

Smoked Fish Strategy Brief

National Fish Sector Overview

The Nigerian fisheries sector is an important sector from both an economic and social standpoint. In 2009, the sector contributed approximately US\$1 billion to the country's GDP. In coastal communities the sector is an important contributor to employment, livelihoods, and household food security.

The supply of fish to the Nigerian market is met by both domestic and imported sources. The total supply of fish in the country is approximately 1.5 million metric tonnes with a wholesale value of approximately \$1 billion. The domestic supply consists of wild captured and farmed fish. In 2010 the domestic supply was approximately 851,420 metric tonnes disaggregated into 619,375 metric tonnes of captured fish, 200,535 metric tonnes of farmed fish and 31,510 tonnes from industrial trawling¹. Although domestic supply is currently dominated by wild captured fish, pollution and unsustainable fishing practices are gradually eroding the dominance of this channel.² Conversely, the supply of farmed fish is gradually increasing from 20% of domestic fish supply in 2009 to 24% in 2010³. The imported supply consists of frozen fish and smoked fish. Approximately, 648,580 metric tonnes of fish in frozen and smoked forms is imported into the country.

While actual consumption is about 1.5 million tons per year, the hypothetical national demand for fish is currently estimated at 2.7⁴ million metric tonnes. Real consumption is expected to grow due to the rising awareness of the health benefits of consuming fish, steady population growth, and rising incomes. Domestically, fish reaches the end market consumer in an iced, smoked, or fresh state. The fresh fish channel is primarily comprised of domestic wild captured and farmed fish. The smoked fish channel is comprised of either imported smoked fish or domestic wild captured and farmed fish processed by "smokers" before retailing.

This brief will focus on the domestic smoked fish segment of the sector, which is dominated by wild capture fish (representing 95%⁵ of supply). As such, the brief will primarily focus on the wild capture smoked fish value chain.

Niger Delta Smoked Fish Overview

Smoked Fish is fresh fish which is processed by smoked drying. Smoking is deployed in the Niger Delta for primarily two reasons. Firstly, in the absence of widespread cold chain storage, smoking is the dominant form in which fresh fish is preserved. Secondly, smoking fish is a means of product differentiation.

Key participants in the sector include fishermen, fish smokers, distributors and marketers. In terms of employment it is estimated that there are about 16,430 fish smokers, comprised of rural and urban fish smokers. In rural areas, fish smokers numbering approximately 13,080 are dependent almost wholly on wild capture fish for supply. However, in urban areas, fish smokers numbering approximately 3,360 secure supply from both pond fish and wild capture fish. The vast majority of smokers (99%) are women. Conservative estimates number wholesalers and retailers of smoked fish

¹Federal Ministry of Agriculture and Rural Development, Fisheries Department (2010)

² For example, in 2009, (excluding the less than 5% contribution from industrial trawling activities), Nigeria's domestic fish production reached approximately 751,007 metric tons, of which 80% was capture fisheries, and largely artisanal. In 2010, capture fisheries consisted 76% of the country's domestic fish production.

³Farmed or cultured fish have contributed 20% to the domestic fish supply in 2009 at 152,796 metric tonnes increasing to 24% in 2010 at 200,535 metric tonnes

⁴National Bureau Of Statistics/ Federal Ministry Of Agriculture And Rural Development Collaborative Survey On National Agriculture Sample Survey (Nass), 2010/2011

⁵ Figure based on fieldwork by MADE analyst and opinions of industry experts.

products at 18,000⁶; 98% of which are women. In addition, 95% of the fish used for smoking is captured in the wild by approximately 241,000 fisher-folk.⁷

The domestic supply of smoked fish in the Niger Delta is estimated at 324,6171⁸ metric tonnes of fish worth approximately N393bn⁹. This figure can be disaggregated into 10,427¹⁰ metric tonnes of smoked pond farmed fish worth N4.171million and 314,189 metric tonnes of smoked captured fish worth N392.74bn.

The hypothetical demand for smoked fish in the Niger Delta is projected at 376,200metric tonnes¹¹. This demand is driven by consumers in the three primary end markets for smoked fish: households, informal catering institutions and the export market.

Where do we focus and why

In the Niger Delta, smoking activities are concentrated in fishing settlements that depend on wild captured fish and around fish ponds. Rural fishing settlements where smokers live and work together are termed community clusters. In urban areas, smokers operate in non-communal clusters. Non-communal clusters are locations where smoking equipment (usually drum technology) is concentrated for use by smokers. Clusters can be the work-site for anywhere between 15-40 people, who typically own the drums which they use to smoke fish.

In the Niger Delta, rural community smoking clusters of particular relevance in terms of size are located in Ibaka (Akwa Ibom State) and the other similarly sized fishing ports of Brass, Mbikiri, Bonny, and Ukwani. Whilst large urban non-communal smoking clusters include Erekerenwa, Owerri; Igbudu cluster, Warri; and Elioizu and Obio-Akpor clusters, Port Harcourt.

The table below highlights the geographic locations where fish smoking is prevalent, the technologies deployed, and the modality of organisation.

