

Use and commercialization of non-timber forest products in western Burkina Faso

Niéyidouba Lamien, Amadou Sidibe and Jules Bayala

1995/INERA/RSP West-Zone

B.P. 910, Bobo-Dioulasso, Burkina Faso

Abstract

The farming system in Burkina Faso is featured by the omnipresence of trees owing to their non-timber products. These products are very important for the nutritional quality of rural populations and their contribution to income (particularly that of women). However, they remain undervalued. A better knowledge of the potential utilization of these products, and the constraints attached to their transformation and commercialization, would favour their promotion.

The aim of this survey is to study the traditional utilization of the various products in the households and their commercialization in village markets. About 100 households have been monitored to determine the frequency of use of these products in the meals of rural families. The trading and use of about 30 products has been followed in 10 village markets, over a whole year. These products were derived from 17 woody species. Five of these products, originating from *Vitellaria paradoxa*, *Parkia biglobosa*, *Bombax costatum* and *Adansonia digitata*, cost more than 200 CFA francs per kilogram. Compared with other products, NTFPs, especially foods, were the most frequently used. The raw forms of these products supply vitamins for the nutritional health of the rural population. Considering the importance of this role, one might expect to see these species cultivated in plantations, but the way of regenerating these species remains the traditional fallowing practice of the present farming system. The reasons for this can be found in some mythical beliefs about the reproduction of the local species, beliefs that are supported by local evidence. For example, the local species are thought to be slow growing. The growth patterns of the useful local species constitute a challenge to domestication that should be addressed by forestry research.

Introduction

The parkland system is the most widespread system of agricultural production in Burkina Faso (Ouedraogo 1995, Boffa et al. this volume). Trees are present everywhere on the farmers' fields. Trees of useful species are selected in fallow land for retention, before bringing the land into cultivation. Thus tree regeneration is the result of the practice of fallowing. The main reason for maintaining woody species in the fields is the demand for food and traditional medicines, for both humans and animals. These products, which are currently undervalued, contribute to the enhancement of the nutrition of rural populations, a better family income (particularly for women) and the economy of the country. For the products to become commercially important, they must be utilized beyond the national borders. This requires better governmental policies in food technology and processing. The first step is the development of better knowledge of the potential utilization of the various products, and of the constraints associated with processing and commercialization. The aim of this survey is to contribute to better knowledge of these parameters in Burkina Faso. Very little work has been done on this subject at a national scale. Pasco (1990) inventoried some 24 ways of utilizing the products of 21 woody species in the central part of the country. In 7 months of market observations he found 17 products in small-scale trade in the village markets. Hasberg and Coulibaly (1989) observed some 40 products in one of the larger markets in the southwest of the country. They found 15 products valued at over 200 CFA francs kg⁻¹ (in 1989, 200 CFA francs = USD 1). Pasco had identified six of these. Their uses ranged from snacks to family meals.

This survey has identified the traditional forms of consumption of non-timber forest products (NTFP) and estimated the frequency of their use in rural households; it has explored the products that are for sale in local markets. In addition, this survey has examined the hypotheses that-

- the dependence of rural populations for these products and their commercialization is growing, because of the loss of forest resources, relative to population growth and deteriorating climatic conditions

- in commerce, parameters such as the time of production, product quality, the ecological zone and the marketing system, determine the prices charged for the products

Survey of rural households

The survey covers NTFPs that are consumed daily by rural populations, either raw or cooked, and that are more and more involved in small-scale trade in local markets.

Study zone

The study zone of western Burkina Faso lies between latitude 10° and 13° N and longitude 3°-6° W. The climate is Sudanian, with mean annual rainfall between 800 mm in the north and 1000 mm in the south. The vegetation is forest savanna. The agricultural landscape features the Sahelian parkland system, predominated by woody species that bear edible fruit, such as *Vitellaria paradoxa* Gaertn., *Parkia biglobosa* Benth., *Tamarindus indica* L. and *Borassus aethiopum* Mart.

Choice of villages and households

The villages of the survey were the four (Dimolo, Kayao, Kawara, Yasso) where the Institute of Agricultural Research carries out studies on farming systems. They were chosen on the basis of a number of criteria to represent zones having a similar production system. In each village, we sampled 10% of the households (groups of people) sharing the same meal. Each family was chosen at random and followed for 6 days by women interviewers, to note the utilization of NTFPs and potential substitutes for them in the cooking of meals. In total about one hundred households were involved. The survey took place from January to April 1995: a dry period when the populations were not involved in farming activities and lived on the cereals which had just been harvested.

Choice of markets

]Two markets clusters were used, one in the northern part and the other in the southern part of the study zone. The market survey was organized in such a way that the five or six closest villages in turn provided the market to be studied. In other words, every fifth or sixth day the market was in the same village. One of the markets of each cluster of five or six village markets represented a district market. Like urban markets, the district markets could be better supplied with products and have relatively higher unit prices.

Procedures

The use of NTFPs in the meals was closely observed-the ingredients of each meal, their monetary value and their means of acquisition noted. Analysis has stressed use of the forest products themselves and the substitution of alternative products. The investigation on the markets covered a whole year. The objective was to examine the various products that appeared and to see the price fluctuations during the year.

The same market was sampled every third market day. One objective was to list all the NTFPs that were traded. For this, it was decided to interview systematically anyone appearing on the market as a vendor. The choice of this approach was justified by the size of the village markets, and it favours a complete inventory of all the products. During the investigation, parameters like the nature of the products, their uses, their sources of supply, the quantities handled every market day were noted.

We also purchased samples to determine the weights and unit prices. A descriptive analysis was used to explain the utilization and commercialization of the products. The factors that determined the prices were studied through variance analysis.

Household uses of forest products

Non-timber forest products used in preparation of meals

Observation of the households identified that some 30 NTFPs were used, raw or cooked, and that they came from 17 tree species of the savanna or traditional agroforestry parklands. Two levels of consumption were identified-transformed or raw. The first level concerned the NTFPs that are transformed and generally used as ingredients for meals. The second was snacks or a 'fast-food' form-crude or fresh products that are generally eaten outside normal meal times and often when in the bush.

