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THE SUPPLY OF ENERGY-SOURCE FOODSTUFFS IN THE YAP ISLANDS: A PRELIMINARY REPORT

Kazutaka NAKANO

Abstract

Can the Yap Islanders subsist after the foreseeable end of systematic aid programs by the US Government? A preliminary survey of present and future supply of energy-source foodstuffs for the Yap islanders was conducted. Among several starchy crops harvested on the islands at present, giant swamp taro is the islanders' preferred staple. Its yearly land productivity was calculated at 8 million kcal/ha roughly, which is comparable to that of the true taro produced in Oceania. The average ratio of the calorific intake of giant swamp taro to total daily intake was tentatively calculated at two thirds for the islanders. The ratio for rice, totally imported from the US, was calculated as less than a quarter. Thus, the islands supply the islanders with most of their energy-source foodstuffs. Without the systematic aid programs extended by the US Government, the future prospect for islander subsistence seems not quite hopeless. However, this will depend on local policies and the attitudes of the islanders towards cultural change.

Key words: staple food, sustainability of food supply, productivity, consumption, Yap Islands

Introduction

Since the end of World War II, most of the Micronesian islands were under US Government control until their respective times of independence. Even after political independence the island countries relied heavily on the US for financial aid to prevent the decline of their economies. However, the aid amount to the Federated States of Micronesia (FSM) is now being decreased year by year and will approach zero in a few years. At this time, given the lack of exportable merchandise to balance the FSM's international trade, how can the people in the islands subsist? To answer this question for the Yap Islands which come under the Government of Yap State, one of the four states of the FSM, I conducted a preliminary survey on present and future supply of energy-source foodstuffs.

Energy-source Food Crops Grown on the Yap Islands

From Table 1 in FALANRUW (1994), the following starchy food crops commonly grown on the Yap Islands can be noted: breadfruit (*Artocarpus* spp.), true taro (*Colocasia esculenta* (L.) SCHOTT), pumpkin (*Cucurbita maxima* DUCH.), giant swamp taro (*Cyrtosperma chammisonis* (SCHOTT) MERRILL), at least five species of yam (*Dioscorea* spp.), sweet potato (*Ipomoea batatas* (L.) LAM.), cassava (*Manihot esculenta* CRANTZ.), bananas (*Musa* spp.) and tannia, another kind of taro (*Xanthosoma sagittifolium* (L.) SCHOTT). Of these crops, at the present time the most important one seems to be giant swamp taro (FALANRUW, 1994), which is always grown in a swampy patch, usually without a fallow period. On the other hand, true taro, which is considered important for its prestige rather than as a staple (FALANRUW, 1994), is grown in both swampy and upland patches. Neither species can survive in a swamp with salty water. The islanders, however, often convert mangrove areas to taro patches after great and time-consuming effort. Whereas true taro always requires very sunny patches, giant swamp taro is a more shade-tolerant crop and, although it takes a much longer time for its corm to mature, weeding intensity need not be very high. Furthermore, once the high leaf layer of this crop is densely established, few weeds can surmount it, as its name, "giant" swamp taro suggests. However, according to some experts, the area planted with cassava is increasing substantially in the Yap Islands in line with a world-wide trends in the tropics.

Besides the starchy food crops mentioned above, coconut (*Cocos nucifera* L.) must be included as an important energy-source foodstuff, because it is consumed daily by the islanders and contains abundant oil, which has double the energy content of starch.

Land Productivity of Giant Swamp Taro in the Yap Islands

A preliminary estimate of the land productivity of the edible portions of giant swamp taro on the Yap Islands can be made step by step as follows:

1) at some actual taro patches, the distances from the growing points of individidual plants to the nearest "others" were actually measured;

2) using the distribution model shown in Fig. 1 and the mean value of the distances explained above, the average number of individual plants per hectare was estimated;

3) because one individual plant produces one tuber for normal consumption, the average weight of the edible portion of a tuber was multiplied by the value estimated at 2), giving an estimate of land productivity for edible portions of giant swamp taro for the period from planting time to harvest;

4) because tubers are harvested several years after planting, to estimate yearly land productivity,

