

# **A survey on pineapple quality problems and postharvest losses in Benin**

PEF White Paper 19-03

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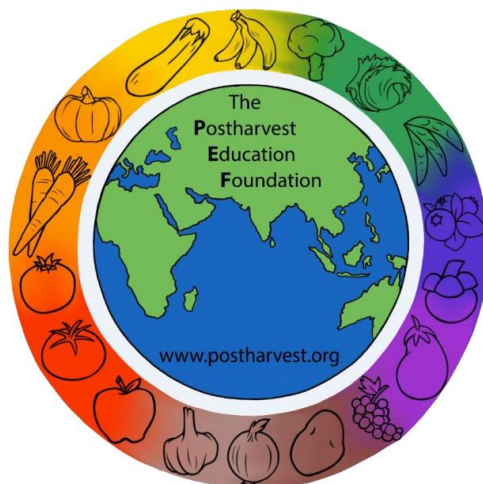
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## **1. Introduction**

This survey was carried out on pineapples harvested in Benin during the month of August in 2018, following the simplified questions list developed by PEF for Commodity Systems Assessment Methodology (LaGra et al 2016, Annex 4). Pineapple is a major fruit crop produced in the country with both nutritional and commercial importance. The fruits are grown mainly in 7 municipalities in the Atlantic Department of Benin. These municipalities are; Allada, Abomey-calavi, Tori-Bossito, Ze, Toffo, Kpomasse and Ouidah where the soil and climate are suitable for the production of pineapples.

There are two main cultivars that are grown; “sugarloaf” which can reach a mass of 2 kg per fruit and is taller in shape, softer in tissue and the “Smooth cayenne” which can reach a mass of up to 3 kg and is cylindrical in shape with harder tissue. For marketing, producers find export markets lucrative and are more interested in working towards increasing their exports. Unfortunately, the export marketing for Benin pineapples faces difficulties due to quality and postharvest problems. An estimated 431,713 tons of pineapple are produced yearly in Benin with about 15 to 25 % total in the loss within the production chain. This estimated percentage of losses per year is disputed, with some saying it could be higher. The system needs an effective tool to carry out the measurements and to determine the exact losses along the postharvest chain.

## **2. Harvesting**

When the fruits are mature, and a market is available, pineapples are manually harvested, usually by hiring women and youth in the community who are in need of temporary jobs (Figure 1a). They commence harvesting by separating the fruits from its parent plant using different methods depending on the market destination. Locally and for local market destinations, fruits are harvested by holding the fruit at the top near to the spiny leaves on the fruit, twisting it to break it from the plant and piled up in the field after harvest before sending them to market. If this is not done carefully, the fruit or the attached stalk can be badly damaged, leading to more rapid decay. For export markets, fruits are harvested by cutting the stalk with a knife. Since the leaves of the fruits and plant are spiny and can pierce into the skin during harvest, harvesters put on thick gloves or if gloves are not available, they wrap a cloth around the hands for protection they need to safely

perform harvesting.



Figure 1. (a) removing the fruits from the plant (b) piling in the field during harvesting.

During harvesting, aluminium bowls are used to collect the harvested fruits (Figure 2 a & b). These bowls weigh between 800g to about 1.2 kg and when filled can weigh about 30kg to 40kg. These bowls also have the capacity to contain 15 to 40 fruits depending on the sizes of the fruits and bowls. The harvested fruits in the bowls are then carried on the head to the packing site and dumped by throwing the fruits to the ground, where sorting, grading and cleaning are done if needed. Grading, sorting and cleaning are often done only with fruits that are meant for export. The fruits are graded into 4 different grades as shown below. The grading is also done taking into consideration the color, size, absence of defects, diseases and uniformity before packaging. Grading for the local markets only takes place at the level of the retailers.



Figure 2. (a) Large metal bowls used for pineapple harvesting (b) collection of harvested fruit.

**Varieties graded according to sizes and weight**

<b>Sugarloaf</b>		<b>Smooth Cayenne</b>	
Very big	- 1.5 kg and above	Very big	A1 - 1.9 to 2.2 kg
Big	- 1kg to 1.5 kg	Big	A2 - 1.6 to 1.9 kg
Medium	- 800g to 1 kg	Medium	B3 - 1.3 to 1.6 kg
Small	- 600g to 800g	Small	B4 - 1.1 to 1.3 kg

**3. Transportation**

Transportation of pineapples from production to the market or port of export is done by vehicle. For local market destinations and for export to Nigeria and Niger, the fruits are commonly transported using motorized vans called Bache. They are loaded by stacking or piling the fruits on each other, layer after layer from the floor of the van until it's filled up to the roof level as seen in Figure 4 below. For EU export markets, the fruits are transported by a large container truck. Fruits for export markets are packaged in cartons stacked on pallets in the container truck. The container trucks can contain a load of about 10 to 25 tons which are transported from the farm to the port where they are loaded into cargo planes and then exported by air.