Sixteen types of meals were observed. In general, forest products were used more frequently than purchased substitutes. The nutrition of the population of this zone is based on maize or millet dough (*tô*), accompanied with a sauce. Four types of meals were the most frequent in the average household: sauce 6 times a week, *tô* 5 times, porridge with cereal 3 times, and couscous with cereal once. The principle ingredients of meals from forest products were young leaves and the fruits. These ingredients can be divided into fats, spices, vegetables and acidic products.

Fats

Szolnoki (1985) reported that as a general rule, the taste and digestibility of some dishes are enhanced by fat, especially karité (shea nut) butter from *Vitellaria paradoxa* fruits. It is the only tree product used as a cooking fat in the households of the zone and is used more frequently than other oils (table 1).

Shea nut butter and oil are used for *tô*-to prevent its surface from drying up, to improve the taste and to make it more appetizing. Another use of shea nut butter that should be mentioned is the frying of fritters and griddle cakes for sale in the markets. The occurrence of this activity in the marketplace was the reason that it was not observed in the household survey.

Table 2. Frequency use of karité butter and other oils (cotton oil, groundnut oil or sesame oil) for cooking in Burkina Faso

	Karité butter (%)	Other oils (%)
Couscous	80	20
Dough sauce (sauce de <i>tô</i>)	89	11
Porridge	100	0
Cereal dough (<i>Tô</i>)	66	34

High-quality shea butter is white, odourless and made from fresh nuts. Stale material results in a dark butter with an unpleasant bitter taste, which has to be disguised by adding garlic or lemon juice.

Local research (IRBET & ISN/IDR 1988) has identified ways of handling shea nuts that result in good quality butter. Further research by food technology laboratories could examine other means of ensuring quality and, hence, value.

The spices

Spices are by definition substances used to season the dishes and give them a better taste. The NTFP used as a spice in the meals is *soumbala*, made from the fermented seeds of *Parkia biglobosa*, or *nééré*. Purchased 'Maggi' sauce and the fermented grains of *Hibiscus sabdarifa* (sorrel) are sometimes used to replace *soumbala*. *Néré soumbola* is used in *tô* 50% of the time and

in couscous 71%; Maggi 34% in tô and 29% in couscous; and sorrel soumbala 16% in tô and not at all in couscous.

Given the low density of *Parkia biglobosa* trees, the fruits are plundered before they are completely ripe. The soumbala obtained from unripe fruit is generally of poor quality. Hasberg & Coulibaly (1989) report that the traditional authorities in Diongolo, a village in their study zone, have set a date for the start of harvest because otherwise the population pillages the *Parkia biglobosa* pods at night. Because of the resulting low quality, housewives tend to use Maggi spices when their purchasing power allows them to do so. Just a small quantity of Maggi is sufficient to improve the flavour. Pasco (1990) reports that women with big families associate Maggi with soumbala to get a better taste for the least cost. The consumption of Maggi spice is not without risk. Stocks are often past their 'sell-by' date and old stock can be the cause of blood pressure diseases, according to local doctors.

Soup vegetables

Soup is the most commonly cooked meal in the houses of the region. Several elements enter into its preparation. However, vegetables are the base that one combines with other products. The leaves of *Adansonia digitata* (baobab) were used in soups 41% of the time and the flower parts of *Bombax costatum* 12%; vegetable products consumed in soups included okra (26%), sorrel leaves (8%), *Ceratotekea sesamoides* leaves (5%), sesame (4%), beans and eggplant (2% each).

In addition, the leaves of *Corchorus* spp., *Securidaca longipedunculata* and *Vitex doniana* are important soup vegetables for the dry season. However, the consumption of these species was not observed during our investigation.

Acid or alkaline products

The cooking of meals such as tô and porridge is based on water and cereal flour. To give these meals a sour or potassic taste, women add some acidic or alkaline products. The former seems to improve the keeping quality of the tô. The results showed that 71% of porridges and 53% of the tô cooking are treated with acidic or alkaline products and that a number of different products were used (table 2).

Table 2. Use frequency of acidic or alkaline products in cooking in Burkina Faso (in percentage)

	Porridge	Dough
Tamarind	47	38
Lemon	30	0
Fermented juices from cereal flour	18	16
Fermented juices from local beer residues	3	6
Potash	1	40

Leaf and fruit products of tamarind (*Tamarindus indica*) are the most commonly used tree products for the souring of meals. Compared with the substitution products, which are cereal or beer residues, juice and lemon, the Tamarind products are the ones most used in the houses. The sourness of juice from beer residues is obtained by keeping it for two or three days. Potash is a filtrate of ashes obtained by calcinating vegetable matter. The composition varies from region to the region.

Household consumption

The average size of a household in the study area was 11 people. Estimates of the quantities and values of tree products used for each meal were obtained during the household and market survey (table 3). The values obtained are clearly higher than Pasco's (1990). This can be justified by the

poor forestry resources of the study zone and the existence of very competitive substitution products.

Table 3. The quantity (g.) and value (francs CFA)* of an average household (11 people) intake of non-timber forest products in Burkina Faso, according to the type of meal

	Sauce		Dough		Porridge		Couscous		Fated rice	
	CFA	g	CFA	g	CFA	g	CFA	g	CFA	g
Karité butter	21	61	14	42	21	62	29	87	86	257
Oil	50	-	61	-	-	-	67	-	-	-
Soumbala of <i>P.biglobosa</i>	21	46	-	-	-	-	17	37	21	46
Soumbala of <i>H.sabdarifa</i>	16	-	-	-	-	-	-	-	-	-
Maggi spice	23	-	-	-	-	-	29	-	33	-
<i>A. digitata</i> leaves	19	188	-	-	-	-	-	-	-	-
Flower parts of <i>B. costatum</i>	20	72	-	-	-	-	-	-	-	-
<i>H. esculentus</i> fruit	32	-	-	-	-	-	-	-	-	-
Leaves and fruit of <i>T. indica</i>	-	-	16	-	17	-	-	-	-	-
Total	202		91		38		142		140	

* 200 CFA francs = USD 1 in 1989

To make a sauce of baobab leaves or from the flower parts of *Bombax costatum*, the housewife should invest 40 CFA francs on average to obtain the main ingredients. This is a high price for women who generally have no profit-making activities, nor any financial support from their husbands for condiments.

Acquisition of the products used for meals

Women most frequently buy karité butter and néré soumbala, rather than obtain the tree products free (table 4). Not all women master their processing. Women, even if they manage to collect the fruits, prefer to sell them fresh and to buy the finished product from processing specialists when they need it. This is because the technologies themselves take a lot of time. The flowers of *Bombax costatum* are less frequently bought, however, because they need no processing. Baobab leaves are bought because they are scarce.