LOCATION	SMOKER POPULATION (Drum)	SMOKER (Altar)	POPULATION ¹²	Non-communal Community Clustered	Clustered/
RIVERS STATE					
Port Harcourt	650		10		Clustered and Non clustered
River 7			80		Clustered
Agaja			50		Clustered
Lighthouse			30		Clustered
Sandfill	30				Non clustered
Amaria			50		Clustered
Orosikiri			30		Clustered
Park			30		Clustered
Kala-ibiama			30		Clustered

⁶Based on fieldwork by MADE analyst

⁷National Bureau Of Statistics/ Federal Ministry Of Agriculture And Rural Development Collaborative Survey On National Agriculture Sample Survey (Nass), 2010/2011. There are 253,213 fishery holders (captured and fish farmers) in the Niger Delta disaggregated into 158,339(62.55%) males and 94, 874(37.47 %) females. From fieldwork pond farmers are estimated as 12066

⁸Aggregate of smoked pond fish figures and captured fish figures

⁹price of smoked pond fish is N400 per kg

¹⁰Federal Department of fisheries 2010 reports national figures of 200535MT. NBS/FMARD NASS Draft report 2011 puts the NDR pond production at 26% of national figures.

¹¹Based on figures from Projected Population and Fish Demand by Federal ministry of Agriculture and Water Resources Fisheries Department/ Fisheries statistics of Nigeria (2007) for 140million population. The entire Niger Delta Region fish demand is projected at 585000metric tonnes with half demand for smoked fish

¹²A conservative estimate of smokers' population based on interviews.

Koruoma		30	Clustered
Subtotal			1020
AKWA IBOM STATE			
Ibaka		1000	Clustered
Oron		800	Clustered
Ipeono		500	Clustered
Itu		700	Clustered
Eket		600	Clustered
Subtotal			3600
DELTA STATE			
Abaragada/Eyinyin/Onuaboh/environs		1440	Clustered
Warri, Ughelli, Isoko	55		Clustered and Non clustered
Subtotal			1495
IMO STATE			
Owerri		300	Clustered
Oguta	215		Non clustered
Subtotal			515
BAYELSA STATE			
Mbikiri/Amatu/Yokri/Agee Ogulaha/Kolouama/Izetu/Keni		2500	Clustered
Edo State Cross River State Abia State Ondo State	2410	4900	Both
TOTAL POPULATION(non-clustered)		3360	
TOTAL POPULATION(clustered)		13080	
Total Smokers		16440	

Table 2: Geographic locations of prominent fish smoking areas

VALUE CHAIN PROFILE

END MARKETS

There are three main end market segments in the smoked fish value chain:

Household consumers in the Niger Delta: This market segment has a population size of 31,224,577. Household consumers typically purchase dried fish products for use in traditional foods, in particular soups.

The informal catering segment: This segment has an estimated 16,700 participants who utilise the dried fish products for food to be sold to the consumer public.

The regional export segment: This segment comprises of those who live outside the region who consume the region's smoked fish which is aggregated in Aba (Abia State) and Onitsha (Anambra State) markets before distribution to various cities in Nigeria.

The current supply of smoked fish into the above end markets is approximately 333,441 metric tonnes; whilst the estimated hypothetical demand is projected to be 376,200 metric tonnes. At this time, demand per end market segments cannot be calculated. Potential growth in these end markets is being driven by smoked fishes' longer shelf life and consumer preferences towards fish products as a healthier source of protein.

In the smoked fish market, demand spikes during the festive seasons, in particular Christmas and Easter. In terms of supply, supply peaks during the dry season (November to March) and dips during the rainy season (March to October). As such, the price of smoked fish is seasonal, dipping when supply is high and rebounding when supply is low.

Sector Competitiveness

The price of smoked fish is differentiated by source. As illustrated in the table 2 (below) smoked wild capture fish is the most expensive because of supply constraints and preference for taste, whilst the cheapest is smoked pond fish. Imported smoked fish is a relatively new product on the market; imported pre-filleted and smoked fish is sourced from in particular Thailand, Mali, and Republic of Benin.

Table 2: Comparative Retail Prices of Smoked fish Products¹³

Fish Type	Imported smoked Fish	Smoked Captured fish	Smoked Pond Fish	Smoked imported Fish
Retail Price(₦/Kg)	₦ 1,350	₦ 1,875	₦ (700-1,000)	₦ 1,500

Within Nigeria, smoked fish from the Niger Delta is domestically competitive in terms of quality, especially when compared with smoked fish from the Northern inland waters which are often not gutted or well cleaned.

In addition, competitiveness of the sector in the Niger Delta is impacted by the availability of pond fish and wild capture fish. Limited availability has limited the region's supply of both smoked farmed and wild capture fish. As a result, imported smoked fish despite being more expensive is beginning to gain a foothold in the local market. However, the relatively new emergence of this new market segment entails that levels of importation have not yet been quantified.

Value Chain Structure

The sector is comprised of pond farmers and fisher-folk who supply fresh fish to smokers for processing. Smoked fish is then sold to wholesalers and retailers who in turn sell it onto the end consumer.

Pond Farmers (Producers)

Fish farmers or producers number 12,066 in the Niger Delta disaggregated into 2,413 female fish farmers¹⁴ and 9,653 male fish farmers. Across the Delta, fish farms exist as individual holdings, expect in Warri, Agbor, and Asaba, Delta State where they are clustered.

Pond farmers typically sort and grade fish before sale; with the smallest and poorest quality fish going into the smoking market. As such, pond farmers typically only sell out graded fish of 0.5kg and less to smokers for N350-400/kg. Whilst fish weighing between 1-1.5kgs is sold to distributors at N 650-700/kg and fish above fish 1.5kg is sold to Caterers, hotels and institutions at N800/kg.

