CASE STUDY ON REDUCING FOOD LOSS IN PALM OIL IN CAMEROON

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Rashmi Ekka and Mandeep Sharma

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SUMMARY

Cameroon is among the major producers of palm oil in Africa. Although oil palm is native to Africa and its oil has been used in traditional cooking for a long time, there is a growing interest in increasing its production because of increasing global and local demand. To meet the growing demand, countries in Africa are steadily increasing area under oil palm production and Cameroon is leading them. A majority of this expansion is happening at the expense of forests, e.g. in Southwest Cameroon, 67% of oil palm expansion from 2000–2015 was at the expense of forests. The high palm oil demand is driving a boom in the informal sector which is becoming a foremost source of deforestation. Non-industrial smallholder farmers constitute the informal sector which is unregulated and suffers from many productivity challenges including high pre-harvest and postharvest losses, resulting in low efficiency. Postharvest food loss in palm oil occurs on-farm and during processing. On-farm loss is primarily because of the harvesting of underripe fresh fruit bunches and is relatively small (5-10%; equivalent to 1% crude palm oil (CPO) loss) which is on par with regional countries. However, processing losses are very high, 9-15% of total CPO production. This is further significant considering that non-industrial smallholder farmers are using 70% of the oil palm area for producing only 50% of the total CPO. Around 40% of smallholder farmers use manual mills that have an oil extraction rate (OER) of 12% while the rest use semi-motorized mills with an OER of 16%. Both of these OER are well below the industry average of 21%. Investing in processing equipment will result in improved OER and higher palm oil production without the need for increasing production area, the key reason for deforestation. With small investments, manual artisanal mills can be upgraded to semi-motorized mills, thus increasing OER from 12% to 16%. Furthermore, high-performance mills with OER similar to industrial mills (21%) and processing capacity of 1-2 MT/hr. can be established by using a cooperative model to offset the higher set up cost.

BACKGROUND

Sub-Saharan Africa is the geographic origin of the oil palm and it is cultivated across West and Central African countries. The main producers are Nigeria, Ghana, Ivory Coast, and Cameroon. Since 2000, oil palm expansion has significantly accelerated in several African countries, primarily due to increased global demand and profitability of this trade. Moreover, with a growing population and improving living standards, the edible oil consumption across Africa is projected to triple by 2050 (Byerlee et al., 2017). The emerging palm oil industry in Africa is providing economic and social development opportunities, however, its ecological and related social effects can prove to be devastating.

The uptick in the global palm oil demand is because of its ever-increasing use in non-traditional sectors. Traditionally palm oil was only used for cooking but now around half of the packaged products in supermarkets contain palm oil. Palm oil is being used as a substitute for animal fat in baked products, soaps, and cosmetics, and biodiesel. The consumption of palm oil has doubled over the past 15 years to nearly 8 kg per inhabitant of the globe and shows no sign of slowing down (European Parliamentary Research Service Blog, 2018).

In Africa, Cameroon is the fourth-largest producer of palm oil and a leading country for oil palm area expansion (Ordway et al., 2017). It is estimated that in Southwest Cameroon, a top producing palm oil
region of Africa, 67% of oil palm expansion from 2000-2015 occurred at the expense of forest (Ordway et al., 2019). Many regions in Cameroon have the required growing conditions for oil palm. South-West, South, and Littoral are the most attractive regions for investors. While there is extensive literature on Palm Oil and deforestation in West Africa, this case study will focus only on challenges relating to food loss and waste.

In Cameroon, the total area under the oil palm plantation is 200,000 hectares (ha). In 2019, the crude palm oil production (CPO) was 350,000 MT (Table 1) while the demand is much higher. For 2020, the Cameroonian government has authorized an import of 70,000 MT of CPO.

In Cameroon, the area under the oil palm is likely to continue to increase for a couple of reasons. First, Cameroon is a net importer of palm oil and with a growing population, its demand is also increasing. Second, with an increasing focus on the negative environmental and social impacts of oil palm plantations in Southeast Asia and the resulting regulations, large oil palm companies have diversified their production areas and have invested heavily in West and Central Africa. Cameroon has emerged as an attractive target because of favorable growing conditions, availability of suitable and inexpensive land, and political will to develop and diversify its agriculture sector (Hoyle and Levand, 2012).