Table 4. Proportion of meal ingredients bought and obtained free

	Bought	Free
"Maggi"	98	2
Soumbala of néré	90	10
Oil	88	12
Leaves of baobab	85	15
Butter	77	23
Okra fruits	69	31
Soumbala of <i>Hibiscus esculentus</i>	65	35
Tamarind	57	43
Bombax	48	52

Potash	18	82
Leaves of <i>Corchorus</i> sp.	5	95
Lemon	0	100

Snacks

The products eaten as snacks by individuals are difficult to quantify and were not recorded in this survey. The main species are, however, known from market surveys and the literature (von Maydell 1983, Pasco 1990) (table 5). The frequency of use and quantities eaten by families have not been estimated.

Consuming fruits direct from trees is important for the nutrition of rural populations, as it maximizes vitamin intake (Szolnoki 1985). Various products are available at different times of the year and complement the basic foods such as cereal dough, which is relatively low in vitamins and minerals. These snacks are therefore important for the health of the people.

Table 5. Tree species contributing to nutrition as snacks in Burkina Faso

Tree species	Product	State and mode of consumption	Production period
<i>Adansonia digitata</i> (baobab)	white pulp that covers the seeds of dry fruit	sucked as snack; ground into flour, and used in juice, added to millet couscous	January-March
<i>Vitellaria paradoxa</i> (karité or shea nut)	pulp of fresh mature fruit	grated directly	June-August
<i>Balanites aegyptiaca</i>	pulp of mature fruit	sucked as snack after skin is removed	November-December
<i>Blighia sapida</i> (akee apple)	fresh aril of the seed	detached from the seed and consumed raw	March-July
<i>Detarium microcarpum</i>	fruit pulp	sucked as snack, fresh or boiled after skin is removed	February-May
<i>Parkia biglobosa</i> (nééré)	powdery pulp	eaten directly as snack or boiled into an edible paste or porridge	March- August
<i>Saba senegalensis</i>	pulp of fruit	sucked as snack	May-June
<i>Sclerocarya birrea</i>	nut	eaten like groundnut	June-August
<i>Ziziphus mauritiana</i>	pulp of the fruit	eaten directly or ground into flour, formed into fritters	January-February
Trees for honey	nectar taken and turned by the bees into honey	consumed directly or as sweetener in other dishes	March-June

These fruits become available at the time that farmers are starting their annual farming cycle and when food stocks are low. This makes them especially important during the cultivation period. Eating these snacks provides the energy for work.

Furthermore, the ground pulp of *P. biglobosa* forms a flour that is often taken to the field as the only meal for the day. Mixed with water into a dough, or bulked up with millet flour, its consumption supplies the farmer with energy, because of its high glucid content in (table 6).

Nutritional importance of non-timber forest products

The chemical composition of some NTFPs has been investigated by several authors: Szolnoki (1985), Bergeret & Ribot (1990) and Pasco (1990), as summarized in table 6.

Table 6. Food value of some non-wood forest products

Data from Bergeret A. and Ribot J.C. (1990), Pasco L. (1990)

* = grams per 100 g of matter ** = milligrams per 100 g of matter

Commercialization of non-timber forest products in Burkina Faso

Two categories of tree products from the parkland and forest savanna, were identified in this study:

- products available for only a very short period (1 to 3 months), which were mostly consumed as snack foods;
- products available for at least 4 months on the markets; these products can be dried or processed for storage and are often the main ingredient of meals

Factors determining product prices

In general, product price is governed by its availability and condition of acquisition, place of origin and the kind of market. Traditionally the ownership of the trees in forest savanna and parkland was communal. Nowadays the ownership of trees in young fallows and parkland is private (Lamien & Bayala 1994). Only people exploiting these lands and their relations are permitted to gather products from these trees.

This study identified three means of product acquisition:

- gathering from the trees in farm land and from newer family fallow lands
- gathering from the trees of old communal fallow lands or by theft from other families' farms
- purchasing from suppliers

The means of acquisition had a significant effect on the price (table 7), the products purchased from a supplier being the most expensive.

Table 7. Average product price per kilogram in 1994/95 (francs CFA) of various non-timber forest products in Burkina Faso, according to the means of acquisition (numbers in brackets = no. of samples)

Products	Personal trees		Communal trees		Supplier	
Néré grains	83.1	(68)	141.5	(16)	161.1	(8)
Soumbala	369.3	(8)	351.3	(47)	437.6	(95)
Néré flour	31.1	(17)	99.0	(2)	185.1	(9)
Butter	170.9	(9)	248.4	(32)	255.5	(89)
Soap	-	-	367.5	(2)	233.1	(95)
Karité nut	31.9	(64)	-	-	41.0	(1)
Honey	249.0	(8)	-	-	-	-
Baobab leaves	98.0	(10)	103.1	(10)	-	-
Tamarind fruit	139.8	(8)	201.1	(32)	243.8	(9)
Bombax flower parts	268.3	(7)	377.7	(29)	-	-
Others	113.1	(94)	165.3	(20)	157.9	(16)

In 1994/95, 500 CFA francs = USD 1

Product price was also determined by the ecological zone. Markets in the north were more expensive than those in the south (table 8). This is related to the northern area being drier (700 mm vs 1000 mm) and having a greater population density (60 vs 9 inhabitants km⁻²). These two factors continue to make tree products more scarce in the northern area. Prices therefore reflect the laws of supply and demand.

Table 8. Average product price per kilogram (francs CFA) of non-timber forest products in Burkina Faso, according to the ecological zone (numbers in brackets = no. of samples)

Products	Northern zone		Southern zone	
Néré grains	151.1	(23)	83.0	(69)
Soumbala	602.8	(42)	330.9	(111)
Néré flour	174.4	(11)	31.1	(17)
Butter	383.6	(33)	199.8	(98)
Soap	287.4	(28)	214.7	(70)
Karité nut	-	-	32.1	(65)
Honey	373.0	(1)	187.0	(8)
Baobab leaves	105.9	(16)	60.0	(4)
Tamarind fruit	208.8	(48)	34.0	(1)
Bombax flower parts	389.2	(29)	194.7	(7)
Others	153.3	(54)	106.4	(76)

In 1994/95, 500 CFA francs = USD 1

Contrary to expectation, and with the exception of shea nut and shea butter, the village markets were not significantly cheaper than the district markets (table 9). Market prices were also strongly affected by the time of year and availability of the products.