Fisher-folk (Harvesters)

¹³ From 2013 fieldwork survey by MADE analyst

¹⁴ In some cases there is joint ownership between couples which would result in female farmers numbering about 3000.

There are approximately 241,147 fisher folk in the Niger Delta disaggregated into 150,789(63%) males and 90,358(37%) females¹⁵. While the men engage in finfish fishing, women are primarily engaged in shellfish fishing.

The productivity of fisher-folk is differentiated by location and socio-economic status. Fishermen who are based in areas with electricity are able to make ice from their own household deep freezing units; allowing them to engage in 2-3 daylong fishing trips. However, fishermen from areas without electricity to make ice are constrained to day trips not exceeding 24 hours. In addition, only some fishermen own their boats; with the most common ownership structure being that of joint ownership.

A major challenge facing fisher-folk is post-harvest losses. Post-harvest losses occur from the time of harvest up till the time of processing. At peak harvest periods, lack of on-board refrigeration units leads to the loss of as much as 15%¹⁶ (or 8,288 metric tonnes) of their harvested volume before sales. In a typical fishing village the estimated value of loss for fisher folk can be as much as N10.36bn. In addition, smokers make losses after purchase if they are unable to handle the quantity of landed fish in time to prevent spoilage, or when smoking is not done properly. The estimated loss on shore is as high as 20% of catch purchased. During the peak harvest season, the estimated value of loss for community smokers is as much as N19,092bn.

Smokers

In the Niger Delta, there are approximately 16,440¹⁷ smokers of which 99% are women. Smokers kill, gut, and prepare the fish prior to smoking as well as tend to the fish and firewood during the smoking process. Traditionally, smokers worked in community clusters on smoking platforms or altars. However, in urban areas smoking is now even done at the home with drum technology.

Smokers can be differentiated into '*smoking mummies*' and small-scale smokers. '*Smoking mummies*' control the sale of fish from specific boats; thereby securing a steady supply of fresh fish which they then go on to smoke at scale. '*Smoking mummies*' are often employers, hiring women to prepare and smoke fish. Small-scale smokers are relegated to either buy smoking mummies' excess fresh fish (fish that they do not have the capacity to smoke) or directly from fisher-folk at beach markets

Smoking Technologies

The smoking technologies deployed differ by geographic location and the financial capability of the smoker. For example, the smoking platform is usually deployed in poorer rural/riverine communities and drum technology is typically deployed in urban areas. There are primarily two methods of smoking: traditional and modern. And within each method there are different technologies which can be used.

Traditional Methods

Smoking platform

Smoking platforms or altars are typically utilised in rural fishing settlements. The smoking platform or altar is constructed from wood; with the fish strung up along the platform and a fire lit beneath. The platforms are housed in '*smoking huts*' which are in essence thatched huts used for the purposes of smoking. The fish is smoke dried for three days to attain the required level of reduced moisture content. Platform smoking capacity is 500kg per hut over a three day period.

¹⁵National Bureau of Statistics/ Federal Ministry of Agriculture and Rural Development Collaborative Survey on National Agriculture Sample Survey (NASS), 2010/2011. There are 253,213 fishery holders (captured and fish farmers) in the Niger Delta disaggregated into 158,339(62.55%) males and 94, 874(37.47 %) females.

¹⁶Based on fieldwork. Estimated total catch is 59,200tonnes at 100 peak harvest days of 2tonnage boats numbering 296

¹⁷ Estimate from fieldwork

Challenges with smoking platforms include that they are housed in highly combustible thatched huts, which in some cases are clustered together rooftop-to-rooftop. Fire outbreaks are common. In the two main fishing villages of Mbikiri and Ibaka there are 2-3 fire incidences every year as a result of smoking activities leading to loss of life and property. In addition, in order to ensure that the fish are adequately smoked, smokers often sleep in the huts, running the risk of smoke poisoning, fire burns, and long-term respiratory problems. In addition, smoking platforms require a large amount of firewood, leading to deforestation around fishing villages.

Drum Technology

Smoking drums are usually deployed in urban areas and are considered a safer option and a technological upgrade in comparison to the smoking platform. Smoking drums are metal containers in which wood is placed and lit. The fish are then placed on a metal rack which lies across the top of the container. The fish take approximately 2-3 days to smoke to the required level of reduced moisture content. The smoking capacity of drums is approximately 15kg-20kg per drum depending on fish size.

Smoking drums are considered a technical upgrade from the smoking platform because they use less firewood and have a reduced negative health impact, particularly on eyes, the skin, and the respiratory system.

Improved Modern Technology

There are several types of improved smoking kilns in the Nigerian market. However the main types are the Chorkor Oven and the National Institute of Marine Research (NIOMR) smoking kiln.

Chorkor Ovens

The Chorkor Oven is a traditional oven made of red earth or brick. It has a fish smoking capacity of up to 300kg of fish at a time. During the smoking process, fish are stacked on several trays, which are rotated during the 5 hour smoking period to avoid burning the fish¹⁸. Chorkor ovens are typically constructed by community people.

However, deployment in the Niger Delta is not common, because of the lack of red earth and brick. In addition, when the Chorkor oven has been deployed, it has been deployed within the context of a donor funded programme, as opposed to the oven being brought to the market through the commercialisation efforts of a local manufacturer or a local service provider.

