Market Development in the Niger Delta (MADE)

OIL PALM CASE STUDY

ABOUT MADE

The Market Development in the Niger Delta (MADE) programme is advancing rural agricultural markets and other sectors that impact on poor people, to reduce poverty and conflict in the Niger Delta region. Funded by the UK Department for International Development (DFID) and implemented by Development Alternatives Incorporated (DAI), the programme is facilitating growth in sustainable access to skills, inputs and markets to increase incomes for poor smallholder farmers and entrepreneurs in MADE's target sectors of cassava, fisheries, agricultural inputs, oil palm and poultry. The first phase of programming (September 2013 – February 2018) made significant progress and was able to surpass its target in achieving a 15% income increase for more than 150,000 people in the Niger Delta area. Building on the success of MADE I, DFID approved a costed extension for an additional two years (March 2018 – February 2020), which targets increased incomes of additional 155,000 smallholder farmers and entrepreneurs. The expectation is that 30,000 of those with increased incomes will be poor low-skilled youths and women from Edo State, who are susceptible to human trafficking.

TABLE OF CONTENT

SUMMARY

The global palm oil market is growing at a Cumulative Average Growth Rate (CAGR) of 7.2% and expected to reach USD 92.84 billion in 2021. In contrast, there has been a decline in Nigeria's global market share of palm oil from the 1960's when the country was producing 45% of the global output to a current output that represents only 1.7%.[1]

Palm oil production in Nigeria is largely concentrated in the Niger Delta region, with smallholders accounting for about 80% of the production. Over a million smallholder plantation farmers, millers, processors, farm workers, wholesalers and retailers are involved in the sector. Local production has stagnated at a little less than a million metric tons since 2012,creating an estimated annual deficit of about 500,000 metric tons (worth 200 billion naira). Inefficient production and processing in Nigeria have led to abysmally low levels of output of palm oil compared to other producing countries in Asia. The key constraints include low awareness and use of new technologies, weak flow of information on availability and economic value of improved technologies, lack of capacities of local fabricators to manufacture and promote improved processing equipment, limited access to information on better plantation practices and usage of agricultural inputs. These low yields reinforce the low prices and incomes earned by smallholders and consequently limiting potential for wider economic growth.

MADE's interventions in the palm oil sector are driven by a strategy to increase the productivity of processors and farmers towards world standards. This was expected to increase profitability and drive substantial investments to meet demands for household and industrial palm oil and increase income for farmers. MADE implemented a broad strategy to: (a) improve access to and adoption of improved processing and harvesting technologies, and (b) promote increase in productivity of smallholder farmers through Best Management Practice (BMP) and increased access to inputs such as use of crop protection products and quality seedlings. MADE worked with different stakeholders (the Nigerian Institute for Oil Palm Research - NIFOR, fabricators, harvesting equipment marketers, improved Oil palm nut producers, commercial millers and harvesters) to enhance capacities and align incentives to be able to provide improved products, technologies and services that has changed the functioning of the system and helped to increase the productivity and incomes of 20,0000 smallholder farmers and processors.

In this case study, MADE tells the story of its palm oil intervention; highlighting interventions' approach and implementation, lessons learned, innovations, and overall impact. The document is expected to add to the body of knowledge and be useful to other implementing stakeholders within and outside the sector, for learning, adoption and adaptation.

1 https://www.zionmarketresearch.com/report/palm-oil-market

CHAPTER ONE

BACKGROUND

Oil palm is an important crop in Nigeria whose main products (oil and kernel) are used for food and non-food purposes. Palm oil accounts for about 70%

Sector Analysis

Oil palm is an important crop in Nigeria whose main products (oil and kernel) are used for food and non-food purposes. Palm oil accounts for about 70%[2] of the Nigerian vegetable oil market as oil palm yields highest oil per hectare when compared to other sources of vegetable oils. Consumption of palm oil in Nigeria is increasing with estimates of 1.2 million metric tons in 2010 to about 2.4 million metric tons in 2018[3] (valued at between 480 - 960 billion naira). But output is not enough to match the demand, with production currently stagnating and suffering a deficit of 500,000 – 1.1 million metric tons.

The deficit is bridged by legal and illegal imports. Legally imported palm oil accrues a 35% tariff, introduced by the Federal Government of Nigeria in 2016 to stimulate local production and substitute for hard currency payments for the imports. Legal imports are largely sourced from Malaysia and Indonesia, but illegal imports coming from West Africa have increased through the porous western border of Nigeria. During the economic recession in 2016, the Central Bank of Nigeria included palm oil in the list of prohibited items not directly funded with official foreign exchange rate, greatly increasing local prices and led to a surge in local demand for industrial palm oil while importation and total industry supply tapered.

2 Report on Survey of Selected Agricultural Raw Materials in Nigeria on Oil Palm. Raw Materials Research and Development Council, 2004

3 https://www.proshareng.com/news/Agricultur e/Fact-File-on-Crude-Palm-Oil-(CPO)-in-Nig/3 9032

Consequently, average local crude palm oil (CPO) prices jumped 54.4% and 58.9% in 2016 and 2017 respectively as local demand expanded, while import prices grew, without a commensurate increase in supply. Based on this, two major listed industrial processors (Okomu and Presco) witnessed notable and faster pace of improvements in revenues and profitability even as growth in production has been slow. These processors have focused on expanding production, especially over the last three years by investing in increasing total land area under cultivation, expanding milling and refining facilities to meet up with expected additional output.

The Niger Delta region accounts for about 53% (ranges from 1.4 million hectares - 1.8 million hectares) of area under oil palm cultivation with the naturally-growing low-yielding wild grove varieties occupying 74% of area under cultivation across the region. The remaining 26% comprises the improved tenera varieties and is especially concentrated around Edo, Delta and Ondo states due to proximity of the Nigerian Institute for Oil Palm Research (the main source of the improved tenera variety). The main actors can be broadly categorised into two:

a. The small /medium scale producers who account for 80% of fruit and oil production. These "producers" (most of whom do not grow palm but simply harvest fruit) comprise the dominant wild grove gatherers who only harvest bunches from the wild grove trees and the small/medium scale farmers that cultivate the improved varieties with average land size of less than 4 Ha. Even farmers with their own plantations have not been investing in the production of fruit due to the low prices, leading to very low yields. The small-scale producers are main suppliers of fresh fruit bunches (FFBs) to inefficient artisanal and small-scale millers and processors who produce palm oil (with free fatty acid content of more than 5%) for household use. These small-scale millers historically have had average oil yields of 1/3 of the industrial mills, reducing profitability, and lowering prices for fruit.

b. The integrated plantations include production, processing and marketing. They cultivate improved varieties with average land size of not less than 10,000 Ha and own industrial mills producing special palm oil (with free fatty acid content of less than 5%) and refined specialty products used by food, dairy, confectionary, personal care products and livestock feed industries.