Table 9. Price per kilogram (francs CFA) of non-timber forest products in Burkina Faso, according to the type of market (number in brackets = no. of samples)

Products	District markets		Village markets	
Néré grains	100.7	(50)	103.8	(42)
Soumbala	386.9	(48)	414.1	(105)
Néré flour	44.3	(15)	127.2	(13)
Butter	260.8	(42)	240.6	(89)
Soap	259.0	(24)	227.8	(74)
Karité nut	38.7	(19)	29.3	(46)
Honey	280.0	(5)	187.0	(4)
Baobab leaves	80.4	(9)	117.2	(11)
Tamarind fruit	195.1	(22)	212.6	(27)
Bombax flower parts	309.5	(13)	383.2	(23)
Others	140.9	(53)	120.8	(77)

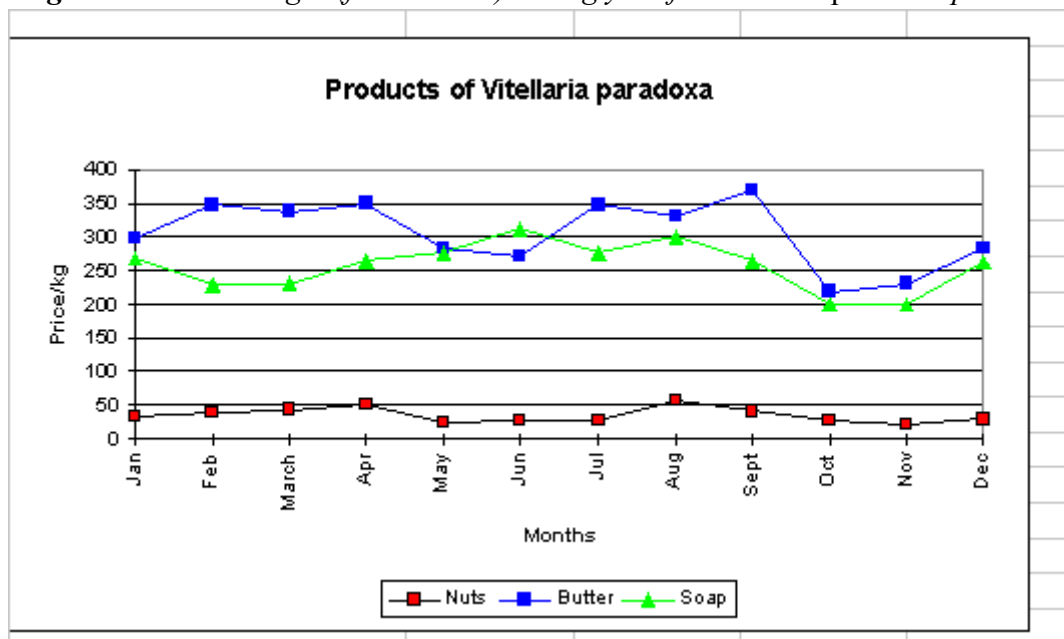
In 1994/95, 500 CFA francs = USD 1

Vitellaria paradoxa

For example, the nuts of *Vitellaria paradoxa* averaged 34 francs CFA, while the butter and soap made from them averaged 306 and 257 francs CFA respectively. These figures compare with those

of Hasberg & Coulibaly (1989) of 69, 345 and 289 francs CFA for the nuts and for yellow and grey butter respectively. The price of the nuts was lowest from May to July, the period of nut harvest (fig. 1). Trading started in August and September, and the price rose with the increased demand as traders intervened. But the demand from the traders did not last because the possibilities of distribution on the regional and international scale were limited and often uncertain. IRBET & ISN/IDR (1988) report that the products of karité from Burkina were detrimentally affected by mishandling, which lowered the quality and price. The period of August to September corresponded to the period when the great majority of the women devoted themselves to roasting and processing their nuts into butter or into soap. This caused a decline of the price of these processed products. Prices then rose again as women became more involved in the cropping activities.

Figure 1. Price changes (francs CFA) during year for *Vitellaria paradoxa* products

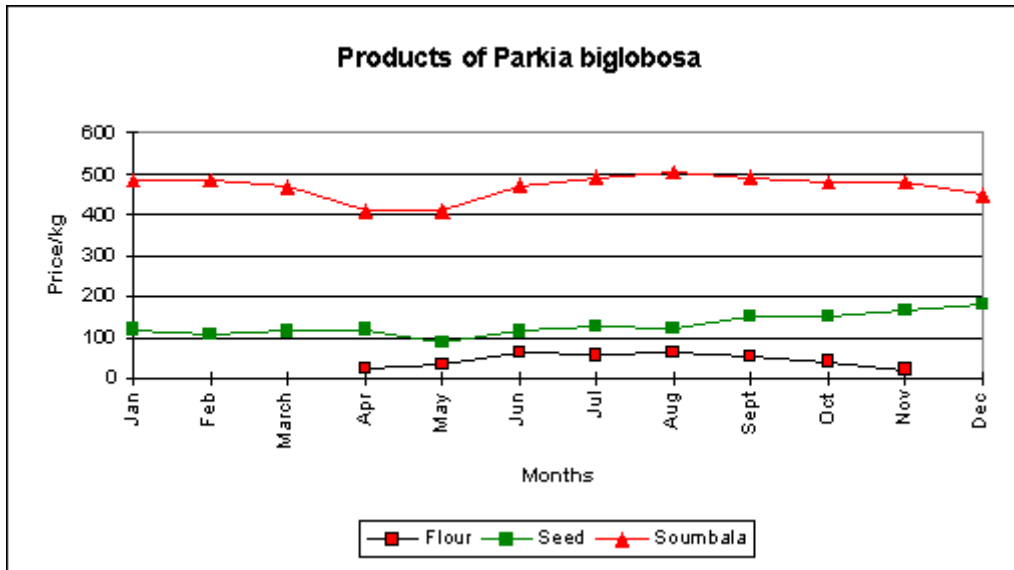


500 francs CFA = USD 1

Parkia biglobosa

The products of *P. biglobosa* are seeds and their by-products: the soubala and the pulp of the pod, which forms a yellow flour. The average price per kilogram is 128 francs CFA for the grains, 477 francs CFA for the soubala and 43 francs CFA for the flour. These prices fluctuate during the year. The harvest is in April-May, when prices are low (fig. 2). After this period, the seed prices increase regularly until they reach a value of about 200 francs CFA in December. The price of soubala rises from 410 francs CFA at harvest to between 450 and 500 francs CFA for the rest of the year. Seed storage occurs while traders wait for this price rise. It logically causes a rise of prices, which then declines as stocks are used to make soubala. The flour is marketed for only 8 months because of storage problems. Its price is highest shortly after the harvest period.

