caribbean

In arguing for the cultivation of the baobab in the Caribbean I would suggest that the usefulness of the tree is more than its value as a garden curiosity, a garden specimen, a shade tree, a source of commercial products and, a food tree. These uses of the baobab in the Caribbean are only some of the reasons why its cultivation should be extended, there are others that should be considered.

It is generally recognized that trees play a very important role in preventing erosion. The baobab is one of many trees that should be considered in an effort to establish sound conservation practices in the Caribbean. The tree would be especially valuable in areas which have been severely eroded, such as the Yallahs River Valley in southeastern Jamaica.

Pasture tree

The baobab should be considered as a pasture tree in the Caribbean for it provides several advantages. It is tolerant of dry conditions, it offers shade in places where there are usually few trees, the leaves can be used as feed in the spring and summer (as they have been in Nigeria), the dried pulp can be burnt as a fumigant to combat biting insects on animals as it is in parts of Africa (assuming this treatment is necessary or proves successful when tested) and the tree itself can be used as a live fence post tree. The baobab would be difficult to establish as a fence post tree (unlike the growstake, *Gliricidia sepium*, which is common in Jamaica and is easily propagated from large cuttings). The fact that the bark of the mature tree can withstand great abuse, however, makes it worthy of being considered for this kind of use.

Habitat for other species

It is clear that human activity affects the survival of many species often resulting in the impoverishment of the biological environment in which it takes place. Planting baobabs would help to counteract this trend especially in the drier parts of the Caribbean which in many cases have been stripped of tree cover. In the arid and often treeless savannas of Africa the baobab is famous for the number of species it supports (Coe and Isaac, 1965; Owen, 1974). The baobab is rightly referred to as a tree that "teems with life." These include lizards and snakes; a wide variety of birds such as the pygmy falcon (*Poliohierax semitorquatus*), buffalo weavers (*Babalornis albirostris*), the greater honeyguides (*Indicator indicator*), barn owls (*Tyto alba*), Wahlberg eagles (*Aquila wahlbergi*), starling (*Spreo superbus*), and the orange-bellied parrots (*Poicephalus rufiventris*); many insects, especially bees, ants and caterpillars which includes one kind eaten by the Venda of South Africa (Winter and Killick, 1966); and several mammals, primarily bats, rats, squirrels, lesser bush babies (*Galago Senegalensis*), baboons and elephants.

In the drier parts of the Caribbean where many trees have been destroyed for firewood, charcoal, fence posts, yam sticks and so on, the baobab would provide an excellent habitat for many birds. There would be no reason for people to cut these trees down as they are virtually useless for timber and fuel. The wood is of poor quality being light, soft, spongy and water-logged.

To understand the role that baobab can play in the ecology of the Caribbean we need to study the trees that already exist in the region. For example, people in Africa frequently go to the baobab tree in search of honey (Stow, 1965) and in some cases they will hang artificial hives in the branches of the baobab (Aitken, 1951; Fleuret, 1980). While in St. Croix this summer I noted that the tree at Grove Place had a natural hive in one of its huge trunks. In Butler Bay St. Croix, I photographed a fruit on one of the trees with a hole at the top of it that was approximately one inch across. I also found fruits on the ground that had holes through their woody capsule. We need to learn a lot more about the ecology of the baobabs in the Caribbean.

Medicine

Among the many uses of the baobab is its value as a source of medicines for treating fevers, dysentery and other illnesses. Many writers have discussed the medicinal value of the tree, especially the bark, leaf and fruit which are the most frequently cited sources of health products. Given the long period of time over which this tree has been associated with human life, we should examine the medicinal claims that are made for the various remedies of which the baobab is a part. It is possible that when the medicinal uses of the baobab have been carefully examined, we will find something worthy of being added to the traditional folk medicine of the Caribbean.

Craft

In Africa the woody gourd-like capsule of the fruit is used as a water container and to make cups, bailers, floaters, and various kinds of vessels. While these uses have been displaced in many places by plastic and metal utensils the capsule, like that of the calabash,

might still find a place in the toy chest of children and in the craft industries of the Caribbean islands whose importance to many people should not be overlooked. Although they are not as beautiful as the seeds from plants like the John crow bead (*Abrus precatorius*), seaside bean (*Canavalia maritima*), nickal or wari (*Caerlpinia bonduc*), Job's tears (*Coix laeryma-jobi*), horse eye (*Mucuna sloanei*), red bead tree (*Adenantha pavonina*), woman tongue (*Albizia lebbbeck*), cocoon (*Entada gigas*), and the flamboyant (*Delonix regia*), they can still be used to string necklaces as they have been in Africa (Dalzier 1937).