Poor availability of some crucial supporting services such as extension services, input supply, processing and harvesting technology supply, improved seedling supply, and finance impacts negatively on the performance of the sector. Extension services are largely rendered by relevant government agencies such as the Agricultural Development Projects (ADP) and Ministries of Agriculture who are understaffed and under resourced. In addition, the improved seedlings, which are primarily produced by NIFOR and distributed mainly through the government agencies, are of erratic quality. Inputs such as fertiliser and crop protection products are supplied by agro-inputs companies through their network of agro-dealers and retailers. Smallholders rely on local fabricators to produce processing equipment and harvesting tools. Finance is a critical resource for farmers, but they largely depend on informal financing as unfavourable terms of credit prohibit many smallholder farmers from accessing formal credit.

Rationale for working in the Oil Palm Sector

MADE had selected the oil palm sector in the Niger Delta region because of the potential to close the annual supply deficit especially by smallholders. The sector provides employment and primary source of income for about a million smallholder plantation farmers, millers, processors, farm workers, wholesalers and retailers in the region spanning production, processing and marketing functions.

There are key points of leverage for improving the functioning of the oil palm sector in the Niger Delta region. The providers of improved inputs, technologies and services available within the region creates opportunities to align incentives leading to introduction of new products and services that enhance the productivity of smallholders. The farmers and millers are already concentrated in certain geographic clusters across various states which provides opportunities for supply side actors to engage with them. In addition, the federal government of Nigeria (FGN) has shown keen interest in the sector; oil palm was one of the crops of interest under the FGN's Agricultural Transformation Agenda (ATA). The intervention sought to improve access and use of improved variety seedlings, fertilisers, improved processing mills and motorized harvesters by smallholder farmers in a bid to enhance productivity of farmers.

Gender dynamics and the role of women in the value chain

While women are found in all functions along the oil palm value chain, they dominate the processing and marketing segments, while the men are mainly found within the production segment. This is related to the power dynamics where the land ownership system within the region favours possession, inheritance and planting of long-term economic crops by men. Within the smallholder plantations, the women work mainly as labourers and bunch carriers.

At the processing function, the introduction of more efficient semi-manual screw press processing equipment transformed a female dominated high level of effort function, into a male dominated function in many clusters. Men had the resources to invest in machines, which yielded relatively more output in less time, thus pushing out the female dominated traditional processing of pounding fruits in mortar. This was not a bad thing, as yields are much higher from the screw press and it is more profitable for women to purchase and bring fruit to process at fee- based commercial mills. The women who dominated the traditional processing business have integrated themselves into the value chain either as "processors" (who bring fruit to the mills for processing) or suppliers of fresh fruit bunches.

Interventions targeting improvement in the production and processing segments will benefit women as increased productivity at the mills will yield higher quantities of oil, making the processing and trade of oil more profitable. This in turn will lead to greater demand for FFB from the plantations, stimulating improved harvesting to capture more of the low hanging fruit, followed by increased investment in the plantations using technologies accessible to women.

CHAPTER TWO

ANALYSIS OF CONSTRAINTS WITHIN THE OIL PALM SECTOR

The widespread artisanal traditional mills were characterised by use of inefficient semi manual processing technologies with low extraction rates (5-10%) when compared to international best practice (24-27%)

MADE conducted in-depth research in 2013 which identified that production and processing were inefficient at small scale levels. Output at plantations (yield per ha) and mills (oil extraction rates) were abysmally low compared to other producing countries in Asia and Africa. At the production level, the output of smallholders in the Niger Delta region is low - about 2.5 tons of Fresh Fruit Bunches (FFB) per ha compared to achievable yields of 15-25 tons of FFB per ha with best management practices.

The widespread artisanal traditional mills were characterised by use of inefficient semi manual processing technologies with low extraction rates (5-10%) when compared to international best practice (24-27%) which led to loss of 60-70% of the oil. Many of the mill owners are commercial service providers, where processors bring fruits for processing on fee-based arrangement; nonetheless the machines are inefficient with low throughput capacity resulting in long queues and delays and ultimately wastage of fruits especially during the peak period. These low oil extraction yields impacted on the price that could be paid for fresh fruit bunches (FFB), making production of FFB unprofitable, leading to farmers to simply harvest, rather than invest in growing, the FFB. Low productivity of oil processing led to low prices offered for oil palm bunches, reinforcing the low incomes earned within the sector leaving smallholder producers and processors with little or no incentive to increase output and yields respectively.

In addition, harvesting is traditional and inefficient resulting in time consuming and laborious process led by tree climbers, with low harvesting rates by small holders. Shortages of tree climbers to do the harvesting and high cost of harvesting lead to reduced quantities of bunches being harvested as the low price of FFB did not warrant the expense of harvesting.

MADE's research revealed that the Small-Scale Processing Equipment (SSPE comprising the steriliser, digester, screw press and clarifier) designed by NIFOR to improve oil extraction existed, could be manufactured locally and was capable of increasing oil yields by about 40-50% (up to 14% total oil extraction)compared to the omnipresent screw press machines. It is important to note that the majority of artisanal small-scale millers were unaware of the SSPE and its benefits, despite their accounting for 80% of palm oil production in the region. The technology was never commercialised and promoted for uptake by smallholders. NIFOR and only a few agro-equipment fabricators (with links to NIFOR) produced the equipment, mainly for larger-scale millers, or for sale to government and oil companies for onward donation to communities. These latter were usually plagued with lack of ownership and ultimately, abandonment of the improved equipment. Skilled agro-equipment fabricators believed smallholders were unable to afford improvedtechnologies driving a system which perpetuates the purchase and donation of improved technologies to smallholders. Many local fabricators emerged through the apprenticeship system and were low skilled, even though they were the main suppliers of agro-processing equipment to farmers and millers within farming clusters. Most of these fabricators lacked technical capacity to fabricate improved technologies based on low utilisation of formal systems of training and certification. This reinforced weak flow of information on availability and economic value of improved technologies to millers. In areas where millers were aware of the technology, the size of the SSPE was usually beyond their capacity - the SSPE produced by NIFOR is the 2-ton capacity worth between N2.5-N4 million whereas the small-scale millers process about 0.5- 1-ton worth of fruits per day. The high upfront cost required for purchase restricted access to this equipment by small-scale millers. These millers have little access to credit facilities, and where available, the cost of bank financing is often so expensive as to make it prohibitive to access.

At the industrial processing levels, the large integrated processors were operating below optimal capacities largely due to low supplies of FFB (from aging plantations) to feed the mills, with uncompetitive local prices compared to imports. Domestic industrial production faced increasing threats from relatively cheaper priced imported oil in the absence of the import tariff.

