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Full Length Research Paper

Evaluation of the Marketing Chain of *Parkia biglobosa* (Jacq. Benth) R. Br. ex G. Don in South-West Nigeria

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Abstract
The study evaluates the various activities of the marketers of *Parkia biglobosa* (Jacq., Benth) along the marketing chain in Ekiti, Oyo, Ogun, Ondo, and Osun States of Southwest Nigeria. Multistage random sampling technique was used to select six study sites within each of the States in the order of three Local Government Areas (LGAs) and two villages randomly selected from each of the three LGAs to make a total of thirty (30) study areas . One hundred and fifty respondents that involved in the processing and marketing of *P. biglobosa* were sampled for data collection. Structured questionnaire was developed for the respondents and administered through individual and Focus Group methods. Also, interview of the respondents was conducted to supplement the data obtained from the questionnaires. The trade of *P. biglobosa* was in two stages; first is the marketing of *P. biglobosa* dry seeds while the second stage was the marketing of the processed (fermented) seeds. The processing activities at each of the stages take great experience and time, as well as labour. This is mainly done by both children and women. The dried seeds are sold to the village merchants who later sold to the wholesaler for onward sale to the retailers. The finished fermented products were shaped by hand and sold to the retailer who buys in dozen. Selling by the retailers is by hawking the products wrapped in nylon and in boxes or calabash. There were increases in the selling prices of the processed and unprocessed seeds from the farm gate to the final consumers. It was recommended that simple and easy to use technology that will facilitate good hygiene practices should be developed for the processing and packaging of the Parkia products. The traders also needed to be educated and familiarized with good hygiene practices.

Key words: *Parkia biglobosa, value chain analysis, dozen price, intermediaries, processed / fermented seeds*

Introduction

Non-timber Forest Products (NTFPs) can be referred to as all the resources that may be extracted from forest ecosystem and are utilised within the household or are marketed or have social, cultural or religious significance (FAO, 1988; 1995; 2001). Within the overall set of NTFPs, the vast majority of species/products are consumed directly by the people that collect them, or are traded in small quantities. NTFPs are harvested for both subsistence and commercial use either regularly or as a fall back during times of need. They also add to people's livelihood security, especially for rural dwellers. NTFPs also have cultural significance and value (Cooks & Wiersum, 2003).

Parkia biglobosa (Jacq. Benth), popularly known as locust beans, belongs to the family, leguminosae and the subfamily Mimosoideae (Hopkins 1983). Some major synonyms for *P. biglobosa* are *P. oliveri*, J.F Macbr, *P. clappertoniana* (Keay, 1989). *P. biglobosa* is found in nineteen African countries: Senegal, The Gambia, Guinea Bissau, Guinea, Sierra Leone, Mali, Côte d'Ivoire, Burkina Faso, Ghana, Togo, Benin, Niger, Nigeria, Cameroon, Chad, Central African Republic, Zaire, Sudan, and Uganda. The use of the fermented beans of African locust bean dates back many centuries and was already described in the 14th Century (Sina & Traore, 2002). *Parkia biglobosa* species has important socio-economic and cultural values for local people. It is a food species whose importance is well recognized both regionally and internationally. *P. biglobosa* is an important tree species which generates non-timber forest products. It is a basic and therapeutic food and is a source of wealth. The pulp of the fruit pods is rich in sucrose and the seeds are rich in carbohydrates, proteins and lipids, thus constituting an important source of energy. In association with crops, the species help to enrich physico-chemical soil characteristics which in turn help to increase crop yields.

The tree of *P. biglobosa* is medium-sized and up to 20(–30) m tall. Leaves alternate, up to 30(–40) cm long. Inflorescence a pendulous head arranged racemosely and fruit is linear-oblong pod. The seeds are embedded in yellowish endocarp with distinct pleurogram on lateral face, testa hard, smooth, glossy dark brown. Trees start flowering at 5–7 years while still comparatively small. They reach their maximum height after 30–50 years, and can reach an age of 100 years. African locust bean flowers in the dry season in the Sahel region from December to April, slightly earlier in less dry regions. Flowering coincides with loss of leaves; new foliage develops after peak flowering. The flowering period lasts 3–8 weeks depending on the region. Mature fruits develop by April to

May. However, 2 periods of flowering and fruiting per year may occur (Sina & Traore, 2002).