The fruits meant for export markets are thoroughly washed with water if necessary to remove chemical residues such as from the application of ethephon that produces ethylene to degree the fruits and make them appear to show a color related to ripening. (Pineapples are non-climacteric fruits, and so do not respond to ethylene by increasing in sweetness or flavor). These chemicals sometimes exceed the maximum limit on fruits and must be thoroughly washed before packaging is carried out. The distance for transportation varies depending on the municipality of production or where the fruits have been loaded for transportation. The main market for wholesale, distribution and port for exportation is in Cotonou which is about 55 km from the nearest municipality and up to about 97 km from the furthest municipality of production.



Figure 3. Bache vans for local transportation



Figure 4. Loading into Bache Vans



Figure 5. Packaging for exportation



Figure 6. Loading into a container truck

#### **4. Marketing destinations and practices**

The wholesale buyer meets the producer at the farm and negotiates the price, buys the fruits directly from the farmer (Figure 7 a & b). The producer sells the fruits depending on the identified markets and also considering some important fruits characteristics in terms of sizes, weights, etc. Usually, the qualities of fruits sold for export are different from that which is sold for the local markets and this also affects the different prices. The export marketing destinations are the European Union, Nigeria, Niger and Burkina Faso.

The main local market and distribution center is Cotonou where the fruits are transported for marketing at wholesale, retail or redistributed to be transported to other local markets. The fruits are generally marketed fresh and also processed into juice. Drying is being practiced but on a very small scale. For export, they are bought from the producer, prepared near the field and transported directly to the port which is located in Cotonou for the European markets or transported directly across the border to nearby countries. The sorting and grading are done by the wholesaler at a big local market in Benin named 'Dantokpa market'. The wholesaler at the local markets sells the fruits to retailers who then retail to consumers.

There are two categories of retailers; the mobile and immobile retailers. And there are also different retailing methods. (1) The mobile retailers are those who carry the fruits in a tray or bucket on their heads moving about looking for consumers. (2) The immobile retailers are those who have fixed positions where consumers come and meet them to buy the fruits. These two categories of retailers can both retail the fruits to the consumer unpeeled or peeled.





Figure 7 a and b. Wholesaler negotiates the price with producer



Figure 8. Bache van transporting



Figure 9. Off- loading at the wholesale center



Figure 10. Wholesale market



Figure 11. Retailer

## 5. Causes and sources of quality problems and postharvest losses

Quality problems and postharvest losses are serious problems in the pineapple production sector in Benin. The causes, sources and problems can be identified at all levels within the production chain, but losses are mainly experienced within postharvest where marketing and consumption calibrate the fruit value. It is also important to note that there are several pre-harvest activities that impact the postharvest chain. The pictures and table below present an understanding for some of these causes and sources of quality problems and postharvest losses.



Figure 12. Broken bowls with sharp edges



Figure 13. Farm infested by weeds



Figure 14. Being disposed of for lack of markets



Figure 15. Disposed of for lack of market



Figure 16. Poor transportation from farm to the packing site



Figure 17. Fruits with juice leaking due to breakage

## 6. Market prices

The prices for pineapples for farmers, wholesaler and retailer depend on the destination market. The pricing also has to take into account characteristics such as the size, grade, weight and other quality factors. For export markets, the sorted, graded and the sizes differ for each company that buys at wholesale.

Farm gate price: In August 2018, there were three companies offering different prices to farmers for fruits purchased for export, below is the name of the exportation company and their prices per kg. (589 CFA = US \$1).

- 1) FREE DOOR = 85 CFA/kg
- 2) SAVE DE BENIN = 80 CFA/kg
- 3) ROYAL EXIM = 75 CFA/kg

For local market, the farmer offers the prices per van loaded full. A full loaded Bache van is approximately 2.7 to 3 tons. The prices per loaded van and sizes of fruits as indicated below:

- |                |                  |   |
|----------------|------------------|---|
| 1. Big size    | (1.2 kg)         | = 150,000 CFA (equivalent of 50 CFA/kg) |
| 2. Medium size | (600g – 1.2kg)   | = 90,000 CFA (equivalent of 25 CFA/kg)  |
| 3. Small size  | (600g and below) | = 40,000 CFA (equivalent of 13 CFA/kg)  |

Wholesale price: Prices offer by wholesaler also depends on the sizes and how they have been graded. The prices are for small sizes; 35 to 60 CFA, medium size 60 to 100 CFA and big size 100 to 150 CFA.

Retail price: Retailer prices depend on the size of the fruits. Small fruits are sold at 100 to 150 CFA while medium-size fruits are sold from 150 to 200 CFA and big size sold from 200 to 300 CFA. These are the price ranges that work for both seasons.