A synthesis of the constraints identified during the field research are:

a. **Lack of information on oil palm best management practices (BMP) and improved processing practices** —Agricultural information and extension service provision have been very weak due to low capacity by the underfunded government agencies (ADPs, Ministries of Agriculture, etc.).

b. **Limited access to and utilization of improved inputs and technologies**—Lack of understanding regarding benefits and proper application of inputs by smallholders' limit use and corresponding positive impact on yields. This is reinforced by limited understanding of market opportunities and farmers' needs in the region by Agricultural input companies. NIFOR has done a lot of good work on developing technologies for processing but has not been able to get them mainstreamed into the commercial channels. Use of improved processing technologies is limited due to reasons such as low awareness, weak flow of information on availability and economic value of improved technologies, lack of capacities of local fabricators to manufacture

improved equipment, high upfront cost required for the purchase of technologies and limited access to credit for investment in capital assets. At the same time, NIFOR is charged with producing the certified seedlings, but quality control standards have been questionable, leading to a proliferation of low-quality seedlings.

c. **Inefficient harvesting technologies** — Even though simple technologies like the Malaysian Knife were in use on commercial plantations, they were not used by smallholder farmers who relied on expensive and inefficient tree climbers for harvesting. Shortages of tree climbers also reduced the harvesting options.

d. **Limited access to finance** – The high cost and low interest of financial institutions to lend restricts the availability of credit to many smallholder farmers needed to purchase production inputs, processing equipment, or working capital to purchase fruit for processing; the main source of finance is their informal savings groups thus limiting investments in agriculture.

Using the SSPE has helped me to reduce drudgery and gain speed in processing. With the old manual press, I used to process 0.5 tonne of FFBs over 2-3 days, but I now process 1 to 2 tonnes of FFBs per day. I have also recorded a 33 per cent increase in the quantity of oil I used to get from the previous mill, and the oil is drier which fetches me a higher price in the market. This gives me additional income that allows me to take care of my children and process more fruits.

Margaret Osadiaye

FFB processor and member of Eko-Edo Oil palm Multipurpose Cooperative Society Ekekhen, Igueben LGA, Edo state

CHAPTER THREE

MADE'S STRATEGY FOR INTERVENTION WITHIN THE OIL PALM SECTOR

MADE's vision for growth for the oil palm sector hinged on improving processing efficiency and productivity at the mills through the use of improved technologies by smallholders which would increase output by at least 30%

Improving efficiencies in oil palm processing, harvesting, and production as well as bridging the knowledge gap are important for reversing constraints within the sector and holds enormous potential to raise incomes for poor small-scale market actors in the Niger Delta region.

MADE's vision for growth for the oil palm sector hinged on improving processing efficiency and productivity at the mills through the use of improved technologies by smallholders which would increase output by at least 30%. This would in turn create the incentive to process more FFB, thus stimulating demand for more FFB. The increased demand for FFB would incentivize small-scale plantation farmers to harvest the already available fruit, and then improve productivity of existing palm by adopting best management practices and utilising inputs in the short term and expanding area under cultivation in the long term. The net result will be increased productivity, enhanced competitiveness and increased incomes. MADE recognised that, once there was demand for the fruit, farmers would invest in delivering more fruits, first by harvesting already available fruits that were left on the trees due to high costs of harvesting, and simultaneously investing in increasing their productivity at the farm level.

This brought about three levels of interventions by MADE:

a. **Building the market for improved processing technologies;**
b. **Building the market for improved harvesting technologies; and**
c. **Improving productivity of farmers at the plantation level.**

Building the market for improved processing technologies

Informed by this research and existing work from its local partner, the Foundation for Partnership Initiatives in the Niger Delta (PIND), MADE designed a two-pronged strategy of a)strengthening the capacities of lead agro-equipment fabricators and marketers to manufacture and promote the adoption of improved technologies and b) stimulating demand for those improved technologies. The first prong anticipates competent and skilled equipment providers manufacturing and actively marketing improved technologies to smallholders. The second prong focuses on raising awareness and demonstrating the economic benefits of using the technologies. The business model was to get equipment fabricators to collaborate with smallholders to demonstrate the economic benefits of using improved technologies to other farmers, millers and processors in a bid to stimulate purchase and usage across clusters within the region. As demand increased, other technology providers were expected to crowd into the market and further adapt the technologies to suit smallholders. The strategy was intended to stimulate changes such as active involvement of the private sectorequipment suppliers in assessing challenges faced by smallholders and turning them to potential opportunities for providing improved low cost technology solutions while knowledge of the existence and value proposition of improved technologies will stimulate demand for those technologies.

Phase I: 2014 – 2015

At the beginning, MADE identified and trained nine lead fabricators as potential partners in producing and marketing improved processing technologies for small and medium scale millers. The relative newness of the SSPE technologies in the region, required awareness raising initiatives targeted at small-scale millers and farmers. MADE supported linkage platforms that enabled fabricators to engage agricultural extension agents (a major source of information to farmers and millers on improved technologies), processors' cooperatives and commercial millers. The aim was to provide information on the increased functionality and potential financial benefits of the improved processing technologies and raise awareness on upcoming demonstrations of improved processing equipment.

MADE also identified purchasing power as a constraint and facilitated the scale down of the two-ton capacity NIFOR SSPE technology (costing N2.5-4 million) to 0.5-ton capacity (costing N750, 000). This made it more affordable and addressed the credit constraints faced by small-scale millers.

In early 2015, MADE worked with eight of the nine trained fabricators in collaboration with mill owners to embark on demonstrations aimed at showing mill users the benefits and use of improved processing equipment in a bid to stimulate demand for the technology. The fabricators recognised interest and acceptance of the technology by small-holders but actual sales were low. Only 3 units were sold by the 2nd quarter of 2015.

The fabricators identified limited reach and lack of funds by smallholders as the major constraints for low adoption. It was also observed that the initial, improper targeting of all millers also contributed to low acceptance and demand for the technology. Therefore, the marketing adapted to focus on targeting mill owners with the most incentive to get the technologies, i.e. the medium scale mill owners with excess capacity and the commercial millers who provide services to numerous processors and would

be interested in providing efficient services and improving capacity utilisation at their mills. But this still did not increase sales much.