Improved mechanical smoking kilns (e.g. NIOMR and Azemor Smoking Kilns)

Improved mechanical smoking kiln such as those manufactured by NIOMAR are constructed from metal (see image below) and have different capacities. The size of the NIOMR kiln ranges from a 25kg smoking capacity to a 250 kg smoking capacity with the corresponding price differences illustrated below:

- 25kg-N110,000.00
- 50kg-N160,000.00
- 100kg-N260,000.00
- 250Kg-N510,000.00

The NIOMR kiln is perceived as a more efficient smoking kiln because the smoking process does not require the smoker's oversight. Once the fish is inserted, the thermo-regulated kiln ensures that the fish is evenly smoked to the reduced moisture content required for a long-shelf life.

¹⁸NPFS(National Programme For Food Security)



Figure1: NIOMR smoking kiln

NIOMAR smoking kilns reduce the smoke drying period to 3-4 hours per batch and more evenly smoke the products. In addition, NIOMR kiln smoked fish have a longer shelf life. The primary difference between the Chorkor and NIOMAR ovens are illustrated in the table 3.

Description	• Chorkor Kiln	• NIOMR kiln
Fuel usage	Uses wood for smoke and fire production	Uses coal only. Forest resources are available locally.
Panel separator	There is no panel separating the fish from the flames. So the fish needs constant tending so that the flame does not become too hot and then burn the products.	A panel separating the flames from the fish is available to prevent burning or charring of the fish products.
Fish rotation	There is need for the rotation of trays between top layer and the bottom layer in order to ensure evenness.	Due to the features of the NIOMR kiln there is all round evenness assured without manual tray rotation.
Production material	There is need for the availability of red earth or bricks as a major component of the kiln construction which is not readily available everywhere in the Niger Delta Region.	All kiln components are manufactured and are independent of the end users input. Supply of coal in sufficient quantities is possible from the surrounding mangrove forest resource?
Reduced moisture content efficiency	The oven does not reduce the moisture content of the fish to the requisite level; reducing the shelf-life of the fish.	The kiln reduces the moisture content of the fish to the requisite level; prolonging its shelf life.

A comparative analysis between the old traditional method and the new kiln method is illustrated in table 4, below. This analysis contrasts the traditional smoker mammie to the modern smoker mammie who either rents a smoker in the village, or owns her own.

		CAPTURED SMOKED FISH BIG FISH MAMMIE SMOKER MODEL					
CAPITAL COSTS		UNIT PRICE	TRADITIONAL METHOD		NIOMR KILN METHOD RENTED	Comment	NIOMR KILN METHOD - OWNED
THATCH SHED			2,000		2,000		2,000
SMOKING PLATFORM			2,000				-
Kiln					510,000		510,000
SUB-TOTAL			4,000		512,000		512,000
OPERATING COSTS							-
cost of 160Kg fresh fish (10 basins of 16 kg)	10	20,000	625,000		937,500		937,500
Smoking capacity(Kg)/load			500		250		250
3-day smoking capacity (Kg)			500		750	NOTE	750

firewood/coal for 3 days	3	10,000	30,000	2,200	6,600	NOTE	6,600
Labour cost		3,000	9,375		14,063		14,063
Tolling fee					75,000		
Depreciation							510
Sub-total			664,375		1,033,163		958,163
SALES							
Gross sales(3 days production)	10	30,000	937,500		1,406,250		1,406,250
Profit over 3 days			273,125		373,088		448,088
Return to labor/day			NGN 91,042		NGN 124,363		NGN 149,363
Fuel cost (N/Kg)			62.5		8.8	NOTE	8.8

Table 4: Comparative cost analysis of the smoking platform technology versus the improved kiln technology

The profitability analysis demonstrates that a woman smoking three loads of 250kg per day, compared to a smoker who is smoking 500kg for three days, earns significantly more money over the three day period, while having a lower outlay of cash per day.

Even more important is that when a return on investment is carried out. Although the initial cost of an improved smoking machine is higher than a drum or smoking alter, an improved smoking machine can pay for itself in as little as 25 days if used as an investment, which is managed by one individual and then rented out to small smokers on a daily basis. Considering that there are about 100 smoking days in a year, this means that it can pay for itself quickly and still turn a good profit for the year.

When viewing profitability from the perspective of the small scale smoker, who has limited financial capacity to purchase fish for smoking (can only afford to buy 1-2 basins at a time), it is most important to analyse it from the perspective of return to labour. This entails calculating how much money the smoker can make from a day of her labour. Given that a major constraint for the smoking women is their financial capacity and cash flow to buy fish for smoking, the improved smoking technology smokes the fish three times faster (one day instead of three), which allows the women to turn their limited inventory more quickly. All other elements remaining constant, this can increase their return to a day of labour threefold. The following table compares the return to labour for a small scale smoker.

Table 5: Comparative analysis of operational costs of the drum technology versus the kiln smoking technology

OPERATING COSTS	units	cost	traditional	unit	modern kiln
cost of 160Kg fresh fish (10 basins of 16 kg)	1	20,000	20,000		20,000
firewood/coal for 3 days	3	1,000	3,000		-
Labour cost (own labour)					
Tolling fee (smoking charge)					3,200
Sub-total			23,000		23,200
SALES					
Gross sales(3 days production)	1	30,000	30,000		30,000
Gross Profit per basin			7,000		6,800
Return to labor/day	3		NGN 2,333	1	NGN 6,800
			\$14.58		\$42.50

In addition, since one of the main sources of loss to the sector is the spoilage due to low capacity to smoke the entire catch when it comes in and the quality of smoking, the increased rate of smoking will result in lower overall spoilage.