Figure 2. Prices changes (francs CFA) during the year for *Parkia biglobosa* products (1994-95).

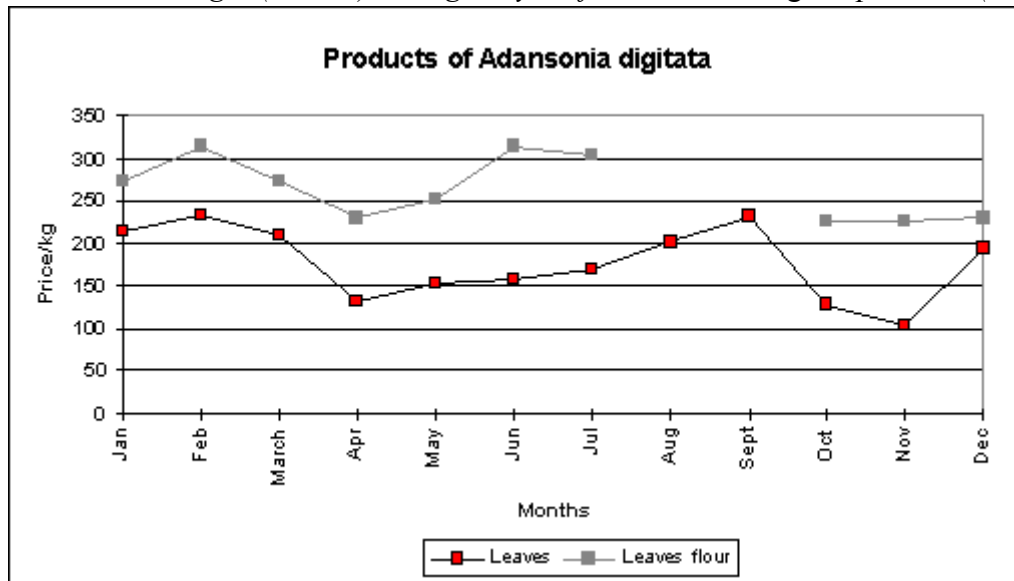


500 francs CFA = USD 1

Adansonia digitata

Young leaves of baobab are available from May to July (fig. 3). The women dry them immediately for storage and use them in January-April, when it becomes more difficult to find soup vegetables. This is associated with a rise of the price of dry and powdered leaves following a growing demand from the traders. The low price in October-November is said to be because the baobab leaves cause lips to crack in the cool season.

Figure 3. Prices changes (F CFA) during the year for *Adansonia digitata* products (1994-95)



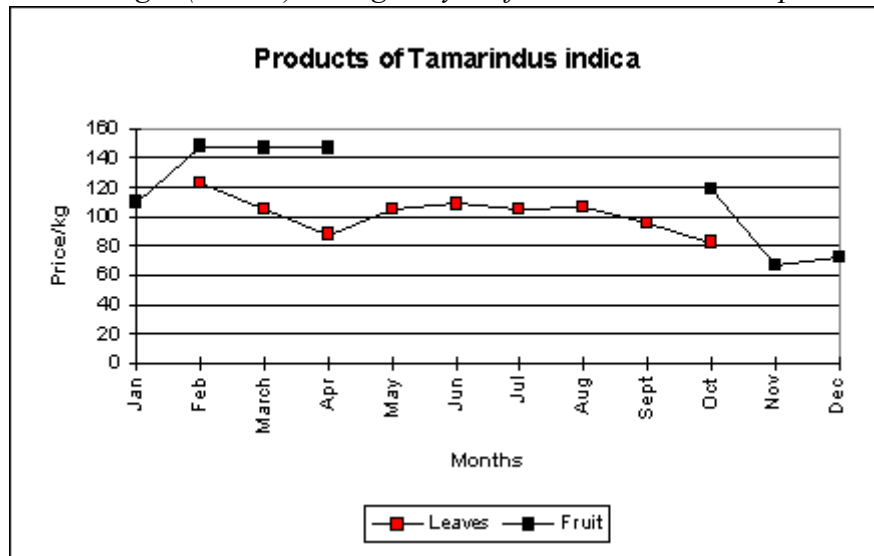
500 francs CFA = USD 1

Tamarindus indica

Fruit and leaves are available in October and May respectively (fig. 4). They both play the same role, that of souring meals, and they can be processed and preserved for a time. The average price per kilogram of fruit is 116 francs CFA, whereas the price of leaves is 102 francs CFA. These values are lower than Hasberg & Coulibaly's (1989), owing to the fact that latter were obtained on urban markets. The fruit prices rise to their highest value from February to April. The period

corresponds to the preparation for Muslim fasting. *T. indica* products are in particular demand to sour or even to sweeten the fasting porridge.

Figure 4. Price changes (F CFA) during the year for *Tamarindus indica* products (1994-95)