The low sales of SSPE discouraged some of the trained fabricators who were not good at marketing. Traditionally, sales of agro technologies had always been on demand with the buyer paying all cost up-front before the fabricator produces and delivers the machines. As the SSPE is relatively more expensive than the manual processing machines, it meant mill owners could not pay all cost up-front but required additional funding or spreading their payments over a longer period. Four fabricators were keen on trying out the possibility of an instalment payment structure (in partnership with financial institutions) whereby small-scale actors could acquire these technologies and phase payment over a period rather than the usual up-front payment requested by fabricators. MADE facilitated linkage between the technology providers and financial institutions based on the instalment payment model. Nonetheless, many of the financial institutions were reluctant in keying into the model based on their perception of risk inherent in dealing with smallholders and poor understanding of the palm oil business. This led to the second phase of the intervention in late 2015 with the design and introduction of the Technology Adoption Grant (TAG), a smart subsidy designed to stimulate uptake and raise awareness.

Phase II: 2015 – 2018

The low uptake of the SSPE technology as a result of low awareness of the value proposition and poor access to finance by smallholders caused MADE to restrategize on how best to stimulate demand for the improved technology. It became apparent that for the technology to be widely adopted, it had to be visible. Given the cloistered nature of rural Niger Delta, knowledge about an improved processing technology was only available within 10-20 km of the technology. So to stimulate uptake, far more of the SSPEs needed to be on ground and in use to demonstrate the efficiency. The TAG was designed specifically as a smart subsidy to stimulate the demand for the equipment, by demonstrating commercial incentives, production efficiency and benefits to the actors on the supply and demand sides.

MADE engaged selected supply side actors- fabricators and marketers - to promote the uptake of the new technologies through TAG. The fabricators targeted commercial mill owners who met the selection criteria and expressed willingness to meet the TAG conditions: 50% up-front payment by the mill owner, a commitment to promote use of the equipment amongst non-mill owner processors. The mill owners were screened and upon being successfully vetted and signing the output based agreement, deposited 50% of the cost of equipment with the fabricator. MADE then disbursed a further 30%. As an output based grant, MADE only facilitated the disbursement of the 20% balance upon delivery and installation of equipment. Post installation, the grantees were supported in setting up technology demonstrations by the fabricators to create awareness and stimulate usage of the technologies by the ultimate poor beneficiaries - processors and farmers. The millers organised demonstrations and awareness raising events for non-mill owner processors while the fabricator used the mills to organize demos for other prospective mill owners within the same cluster in a bid to reduce travel. Participants at the SSPE demonstrations became aware of the capability of the new technologies to increase oil yields by approximately 30% more than the output of the traditional processing technology. The increased oil output raises revenue by an additional 30%, but all of that went straight to profit, as there were no additional costs. They also recognized that the new technology has the capacity to process about 50-70% more fruits in the same amount of time, which could curb the endless wait/queues at the mills and waste of FFBs in addition to reduced drudgery experienced at mills.[4]

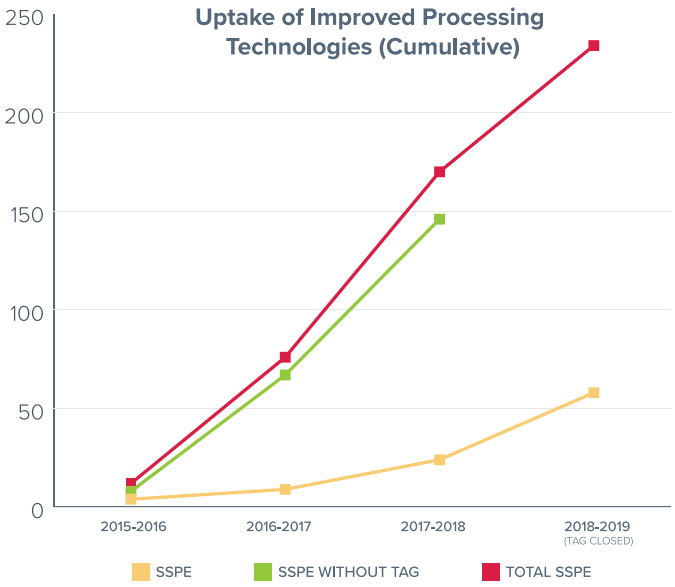
The attributes of the technology and the effectiveness of demonstrations enabled the entrance of more actors, with more fabricators getting involved in providing improved technologies in response to the demand.

4 Millers who process FFB at commercial mills on payment of a fee

Investments in the technology grew with uptake of 8 units of the SSPE between 2015-2016, 59 units between 2016-2017 and 79 more units between 2017-2018 through TAG as detailed in Figure 1. It is important to note that trials by the 1st set of grantees in 2015-2016 and rising prices of palm oil (due to devaluation of naira and increased demand for locally produced industrial palm oil) further convinced more actors to invest in the technologies between 2016-2018 through direct purchase. The number of SSPEs adopted without TAG soared between 2016 and 2019. It increased from three initially in 2015 to nine between 2016-2017, then 15 between 2017-2018 and 34 between 2018 – 2019, to reach a total of 58. As shown in Figure 1, total sales of the 0.5-ton SSPE grew from nil in 2013 to 204 units worth N160 million within the region by 1st quarter of 2019.

The post TAG phase is focused on activities targeted at demand stimulation to increase capacity utilisation of improved commercial mills especially by non- mill owner processors and expanding the supply of improved processing equipment (including additional equipment required by mill owners) leading to further adaptation of equipment in response to demand by millers. For instance, seven additional fabricators crowded-in from Cross River, Akwa Ibom and Ondo States; three making components of the SSPE and others producing the full SSPE. Interestingly too, 32 commercial millers purchased complementary equipment – KF separator, kernel cracker, bigger sterilizers, etc., all in a bid to improve their service offerings to processors.

> *Prior to our partnership with MADE, machine sales were slow, about 1-3 over a year as we had focussed on large scale millers. The engagement with MADE pointed us in the direction of the huge market potential amongst small and medium scale millers which informed the tweaking of our model. The decision to scale down on size and cost of the SSPE and embark on its promotion was the best we had taken in recent times as we experienced a 300 percent increase in sales by the third year,"*
>
> ***Engineer Babatunde Abdulkareem***
> *Managing Director, Muhat Nigeria Limited, Edo State*



Improving Access to Improved Harvesting technologies

Faced with a shortage of climbers and the high cost and difficulty of harvesting, much of the available FFB was never collected because it was uneconomical. With higher yielding processing equipment, demand for fruit increased, requiring better harvesting solutions.

Introducing the Mechanical Adjustable Harvester (MAH)

MADE's focus on introducing the Mechanical Adjustable Harvester (MAH) followed the same path as the SSPE:

a. Identification of Agro-dealers and marketers: There were few agro-dealers in the region that sell improved harvesting technologies. However, MADE identified and engaged two agro-dealers (Best Garden and Texmaco) interested in promoting sales of the MAH – an improved harvesting technology which was already in the market but about which limited knowledge existed on the use of the technology. These marketers were supported to develop the business case for use of improved technologies and they were linked with harvesters.