High palm oil demand has led to a booming informal sector, driving rapid land-use change. Recent studies have demonstrated that deforestation is greater around artisanal mills rather than industrial mills and oil palm area expansion by smallholders is the leading cause of deforestation (Ordway et al., 2019). These forests are home to different species of great apes that are critically endangered.

Cacao is another major agricultural product of Cameroon and is grown for export. Although the cacao sector is more organized, the palm oil market is more stable and profitable when compared to cacao, which is impacted by global cacao prices. However, the palm oil sector is less organized and few farmers are participating in palm oil cooperatives. Moreover, the seasonality of prices highly influences the behavior of producers both in the retention of oil for sale at specific times and the decision to mill oil themselves instead of selling fresh fruit bunches (FFB) to agro-industries or local processors (Nkongho et al., 2014).

Few palm oil agro-industrial companies in Cameroon have welcomed the introduction of the Round Table for Sustainable Palm Oil (RSPO) and are working to get the RSPO certification. This move has been supported by WWF Cameroon and WWF Gabon. However, this certification has not yet been contextualized to apply to the large non-industrial palm oil sector.

**PALM OIL MARKET**

Farmers have several options for selling FFBs, fruits, and crude palm oil in the market:

1. The fresh fruits can be directly sold to the local market. These fruits are commonly used in traditional meals. The amount of fruit sold directly is very little but profitable.
2. Farmers can sell FFBs to intermediaries. Intermediaries process FFBs to obtain CPO and can sell it directly to the market or wholesalers.
3. The farmers mill their FFBs in artisanal mills and sell the CPO from the mill or in the market.
4. Larger farmers (>20 ha plantation) and farmers in the vicinity of agro-industrial mills also sell their FFBs directly to the agro-industrial mills.
FFB price is fixed by the agroindustry. The price commonly used is 50,000 FCFA/MT; SOCAPALM has a price range of 50,000 - 68,000 FCFA/MT depending on the amount delivered by farmers. Besides, mills pay some of the transportation and processing costs to farmers. CPO price is regulated by the Ministry of Trade. The per MT price of CPO is 450,000 FCFA (FAO, 2019). The fixed prices are only followed by the agro-industries and secondary processing industries. Artisanal millers who sell directly to consumers, do not follow the fixed prices and their price varies with the supply and demand of CPO in the market. Farmers get a better margin when they mill their own oil and sell directly to consumers, however, the quantity of oil milled is lower because of the poor extraction rate (Table 1).

Generally, during peak season, between November and June, the quantity of CPO in the market is sufficient and the artisanal millers can sell their oil anywhere between 300 FCFA to 600 FCFA per kilogram (compared to the government fixed price of 450 FCFA). Meanwhile, during the July to October low season, the CPO prices of artisanal millers can go up to 850 FCFA per kilogram. Producers with a good financial base, produce and preserve their oil during the peak season to sell it during the low season and benefit from the increase in prices. Higher profits in the artisanal CPO is driving the interest of smallholders for bringing more area under oil palm cultivation (Nkongho et al., 2014).

**PALM OIL PRODUCERS**

As shown in Table 1, oil palm producers in Cameroon can be largely divided into three categories: non-industrial smallholder farmers, advanced non-industrial farmers, and agro-industrial/plantation farmers. Non-industrial smallholder farmers contribute half towards the total CPO production and use 70% of the oil palm area planted in Cameroon (Nkongho et al., 2014). The non-industrial farmers are further divided into non-industrial smallholders and advance non-industrial farmers.