The uses of the different parts of *P. biglobosa* have been identified by various authors (Campbell-Platt, 1980; Booth and Wickens, 1988; Abbiw, 1990; Sina & Traore, 2002). Fermented seeds ('soumbala', 'dawadawa', 'netetu') serve primarily as a condiment for seasoning sauces and soups. Medicines derived from *P. biglobosa* are of value to a rural community that cannot afford or have access to "modern medicine". In West Africa the bark, roots, leaves, flowers, fruits and seeds are commonly used in traditional medicine to treat a wide diversity of complaints, both internally and externally, sometimes in combination with other medicinal plants. The bark is most important for medicinal uses, followed by the leaves. Medicinal applications include the treatment of parasitic infections, circulatory system disorders, such as arterial hypertension, and disorders of the respiratory system, digestive system and skin. In veterinary medicine, a root decoction is used to treat coccidiosis in poultry. Throughout the dry season, the green leaves of *P. biglobosa* remain on the tree, a valuable source of animal fodder. Farmers will trim the lower branches of the tree and feed them to their livestock. Sabitti and Cobbina (1992) investigated *P. biglobosa* and compared the nutritional value to other savannah species trees and found the leaves had a high amount of crude protein and high-energy value, key criteria for good quality fodder. The seeds are added to poultry feed after treatment to remove their antinutritional properties. The leaves are a useful, but not very palatable fodder. They are mixed with other feed because the concentrations of phosphorus, magnesium and sodium are too low. The wood is suitable for making kitchen implements, such as mortars, pestles and bowls, and handles of hoes and hacks.

P. biglobosa is used for charcoal production and firewood, although the fruits and seeds are considered more economically important than this. It is occasionally also used for house building, mainly for indoor construction, also used as firewood, and may be suitable for paper production. The fibres of pods (husks) and roots are used as sponges, strings of musical instruments and for the production of small baskets. African locust bean has a reputation for soil improvement; its leaves are applied as green manure. It is also important in apiculture (beekeeping), being a good source of nectar and suitable for the placement of hives. African locust bean is very important in West African culture. It plays a role in all major rituals, including those associated with birth, baptism, circumcision, marriage and death. It may serve as a decorative avenue tree. Roasted seeds are used as a coffee substitute known as 'Sudan coffee' or 'café nègre'. Ground seeds are mixed with *Moringa oleifera* Lam. leaves to prepare a sauce, and are also used to make doughnuts. The mealy pulp from the fruits is eaten or is mixed with water to make a sweet and refreshing drink rich in carbohydrates. Boiled pods are used to dye pottery black; the ash is applied as a mordant. The bark is rich in tannins and may be used for tanning hides, but the resulting leather is often of moderate quality especially with regard to colour, which is often reddish, uneven, and darkens when exposed to light. The leaves are sometimes eaten as a vegetable, usually after boiling and then mixed with other foods such as cereal flour. Young flower buds are added to mixed salads Burnt pod husks are used in Senegal as an adulterant of, or additive to, tobacco (adding pungency). Green pods are crushed and added to rivers to kill fish. The nutritional value of the fish is not adversely affected so long as they are cooked or dried.

A value chain in the marketing of a product describes the full range of activities required to bring a product from the producer to the consumer, emphasizing the value that is realized and how it is communicated (Marshall, *et al.*, 2006; Vermuelen *et al.*, 2008). Different literatures use the terms 'supply', 'value' and 'marketing' chain. The terms differ slightly in their emphasis. 'Supply chain' is favoured by economists to highlight issues of competitiveness (Porter 1985), industrial organization and clustering. In conducting the value chain analysis, one need to identify the main actors and the flows of products, money and other necesary information.