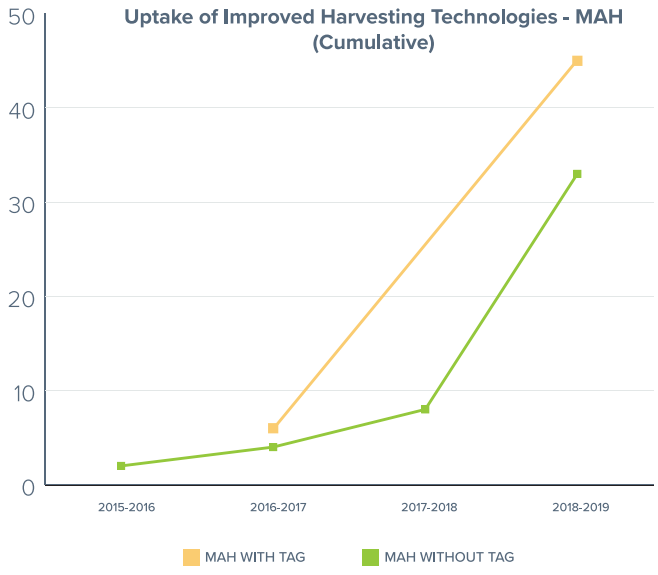
b. Demonstrations of improved Harvesting technologies and practices to harvesters and farmers: Trained harvesters in collaboration with the agro-dealers demonstrated the improved harvesting equipment to small and medium scale farmers and harvesters within the region. These demonstrations were further expanded into the best management practices demonstrations aimed at improving productivity at the plantation level as in the third intervention focus discussed below.

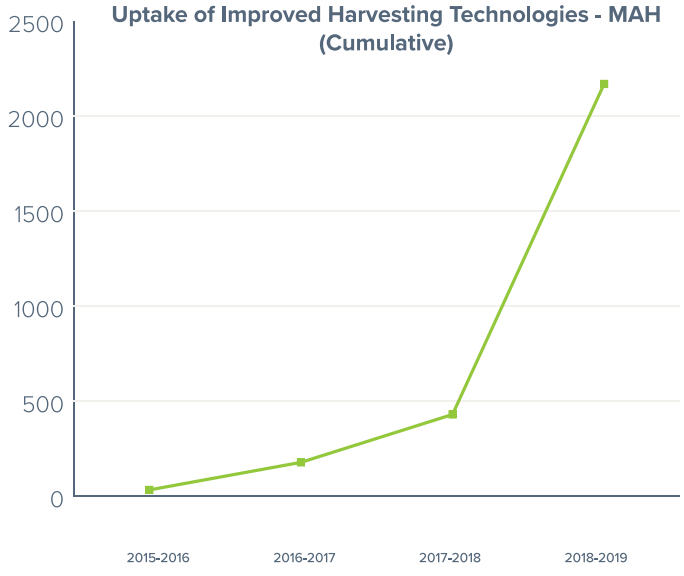
At the initial stage, despite the interest of smallholders and harvesters in the technology, the uptake of the MAH was low due to relatively high cost. Equipment for traditional harvesting method costs almost nothing, requiring no expertise except the ability to climb as compared to N160,000 for MAH. MADE used the TAG to stimulate uptake which led to the purchase of three units of MAH between 2015-2016, 7 units between 2016-2017 and 17 units between 2017-2018.

Introduction of the Malaysian Knife (MK)

The devaluation of the naira between 2016-2017 increased the price of the imported MAH by 112% which resulted in a sharp drop in demand. However, the programme identified and supported the adoption of the non-mechanical Malaysian Knife (MK) alongside the MAH. The MK is made up of a long extendable pole and sickle for harvesting – making it more effective and safer to use compared to the climbing method. MADE engaged with 2 agro-dealers involved in the sales of MK and supported them to promote and expand the product offerings to smallholder farmers and commercial harvesters as they were only focussed on selling to plantations. These agro-dealers in collaboration with harvesters and farmers groups organized demonstrations which led to increased uptake of the Malaysian knife. Obviously, it was more cost effective and met the needs of the farmer as it was as close as possible to the crude method they were already used to; it could reach taller trees and required less maintenance

compared to the MAH which was mechanised with limited reach for tall trees. As shown in Figure 2, the sales of MK went from 34 units in 2015 to 1,516 units by 1st quarter of 2019.





Improving productivity at the plantation level —

Improving Access to Oil Palm Best Management Practices (BMP) and promoting private sector driven supply of improved seedling varieties

Introducing Better Management Practices - BMP

With demand for fruit increasing beyond the available unharvested fruit, there was now incentive for farmers to increase production, switching from a “harvesting” mentality to a “growing” mentality. MADE leveraged the work started by its partner, PIND, on BMP and commercialised it to include commercial drivers of the training. The objective of the BMP was to upgrade existing plantations that had fallen into disrepair with low yields of less than 4 MT/ha, so that they could increase to 8 MT/ha within 2-3 years after proper care of the trees.

MADE engaged input companies on potential opportunities within the Niger Delta which led to the pilot with Candel, a key crop protection company interested in expanding its reach to oil palm farmers to organise BMP demonstrations using lead farmers. The BMP demonstration plots were designed to increase farmer’s knowledge of practices such as weed control, canopy management (pruning) and proper use of foliar fertilisers to catalyse sales and use of inputs (specifically, crop protection products, farming implements and fertiliser) leading to increased productivity. The BMP demos highlighted good pruning practices and promoted the use of MAH and MK for demonstration purposes thus contributing to their uptake.

It was however observed that Candel had limited technical knowledge on BMP given the specialised management practices for oil palm unlike other common crops, thus MADE engaged SHERDA (an organization with expertise on oil palm production) as a co-facilitator to support Candel by developing oil palm BMP training manuals and training Candel’s field representatives and lead farmers on conduct of oil palm BMP demonstrations.

SHERDA worked with Candel to continue to promote BMP demonstrations for small holder farmers, 200 demo plots were established across nine states, integrating 112 lead farmers as retailers and reaching 2,000 small holder farmers, 30% of whom were women.

MADE also facilitated the development of retail channel that embeds BMP into input retailing. Other key products providers (marketers of harvesting equipment) were linked to input retailers with the aim of stimulating commercial relationships between the two parties regarding promoting sales of the other key resources required for adopting BMP.

Introducing a market system for improved seedlings

The poor reputation of Nigeria's improved oil palm seed production companies, especially NIFOR, had put a damper on the demand for locally produced Tenera seedlings. The limited access to quality Tenera seedlings (higher oil yielding varieties) prevents farmers from planting the most productive variety with adverse effect on farm productivity. NIFOR has been the main supplier of Tenera, but because they had low quality control and did not have a commercialized channel of distribution in place, it allowed middlemen to offer poor quality seedlings under the guise of NIFOR.