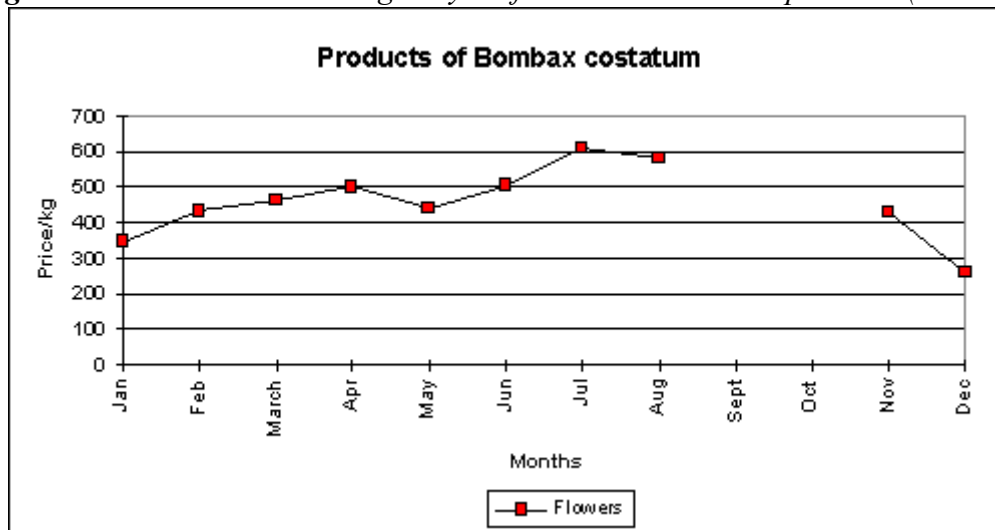


500 francs CFA = USD 1

Bombax costatum

Bombax flowers are used as vegetables for soups. Flowering occurs between November and January when the price is 260 francs CFA, this rising to 580 francs CFA when the product becomes rare (fig. 5). These prices are higher than previously recorded (Hasberg & Coulibaly 1989, Pasco 1990) but this is probably because of differences in availability between years and sites. In this case the higher price seems to be found in sites where the tree is common-so apparently increasing the demand.

Figure 5. Price evolution during the year for *Bombax costatum* products (1994-95).



500 francs CFA = USD 1

In general, we can conclude that the evolution of prices of NTFP during the year conforms to the theory of demand and supply. However, we observe a certain irregularity in the evolution of the prices that can be explained by two phenomena. On the one hand, most of the sales people are not specialists in marketing. A woman will never sell all her stock, even at the moment when the price received by the supplier is at its highest level. On the other hand, as for cereals, groundnuts, farm animals, the stocks of NTFP constitute a kind of saving. The farmer therefore sells only to solve a

problem. *P. biglobosa* seeds, for example, are often exchanged for cereals to bridge a period of poor availability.

Conclusion

We have shown the omnipresence of NTFP in the daily nutrition of the rural population of Burkina Faso. Products from various tree species of the parklands agroecosystem are used as major ingredients of the diet throughout the year and also contribute important snacks during the period when other foods are scarce. Thus, it is clear that these products are extremely important to the welfare and health of the rural population. Despite this importance, the tree products continue to be produced by the traditional practice of fallowing and preserving the useful trees in the subsequently created fields. Tree planting is not a tradition because it is believed that the trees are slow growing and that 'you will not see the fruit of the tree you have planted yourself'. To motivate people to domesticate local tree species, genetic selection is needed to promote faster growth, earlier fruiting and improved yield and quality. It must be mentioned, however, that the corollary of domestication is an increased value for their products. This could occur through expanded trade and better postharvest technology.

Acknowledgement

We could not conclude without grateful thanks to IFS (International Foundation of Science), whose financial support has permitted to carry out this work, and Dr Elias Ayuk, ICRAF agroeconomist and our research project adviser.

References

- Bergeret A. & Ribot J.C. 1990. *L'Arbre nourricier en pays sahélien*. Edition de la Maison des Sciences de l'Homme, Paris. 233 p.
- Hasberg S. & Coulibaly E. 1989. Etude de marché des produits forestiers. Document de travail N° 8 FAO/MET, Banfora, Burkina Faso. 15 p.
- IRBET & INS/IDR. 1988. Séminaire national sur la valorisation du karité pour le développement national: Bilan et perspectives. ICRAF, Ouagadougou, Burkina Faso. 185 p.
- Lamien N. & Bayala J. 1994: Espèces ligneuses des parcs agroforestiers du terroir de Yasso: fonctions dans le système de production agricole et stratégies de leur gestion rapport de recherche. INERA, Bobo-Dioulasso, Burkina Faso. 32 p.
- Ouedraogo J. S. 1995. Parcs Agroforestiers au Burkina Doc. N° 79 Rapport de consultation sur le réseau SALWA-IRBET, Ouagadougou, Burkina Faso. 96 p.
- Pasco L.J. 1990. Utilisation et commercialisation des produits ligneux et non ligneux des essences forestières locales dans le département de Zitenga (province d'Oubritenga). Mémoire IDR Université de Ouagadougou, Burkina Faso. 80 p.
- Szolnoki T.W. 1985. *Food and fruit trees of the Gambia*. Stiftung Walderhaltung and Bundesforschungsanstalt für Forst- und Holzwirtschaft, Hamburg. 132 p.
- von Maydell H.-J. 1983. *Arbres et arbustes du Sahel: leurs caractéristiques et leurs utilisations*. Eschborn GTZ, Germany. 531 p.



Plate 6. A trader purchasing shea nut butter at a village market in Burkina Faso. (photo: N. Lamien)



Plate 7. A lady frying Parkia biglobosa flour cake with shea nut butter (photo: N. Lamien)



Plate 8. Commercialization of soubala (fermented grains of Parkia Biglobosa) at a market in western Burkina Faso. (photo: N. Lamien)



Plate 9. A girl selling soubala in the street (photo: J. Baxter)

4.0 BRIEF DISCUSSIONS ON INDIVIDUAL TREE SPECIES AND FRUITS

According to Jensen's survey, the most important fruit trees in Owambo are for example: *Sclerocarya birrea* subsp. *Cafra*, *Berchemia discolor*, *Diospyros mespiliformis* and *Hyphaena petersiana*. Other important fruit trees known in Namibia are *Schinziophyton* (formerly *Ricinodendron*) *rautanenii*, *Strychnos cocculoides*, *Strychnos spinosa*, *Adansonia digitata*, *Acanthosicyos horridus* among others. Each species is briefly examined in respect to distribution, general biology, the traditional uses and their products, their nutritional values, socio-economic importance commercial potential, domestication potential and what has been, and could be done in the marketing of these fruits and their derived products.

4.1 *Schinziophyton rautanenii*, *Manketti/Mongongo*

Formerly known as *Ricinedendron rautanenii*. This tree seems to be available all over the Kalahari sands of North Eastern Namibia. Although still found in concentrated areas, it depends on certain biophysical factors such as soil types, temperature and altitude.