It was noticed that pineapples are harvested year-round though there are peak periods. As the export market fluctuates, the local market is affected. Producers prefer export markets to local markets because of the favorable prices and quantity. Export markets are not constant and thus fluctuate. During the peak harvest, or when there is no export market, the local market experiences dumping and wastes. Fruits that are damaged are not sold since consumers do not buy fruits that are damaged. Damaged fruits are discarded and thrown away as waste.

## **7. Improvements observed**

Generally, within the postharvest chain, producers and marketers implement few if any improved postharvest management techniques. This is either due to lack of education on cost-effective postharvest technologies or ignorance of the effect of handling on losses within the chain. The few postharvest management applications observed, such as careful handling during harvest, keeping the fruits clean and washing the fruits with water to remove excess chemical residues and improved packaging in cartons are done by exporters just to satisfy the export market requirements.

Other improvements that were observed being done is the transformation of the fruits into juice and drying. The transformation into juice is also still at a small scale and does not satisfy the demand due to some constraints such as lack of good quality processing equipment and packaging materials.

Though the above local improvements observed are carried out on a small scale, they still significantly reduce the amount of losses in the postharvest chain and are mainly carried out by traders.

## 8. Costs and benefits

Cost/Benefit worksheet for the postharvest improvement of pineapple drying.

<b>COST BENEFIT WORKSHEET (Annex 7)</b>		
Harvest of 500 kg of Pineapples in Benin		
	<b>Traditional Practice</b>	<b>Improvement</b>
<b>Description</b>	<b>Without postharvest management application</b>	<b>Drying after harvest to extend shelf life and add value. (unit in g after dried)</b>
<b>Costs</b>		
Drying is 300 CFA / kg		150,000 CFA
1 kg fresh = 60 CFA	30,000 CFA	
1 kg fresh = 40 g dried		
<b>Relative Cost</b>		<b>5 times the traditional cost</b>
<b>Expected Benefits</b>		
% Losses	25 %	10 %
Amount for Sale	375 kg	450 kg (18,000 g dried)
Market value/kg	100 CFA /kg	400 CFA /40g
Total market value	37,500 CFA	180,000 CFA
Value - Cost	7,500 CFA	30,000 CFA
<b>Relative Profit</b>		<b>4 times the profit of traditional fresh market sales</b>
# US\$1 = 589 CFA		

The expenses involved in drying pineapple fruits at first appear to be high (5 times the cost of selling the fruits as fresh pineapples). However, farmers make much more profit (4x) with the improvement compared with the traditional practice. The main market destination for the produce under improvement is the international markets. Most local people (consumers) are not familiar with dried pineapple but are now gradually getting to know it and enjoy the quality. Hotels and restaurants are now starting to make requests for dried pineapples. The volume of locally dried pineapple is not yet able to satisfy the demand due to some challenges such as the scale of production and the drying technology used.

The postharvest process of marketing the dried produce is less expensive and easier to handle than the process of selling the produce fresh by marketers. It is also estimated that it reduces the losses from 25% to 10% and if more education is provided on improved postharvest handling and drying technologies we can reduce the losses to near 5%.

## **9. Summary of causes and sources of quality problems and postharvest losses (CSAM Annex 1)**

### **A. Planning/Pre-Production**

- The problem of land acquisition
- Production/distribution of planting materials
- Financial incentives

### **B. Production**

- Climatic constraints
- Poor water management and irrigation problems
- Seeds/planting materials unavailable
- High cost of farm inputs
- Lack of technical know-how
- Labor inefficient
- Pest, weed and diseases problems
- Poor fertilization

### **C. Postharvest**

- Rough on-farm handling
- Poor field containers
- Poor in field sanitation
- Poorly trained labor
- Lack of shade
- Improper stacking
- Rough loading/unloading
- On-farm transport
- Lack of infrastructure
- Agro-processing limitations (reliance on solar drying in a humid climate)
- Lack of operating capital

### **D. Marketing**

- Lack of market development and promotion
- Quarantine restrictions
- Local/regional policies
- Lack of quality control
- Small volumes

## **10. Needs and issues identified by the survey**

### **A. Research needs**

During production, farmers faced climatic constraints due to lack of research development in the production system that could share knowledge and other relevant information with producers to better understand conditions and consequences of climate variability in the production program.