MADE worked with PIND on strengthening the support market for the delivery of improved nut/seedlings varieties to smallholder farmers by promoting private sector driven supply of improved oil palm seedlings by engaging SHERDA as a co-facilitator to support the implementation of the access to improved seedlings intervention. The programme identified three sprouted nut producers (S-ATM, Allisee and NIFOR) with interest in developing their distribution channels.

Information on size of the potential demand for nuts and the presence of reliable Private Nursery Operators (PNOs) spurred the sprouted nut producers to improve their engagement activities with private nursery operators.

The activities included capacity strengthening for PNOs to upgrade their quality control and BMP as well as conduct awareness and demand stimulation activities within their clusters for farmers on the importance of planting genuine certified seeds. This led to introduction of new varieties - S- ATM introduced Deli, Allisee introduced Allisee Wonder while NIFOR introduced the newly developed EWS II- which produces an additional 2 tons per ha and reduction in fruiting period by six months. The programme also conducted trainings on best nursery and plantation management practices and how to operate profitable nurseries.

A total of 164 PNOs (25% women) were trained and 54 of them have set up demonstration nurseries reaching 3,257 farmers. These key activities are driving increased interaction between sprouted nut producers and private nursery operators and supply orders resulting in bookings for 64,000 sprouted nuts by trained private nursery operators in 2018.
While this intervention is in a nascent stage, MADE is already seeing increased availability; Allisee has doubled its production capacity, and other sprouted nut producers are entering the market. Two foreign sprouted nut producers are now investing in promotion of sprouted nuts through PNOs; while 12 additional PNOs have purchased 21,000 sprouted nuts. The increase in demand for sprouted nuts has led sprouted nut producers to increase their investment in nut production facilities and distribution across the region.

CHAPTER FOUR

CROSS CUTTING CONSIDERATIONS

Gender consideration

MADE adopted strategies to ensure better targeting of women. For the processing technologies intervention, MADE worked with commercial processors to strengthen their capacities to demonstrate the benefits and use of the improved technology to processors (women account for about 70% of processors). This resulted in women accounting for about 74% of the adoption of use of improved processing technologies and experiencing increased oil yield. In addition, MADE worked with select female business membership organisations such as the Quintessential Business Women Association (QBWA) to stimulate uptake of the improved processing technologies. Nonetheless, access to finance has been a challenge.

Environmental consideration

Some of the key resource requirements for processing palm oil include firewood (as source of fuel) and water. Increase in population and economic activities are making these resources scarce. The fabricators of the improved processing technologies are adapting the technologies taking into consideration the decline in availability of these resources and the implication on cost of processing. The steriliser component of the SSPE is made of thick metal (that allows it to retain heat) and uses the steaming method, thus requiring less water. The modified sets of clarifiers also utilise less water based on feedback from the millers. In addition, the chaff from the kernel during palm oil production is used as fuel and the sludge is used as animal feed.

Oil Palm best management practices (BMP) encourages minimal use of pesticides and reuse of organic laden materials within the farm and from the processing mills such as the use of empty fresh fruit bunches, mill effluent etc. as organic manure for oil palm plantation.

CHAPTER FIVE

KEY MARKET SYSTEM CHANGES AND IMPACT ON THE POOR

MADE is beginning to see evidence of fabricators and marketers adapting the promotional models and technology design

Market System Changes

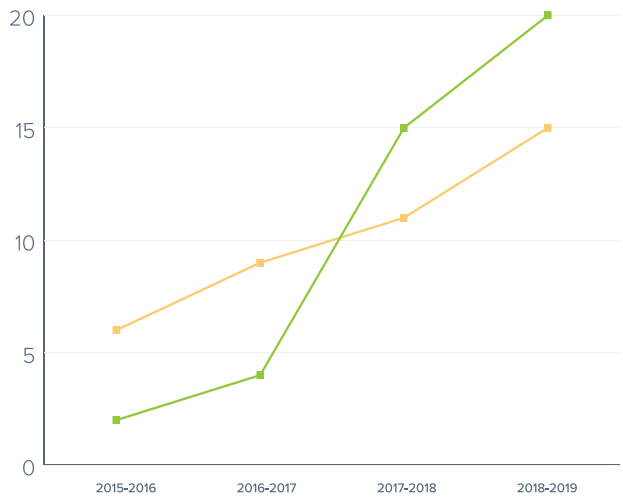
Development of commercial markets for improved technologies

The technology related interventions provided a platform for fabricators and marketers to engage with small scale consumers resulting in business improvement, improvement in after sales support and adaptation of the technologies in terms of appropriateness and suitability for the targets. There is an increasing institutionalization of the business model by the fabricators and marketers as they expand promotional activities to other states within the region. MADE is beginning to see evidence of fabricators and marketers adapting the promotional models and technology design. Fabricators of improved processing technologies have integrated other sales strategies (beyond demonstrations) such as use of radio jingles and sales agents to promote sales. Some of the marketers of the harvesting tools have incorporated the use of BMP training manuals and promotional leaflets which are distributed to farmers' groups and cooperatives to create awareness and stimulate demand. In response to feedback from customers (commercial mill owners), fabricators have also made some technical modifications to the SSPE. This is to ensure suitability of the technology to customers across various geographical locations. An example is the reconstruction of some components of the SSPE-sterilizer and clarifier to utilize less water and plans

to further scale down on size of the equipment to suit the needs of the millers. In some areas, the feedback was on the associated high cost of operating the SSPE which led to the modified version that requires a 5 HP prime mover (compared to original version of 8 HP) and reduced installation cost by 57%. Also, in response to the peculiarities in some locations, fabricators have adapted the processing equipment to enable the mills to handle fruits from local variety (Dura spp, found mostly in wild groves) as well as Tenera spp which the SSPE was originally designed to process. This is an important adaptation made by fabricators in some of the locations as observed in Cross River, Imo, Edo and Akwa Ibom. This has improved the suitability of the improved processing technology for both local and improved varieties.

The increased awareness and visibility of the processing technologies is stimulating demand and increase in the number of fabricators and marketers providing solutions. Over the period, seven new fabricators have crowded into making and selling SSPEs in the region, without project support; four of these fabricators make and sell clarifiers while the remaining three are selling complete SSPEs, leveraging demand resulting from promotional activities of fabricators and commercial mill owners in previous years. Two additional importers started selling harvesting technologies with about 23 agro dealers and 11 non-agro-dealers selling the equipment across the region as shown in Figure 3.