Marketing chain of NTFPs involve a large number of different actors. It is only in the shortest chains that the producer harvests the product, carries out the processing and sells the product to the final consumer. In all other chains, different activities are carried out by different individuals, groups or organizations. However, it is often the case that a particular actor is engaged in more than one activity. The major actors include the producers that engage in planting of the produce or the wild extractor; the middlemen who are the wholesale and retail traders, and the village merchants; and the ultimate consumers. Understanding the specific role of each actor is essential if conditions for the poorer actors in the chain are to be improved. In an equitable chain, all actors should be reasonably compensated for their contribution, including labour, technical expertise, marketing skills and so on. (Vosti, *et. al.*, 1997; van Dijk, 1999; Humphrey, 2000; Marshall, *et al.*, 2006).

There are several advantages to market actors if small-scale producers can access modern as well as traditional markets. Consumers are increasingly demanding locally produced food, and food that is produced and traded fairly. Governments are also looking for sustainable models of rural development that bring the best and widest benefits to society. For these reasons, improving market potentials and finding ways to include small-scale producers can be a sensible business strategy. Yet, businesses are often unable to achieve this on their own (Vermuelen *et al.*, 2008).

The potential contribution of forests to poverty reduction is the subject of some debate (Mayers and Vermeulen 2002; Oksanen *et al.*, 2003; Bird and Dickson 2005). At one level, industrial forest operations can contribute to poverty reduction through national economic growth and, more directly, by providing employment for poor people. At another level,

forests can be an important source of subsistence support for low-income households living in and adjacent to forests. Many studies document the fact that forest-dependent people often have few options except to gather and hunt NTFPs for their food, medicines and cash income (FAO 1995; Falconer 1996; Ros-Tonen 1999). Nevertheless, our understanding of the role of forests in rural development remains limited, and it is not clear whether a high level of current forest dependence necessarily corresponds with a high potential of using forests to reduce poverty in the future (Angelsen and Wunder 2003). What is certain is that there are many emerging opportunities for pro-poor forest activities to complement and strengthen key components of livelihoods and poverty reduction. These are not without their challenges. There is a pressing need to facilitate specific interventions that enable forest resources to play a greater role in livelihoods through improved local forest governance.

Marketing of NTFPs at the local level are not well known, but are thought to have significant impact on rural economies. In evaluation of marketing of NTFPs, it is important to understand the channel of distributions and how profit is made by different actors. A few of the edible forest products are prominent enough to generate national economic data. The study therefore evaluated the different marketing networks of *P. biglobosa* starting from the point of production with the view to improving the trade and rural economy and facilitates product development.

Methodology

Sample size and methods of data collection

Five states in Southwest Nigeria (Ekiti, Oyo, Ogun, Ondo, and Osun) were selected for the study (Fig. 1). Multistage random sampling technique was used to select six study areas within each of the States in the order of three Local Government Areas (LGAs) and two villages randomly selected from each of the three LGAs to make a total of thirty (30) study areas. One hundred and fifty respondents that involved in the processing and marketing of *P. biglobosa* were randomly sampled. Structured questionnaire was developed for the respondents and administered through individual and Focus Group methods. Also, interview of the respondents was conducted to supplement the data obtained from the questionnaires. The study of marketing and channel of distribution of the *P. biglobosa* started from the point of production, and this was monitored up to the sale of the dry seeds at farm gate, processing of the dry seeds to fermented product, and eventual sale of the final products by retailers to the consumers. Purposive sampling method was used to select local markets where *P. biglobosa* were sold. Contributions of the *P. biglobosa* to the middlemen, as well as its potential to the livelihood of the rural economy were also evaluated.