## **B. Extension/Training needs**

- ✓ Water management a problem; during the planting season of pineapples, the young seeds constantly need water to develop roots and grow, this can be done through proper irrigation systems which are not available, due to lack of irrigation skills and equipment.
- ✓ The wrong usage of agricultural chemicals such as synthetic fertilizer, ethephon for ethylene that produce the ripened color on fruits usually exceed the residue limits and would result in disqualification for exports or pose a health risk for consumers. The wrong usage of these chemicals also affects the markets and shelf life of the produce. Benin pineapples were banned in the export market for failing to meet the standard of chemical residue limits.
- ✓ Lack of technological know-how with respect to farm management, crop establishment, crop maintenance, pruning, training and weeding. Fruits are left to mature in weeds resulting in severe quality problems such as poor uniformity, color, size, and shape and are also affected by insects or rodents. Poor crop location, internal pathways and poor access to the main roads leading to the packing site cause delays during harvest, harvesters and fruits falling on the ground causing fruit damage and bruises.
- ✓ Throwing was observed during loadings as employees rush the work to quickly collect their payment. Sometimes internal injury or breakdown and cracks are not immediately noticed until after hours later, usually when the fruits are already at the markets.
- ✓ Rough on-farm handling of fruits during harvest is a common practice except in few situations under strict supervision when the produce is meant for export markets. And also, poor field containers used during harvesting. Using broken bowls with sharp edges cause cuts and bruises on the fruits.
- ✓ Harvest laborers are not maintained, and new harvesters are brought in at every harvesting period thus causing the harvesting to incur losses every time.



- ✓ Poor in-field sanitation is common practice when fruits harvested are thrown on the ground during loading, fruits pickup dirt and appear dirty before arriving at the market.
- ✓ Fruits are exposed to direct heat from sunlight due to lack of shade for pre-cooling during harvest. Temperatures can reach up to 39oC. No cold transport and storage facilities are available. Quality problems that occur during harvesting, packaging, loading, transportation and off-loading start to manifest at the level of retailer and consumer.
- ✓ During loading for local transportations, fruits are stacked on others in layers with nothing separating each layer from the other. Sometimes after loading, fruits are not transported immediately and are also not unloaded immediately upon arrival to the intended destination and are left in direct sun or rain under poor loading and transportation conditions.
- ✓ Fruit processing in Benin is still very limited and with many challenges and poor planning resulting in wrong harvesting time.

### **C. Advocacy issues**

- ✓ Cultivation of pineapples is mostly carried out by private individual farmers and producer organizations such as cooperatives on small, medium and large scales. Land acquisition for production often pose challenges since cultivation is mainly carried out in the Atlantic department. Land ownership conflicts are common, during leasing or land purchase, a piece of land can be leased or sold to more than one person at a time creating land disputes that eventually will disrupt production plans.
- ✓ Farmers expressed difficulties and lack of access to credits, lack of production and distribution of planting materials, farm input supply not available. Farmers complained of poor-quality seeds which often result in poor yield and poor quality of produce.
- ✓ The observation was carried out and seen that most young people are not interested to work on the agricultural field, it is also reported that the government is not on her

own part putting in place a mechanism that can encourage young producers of pineapples.

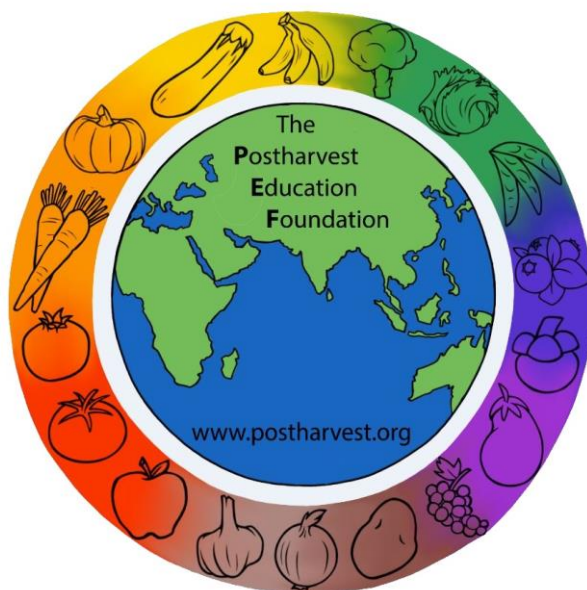
- ✓ Fruit processing skills and facilities are limited to provide and added value to the commodity such as transformation into juice, drying, jam, etc. if the fruits cannot be sold all fresh or for conservation.
- ✓ Fruit processing in Benin is still very limited and with many challenges including lack of markets.
- ✓ Quality control of pineapple production in Benin is ineffective. It is mainly done by a government agency which lacks the skills and credibility.

## **11. Conclusions**

Postharvest technology improvements for pineapples in Benin are not effectively applied. More research, a wide range of training and education, and a mechanism for promoting appropriate cost-effective technology application are needed to encourage production, reduce losses and improve the profits of producers, traders and marketers. Advocacy issues include the need to promote production and consumption of dried pineapple fruits in Benin and at the same time to look for new markets for these kinds of products.

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