Fabricators and Marketers promoting Sales of Technologies



The intervention has leveraged private sector investment for the improved technologies as well as additional equipment deemed functional by smallholders. For palm oil, MADE's investment has leveraged additional NGN319.5 million investments in these technologies in the region.

Increased capacity utilization of processing and harvesting technologies

Prior to the intervention, improved technologies had been mostly donated by government and donors and were largely unutilised and abandoned upon the first signs of breakdown as no one took ownership. Today, private sector investors are seeking innovative ways to make their investment profitable and as such are driving increased utilization of these technologies.

The commercial millers and harvesters continue to organise demonstrations and meetings with associations and local groups of farmers and processors to sensitize them on benefits of the SSPE, MAH and MK.

Overall Intervention Impact on the Poor

MADE's systemic interventions have generated significant improvements in the availability and use of core productive technologies. The demonstrations accompanying the sales of more than 200 SSPEs have exposed 7,433 processors and mill owners (4,964 Male; 2,469 Female) to the technology and better processing practices through demonstrations and other awareness raising initiatives across the region. The 32% increase in extracted oil output for the SSPE has triggered more usage of SSPE mills and resulted in 3,325 processors (74% women representation) using the new improved milling services. They have benefited both from more oil per batch, as well as increasing their number of batches by an average of 50%. This has led to the increase in quantity of FFB being processed from 1 ton-2 tons to 3-8 tons for small-scale and medium-scale mill owners, respectively per day. This in turn is leading

to increased purchase of FFBs from smallholder farmers with attendant benefits for harvesters and FFB carriers who are mainly women. The introduction of the SSPE has also improved the income generating ability of processors. The processors utilizing the SSPE mills earn additional average of N9,100 per tonne of FFB which represents a 35% increase in revenue, but a much higher increase in net income. Since the volume of fruit is the same, the increased oil output is all profits.

For MAH and MK, 7,361 farmers (4,960 Male; 2,501 Female) were exposed to the technology and better harvesting practices through demonstrations and other awareness raising initiatives across the region. This and other benefits triggered usage of harvesting technologies and resulted in 4,805 farmers (35% women) purchasing improved harvesting services. The introduction of the MAH and MK has enabled farmers to harvest more FFBs per ha - average volume of fruits harvested with the use of MK (100 FFBs), MAH (140 FFBs) compared to 80 FFBs through manual climbing efforts. 5,011 small-scale farmers are gradually adopting BMP and purchasing relevant inputs with increasing demand for improved seedlings for new plantations. Upgraded plantations through BMP have increased their yields from 4 MT/ha to 10 MT/ha.

Mill Users/ Processors

Key Impact

Increased oil extraction by **33%** and reduced losses

Net Income from Palm oil

N1,350,000 /season

Fabricators

Key Impact
Increased sales of improved SSPEs

Net Income from processing equipment

N2,040,000/ fabricator/ season

Farmers

Key Impact
Increased yield of **30%** from patronage of mills using the improved SSPE

Net Income from additional FFB

N90,000 per year per farmer

How we managed Challenges

a. **Lack of formal skills training institutions for local agro-technology equipment providers in the region:** In Nigeria, metal fabrication is treated as an informal skill requiring no formal training, hence there are no public or private institutions offering trainings on the craft. Many of the fabricators are products of apprenticeship with other established metal fabricators and they had very limited knowledge and innovation in equipment fabrication. So rather than engage a formal institution as a lead actor like in most other interventions, MADE had to painstakingly identify and engage high skilled fabricators and worked with them to train other fabricators.

b. **Prolonged duration between exposure to and adoption of improved technologies, due to shortage of finance and low awareness:** At the beginning, when the fabricators began to promote the SSPE, the initial challenge was that the millers were not able to afford the technologies as it was more expensive than the old traditional method they were using. As a result, there was a slow sales conversion ratio. One of the efforts MADE facilitated was to engage financial institutions in a bid to get them to develop suitable asset financing products for smallholders. Unfortunately, the effort did not yield any results as there are broader structural issues with smallholder agricultural financing in Nigeria. This caused MADE to re-strategize by introducing the Technology Adoption Grant (TAG), a smart subsidy which helped to stimulate the early adoption, demonstrate the value proposition and trigger crowding in. But even with TAG, it still took some time before the adoption picked up, as it was slow at the beginning (between 2015 – 2016) but soared in the last year of the first phase of the programme (between 2017 – 2018). The significant difference was a result of continuously driven promotional activities, particularly demonstrations which got more people to become aware of the improved processing technology, thus increasing adoption with and without TAG.

c. **Prevalence of wild grove in many states limiting adoption of the technologies:** The SSPE was designed to process fruits from Tenera palms, but the presence of large wild groves which was a major source of FFB for farmers in some States further raised concerns on suitability of the improved processing technology in the region. It was challenging for mill owners in those regions to quickly adopt the SSPE because they could only access Dura fruits. On the other hand, there was high uptake of the technology in areas where they had more Tenera fruits. To respond to the challenge, MADE is working with seed producers and Private Nursery Operators to promote the improved seedlings intervention with a view to increasing small holder access to Tenera and gradually phase out the old, unproductive and low yielding palms.