Data analysis

Descriptive analysis include the use of frequency, percentages, photographs and charts.. Mathematically, profit level of the products was determined from the difference of the purchase and selling prices with other external factors held constant.

$$\prod = CP - SP$$

Where: $\prod$ = Profit; CP = Purchase price; and SP = Selling price

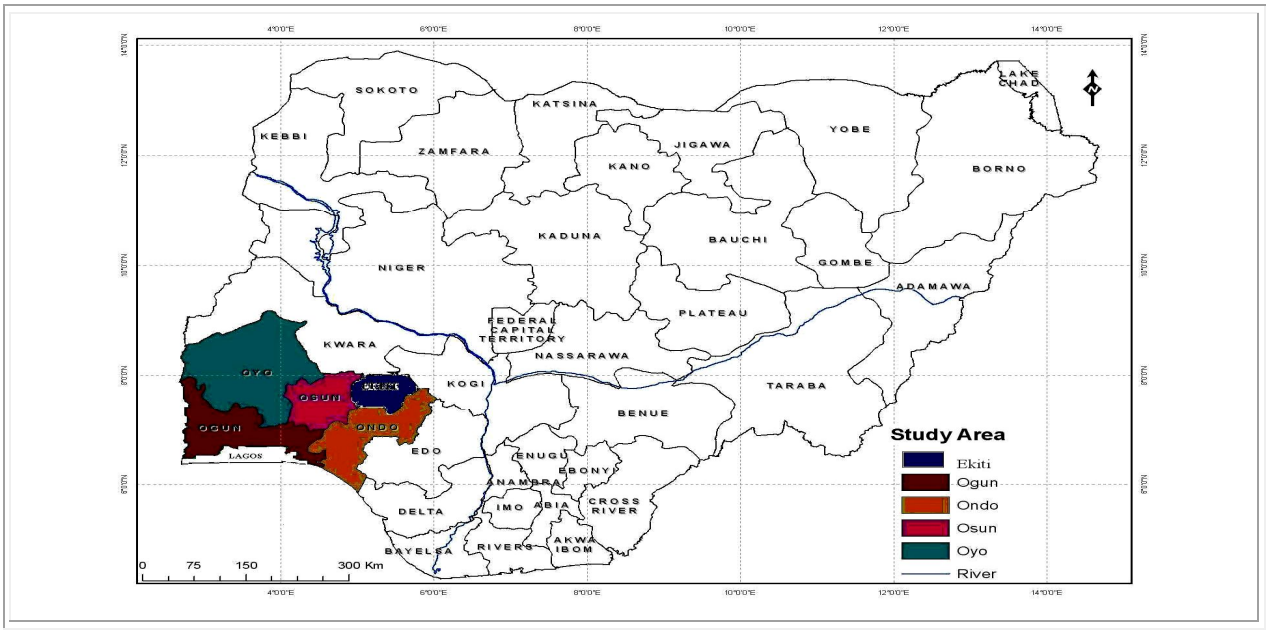

Fig. 1: Map of Nigeria showing the selected States in Southwest Nigeria

Results and Discussion

Production of P. biglobosa

The tree of Parkia is normally found in the savannah region but not planted in most cases, rather spared during land preparation for farming. This means that the tree of *P. biglobosa* is widely distributed in the wild, fallow land, and agricultural land. People still regard *P. biglobosa* as an important natural local resource. Only under dire economic circumstances are farmers compelled to destroy the trees. *P. biglobosa* usually is protected on farmlands, though the present deteriorating economic situation and poverty force some farmers to sacrifice the tree for charcoal or firewood. The immediate and somewhat desperate needs outweigh the long term and diverse value of trees and *P. biglobosa* as a resource. The tree provides financial benefits, and the many diverse uses and traditional regard still have enormous value.

Demographic characteristics of the traders of P. biglobosa

As indicated in Table 1, all the traders of the *P. biglobosa* were female with majority in the age bracket of 31-40 years. The traders were married and trading was their major occupation. Many of the traders did not have formal education and were indigene of the area where they engaged in marketing of the *P. biglobosa* products.