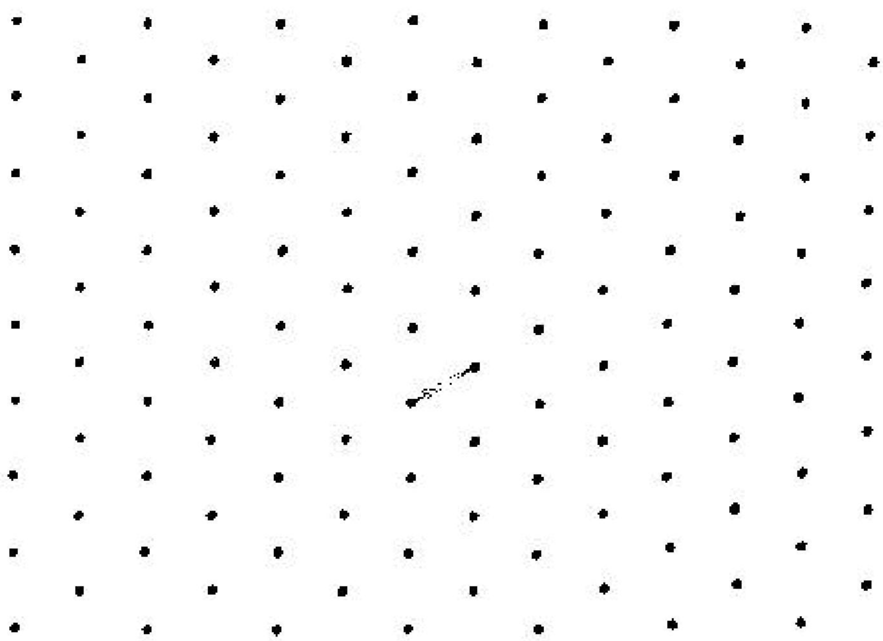

Fig. 1. Distribution model of the individual plants of giant swamp taro grown in a patch.

the value obtained at 3) must be divided by the average time elapsing from planting until harvest.

The results of the estimation procedure explained above are indicated below:

1) the mean value of the distances between the nearest individual plants is, as shown in Fig. 1, 88.5 cm, with a standard deviation of 23.17 (n = 39);

2) according to the distribution model (Fig. 1), planting density is calculated at nearly 15,000 individuals (i. e., 15,000 tubers) per hectare;

3) the mean value of the 14 samples of edible portion actually measured at the shops was 1.33 kg (fresh weight). Thus, 1.33 kg/tuber × 15,000 tubers/ha = 19,9500 kg/ha ≒ 20 ton/ha;

4) most tubers are dug up between 3 and 4 years after planting (according to UNTAMAN (1982) the interval is usually 4 years). Thus, if the interval is 3 years, yield = 6.7 ton/ha; if 4 years, 5.0 ton/ha yearly.

Because I was able to stay in the Yap Islands only for a short period, the amount of information available for estimating the land productivity of giant swamp taro is somewhat inadequate. Still, on the rough estimates mentioned above, the yield of edible portions is 6 ton/ha yearly. This value is similar to VICKERS' (1982) tentative estimate (namely, 7.5-10.0 ton/ha for a growth period of between 18 months and 2 years), and converts to 7,860,000 kcal using FRENCH's (1986) data, or 8,440,000 kcal using MAY & ANIANI's (1984) data. These values for the energy content of giant swamp taro are in the range of those for true taro and giant taro (*Alocasia macrorrhiza* (L.) SCHOTT) sampled in the South Pacific region (HONGO & OHTSUKA, 1993). If we adopt an intermediate value between the preceding two, the calorific yield of edible portions may be roughly considered to be 8,000,000 kcal/ha yearly.

When this estimate is compared with the yield data of true taro produced in Oceania, excluding the data obtained from fertilized patches, it is low but not outside the range of the data in anonymous (1982). This finding does not change even if we take into account other data, such as in ONWUEME (1978) and OHTSUKA (1994).

In conclusion, the land productivity of giant swamp taro in the Yap Islands is comparable to that of true taro grown on unfertilized patches in Oceania, even after allowing for the fact that true taro is usually harvested in less than a year after planting time.

Consumption of Giant Swamp Taro in the Yap Islands

The estimation of per capita daily consumption of foods is notoriously difficult and inaccurate without a person-to-person watch on sampled subjects over a long period. Because circumstances did not allow me to conduct a precise survey and accurately estimate the islanders' daily consumption of giant swamp taro, I was obliged to rely on information from interviews with people in villages and in one town, Colonia. Most adults eat giant taro twice daily, while some eat it three times and some only once. The usual consumption at one sitting was suggested by showing me the amount of actually consumed tuber. Thus, the daily consumption of a male adult was tentatively estimated at about 800g in fresh weight. Based on this value, the mean daily consumption of the islanders was calculated, using sex-age data on the population (anonymous, 1996) and the following values (adapted from HINTON, 1969) in International Scale of Man Units*:

Age in years	Male	Female
0- 4	0.25	0.25
5- 9	0.50	0.50

Age in years	Male	Female
10-14	0.75	0.75
15-49	1.00	0.80
50+	0.90	0.80

Thus by my calculation explained above, the per capita daily consumption of giant swampt taro in the Yap Islands is nearly 1,200 g, which converts to about 1,600 kcal using the intermediate value of energy content mentioned above (FRENCH,1986; MAY & ANIANI, 1984).