Fiber and water storage

Two of the important traditional uses of the baobab in Africa were the fiber obtained from the inner bark (and used to make bags, strings for musical instruments and other purposes, tethering rope, matting, and door curtains), and the water that is natural or artificially stored in the tree (Blunt, 1923; Newbold, 1923; Owne, 1968; Fenner, 1980). It is doubtful whether the baobab will ever be useful in these ways in the contemporary Caribbean where industrial products have replaced many products derived from plants in the immediate environment and where water is available through an organized public works program or from rivers, wells, stand pipes and even water trucks.

Preservation of baobab

Over the years the baobab has been protected by traditional cultural values in many parts of Africa. More recently, however, Owen (1970) and others have pointed out that the development of urban Africa including the construction of roads, the opening up of mines and the extension of agricultural and pastoral activities has had a negative impact on the survival of the baobab. Restrictions imposed on elephant populations by human activities has also resulted in the increasing destruction of baobabs. Owen argued in 1970 (p. 35) that "the major threat to the species" at that time was "degradation by elephant". Robertson-Bullock's (1974) description of his 1960 visit to the Luambe Game Camp in what was then Northern Rhodesia is the most frequently cited report in this regard. Of a total of 38 trees, 36 were scarred by elephants over a period of two weeks. This was the first reported case of elephants destroying large numbers of trees in such a short period of time. The previous report was 1957 when only one tree was destroyed by elephants. Similar reports have come from East Africa concerning the Tsavo National Park in Kenya (Box and Sheldreck, 1963; Owen, 1974). While no one has argued that the baobab is on the verge of extinction, scholars like Owen (1970, 1974) and Maheshwari (1971) have expressed concern for its future. One important reason, therefore, for cultivating the baobab in the Caribbean is to insure its survival especially where this involves preserving the genetic diversity of the species.

Conclusion

It is quite clear that the mere cultivation of baobab trees in the Caribbean will not be the solution to major food problems now facing the region or the problem of "foreign exchange" which we hear so

much about today. It would not even seem relevant to those who believe that there is one simple, clear-cut, overall solution to all the problems of the region. I do not share this perspective. Given its actual and potential usefulness, the cultivation of the baobab and other useful exotic trees like the litchi (*Litchi chinensis*), and mangosteen, (*Garcinia mangostana*), should be considered a necessary detail of any effort toward the overall development of Caribbean culture. The baobab excites curiosity, it has the potential to be of limited commercial value in the local market and it provides food, drink and shade. It touches on the history and folklore of Caribbean people and has potential uses, some of which I have described in this paper.