Along the same lines, Table 6 shows the comparative analysis of using another traditional smoking technology (drum smoking technology) versus using the more modern smoking kiln technology. The issues addressed in the narrative on the traditional smoking altar vis-à-vis the modern smoking kiln remains the same for the drum versus modern kiln smoking technologies. Relatively minor differences lie in the location of kiln deployment and equipment capacity. Whilst the 250 kg kiln is to be deployed in the rural communities with large clusters of smokers, the 25kg kiln or the 50kg kiln will be deployed in the urban regions in lieu of the traditional drum smoking technology presently in use. Prevalent in the urban areas are the pond fish smokers.

Modern kiln capacity is 25kg and the drum capacity is 20kg. Smoking the same amount of fish, the smoking duration using the modern technology is half the time for the drum technology. The return on labour per day is higher with the modern kiln technology at N6,080 as against N2,920 realised using the drum smoking technology. The fuel usage is lesser in the case of the modern kiln at N22/kg as against N50/kg for the drum technology at full equipment capacity. Smoking the same quantity of fish, the kiln technology at less than half capacity loading has a N55/kg fuel cost compared against the drum technology's N50/kg fuel cost.

Investment Costs	Assumptions	Traditional drum smoking technology				Comments	New kiln smoking technology			
		vol.	unit	unit cost	Total cost		vol.	unit	unit cost	Total cost
Cost of Drum		1	no	3,000	3,000					
Cost of welding				500	500					
Cost of grille				2,500	2,500					
Cost of kiln						25kg kiln	1	no	100,000	100,000
TOTAL INVESTMENT COST					6,000					100,000
Operational Costs										
2-day smoking capacity	20kg	20	kg			50 kg	50	kg		
Cost of fish	20kg of small fish per load	20	kg	350	7,000		50	kg	350	17,500
Firewood/coal					1,000.00	1/2 bag of coal	0.5	bag	2,200.00	1,100.00
Rent	Per day rental	2	days	80.00	160.00	N28000/month	2	days		2,240.00
Tolling fee	own labour	20	kg			N100/kg (equipment payback charge)	20	kg	100.00	2,000.00
TOTAL OPERATIONAL COST					8,160.00					21,840.00
At same loading capacity, Fuel costs(N/Kg)	25kg	20	kg		50.00	¼ bag of coal	20	kg	1,100.00	55.00
SALES										
Sales cost	(N700-N1000)/kg	20	kg	700.00	14,000.00		50	kg	700.00	35,000.00
Gross profit					5,840.00					13,160.00
Return on labor/day					2,920.00	NOTE				6,080.00

Fuel cost/ Kg of fish				50.00	NOTE			22.00
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Table 6: Comparative Analysis of the drum smoking technology versus the modern kiln smoking technology (smokers' ownership of equipment model)

Wholesalers and Retailers

Conservable estimates place the number of wholesalers and retailers at 18,000,¹⁹ of which 98% are women. Wholesalers often act as aggregators of smoked fish, assembling and transporting smoked fish products to markets in for example Creek Road market Port Harcourt, Ogbe-ljoh market Warri, Yenagoa and Aba markets. Retailers sell products directly to consumers at urban markets. Retailers who sell smoked pond fish, also often smoke the fish themselves. In contrast, wild captured fish is almost exclusively smoked by dedicated smokers.

Supporting Organisations

National Institute of Oceanography and Marine Research (NIOMR)

NIOMR is a research institute, which conducts research on effective smoking technologies. In addition, NIOMR is one of the primary smoking kiln manufacturers in the country. NIOMR has developed an insulated, thermally regulated smoking kiln capable of smoking 250kg of fish at a time. They also provide training services and consultancies to fish farmers.

Associations

Fishermen Association

Fishermen Associations represent wild catch fishermen. Associations include the Bonny Indigenous Fishermen Cooperative Union, Nigerian Union of Fishers, and Aquaculture and seafood Dealers (NUFAS). They provide an important organisational structure through which to reach a large number of fisher-folk.

Producer Associations

Producer associations represent pond farmers and advocate for pond farmers at a policy level and provide services. Producer associations existing in Rivers State are Grassroots Farmers Association and Rivers State Aquaculture Society (RISAQUAN).

Professional Associations

Professional associations such as Fisheries Society of Nigeria (FISON) and Aquaculture and seafood Dealers (NUFAS) are umbrella organisations for those who are engaged in the fisheries sector.

Market Associations

Market Associations operate in urban markets across the Delta. Market Associations control which players can buy and sell fish products in any given urban market. Without membership to a market specific association wholesalers and retailers are unable to purchase wild catch fish.