Table 1: Demographic characteristics of the traders of *P. biglobosa* in South West Nigeria

Variables	Frequency n = 150	Relative frequency (%)	Mode
Gender			
- Male	0	0	Female
- Female	150	100	
Age distribution (years)			
- 20-30	12	8.0	
- 31-40	50	33.3	
- 41-50	40	26.7	31 – 40 yrs
- 51-60	38	25.3	
- >61	10	6.7	
Marital status			
- Single	12	8.3	
- Married	138	91.7	Married
- Widowed	0	0	
- Divorced	0	0	
Major occupation of the traders			
- Farming	55	3.3	
- Trading	145	96.7	Trading
- Civil servant	0	0	
- Others	0	0	
Highest Education status the traders			
- No formal education	107	71.7	
- Primary	43	28.3	
- Secondary	0	0	No formal
- Adult educ	0	0	education
- Diploma	0	0	
- Degree	0	0	
Nativity of the traders			
- Native	117	78.3	Native
- Immigrant	33	21.7	

Processing of Parkia

Series of stages are involved in the local processing of the Parkia seeds. The processing activities at each of the stages take great experience and time, as well as labour. This is mainly done by both children and women. The local processing of *P. biglobosa* fruits and seeds are divided into the following stages:

a) **Collection of ripe fruits:** The preparation of Parkia bean seed is a traditional family art practiced with rudimentary utensils (Adedokun, 2006). Like the *V. paradoxa*, women and children are also principally responsible for the collection and gathering of Locust bean fruits. Ripe and mature fruits are collected mainly as windfalls. In some cases, matured fruits are harvested with long stick. These are then gathered in sacks and tie in bundles for easy transportation.

b) **Dehusking and seed removal**: In most cases, the fruit valves are opened with hand by removing the fibrous strand extending from the base to the apex, and the seeds with adherent pulp (yellowish endocarp) are removed. The pulp containing the seeds are pounded and sieved

through a coarse mesh, and subsequently washed to remove the pulp completely in the river or flowing stream (Sina & Traore, 2002).

c) **Seed drying and storage:** The washed seeds are then dried in the sun for and impurities removed for proper storage in sacks and other air-tight containers.

d) **Seed separation and dehaulling:** The dried seeds are boiled in water in a covered earthen ware or metallic pot for 12-14 hours to soften the seed coats or testa (Adebayo, 1993). The boiled seeds are put in a mortar and pressed by foot or rubbing between palms, sand or other abrasive materials to separate the cotyledon from the testa. Wood ash is added, then washed thoroughly and the testa removed from the soft cotyledon using basket or perforated calabash. As this operation requires the use of large quantities of water, it is usually carried out at a source of constant water such as stream or well. The washed beans are boiled again for 2 hours in a metallic pot. Potash, a softening agent locally called "kaun" in Yoruba, may be added during this second boiling to aid the softening of bean cotyledons. A native potassium carbonate and bicarbonate is added again (Adejumo, 2008).

e) **Fermentation:** After the second boiling, hot beans are drained with the use of raffia sieves or baskets and spread on clean calabash trays. The beans are then covered with leaves or other materials to generate warm that aid fermentation process. The calabash trays are stacked together usually about 2 or 3 and wrapped in layers of jute bags to provide warmth and humid atmosphere. The seeds are then left to ferment for 24 hours or longer. Fermentation is usually a spontaneous bacterial fermentation under alkaline conditions. During fermentation process, bean cotyledons changes colour from light brown to dark brown or ash colour and become soft (Odunfa, 1983; Omafurbe *et. al.*, 2004; Adejumo, 2008).

f) **Final products:** Two types of local condiments are produced from the fermented seeds depending on the moisture content level. The fermented seeds were either dry in the sun for further storage or left moist and soft, pressed with hand, and ready for market. During drying, salt or ash can be added to improve the flavour (Sina and Traore, 2002) or to enhance preservation and prolong the shelf life of the product while in storage (Adejumo, 2008).

Marketing Chain of Pakia biglobosa

The trade of *P. biglobosa* was in different forms starting from the dry seeds to the processed (fermented) seeds (Fig. 2). The fermented seed is popularly used by different tribes in Nigeria as seed soup seasoning and commonly known as *iru* in Yoruba, *ogiri* in Ibo, and *Dadawa* in Hausa. The trade of *P. biglobosa* has two marketing stages: marketing of the unprocessed fruits and the dry seed, and marketing of the fermented seeds products. For the first stage of marketing, the mature fruits were allowed to drop from the mother tree and mainly gathered by women and children on the farm or from the wild. Sometimes, adult men can climb the trees to collect the fruits. The unprocessed fruits were sold in bundles, but this may not attract good pricing and profit, producer therefore preferred to add value by dehusking, washing and drying the seed which is then sold in bag, basin. The dried seeds are sold to the village merchants who later sold to the wholesaler for onward sale to the retailers.