Bibliography

- Aitken, Russell B. (1951) The tree that time forgot." *Natural History*, December 1951, pp. 456-63.
- Allison, P.A. (1962) Historical inferences to be drawn from the effect of human settlement on the vegetation of Africa. *Journal of African History* III, (2) 241-9.
- Armstrong, P. (1977) Baobabs: remnant of Gondwanaland *New Scientist*, January 27 212 - 3.
- Backer, C.A., and Bakhuizen van den Brink, R.C. (1963) *Flora of Java*, 1. The Netherlands: N.V.P. Noordhoff-Groningen.
- Blunt, H.S. (1923) Tebeldis. *Sidan Notes & Records*, 6 (1) 115 - 6.
- Brandis, D. (1906/1971) *Indian Trees*. Dehra Dun, India: Bishen Singh Mahendra Pal Singh.
- Burton-Page, J. (1969) The problem of the introduction of *Adansonia digitata* into India. In P.J. Ucko and G.W. Dimbleby (eds.) *The domestication and exploitation of plants and animals*, Chicago/New York: Aldine-Artherton Inc.
- Carr, W.R. (1955) Ascorbic acid content of baobab fruit. *Nature* 176 (4496) 1273.
- Coe, M.J. and Isaac, F.M. (1965) Research Notes. *East African Wildlife Journal*, 3 123.
- Cowan, D.V. (1952) *Flowering trees and shrubs of India*. Bombay, India: Thacker & Co., Ltd.
- Dalziel, J.M. (1937) *The useful plants of West Tropical Africa*. London: Crown Agents for Overseas Governments and Administration.
- Dassanayake, M.D. (Ed.) *A revised handbook to the flora of Ceylon* Washington, DC: Smithsonian Institution.
- De Winter, B., de Winter, M. and Killick, D.J.B. (1966) *Sixty six Transvaal trees*. Transvaal: Botanical Research Institute.
- Emboden, A. (1974) *Bizarre plants: Magical, monstrous, mythical*. New York: MacMillan Publishing Co., Inc.
- Everett, H. (1980) *The New York Botanical Garden Illustrated Encyclopedia of Horticulture*, 1 48-50. New York & London: Garland Publishing, Inc.
- Fairchild, D. (1931) *Exploring for plants*. New York: MacMillan & Co.
- Fenner, M. (1980) Some measurements on the water relations of baobab trees. *Biotropica* 12 (3) 205 - 9.
- Fleuret, A. (1980) Nonfood uses of plants in Usambara *Economic Botany* 34 320 - 33.
- Guy, G.L. (1967) Notes on some historic baobabs. *Rhodesiana* 16 17-26.
- Harlan, J.R., and de Wet, J.M.J., Stemler, A.B.L. (Eds.) *Origins of African Plant Domestication*. Paris, France: Mouton Publishers.
- Hobley, C.W. (1922) on baobabs and ruins. *Journal of East African Natural History Society* 5 75-7.
- Hollis, R. (1963) Reflections on baobabs. *The Nigerian Field* 28 (3) 134-8.
- Hooker, J.D. (1872) *Flora of British India*, Vol. 1 Reprinted 1973 by: Ms. Bishen Singh Mahendra Pal Singh, New Connaught Place, Dehra Dun and M/S. Periodical Experts, Delhi, India.
- Irvine, F.R. (1961) *Woody plants of Ghana (with special reference to their uses)*. London: Oxford University Press.
- Maheshwari, J.K. (1971) The baobab tree: Disjunctive distribution and conservation. *Biological Conservation*, 4(1) 57-60
- Maheshwari, J.K. (1971) The baobab tree: Disjunctive distribution and conservation. *Biological Conservation*, 4 (1) 57-60.
- Meek, C.K. (1971) *The northern tribes of Nigeria*. London: Frank Cass & Co., Ltd.
- Neal, M.C. (1965) *In gardens of Hawaii*. Hawaii: Bishop Museum Press, pp. 568-71.
- Newbold, D. (1924) More notes on Tebeldis. *Notes and Records*, 7 (1) 135-7.
- Nicol, B.M. (1957) Ascorbic acid content of baobab fruit. *Nature*, 180 (4580) 287.
- Owen, J. (1968) Water storage properties of *Adansonia digitata* (baobab). *The West African Archaeological Newsletter*, 9 95-6.
- Owen, J. (1970) The medico-social and cultural significance of *Adansonia digitata* (Baobab) in African Communities. *African Notes* 6 (1) 24-36.
- Owen, J. (1974) A contribution to the ecology of the African baobab. *Savanna*, 3 (1) 1-12.
- Palmer, E. and Pitman, N. (1961) *Trees of South Africa*. Amsterdam: A.A. Balkema.
- Pardy, A.A. (1953) Notes on indigenous trees and shrubs of S. Rhodesia. *The Rhodesia Agricultural Journal* 50 (1) 5-6.
- Prain, D. (1963) *Bengal plants*, Vol. 1. Botanical Survey of India. Calcutta, Government of India.
- Rindos, D. (1984) *The origins of agriculture*. Orlando, Florida, U.S.A.: Academic Press.
- Robertson-Bullock, W. (1974) Elephants eat baobab trees in Northern Rhodesia. *African Wild Life*. 14 (2) 1960 143-5.
- Santapau, H., and Henry, A.N. (1973) *A Dictionary of the flowering plants in India*. New Delhi, India: Publications and Information Directorate.
- Shaw, T. (1976) Early crops in Africa: A review of evidence. In J. Harlan et. al (eds.) *Origins of African Plant Domestication*. Paris, France: Mouton Publishers.
- Stewart, J.L., and Brandis, D. (1874) *The forest flora of north-west and central India: A handbook of the indigenous trees and shrubs of those countries*. Prepared at The Herbarium of the Royal Gardens, Kew, England.
- Stow, G.W. (1905) *The native races of South Africa*. New York: The MacMillan Co.
- Ucko, P.J. and Dimbleby, G.W. (Eds.) (1969) The domestication and exploitation of plants and animals. In *Proceedings of meeting of the Research Seminar in Archaeology and Related Subjects*. Chicago/New York: Aldine-Artherton, Inc. pp. 331-5.

Watt, J.M. and Breyer-Brandwijk, M.G. (1962) *The medicinal and poisonous plants of Southern and Eastern Africa*. (2nd Edition). Edinburgh and London: E. & S. Livingstone, Ltd.

Weiss, E.A. (1979) Some indigenous plants used domestically by East African coastal fishermen. *Economic Botany*. **33** (1) 40.

Wilkinson, M.L. (1984) The tropics' crown of glory. *Americas* **64** 2-5.

Wright, I.M. and Kerfoot, O. (1966) The African baobab—Object of the awe. *The Journal of Natural History* **75** (5) 50-3.