Supporting Services

Regulatory Framework

Domestically, the trade of smoked fish is not subject to any regulation. However, the exportation of smoked fish to global markets— an end market of increasing interest to some fish smokers— is

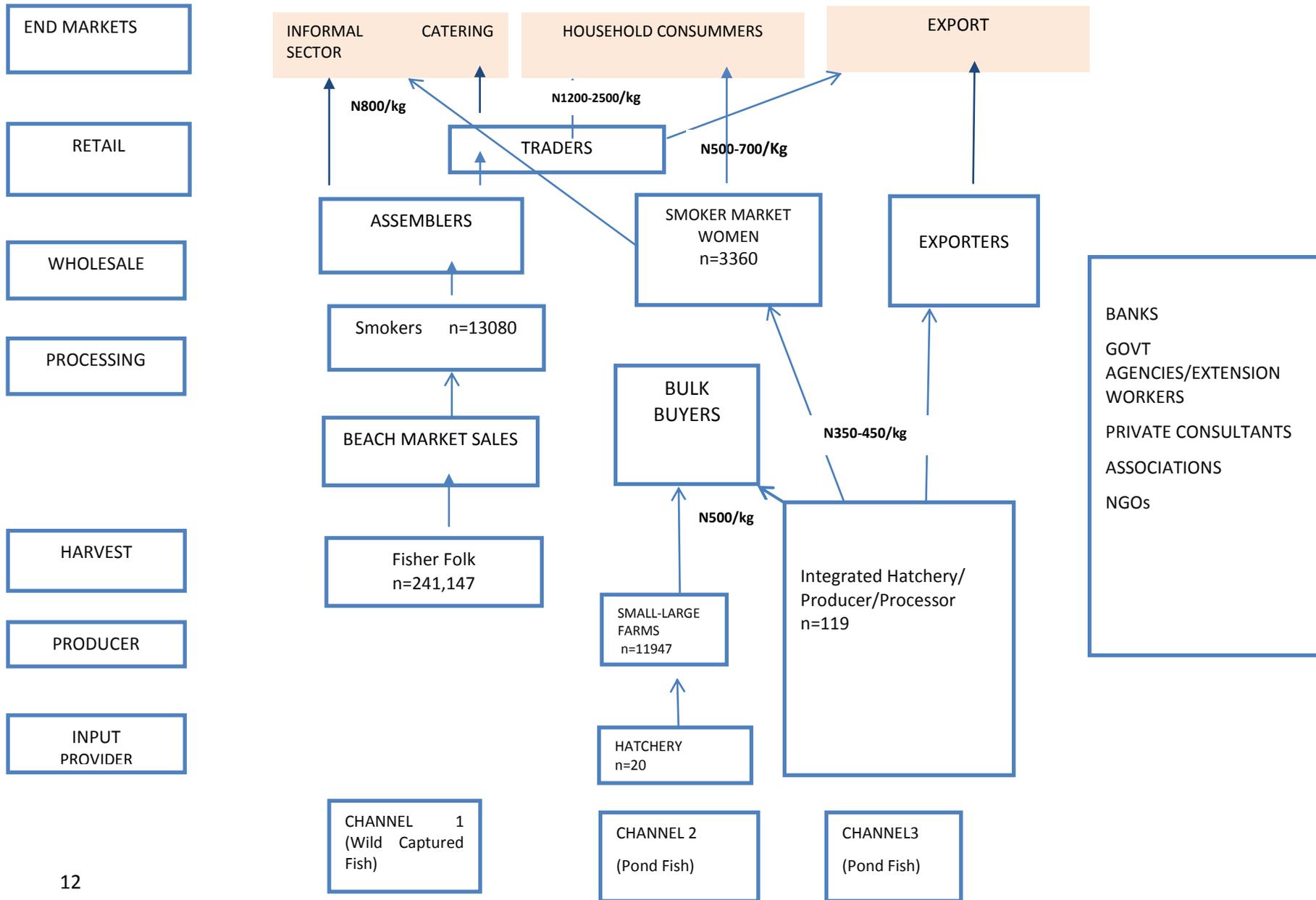
¹⁹ Estimate based on fieldwork

subject to regulation. In regard to the exportation of smoked fish, particular organisations of importance include:

Nigerian Export Promotion Council (NEPC): A government organisation which facilitates the exportation of non-oil products into the global market.

Nigerian Agency for Food and Drugs Administration (NAFDAC): NAFDAC is the Nigerian government agency which amongst other things is responsible for the manufacture and exportation of food.

SMOKED FISH VALUE CHAIN



Description by Channels

The value chain on the preceding page highlights the two primary channels through which smoked fish reaches the end markets: wild captured fish and pond farmed fish.

Wild Capture Fish

Fisher-folk capture fish off-shore in dug-out canoes or motorboats. The fresh fish are then sold at shore-side markets to smokers (both smoking mammals and small-scale smokers). Smoked fish is then sold to traders who take the fish to the urban markets for sale in the market or directly to household consumers and informal eateries at urban fish markets. There are also wholesalers who assemble and export smoked fish to regional markets (outside of the Niger Delta).

Pond Farmers

Pond fish for smoking is usually the smaller out-graded fish (<0.5kgs) which is sold to smokers (often close to the fish pond). Occasionally, fish farmers smoke the fish themselves, however, inaccessibility to markets has stifled this practice. Smoked fish is then sold to retailers who operate in urban markets throughout the delta.