The dried seeds are sold to the village merchants who later sold to the wholesaler for onward sale to the retailers. The finished fermented products were shaped by hand into different shapes and sold to the retailer who buys in dozen quantities. Selling by the retailers is by hawking the products wrapped in nylon and in boxes or calabash.

Marketing of processed *P. biglobosa* marked the second marketing stage. The finished fermented products were shaped by hand into different shapes from round to oval, and flat-round. This is then either kept in calabash and cover with nylon or leaf, or kept in boxes. These are then sold to the retailer who buys in dozen quantities. Selling by the retailers is by hawking the products wrapped in nylon and in boxes or calabash. The wholesalers also have a gathering section in some local markets where retailers and individuals can come and buy the products in dozens and at cheaper rate.

Buying in dozen attracts additional two units of the product, that is, a dozen of the fermented product is twelve units and addition of two units. In other words, a trader who bought a dozen of the fermented product from the wholesaler gets fourteen (14) units as dozen, twenty eight (28) units as two dozens, and so on. The additional money obtained on the two added units as well as profits obtained from selling of the 12 units add up to the profit made by the retailers and hawkers of processed locust beans; meaning the more dozens they sell, the more the profit.

Selling prices along the Marketing Chain

For the first stage of marketing channel, selling of the Parkia seeds at the local level employed the use of local unit measurements like of bag (50kg jute bag), basin and bowl (a basin contains eight bowls). On the other hand, the second stage of the marketing of the processed (fermented) products employs counting of the hand-shaped or wrapped (in nylon or leaf) product. Selling prices varies among the intermediaries and the stages of production (Table 2). For instance, average price of a bag of Parkia seeds which was sold at the farmgate by the producer for 1,250 is sold for 3,250 by the Village merchant (about 160% increase). For the fermented product, a dozen is sold for 110 by the processor while the same dozen was sold for 210 (about 91% increase) by the retailer.