Description: The Manketti tree is a large tree, 7 - 20 metres in height, the diameter up to 60 cm. It gets its leaves in mid to end October, flowers and begin to bear fruits end October towards beginning of November. The fruit ripens from February to April. The production varies from season to season. Other factors such as temperatures and rainfall influence tree behaviour (Lombard CRIAA 1998).

Uses: The Manketti fruits are used in the following ways:

- Outer flesh/pulp of the plum shaped fruit is a relish, eaten raw or cooked.
- The peel and flesh for production of hot liquor known as *Ombike* or *Kashipembe*
- The nut finely crushed and added to meat/vegetables to make a tasty soup or gravy.
- The kernel or nuts of the seeds are the most valuable parts of the fruit. The nuts yield a high quality yellow oil of which about 60% is used for food and cosmetics. The protein content of the nut is nearly 30%
- The shell of the nuts are used as fuel
- The leaves are used as fodder

Food security: The Manketti fruit is an important source of food to many rural communities. This is particularly true in the case of Bushmen communities who do not practice agricultural activities. In his studies, Lee (1973) indicated that many people still depend more on Manketti nuts than cultivated food. For those who cultivate crops, Manketti supplements their food requirements during the poor harvesting year. Manketti fruits are also exchanged with other products such as millet (Mahangu).

More economic values of Manketti fruits: In addition to bartering for Mahangu, Manketti plays other economic roles. In some areas, such as Okavango, Manketti is exchanged 1:1 with Mahangu. One drum of Manketti fruit costs one drum of Mahangu (San/Valuja) (1998). One may buy a can indirectly with Manketti fruits. 200 l drum of Mahangu cost N\$ 700.00 which may easily feed 10 people for 5 months. One may collect these three drums of Manketti fruits and will be able to feed the family of 10 over a year.

The production of a hot liqueur locally known as Kashipembe and its economic values: This is hot drink made from the fermented fruits. Manketti is the most famous for this in Kavango Region. How to destrier is demonstrated by Lombard's work paper titled San/Vakwangali (1998). Kashipembe/Ombike is produced by many people in Namibia, in northern regions of former Owambo and Kavango regions. In Kavango region Kashipembe costs between N\$ 5 - 13.00 per

litter. While in Windhoek the costs between N\$30.00 and 40.00 per litre. Most of the fruits mentioned below are used to make Kashipembe (known as ombike in Oshiwambo).

Oil extraction: Nuts can be removed from seeds after the removal of the flesh. Traditionally, an axe is used to remove nuts. Recently, a manually operated decorticator (removing the inner part or nut from the hard outer shell) for both Marula and Manketti nuts has been developed, making the process quicker, easier and safer. The actual preparation/extraction of oil from nuts is discussed below. The oil extraction is a potential for job creation in local communities. When people were asked to collect the manketti fruits which are deep in the forests, they are prepared to walk as far as 25 km.

4.2 *Sclerocarya birrea* subsp. *Caffra* (*Marula*, *Omwoongo*)

Description: This is a large tree which grows in the veld. A deciduous, single-stemmed tree up to 10 metres in height with a wide spread rounded crown. Leaves are compound, pale green, aggregated at the end of branches. Fruits ovoid, smooth, pale yellow when ripe. The tree has been described in detail by Palgrave (1978), and Fox and Young (1982).

Distribution: The tree species occurs in many countries of Southern Africa. It is mainly found in frost free and relatively warm areas with sandy to loamy soils (Fox and Young, 1982). In Namibia it is found in northern parts of the country. Although it also grows in the veld, it is usually found in the field or near settlement areas. It is commonly found in the Oshana, Omusati, Ohangwena, Oshikoto, Okavango, Caprivi and part of Otjozondjupa regions.

Uses

Wine: The tree produces an outstanding and famous wine (marula wine). The wine comes about when the juice is squeezed out of the marula fruits. Fermented for a few days (depending on individual trees' taste). Thereafter the wine is properly cleaned by sieving the liquid. It has been reported that this drink has a high content of vitamin C. The alcohol content is quite high. It is estimated to be up to 15% per volume, depending on the individual tree and the period the liquid has been fermented for. It is believed that Marula wine increases people's appetite. This is very famous in northern Namibia (Ovambo). So far, extraction of marula wine has been only a woman's job. CRIAA SA-DC Marula Oil Production Project (1998) developed a press to process Marula oil which easily extracts the juice from fresh Marula fruits, being at least twice as quick and with nearly twice the yield as the traditional method.

A second drinking product from marula fruit is a very sweet and almost non alcohol drink. One may compare it with appletizer or other fruit juices from the domestic fruit trees. It is prepared as follows. Immediately when the cover of fruits are removed from the seeds, the seeds are put in a container (normally clay pot), water is added (20 litre for 10 litre container full of seeds) and left for about 12 hours. This becomes a very sweet and non-alcoholic drink. This is usually a drink for children.

Nuts and Oil: Marula seed comprises a hard cover and kernel. It is quite hard to remove nuts from the seed. It is a woman's tasks to remove nuts. They use an axe to open a seed on one side. They use a tool made of iron to remove the nuts. The embryo is really delicious and so highly priced that it is given to special guests. In some parts of South Africa they have been given called 'food for kings' (Junod, in Fox and Young, 1982). These nuts (omaxuku) are mixed with *Mahangu* cake to make a very delicious food. Until very recently, elders have recommended that children should eat such nuts as they say that if a young person makes a habit of eating such nuts he/she will have an uncontrolled appetite for food. So, such a youth may end up stealing other people's food because he/she will feel that the food he/she gets at home will not be enough for him/her.

The embryos are so rich in oil that this can be expressed by squeezing. The nuts are prepared in large quantities of 0.5 kg and more. They are put in the mortar then stamped with pestles. Tactfully, a woman squeezes several times until a considerable amount of oil is separated from the residue known as *edi*. The oil is very highly priced. They are given to special guests with special dishes. In all important feasts, such as a wedding ceremony, marula oil is one of the special foods and the organisers have to see to it that they are available (refer to 4-O regions). Local markets are available for this purpose.

Jam can also be produced from Marula fruits (Ministry of Agriculture, Water and Rural Development, Project on Indigenous Fruits, (1999)).