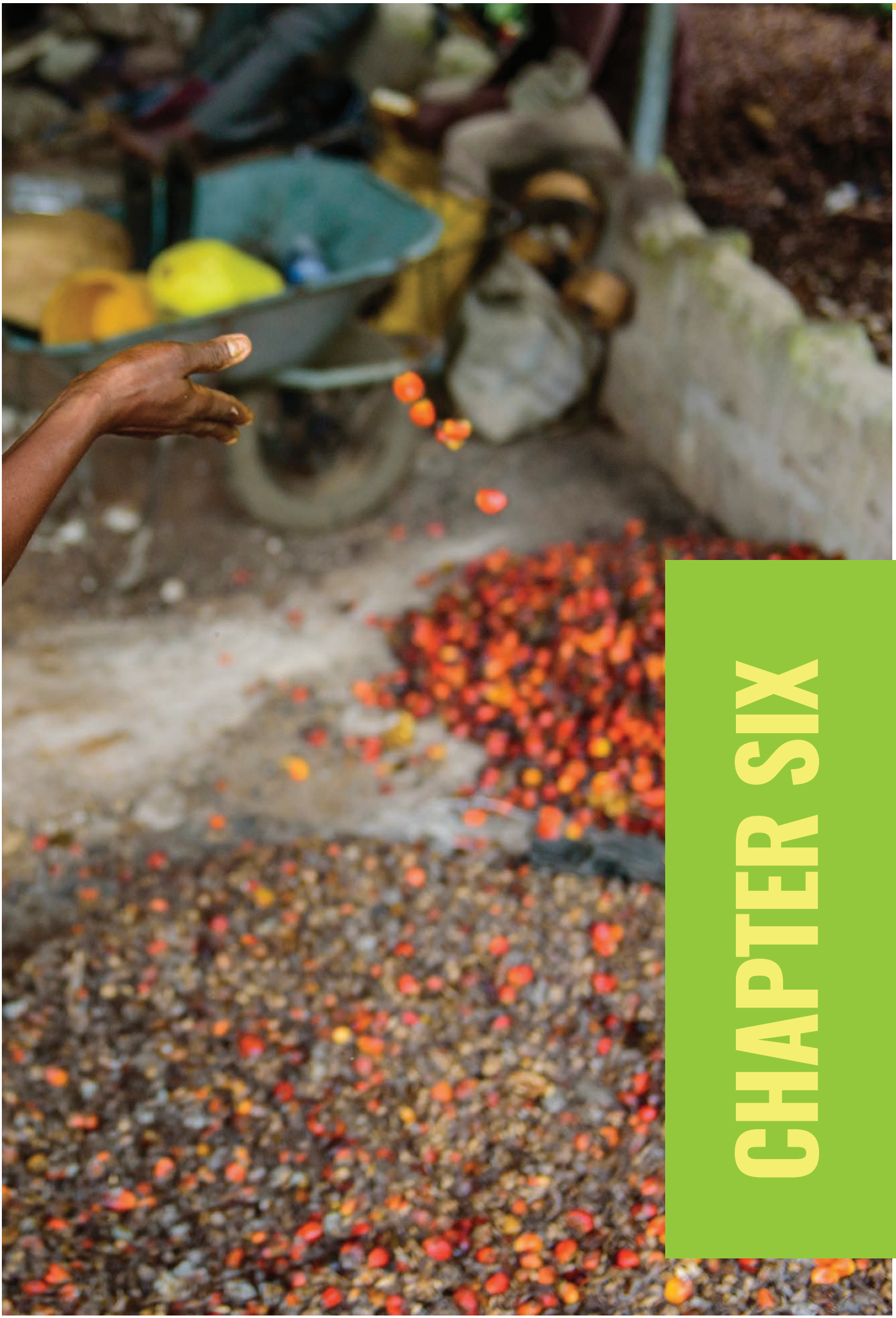
d. **Distortion prevalent in the seed market, as government programs pay for large quantities of free seeds for distribution to farmers** — This practice is unsustainable and has limited the commercialization of seedlings supply. Also, farmers may not be getting genuine Tenera seedlings even though seeds/seedlings handed to them are claimed to be NIFOR Tenera seedlings (but they may not be). Here, MADE continues to build advocacy with government on the need to adopt more sustainable ways of supporting local farmers achieve productivity and increased incomes,

e. **Limited options of appropriate technologies for smallholders as the newly introduced technologies did not address all the requirements of the smallholders—**There were limitations in the availability of appropriate technologies to meet the needs of the smallholders. In the case of improved processing technologies, millers and processors were limited

to the SSPE as new technologies targeting small holders were not developed beyond the NIFOR SSPE. However, in the course of the intervention, the challenges posed by the use of the SSPE triggered adaptation by stimulating interaction between the fabricators, millers and processors which led to innovations on adaptation of existing technologies. For instance, there was integration of the SSPE components in order to increase processing capacity and speed, oil extraction rate as well as optimizing its energy requirements. Other technology innovations different from SSPE are also being explored by the fabricators to meet with market demands and the needs of their clients.

PALM OIL INTERVENTION SUMMARY OF RESULTS - MARCH 2019

Improved Processing Technologies	Improved Harvesting Technologies	Improving Access to Inputs and Best Management Practices
15 Fabricators promoting improved processing technologies	**8** Agro-equipment dealers promote use of MAH and MK	**2** Input Companies integrated oil palm BMP demonstrations into sales strategy (Additional sales of N9M)
234 SSPE worth N194M sold to private and commercial millers	**75 MAH and 2,170 MK** worth N56.2M purchased by Oil palm farmer groups and commercial harvesters	**15** Agronomists trained to implement BMP demonstration plots
8,665 Palm oil mill owners and mill users involved in SSPE demonstrations within the region	**8,211** Oil palm farmers and harvesters involved in MAH/MK demonstrations within the region	**200** demonstration plots established on oil palm best management practices (BMP)
4,027 (74% women) mill users are using improved processing technologies and experiencing average increase of 33% oil yield.	**5,179** Farmers (35% women) used improved harvesting technologies and experienced a 40% increase in FFBs harvested	**6,311** farmers (30% women) were reached through demonstration plots within the region



CHAPTER SIX

LESSONS LEARNED AND CONCLUSION

MADE's engagement with the palm oil sector in the Niger Delta has led to a steady increase in the competitiveness of more than 30,000 smallholder farmers and processors by implementing systemic solutions at most of the critical functional points in the value chain. Strong diagnostics at the inception of the programme based on in-depth economic analysis pinpointed the binding constraints and identified the necessary sequence of change needed to have lasting impact on the sector. The dominance of very low yielding processing technologies was the underlying cause of the systemwide fragmentation and underperformance and needed to be addressed before there could be any substantive change in farmer investment to improve on-farm production. Some of the other lessons learned include:

MADE's engagement with the palm oil sector in the Niger Delta has led to a steady increase in the competitiveness of more than 30,000 smallholder farmers

a. **A critical mass of early adopters is required to stimulate widescale adoption of new ideas and technologies. Having a few demonstrations is nice but not enough to reach scale. Getting momentum means increasing exposure, for new technologies like SSPE and improved harvesting equipment.**

b. **Adoption of improved technologies by poor smallholders improves with availability of cheaper more affordable technologies and/ or appropriate financial products suitable for smallholders to facilitate purchase.**

c. **A holistic approach, including access to technology, finance, and markets, helps stimulate investment in technology uptake over the long term, making it more sustainable. Training farmers on a new technology is not enough to ensure adoption; specific interventions are often required to facilitate finance and market connections as a sustainable tool for production, income and resilience.**

d. It is important to build connections with the private sector and financial institutions early on to attract investment. There is an increasing number of investment funds aimed at buying technology-driven machinery that increases productivity among farmers. As technology companies seek investment funds to increase the use of new agricultural technologies, they often need to address the financing needs of their end customers and identify the right investor for their risk profile and expected returns

e. Capacity strengthening support reinforced the ability of supply side actors to implement interventions.

f. Improved engagement and coordination between input companies and smallholder farmers provides mutually beneficial relationships for both parties.

g. It is paramount to monitor macro-economic trends at the national level and be able to adaptively and flexibly respond to changes at the policy level.

DAI
Shaping a more livable world.

MADE
Market Development Programme in the Niger Delta

UKaid
from the British people