According to data based on the FSM 1988 National Nutrition Survey (anonymous, 1997), per capita daily calorific intake in the FSM is 2,400 kcal. If this value (although its accuracy may be somewhat problematic) is applied here, approximately two thirds of the calorific intake of a Yap islander is supplied by giant swamp taro. This ratio seems a little too high. The reason for the possible overestimate may be that the islanders did not always indicate to me the sizes of the tubers actually consumed, but rather "ideal" ones for ingestion, and also that, although I used the value 2 for the daily times of ingestion of giant swamp taro, the error owing to rounding this number may be serious. Furthermore, the islanders do not always consume all of the cooked quantity of a staple food at each sitting and often abandon the residue. Moreover, they probably cook of other starchy foodstuffs harvested on the islands, such as true taro, in place of cooked giant swamp taro rather than in addition to it. In spite of my possible overestimate, the preceding tentative values for the present per capita daily consumption of giant swamp taro in calorific terms in the Yap Islands can be treated seriously.

Quantitative Importance of Rice Consumption in the Yap Islands

From general observation, the quantitatively important energy-source foodstuff next to giant swamp taro in the islands seems to be rice, which is totally imported from the US. To estimate the weight quantities imported annually, the data in the book of official statistics (anonymous, 1998a) are not very useful because only the amount of money paid for the imported rice is shown there. Furthermore, the book does not show data for the Yap Islands as such but only for Yap State. Based on these figures, nevertheless, we can estimate the weight quantities of rice annually imported for the consumption of the Yap Islanders.

According to one source, the amount of money paid for rice import to Yap State in 1996 was US$178,810, a drastic decrease from the amount paid in 1995, $245,834 (annonymous, 1998a). The first problem to consider is whether these values are based on CIF or FOB price. I fortunately was able to persuate the leading merchant on the islands to give me copies of all the papers of invoice which show CIF prices of rice for his orders in 1996. Another merchant gave me copies of papers where shipping charges for the freight of rice are indicated. Combining these data, we can conclude that the preceding official statistics are based on FOB price, since, if they were based on CIF price, the calculated total weight of rice imported to Yap State in 1996 would have been less than the total import weight reported by the above-mentioned two merchants in 1996. Calculating the export price (FOB) in the USA for 1995 and 1996 by means of FAO's data, we obtain the price values US$323 and $390/ton respectively (anonymous, 1998b). If these are applied here, the total weight of rice imported to Yap State in 1995 and 1996 was 761 and 458 tons respectively. Owing to a distinct rise in the export price in the US during from 1995 to 1996, the relative difference in the total weight of imported rice for these two years is much greater than the relative difference in the amounts of money paid for imports. The leading merchant explained to me the prime reason for the drastic decrease of rice import to Yap State in 1996. It was that the outer islanders of Yap State suffered disastrous typhoon damage that year and thus directly received large quantities of foodstuff, including rice, through the local US agent under the terms of a special aid program for them. As a consequence, they did not need to purchase much rice from the merchants in the Yap Islands and, necessarily, the quantity of imported rice dropped drastically from the previous year.

Taking this into account, we can estimate that most of the rice imported into Yap State in 1996 was consumed by the Yap Islanders. If their total population is estimated to be approximately 7,000 (anonymous, 1996), then their per capita daily consumption of rice was roughly 180 g. This value is obviously an overestimate, because, even if the quantity sold to the outer islanders was small, it was not zero. Thus, the per capita daily consumption of rice in the Yap Islands in 1996 is here estimated tentatively at 160 g, which converts to a little more than 500 kcal, that is, less than a quarter of 2,400 kcal, which the National Nutrition Survey mentioned above gives as the per capita daily calorific intake in FSM (anonymous, 1997).

Future Prospects and Conclusion

The Yap Islanders are generally said to be upholders of tradition. And indeed most of their energy-source food intake seems to be still derived from crops traditionally harvested on the islands, as indicated above. Of these crops, giant swamp taro is most prominent. Reportedly, potential areas for new taro patches have not yet been fully utilized. However, in the Yap Islands we very often heard about and observed symptoms of taro blight, the cause of which has not really been identified yet. The damage caused by this blight is becoming serious. Furthermore, inasmuch as the cooking time for giant swamp taro is rather lengthy, about one hour (UNTAMAN, 1982), it is not suitable for people who commute to an office every morning. Besides being unsuitabe for people adopting a modern life style, other disadvantages are that few young people like working in a muddy swamp to grow it, and while children on the islands prefer rice, by far, to taro, partly because the latter is hard to chew.

Given the present size of the islander population, self-subsistence and sustainability in the production of energy-source foodstuffs in the Yap Islands is quite possible. The last resort for increasing production of energy-source foodstuffs could be enlargement of the production area for cassava in the vast savannah grasslands available (more than one fifth of the islands in area (NAKANO et al., 1987; FALANRUW et al., 1987)), where soil fertility is probably sufficient. On Batiki Island in Fiji the production of cassava in such grasslands has already become dominant (BAYLISS-SMITH, 1978).

In conclusion, whether the Yap islanders can subsist without a systematic aid program will depend on local policies and the attitudes of the islanders towards cultural change.

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Note

*A measure first used in the 1960s (HINTON, 1969).