

Moteio Rumo, 49 and 32 t/ha/yr, respectively. They are also conducting some experiments with cassava-based rations for fattening swine and beef cattle.

Future experiments include continued evaluation of their germplasm, determination of critical periods of weed competition, evaluation of herbicides and determination of optimal planting densities.

There is a great need for more technically trained personnel who can dedicate 100 percent of their time to cassava. CIAT has been asked to help coordinate activities and provide technical orientation, and has made some technical recommendations to the Government. The Ministry plans to meet with the aforementioned national institutions, as well as IVITA, SAIS and CORANDE.

IVITA-Pucallpa is working on cassava production for animal feed. Hugo Ordoñez, ex-CIAT trainee, is in charge of cassava research. There are ongoing experiments on herbicides, intercropping and fertilization. SAIS is interested in cassava for both human and animal nutrition. CORANDE processes the roots for flour and starch. They have five plants with a capacity for 5000 t fresh roots/yr or 1700 ha with an av yield of 15 t/ha/yr. There is a serious problem of steady supply of raw material and drying.

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CASSAVA CULTIVATION IN THE HIGHLANDS OF NEW GUINEA: A PRELIMINARY NOTE

E.B. Holmes
KUK Research Station
P.O. Box 339
Mt. Hagen, Papua New Guinea

The Highlands of New Guinea are an extensive series of mountain ranges, deeply dissected by river valley systems; they are separated into 5 provinces. Prior to establishment of a pilot project for power alcohol production from cassava starch, three sites were surveyed to evaluate potential cassava production levels and cultivation methods. Brief site descriptions are given in Table 1.

KauKau (sweet potato) is the principle staple food crop in the region, but cassava is relatively important in human diets at lower altitudes (1000-1200 m), in the Baiyer River Valley and Chimbu Province (not surveyed). This pattern is, however, considered to be a matter of dietary preference rather than altitude as cassava is often grown at higher altitudes (1500-1600 m) in other areas, by people from the Baiyer region. The roots are also used, to a lesser extent, as a pig food, but there is no evidence of the use of cassava foliage in animal diets.

Two distinct cultivar types were found throughout the surveyed area, with the roots being either yellow fleshed and

"sweet" or white fleshed and relatively "bitter"; however, none appeared to have high or toxic cyanide levels. There was considerable variation in leaf shape, size and color, stem formation and root size and shape, within each type. However, there has been no systematic classification of cultivars in this region of P.N.G. Both cultivar types flower profusely throughout the year and produce fruit. Although the fruit contains seed, there has been no evaluation of seed viability.

It is estimated that yellow-fleshed cultivars are lower yielding than the white fleshed, but the former are preferred in human diets because of their better taste and cooking qualities. Traditional cooking methods in the region are simple, involving either roasting or boiling; however, small quantities may be mixed with meat or tinned fish and then boiled. Apparently little or no cassava is converted to flour or fermented to improve nutritional value.

Traditional cassava cultivation systems are similar throughout the region, cassava being intercropped with bananas, sugar cane and KauKau. Cassava is often grown under shade, which produces plants with long stems and few flower branches but proportionately high numbers of sucker branches.

Land preparation is minimal, except where mounds or raised beds are prepared. In these cases, cassava is usually planted along the mound or drain sides to reduce soil erosion. Excessively long (50-100 cm) cuttings are planted, usually 2 to 3 to a hole at wide spacings or interspersed with other crops. There is no evidence of fertilizer application at any site, and there are some instances of apparent mineral deficiency in depleted soils. Generally roots are harvested only as required for food, little being sold in the local markets. No storage systems were observed.

There is an increasing tendency, particularly in the Baiyer River area, to use improved planting methods and grow cassava as a semicash crop. In these systems single cuttings (20-30 cm) cut from mature woody stems are planted on flat beds in small sole crop blocks at spacings of approximately 90-120 cm. Weeds are controlled by hand, but no fertilizer is applied. Crops are not intercropped but rotated with KauKau, maize and various legumes.