Economic role: All these products, wine and unprocessed kernels and oil, are now available in open (informal) markets in the country. Marula wine is now sold between N\$5 to N\$10.00 per litre (confirmed at Oshakati Omatala open market, March, 1999). In African restaurants in Windhoek, Marula wine is one of the products preferred by many people. The price of Marula wine at this restaurant is N\$15.00 per litre. The same fruits have been developed in South Africa and mixed with cream to make up a famous liqueur known as Amarula. With regard to kernels, there are nine women's groups in northern Namibia involved in oil production. The total number of women involved in these cooperatives are about 1000 women. It has been noticed that, to a great extent, these women do manage themselves showing that there is good scope for a large and effective economic operation in the near future.

In 1997, about 3500 kg of kernels were collected and sold at N\$ 12.00 per kg. The oils are used for cosmetic production in Europe. For this reason, a Trial Marula Oil Production Project came up with a Marula oil processing tool known as prototype 2 press. The press is robust and made principally from scrap metal and has an excellent chance of performing well in rural setting (CRIAA SA-DC 1998). Such work is taking place at Katutura in Windhoek. Oil is sold at +-N\$ 100.00 per litre. This is exported to Europe for pharmaceutical purposes. The trial marula oil project shows that interest in Marula oil from commercial parties is as strong as ever, and negotiations with premier potential buyers show that the project is on the verge of an important commercial breakthrough. The project also brought to light that Marula oil and kernel contains at least one powerful antioxidant and this is regarded as a major marketing benefit. It is expected that this year more than 20 tonnes will be collected.

It is clear that there is tremendous economic potential from the use of the marula fruits. It is necessary to formalise the extraction of marula wine and expand the mechanical extraction of oil from marula kernels. This will add more value to the tree and will enable many people to protect and increase a number of the tree species.

4.3 *Adansonia digitata* (Baobab) - *Bombacaceae*

Description: Baobab is one of the famous and well known trees in many parts of the dry zone of Africa. The tree has a very thick stem with a sparse wide spreading round crown. It reaches up to 15 m in height. For a detailed description, see Fox and Young (1982).

Distribution: It is found in the east and southern part of Africa. In Namibia, the tree is found in the north-west, mainly in Omusati region, but also in isolated cases in other northern regions. It also occurs in east Bushman land Leger (1998).

Uses: The pulp around the seed is eaten when dry. The pulp is left in water to soften and mixed with milk and mealie meal to make a very delicious porridge. Wehmyer (1976) reported that the fruit is rich in vitamin C. Although not very commonly used in Namibia, the bark of baobab are used for fastening thatched grass on the roofs. Palgrave notes that white powder from this fruit can be made into a refreshing drink. He further states that fresh leaves are cooked as vegetables in Zimbabwe.

However, in Namibia's case, there is no mention of leaves being eaten in any form. Furthermore, trees are described in full details by Palgrave, Le Roux, Leger and Fox and Young 1982). In Malawi, local communities produce a soft drink from the fruits and lessons can be learnt from this (GTZ funded Community forestry project, 1997-ongoing).

Economic role: They are sold at informal markets where they cost from N\$ 0.50 to 1.00 per fruit. Unless more efforts are made to promote the fruit, it is unlikely that the fruit will play a significant economical role in the near future.

4.4 Ziziphus mucronata (*Buffalo thorn tree*)

Its sourish fruit is used for making a hot liqueur (Ombike). Due to its taste, it is not consumed raw. Like other fruits, this fruit may play an economic role if the hot liqueur is legalised. Apparently, due to excessive and unmeasured amount of alcohol in Ombike, the government does not encourage its production. However, this is the main source of income among many poor families. An acceptable way of distilling? has to be found so that poor people can continue to get income from this hot but liked alcoholic drink.

4.5 Diospyros mespiliformis (*Jackal berries*)

It is also known as African ebony or Omwandi. It is a large tree up to 25 m in height with large stems up to 45 cm in diameter. It grows wild in northern Namibia and stretches from Kunene to Caprivi region. It is found on clay to loamy soils. Fruits are round berries, crowned with the persistent style, yellowish when ripe. The fruit pulp is soft and very sweet. People do collect the fruits during winter. Normally consumed while fresh especially the sweetest ones. The remaining fruits are dried and consumed at a later time. They are either eaten raw with no special preparation or are pounded, powder mixed with boiled water and millet meal to make up a very sweet and delicious porridge (oshihenyandi) which is liked by many people, especially during the dry period. Furthermore, fruits are fermented for the famous hot liqueur - ombike. This is sold at the price of N\$30.00 per litre.

4.6 Hyphaena petersiana (*Makalani palm*)

Description: Trees are quite tall - 10 - 20 metres. This tree species is found in many parts of Namibia. It covers the northern commercial area of Grootfontein, Tsumeb and Outjo. Its main base is the north-central region - formerly known as Owamboland. They grow along seasonal water bodies locally known as 'Oshanas'. These trees are not fond of Kalahari sand. They like clay and salty soil on the cuvelai flow.

Economic role

Leaves: Shredded into thin strips and used for weaving baskets. Baskets are exported mainly to RSA. They also play a role in the tourism industry. It is one of the products that European tourists are looking for in Namibia.

Fruits: The pulp around the seed is edible. It is quite difficult to pick these fruits from trees. Fruits are eaten in raw form or made into a hot liqueur, as explained below.

Wine and brandy: Palm wine is made by cutting the terminal bud of the fan palm. Unfortunately, the process ends in the death of the plant. It is, therefore, formally forbidden in the country. Many people are still violating this regulation. Although the tree grows slowly, it can be planted and purposely grown. Palm fruit is one of many fruits that can be fermented for a few days so as to make a valuable brandy locally known as *Ombike*. The price of a litre of ombike is about N\$25. - 30. 00.

The seeds may also be carved into small carvings. In the absence of fuelwood, palm seed is used as fuel for cooking in many parts of Northern Namibia.

4.7 Other tree species that provide fruits in Namibia include:

4.7.1 *Strychnos cocculoides* (Monkey Orange)

The plant occurs in Kalahari sand area of Namibia. The fruit is the size of an orange but the outer cover is relatively hard. Many people eat the fruits especially bushman communities. The fruits are also sold on the road side at about N\$ 0.50 to 1.00 per fruit. Economic role will remain locally based.

4.7.2 *Guibourtia Colesperma* (Large false mopane)

Fruits are edible fresh and used to make hot liqueur.

4.7.3 *Ximema Caffra* (Large sour plum)

Fruits are consumed fresh and also used to make a juice. Nuts can be used to produce oil for body ointments.