**TABLE 1. COMPARISON OF PALM OIL YIELD BY DIFFERENT TYPES OF PRODUCERS**

<table>
<thead>
<tr>
<th>PRODUCERS</th>
<th>Fresh Fruit Bunch Yield (MT/ha)</th>
<th>Oil Extraction Rate (%)</th>
<th>Crude Palm Oil (MT/ha)</th>
<th>Estimated Area (ha)</th>
<th>Production (MT)</th>
<th>Food Loss Associated with Oil Extraction Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-industrial/Smallholder Farmers using manual mills</td>
<td>8</td>
<td>12%</td>
<td>0.96</td>
<td>56,000</td>
<td>53,760</td>
<td>9%</td>
</tr>
<tr>
<td>Non-industrial Farmers using motorized mills</td>
<td>8</td>
<td>16%</td>
<td>1.28</td>
<td>84,000</td>
<td>107,520</td>
<td>5%</td>
</tr>
<tr>
<td>Industrial Plantation</td>
<td>15</td>
<td>21%</td>
<td>3.15</td>
<td>60,000</td>
<td>189,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL PRODUCTION IN CAMEROON</strong></td>
<td><strong>8-15</strong></td>
<td><strong>12%-21%</strong></td>
<td><strong>1.75</strong></td>
<td><strong>200,000</strong></td>
<td><strong>350,280</strong></td>
<td><strong>5-9%</strong></td>
</tr>
<tr>
<td>Potential (Best Case Scenario)</td>
<td>24</td>
<td>23</td>
<td>5.52</td>
<td>200,000</td>
<td>1,104,000</td>
<td>-</td>
</tr>
</tbody>
</table>

In Cameroon, 40% of smallholder farmers own manual artisanal mills (12% OER) and the rest have semi-motorized artisanal mills (16% OER). Food loss in palm oil at the processing stage is 5-9% which is due to low extraction rates of artisanal mills. By raising the FFB yield (24 MT/ha) and OER (23%) to international standards, Cameroon
can fulfill its domestic palm oil demand and can become a net importer without increasing the current area under oil palm plantation.

**NON-INDUSTRIAL FARMERS USING MANUAL MILL**

The average FFB yield of non-industrial smallholder farmers is 8 MT/ha and their oil extraction rate (OER) is 12% (Table 1). These farmers use manual mills (Figure 1) for oil extraction and constitute 40% of the total non-industrial farmers.

**NON-INDUSTRIAL FARMERS USING MOTORIZED MILL**

Advanced non-industrial farmers have an average FFB yield between 8-15 MT/ha and OER of 16% (Table 1). The higher yields are possible if the farmer has planted the high performing Tenera variety and if the plantation is not too old. These farmers use motorized artisanal mills (Figure 1) for CPO extraction. Advanced non-industrial farmers make 60% of the total non-industrial farmers.

**AGRO-INDUSTRIES**

Agro-industrial palm oil production accounts for 50% of the total production. As the data in Table 1 shows, the OER of the Cameroonian industrial mill is 21%, which is very close to the Indonesian or Malaysian (22%-24%) industrial mills, however, the FFB yield (15 MT/ha) is not very high compared to those countries or other major producers in the region (24 MT/ha). When compared to non-industrial players in the palm oil sector in Cameroon, the agro-industry is performing more efficiently.

The data in Table 1 clearly shows that due to lower OER and other inefficiencies, while the agroindustry sector is performing at 3.15 MT of palm oil per hectare and 0.4 MT of kernel oil per hectare, the non-industrial farming sector is performing at 0.96 MT – 1.28 MT of palm oil per hectare and no kernel oil production. 90% of non-industrial farmers have less than 20 ha of land and around 80-90% of farmers own artisanal mills (Nkongho et al., 2014). The low productivity of smallholders and the extensive production done by them have negative impacts such as deforestation, causing severe damage to the environment and
biodiversity of the area. Ordway et al (2019) show that deforestation is greater around artisanal mills than industrial mills. Smallholder farmers who operate around these artisanal mills are hence clearing new land for plantation.

**FOOD LOSS**

The postharvest losses in palm oil are assessed at three stages – production, transportation, and processing. Palm oil is extracted from FFBs and a ripe bunch has more oil content compared to unripe one. So, harvesting at the optimal ripeness is very important. Another criterion to measure palm oil production efficiency is the Oil Extraction Rate (OER) which is the weight of oil recovered (CPO) divided by the weight of FFBs. Factors that contribute to high OER include crop ripeness, harvesting intervals, labor availability, training and supervision of harvesters, pollination, and climate variations.

Food loss in palm oil is primarily driven by on-farm loss and processing loss i.e. harvest of unripe fresh fruit bunches (small extent) and extraction related loss (large extent), respectively.

**ON-FARM LOSS**

On-farm loss in Cameroon is estimated to be between 5-10% (estimates by Raymond Nkongho, Leading Palm Oil researcher) and is on par with on-farm losses in Gabon which is estimated to be 8.7% (Maire and Lee, 2017). On-farm losses are primarily because of the harvesting of unripe FFBs and non-harvesting of ripened FFBs. Unripe FFBs are discarded at the farm since farmers don’t want to pay unnecessary transportation costs for unripe FFBs which will not yield much oil. On average a farmer discards 5-10 bunches out of every 100 bunches. The main maturity indicator for a tree that is ready to be harvested is to see whether there are loose nuts on the floor near the tree. Unripe FFBs are mainly harvested when the farm has weeds, and the harvester is unable to see the loose nuts and harvests anyway.