In all systems cassava is cultivated throughout the year, with little or no variation in yield levels; however, growers in the Baiyer River area believe yields are greatest when crops are harvested during April/May.

Time to maturity varied slightly within the regions surveyed, but was 9-12 months on average. Maturity was judged as either the drying of the second flush of fruit or at the time of excessive leaf fall. Yields could only be estimated on single plants harvested from small groups in each region (Table 1). The highest individual plant yield was achieved in a 16-month-old

Table 1. Recorded individual plant root yields at 3 sites in the Highlands of New Guinea.

Site	Altitude/ Annual rainfall	Soil type/pH	Root yields/plant			Root no./plant	
			Range (kg)	Mean (kg)	Estimated mean/yr	Range	Mean
KUK, Wangi Valley, W. Highlands	1600m/ 2396 mm	Deep, black organic peaty clay/4.5-5.5	1.4- 23.6	6.4	5.9	4- 12	9.4
Kwirika, Baiyer River Valley, W. Highlands	1200m/ 2519 mm	Brown-black organic loam over a well- drained clay/ 5.0-5.5	2.5- 19.7	7.9	9.2	4- 9	7.0
Sugu Bulamaka, Erave Valley, S. Highlands	1200m/ 2471 mm	Brown loam of volcanic origin over well-drained red clay/5.0	4.2- 9.8	7.0	10.8	10- 14	12.0

plant from Kuk (23.6 kg fresh root), but adequate yield levels for a commercial venture were indicated at all sites.

It was concluded that each area surveyed had considerable potential for commercial cassava production, but the Baiyer River site, W.H.P. was the most suitable for an initial operation.

It is hoped to establish a million-liter pilot plant for alcohol production. If this is successful, then cassava production on a large scale will be introduced at selected sites throughout P.N.G. Alcohol produced from cassava will then be used as a replacement for imported fuels, in both main population centers and isolated communities (which can be supplied by smaller scale facilities).

Anyone interested in discussing this project should contact the author or Dr. K. Newcomb, Dept Minerals and Energy, P.O. Box 2352, Konedobu, P.N.G.

WHO'S WHO IN CASSAVA: NORMANHA, AN UNFORGETTABLE PERSON

Jairo Ribeiro da Silva, Engenheiro Agrônomo
Gerente Nacional de Mandioca
EMBRATER - Empresa Brasileira de Assistência
Técnica e Extensão Rural
Brasília, D.F., Brasil

Perhaps this title sounds banal; but as hard as I tried, I could not find more appropriate words to sum up my thoughts about this kind-hearted, humane friend and colleague of mine, Edgard Sant'anna Normanha. I am sure that those of us who have had

the privilege of knowing him well are of the unanimous opinion that he is, without a doubt, an unforgettable person.

I believe that his personality is, in part, due to geographical factors since he is a native of Carinhanha, a small and peaceful town of Bahia, located along the banks of the colossal San Francisco River bordering with the state of Minas Gerais, making him a special Bahia x Minas hybrid.¹ As the popular saying goes, "all Bahian donkeys are stillborn,"² and the people from Minas are known for their modesty, capability, accomplishments and above all, their special knack for dealing with people. Isn't Normanha all of this and more?

As he once confessed to me, Normanha had always wanted to study medicine but took up agronomy since his family could not afford to put him through medical school at the time and he happened to be living in Piracicaba, where the Luis de Queiroz school of agronomy is located. I am sure that no matter what activity he would have dedicated himself to, he would have done as well as in agronomy because of his intellectual qualities and perceptiveness. His sensitivity is so acute that, incredible as it may seem, I often thought that he could actually dialogue with the plants and that they could tell him their complaints and aspirations. I still have that doubt today. It would not be surprising if he had been blessed with this divine gift since there is such a close identity between him and the cassava plant, both of whom are important and capable, without losing their modesty and humbleness.

¹ This paragraph is written in a bantering tone, and it is very difficult to convey the images the author creates in Portuguese. A great many local-color jokes are made as to the people's degree of astuteness, intelligence, etc. in the different Brazilian states, of which reference is made to here.

² In other words, there are supposedly no dumb Bahians.