Sectoral Dynamics and Driving Forces

Sectoral Dynamics

- The steady increase in supply of fresh pond fish, which has been bringing down the price of cultured fish, has increased domestic supply of fresh fish for smoking around the fish farms in the Niger Delta.
- In the major smoked fish markets of Aba and Onitsha, smoked wild capture fish from the Niger Delta is increasingly competing with wild capture smoked fish products from the Northern States of Nigeria for market share.
- Even though there is strong demand in Nigeria, some smokers are looking to export markets; in particular those with a significant Nigerian Diaspora population, where they can sell quality packaged smoked fish for a higher price.
- The challenge with the fishing harvest, which is not as abundant in recent years, is reducing the amount of fish available for smoking.

Driving Forces

- Consumer demand for smoked fish is growing, although not on a par with demand for fresh fish.
- Surplus production of pond fish is driving the growth of local smokers around the ponds and in the urban markets, taking up the smaller fish.
- Technology improvements, in particular the introduction of improved smoking equipment, are gradually leading to growth in the smoking industry.
- A need to reduce post harvest losses (amounting to up to 20% during peak seasons) is driving the supply of smoked fish into the market and the demand for effective smoke drying equipment.
- Recognition by Nigerian diaspora of the quality of the fish from the modern kilns is creating demand for exports, attracting the attention of local smokers and recognition of the need to improve quality and packaging.

- The emergence of new imported smoked fish originating from outside the region is driving producers to improve value addition.
- A supportive institutional environment, in particular, the government’s resolve to diversify exports is creating an enabling environment for the exportation of fresh products.

Points of Leverage

Fishing Community Settlements. Large organised fishing settlements offer the opportunity to reach a large number of people through the demonstration and deployment of a smoking kiln.

Smoking Clusters. Large smoking clusters in urban areas offer the opportunity to reach a large number of smokers through the demonstration and deployment of a smoking kiln.

“Smoking Mammies”. The large scale smoking mammies, who often manage the entire chain from fishing to retail, are heavily invested in the sector. Smoking mammies are better placed to purchase smoking kilns, for use by their smokers and other smokers on a fee for service basis.

Smoking machinery manufacturing firms (NIOMAR and Azemor). The manufacturers of these efficient smoking machines producing quality smoked fish with a low payback period are interested in driving the sales of new kilns.

Constraints Analysis

The following systemic constraints were identified:

Supply-side constraints include:

- Lack of a well established cold chain supply results in high levels of fish spoilage at sea and on shore.
- Fish is lost due to biannual fire disasters in fishing community clusters arising from the use of traditional smoking methods.
- Smokers are primarily dependent on wild captured fish for supply. However, wild capture supply is slowly diminishing, threatening smoker’s primary source of supply.
- Pond farmers do not perceive the production of fish for the smoked market as a potentially profitable niche business; rather it is seen as a market to do away with out-graded smaller fish.

Demand-side constraints include:

- Lack of awareness of improved smoking technologies.
- Weak purchasing power to buy an improved smoking kiln

Opportunities:

- With the very rapid return on investment, there is a significant opportunity for selling improved smoking kilns into the fishing clusters.
- Improving the access to a regular supply of ice for the fishermen can lead to a reduction in the overall spoilage and a higher quality of fish for the smokers to smoke.

Synergies with other programs

Other programs with which MADE can collaborate include:

USAID’s MARKETS II

MARKETS II is presently designing a training program involving smoking equipment which will be deployed in Cross River, Bayelsa, Edo, Rivers and Delta States.

Partnership Initiative in the Niger Delta (PIND)

PIND's Appropriate Technology (ATED) and aquaculture sections are deploying chorkor smoking kilns in Delta State, Bayelsa State, with a particular focus on the riverine communities and pond fish smokers.

GEMS 4

GEMS 4, which focuses on developing wholesale and retail markets, is interested in working with MADE on the challenges around improving access to new markets for smoked fish.

VISION AND STRATEGY

Increased Smoked Fish Production

Our vision is to:

1. Reduce post harvest losses incurred by fisher-folk, and
2. Improve the profitability of smokers through the deployment of improved smoking technologies, the increased accessibility to markets through improved marketing and packaging, and increased supply of pond farmed fish.