FFBs need to be sent to the mill within 48 hours or fruits begin to rot and will lead to reduced quality and quantity. Rotten fruits lead to a high level of acidity and are less suitable for refined oil production and can only be used for soap production (Poku, 2002). Rotten fruit also reduces the shelf life and creates a bad odor in the oil, so farmers prefer to sort it out. Additionally, sorting out rotten fruit on the farm also reduces transportation costs. Both underripe and rotten FFBs can be avoided by more skilled and frequent harvesting (every two weeks during the peak season) and reducing wait times on the farm especially during the rainy season. Farmers note that harvesting needs to be done in a supervised manner to reduce on-farm losses. The rotten and unripe fruit decomposes and becomes part of the organic matter on the farm.

Farmers have no transportation costs when they use their mill for processing FFBs. Road connectivity in the oil palm growing region is poor, so transportation to agro-industrial mills is often not a viable option. Smallholder farmers prefer to process their FFBs, that way they have lower processing costs and higher sales margins. To sell to agro-industrial mills, farmers need higher volumes, which can only be achieved through aggregation. However, farmer cooperatives are not very strong and organized in the palm oil sector to facilitate this.

**PROCESSING LOSS**
The low extraction rate is the primary driver of food loss in the palm oil sector. Given that the OER in Cameroon ranges from 12-21% (Table 1), the on-farm loss in comparison is a small fraction. Farmers in Cameroon, prefer to invest in their artisanal mills where a manual mill has an OER of 12% and a semi-motorized mill can yield an OER of 16% (Nkongho et al., 2014). Both of these OER are lower than the agro-industrial OER of 21%. CPO loss at the farm level is 1% during harvest (converting the loss of FFBs into CPO loss) and at the processing level depending on the sophistication of the mill is 9-15% for a total loss of 10-16%. Taking into consideration that close to half of the Cameroonian palm oil is produced by smallholders, it demonstrates the magnitude of food loss in the country’s palm oil sector.

If the 140,000 ha of land currently under non-industrial production increased its oil extraction rates and FFB yield from 12-16% to 21% and 8MT/ha to 15 MT/ha, respectively, they would be able to produce 441,000 MT of crude palm oil up from the current 161,280 MT of crude palm oil. Increased production from increasing oil extraction rate, would easily cover the palm oil deficit in the country and reduce the need for new plantations.

Investment is needed in more efficient mills to improve the extraction rates. For manual press artisanal mills, an investment of $5,500 - 7,000 can convert manual mills to motorized semi-automatic mills of 16%-17% extraction rate can serve a small farmer group. Cooperatives can be an intervention point for high performing mills with a capacity of 1-2 MT/hour, which cost ~$300,000.

**CONCLUSION**

Deforestation in Cameroon is primarily driven by non-industrial or smallholder palm oil producers and is a major environmental concern. When explored, the problem of smallholder led deforestation boils down to these major factors - high domestic demand, low yields requiring more land, the non-existence of farm to mill roads, and inefficient artisanal mills with low extraction rates. The FFB yield is low and is primarily due to old plantations, low yielding varieties, and lack of good agricultural practices. The extraction rates for smallholders is also low when compared to the agro-industry. The reason for this is the use of inefficient mills, lack of transportation for timely milling of FFBs, and unregulated informal CPO market.

The potential to reduce palm oil loss through investing in efficient mills and increasing extraction rates is undeniable. Strong agroindustry is an important aspect of the Cameroon government’s growth policies and increases in industrial palm oil production is one of the crucial aspects of it. Looking at the positive impact of palm oil on the economic growth of Malaysia and Indonesia, this industry has a great potential to elevate Cameroon’s economy too. Thus, when done right, the palm oil industry can provide employment opportunities to the local population, revenue to the state, infrastructure development, and overall development of the agriculture sector. But at the same time, extensive plantation done at the expense of forests has huge negative impact on the ecosystem. To conserve the environment as well as the palm oil sector, increasing palm oil production through investments in processing rather than increase acreage will be key.

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