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# GIANT SWAMP TARO (*Cyrtosperma chamissonis*) IN KIRIBATI

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*(Le Taro géant des Marais (Cyrtosperma chamissonis) au Kiribati)*

## SUMMARY

Kiribati is a small island state consisting of 33 coral atolls in the Central Pacific. The only important staple root crop is the giant swamp taro (*Cyrtosperma chamissonis* Schott) Merr.), known locally as babai. Babai is grown in pits dug down to the water lenses of the atolls. Its production is very labour intensive. Yields of babai in different atolls vary greatly and range between 10-25 t/ha/year. In this extremely resource restricted environment the production of any crop is difficult. A project designed to produce large quantities of babai on commercial lines on Tarawa atoll may be an important stategy in reducing dependency on imported foods by the urban population.

## RESUME

*Kiribati est un petit état insulaire composé de 33 atolls coraliens dans le centre du Pacifique. La seule culture de racine de base est le taro géant (C. chamissonis Schott) Merr.), appelé localement "babai". Le "babai" est cultivé dans des fosses creusées jusqu'à la nappe phréatique des atolls. Sa production est hautement consommatrice de main d'oeuvre. Les rendements varient considérablement à travers les atolls, allant de 10 à 25 t/ha/année. Dans ce milieu aux ressources extrêmement limitées, la production de toute culture est difficile. Un programme visant à produire de grande quantité de babai sur des bases commerciales sur l'atoll de Tarawa pourrait être une stratégie de valeur pour réduire la dépendance de la population urbaine à l'égard des aliments importés.*

## INTRODUCTION

Kiribati, a central Pacific island state, comprises 33 small coral atolls which form an area of 720 sq. km., scattered over 5 million sq. km of oceans with a total population of about 60,000. This nation has an extremely restricted resource environment where the land elevation seldom exceeds 3 m above sea level. The soil mainly consists of coral fragments and is classed as stony sand or stony loamy sand. It is extremely infertile with a large number of nutrient deficiency problems and having a low water retention capacity. There are no running streams and the water for both domestic and agricultural use is derived from shallow wells dug into the fresh water lenses located 1-2 m below the atoll surface. The most ubiquitous crop in Kiribati is coconuts. As in other Pacific islands coconuts is referred to as the "tree of life" meaning that it is able to provide most of the basic needs of island communities such as food, drink, building materials, fuel, ustensils and ornaments.

## HISTORICAL DEVELOPMENTS

Giant swamp taro (*Cyrtosperma chamissonis* (Schott) Merr.), known locally as babai, is the most important staple root crop of the Kiribati people. It is a member of the *Araceae* and has probably been cultivated in Kiribati for several hundred years, even a thousand years. The crop probably originated in Indonesia from where it spread north and eastwards in prehistoric times to Philippines, Papua New Guinea and the islands of South Pacific to become a minor crop in Melanesia and Polynesia but a major crop in Micronesia (MASSAL and BARRAU, 1956 ; BARRAU, 1961 ; PLUCKNETT, 1976, 1977). In Kiribati babai is the main tropical root crop (TRC) and it probably comprises over 98 per cent of the TRC area. Only other TRC grown in isolated pockets is taro (*Colocasia esculenta* L. Schott). *Cyrtosperma chamissonis* is probably the largest plant in the world which produces edible corms.

## PRODUCTION SYSTEMS

In Kiribati babai is grown in pits dug down to the upper level of the water lenses. The pits vary in size from 10-2,000 sq. m. but pits as large as 20,000 sq. m have been known. Digging the pits through hard coralline material is extremely labour intensive but once dug the pits can be used for several generations. Many pits in Kiribati are of ancient origin and may have been dug hundreds of years ago. The tools used in those days were made of giant clams or turtle shells. It is generally accepted that the peak production of babai occurs after many years by which time sufficient organic

matter has accumulated in the pits. The babai plant has a wide range of pH tolerance and can be successfully grown in very fresh to brackish waters.

Babai is a giant perennial herb ranging from 1-6 m (mostly 2-4 m) in height. The crop can be planted throughout the year. The planting material are the tops and suckers although one cultivar (unikaai) produces viable seeds which are rarely used for planting (SMALL, 1974). the plants are usually spaced about 1 m apart for larger cultivars and 50 cm apart for small cultivars. Planting is done in small holes dug into the puddled surface of the pit. Usually leaves and other vegetative material are also inserted in the hole and covered with soil and sand. Once the plants start growing circlets of woven coconut frond or pandanus leaf baskets (bottomless) are inserted around the plant base and these are filled with soil and mulches. As this compost mixture rots more is added. Often tin cans and other iron-made material are also added to improve the severe iron deficiency in the soil. As the corm grows further baskets are added and the process repeated. About four levels of baskets are needed during crop growth and the plants are usually tended about four times per year. A whole pit is rarely planted with babai at the same time. The crop content of any pit usually consists of babai at various stages of growth. This allows for a regular supply of food to the households. In Kiribati no more than three days babai supply is harvested at any one time. Immediately after harvest of one plant another is planted in its place. It is estimated that 3,000-4,000 manhours/ha/year are required to maintain a babai pit at its full production stage. Babai is a slow growing plant and the corms are ready for harvest after 18-24 months but sometimes they are allowed to grow for 5-7 years or even longer. There are at least 18 varieties of babai in Kiribati (LAMBERT, 1977). Some varieties can be harvested after about 9 months growth. The varieties are usually distinguished by the colour of the petiole, shape of leaf (broadly or narrowly sagittate), spiness of the petiole base, ability to produce suckers, palability of the corm and time taken to maturity (VICKERS, 1982). Detailed descriptions of nine varieties are given by CATALA (1957).