STRATEGY

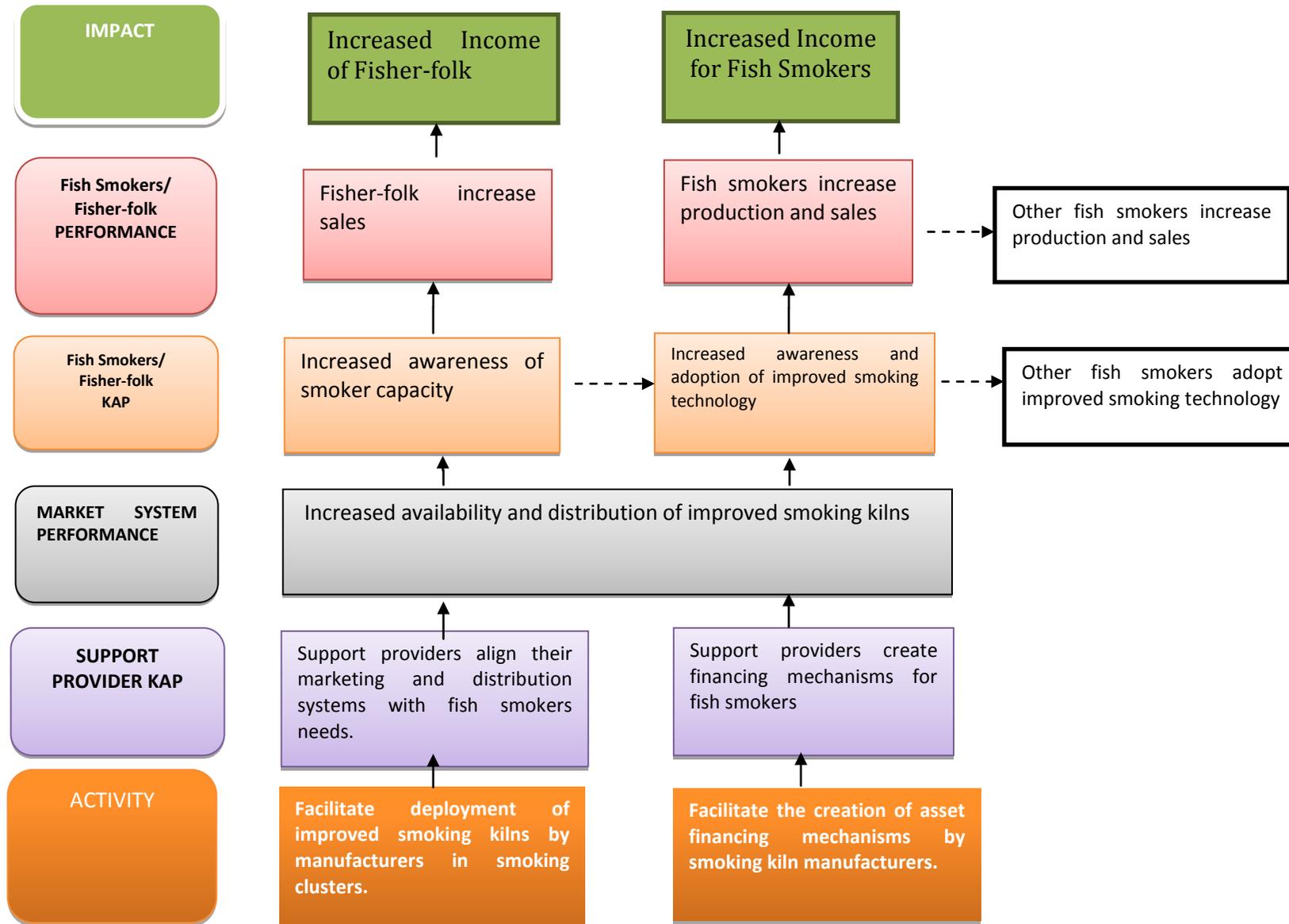
- Improve the awareness of smoking technologies
- Increase the availability of smoking technologies
- Stimulate the uptake of smoking technologies near to the surplus producing pond fish clusters and incentivise pond farmers to produce for the smoker market.
- Improved access to marketing and packaging services

THEORY OF CHANGE

Critical to improving the incomes of fish smokers and fisher-folk is increasing awareness of, and access to, improved smoking technologies.

For fish smokers, access to improved smoking technologies will increase their smoking efficiency (the time it takes to smoke fish) and capacity (the amount of fish that can be smoked). When increased efficiency and capacity are coupled with improved packaging and marketing, fish smokers will access new markets with higher prices; ultimately leading to increased profitability and incomes. Improvements in profitability and incomes will incentivise fish smokers to buy more fresh fish from fisher-folk for the purposes of smoking, thereby increasing fisher-folk income. In addition, for fisher-folk improved access to smoking technologies will increase incomes through decreasing post-harvest losses.

Sector Logic



Potential Intervention

Facilitating Fish Smoking Technology Roll-out

In order to achieve the articulated theory of change, MADE proposes to stimulate the supply of high quality smoking equipment into the rural fishing communities and urban smoking clusters. This will involve piloting fish smoking demonstrations in partnership with a smoking kiln manufacturer (e.g. NIOMR). The smoking kiln manufacturer (intervention partner) would provide the smoking kiln for demonstration purposes. Most likely managing it as a separate business, designed to sell smoking services to small smokers, the pilot will demonstrate the increased efficiency, quality and the profitability to small farmers. With a range of kilns for sale, each appropriate to a different environment, the objective would be to increase demand for the purchase of the kilns by small or large scale entrepreneurs. Demonstrations could also incorporate improved packaging and labeling techniques. MADE would assist the smoking kiln manufacturer to identify the most appropriate clusters to target (addressing the information failures) and improve their marketing capabilities to present a clear value proposition to investors within smoking clusters, thereby enhancing their market penetration.

The pilot smoking demonstration would initially target “*smoking mummies*” who have the immediate financial capability to purchase improved smoking technologies. In addition, smoking mummies are “opinion leaders” or “change agents” within smoking clusters. As such, their adoption of smoking kilns might catalyse take-up by other “*smoking mummies*” and small-scale smokers. The next population targeted will be regular small-scale smokers. If required, MADE will facilitate appropriate asset financing mechanisms for the acquisition of smoking kiln by small-scale smokers and investigate the feasibility of financing mechanisms for the acquisition of smoking kilns for small-scale farmers.

In terms of geographical location, it is proposed that the first smoking demonstrations be located in the beach smoking clusters in Akwa Ibom and Rivers State.

Incentivising Pond Farmers to Produce for the Smokers Market

Incorporate value proposition of producing fish for the smokers market into training curriculum for aquaculture pond demonstrations.