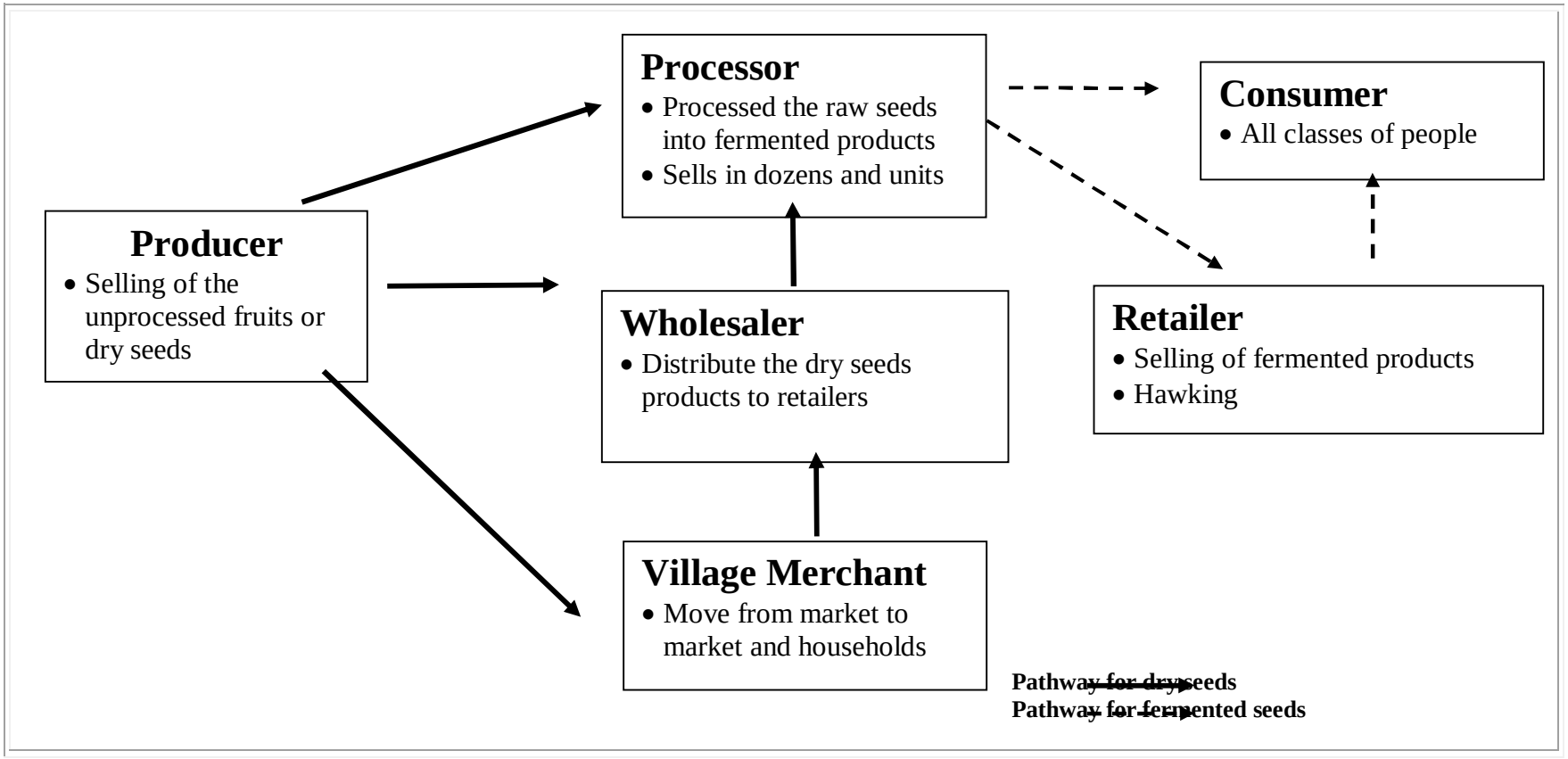

Fig. 2: Marketing Chain of *P. biglobosa* products by the intermediaries in South-west Nigeria.
(Source: Field Survey, 2008)

Table 2: Selling Price differences between the intermediaries of the trade of *P. biglobosa* in Southwestern Nigeria

S/N	Variables	Producers			Village merchant			Wholesaler		Processor		Retailer	
	Unit of measurements	Bag	Basin	Bowl	Bag	Basin	Bowl	Basin	Bowl	Dozen (14 units)	Unit	Dozen (12 units)	Unit
A.	Price Range (Naira)	1,000 – 1500	800 – 1,000	100 – 120	3,000 – 3,500	1,600 – 2,000	200 – 220	2,500 – 3,000	300 - 500	100 – 120	7.1 – 8.6	140 - 280	10 – 20
B.	Average price (Naira)	1,250	900	110	3,250	1,800	210	2,750	400	110	7.8	210	15

Units of measurement: 1 bag (50 kg) = 2 basins (approx. 25 kg/basin) 1 Basin = 8 bowls (approx. 2.5 kg/bowl) Dozen = 12 units [Source: Field survey, 2007 – 2008]

Conclusion

The processed seed of Parkia has very high socio-economic importance, although the processing and marketing is still at the local level and weakly organized. The local management therefore deserves more attention in terms of production, processing, packaging and marketing. The need for initiatives and technology to improve the products is pertinent. For value addtion of Parkia products, appropriate technology needed to be developed at the local level for processing and packaging of the seeds and pulp. The pulp presently has little or no utilisation while the processing of the seeds is largely unhygienic. Simple and easy to use technology that will facilitate good hygiene practices should be developed for the processing and packaging of the seeds. The traders also needed to be educated and familiarized with good hygiene practices.

An evaluation of the genetic constitution and production capacity of *Parkia biglobosa* populations within the entire area of distribution is needed as a basis for developing sustainable management systems while meeting the demand for the products.

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