The yield of babai in Kiribati varies greatly between the wetter islands having over 3,000 mm of rainfall per annum and the drier islands obtaining about 800 mm rainfall per annum. Higher yield is obtained on Butaritari atoll in the Gilbert Group averaging about 25 t/ha/year. The highest yielding cultivar is the slow growing *ikaraoi* which can produce corms of 100 kg but the normal weight is 25-50 kg after several years growth. The faster growing *Katutu* cultivar produces small corms of 7-10 kg each after 18-24 months growth. On drier atolls such as Christmas Island the yield is about 10 t/ha/year. Similar yield figures have been reported for other islands in Micronesia (KAY, 1973 ; SPROAT, 1968). Apart from the corms other useful plant parts are the

leaves and petioles. The leaves are used for thatching, wrapping food and give protection against rain. The spiny petioles are used for weaving baskets and mats.

In Kiribati there are two important pests of babai. The first is the babai beetle (*Papuana huebneri*) which attacks the corms. This pest can be successfully controlled using integrated cultural methods. Biological control is being investigated. Chemical control is not recommended in Kiribati because of the fear of polluting the water lenses. In 1983 a new pest was discovered which has not yet been identified. This is the Makin pest (found on Makin atoll) belonging to order Dictyoptera. This pest also attacks corms of babai. Burning of the babai pits is the recommended control practice for this pest.

## CONSUMPTION, NUTRITION AND UTILIZATION

It is unclear what the annual production of babai is in Kiribati. Based on records held by the Ministry of Natural Resource Development an estimate is 4,380 t/year. This is based on the consumption rate of 0.2 kg/capita/day. This figure is less than half the consumption rate of TRCs in other South Pacific nations such as Fiji, Western Samoa, Tonga and Cook Islands.

Babai is almost always consumed by humans. Only a very small fraction, probably less than 5 per cent, is used for feeding livestock such as pigs and chickens. The general method of consumption by humans is in boiled or roasted forms.

Compared to other TRCs babai is second to cassava in food energy producing 5,480 KJ/kg and having a total carbohydrate and fibre content of 310 g/kg of edible portion. However, babai has low contents of protein and vitamins. In the atoll environment of Kiribati the protein needs of the households are easily met from marine sources consisting mainly of fish, shellfish, crabs and other crustaceans (GEDDES et al., 1982). Coconut palm toddy is a good source of vitamins and is almost invariably used by all households to supplement their diet.

## DEVELOPMENT PROSPECTS

In Kiribati the development of babai is an important issue because of its role in the peoples'diet. Because of increasing losses in foreign exchange for imported substitutes such as rice and flour the Government is particularly concerned about increasing the production and consumption of babai. The most urgent problem is the supply of babai for the 20,000 urban population located on Tarawa and Betio

atolls. These people are the main consumers of imported foods and their access to babai produced in other atolls is restricted because of poor transportation infrastructure.

Presently a project is being considered by the Government of Kiribati to produce babai on Tarawa atoll in large commercial quantities. the project entails production in commercially run pits under high inputs of fertilizer, water, labour and management. It is expected that yields of over 50 t/ha/year can be obtained on a sustained basis. The project will be funded by the Australian Development Assistance Bureau (CHANDRA, 1984). The progress of this project will be useful in indicating whether intensive commercial production of TRCs in Kiribati and other South Pacific nations can be used to alleviate the dependency on imported foods.

## CONCLUSIONS

Babai or giant swamp taro is the most important staple root crop in Kiribati. It is grown in pits dug down to the water lenses of the atolls. Its production is extremely labour intensive. Yields vary considerably between the atolls ranging between 10-25 t/ha/year. A project designed to produce large quantities of babai on commercial lines on Tarawa atoll is presently being considered by the Government of Kiribati.

## LITERATURE CITED

BARRAU, J. 1961. Subsistence agriculture in Polynesia and Micronesia. Bernice P. Bishop Museum, Honolulu, Hawaii, Bull. 223 ; 94p.

CATALA, R.L.A. 1957. Atoll Research Bulletin 59, USA.

CHANDRA, S. 1984. Babai and other root crops project in Kiribati. Report to Australian Development Assistance Bureau, Canberra.

GEDDES, W.H., CHAMBERS, B. SEWELL, R. LAWRENCE and R. WATTERS. 1982. Atoll economy : social change in Kiribati and Tuvalu. Islands on the Line Team Report, Australian National University Press, Canberra, 216 p.

KAY, D.E. 1973. Root crops. Tropical Products Institute Crop and Product Digest No. 2, London ; 245p.

LAMBERT, M. 1977. The cultivation of taro *Cyrtosperma chamissonis* Schot in Kiribati. South Pacific Commission Technical Paper No. 174, 163-165.

MASSAL, E. and BARRAU, J. 1956. Food plants of the South Sea Islands. South Pacific Commission Tech. Paper 94, Noumea ; 51p.

PLUCKNETT, D.L. 1976. Edible aroids ; pp. 10-12 in Simmonds, N.W. (ed). Crop Plant Evolution, Longmans, London.

PLUCKNETT, D.L. 1977. Giant swamp taro, a little known Asian - Pacific food crop ; pp. 36-40 in Proc. 4th Symp. Inter. Soc. Trop. Root Crops, IDRC - 080e, Ottawa, 277 p.

SMALL, C.A. 1974. Atoll agriculture. Cathay Press, Hong Kong.

SPROAT, M.N. 1968. A guide to subsistence agriculture in Micronesia. Trust Territory of the Pacific Islands Agric. Bull. No. 9, Saipan ; 142 p.

VICKERS, M.E.H. 1982. The agronomy of *Cyrtosperma chamissonis* (Schott. Merr.) in Kiribati ; pp. 90-97 in Lambert, M. (ed). Taro production in the South Pacific, South Pacific Commission Handbook 22, Noumea, 144 p.