Nigeria Aquaculture Value Chain Analysis

October 2012

This publication was produced for review by the United States Agency for International Development. It was prepared by Chemonics International Inc.
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MARKETS II

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Executive summary

Nigeria is a big importer of fish, with imports reaching as high as $1 billion in 2007. However, dwindling natural fish stocks, import substitution opportunities, and increased protein consumption with rising incomes, all combine to provide good opportunities for the local aquaculture sector. In fact, the aquaculture value chain is growing fast, more than 30 percent a year. Catfish dominates the sector, but tilapia is also farmed.

The sector’s overwhelming operating concern is fish feed, which can account for between 60 - 70 percent of all costs. A number of fish feed suppliers exist, from cottage industries to commercial operations, while some fish farmers also produce their own feed.

Building the competitiveness of the fish feed sector will require product development and trial, substituting inputs to achieve the best protein and energy mix at the lowest possible cost. This offers great commercial opportunities for soybean and maize producers, on which the fish feed sub-sector is highly dependent.

Processing is largely restricted to smoking. Because it is not particularly complex, producers are increasingly forward integrating into smoking, enabling them to trade in both fresh and processed fish.

As a high-growth sector, in which many stakeholders are relatively new to fish farming, much value chain support will be directed towards building technical and business skills specific to aquaculture, supporting individuals to move into the sector through investment support, and supporting new product development and innovation.

However, little of this matters if the competitiveness of the fish feed sub-sector is not addressed, to ensure that fish farmers receive the best deal possible. Much of the feed sub-sector’s success rests on the competitiveness of the maize and soybean sectors.

<table>
<thead>
<tr>
<th>Strategic priority</th>
<th>Justification / Business case</th>
</tr>
</thead>
</table>
| Build the competitiveness of the input sector         | • Fish feed is a major cost  
• Ensuring availability of high quality inputs at competitive prices is crucial to ensuring the competitiveness of the aquaculture sector |
| Build fish farmers’ technical and operational capacities | • As a comparatively new sector, many producers can still build their skills and the technologies they deploy  
• Introducing best practice techniques will help to control costs and raise output and profits |
| Support business start-ups and growth of existing investments | • Supporting investment will help to grow supply and ensure that capital is used efficiently |
| Support product development and market access         | • Opportunities for growth in local and export markets for new products are not known  
• Linking processors to their customers will help to fuel product improvement and development |
Overview

Feeding Africa

The world food crisis in 2007-08, during which food prices experienced their sharpest rise in 30 years, leading to food riots in many parts of the world, focused global attention on the importance of agriculture. After decades of neglect, investment in agriculture is now on the rise. A notable example in Sub-Saharan Africa is Malawi, which spent as much as 4.2 percent of its GDP on a fertilizer subsidy scheme that moved the country from being a net importer of grain to an exporter to the region. Unfortunately, the amount of the subsidy was not one Malawi could sustain in the long run.

The Food and Agriculture Organization estimates that to keep pace with demand, developing countries will have to double food output by 2050. This amounts to a 70% rise in food production.

While the situation has temporarily eased, fundamental issues have not gone away. At the heart of the developing world’s agricultural challenge is the basic issue that demand is rising faster than supply can keep up.

Population growth, urbanization, and increasing incomes are leading to a shift in consumption from grains to meat in developing countries, requiring greater grain production for feed. In parallel, demand for biofuels is consuming more of the grain production from the large grain exporting countries. On the supply side, land under cultivation has increased but is nearing saturation, and yield growth in cereals is declining, from three to six percent a year levels during the Green Revolution in the 1960s to nearer one to two percent today. In some developing countries, yields are flat.

Not even flat
Agricultural production per capita, 1964-2006

Since 1960, output in Africa has increased by 2.4%, while its population has grown at 2.6%, resulting in food aid requirements that are 4 times higher than other regions.

Source: The Economist; “Whatever happened to the food crisis”; June 2009

The Challenge According to Sachs
Nigeria’s trade patterns

Nigeria’s import base is expectedly diverse, as are its trading partners. While manufactured goods dominate its imports, food products – namely cereals and fish – also feature in its top 10 imports. Import substitution is therefore seen by policy makers as a driver toward achieving self-sufficiency in key agricultural commodities.

Oil is king, dominating Nigeria’s exports, enabling the country to run a trade surplus. If one excludes oil, this picture changes dramatically, with imports dwarfing Nigeria’s non-oil exports. Non-oil exports are indeed growing fast, at a rate of 80 percent a year, albeit from a negligible base, as Nigeria diversifies its economy away from dependence on oil.

A study that looked at the drivers of Nigeria’s growth compared with other African oil producers showed that oil accounted for only 35 percent of the country’s growth between 2002-07, compared to 86 percent for Angola. Agriculture accounted for an encouraging 27 percent of Nigeria’s growth, and services for 37 percent. However, manufacturing accounted for a paltry one percent of total growth, which is concerning for the agricultural processing

The Challenge According to Sachs

Writing about the state of agriculture in Africa, economist Jeffery Sachs summarizes the challenge and solutions:

“...many poor countries’...farmers are producing far below what is technologically possible.”

“Traditional farming uses few inputs and gets poor yields. Poor peasants use their own seeds from the preceding season, lack fertilizer, depend on rain rather than irrigation, and have little if any mechanization beyond a traditional hoe. Their farms are small, perhaps one hectare (2.5 acres) or less. Under traditional agricultural conditions, the yields of grain – rice, wheat, maize, sorghum, or millet – are usually around one ton per hectare, for one planting season per year.”

The key: “There is nothing magic about [a] combination of high-yield seeds, fertilizer, and small-scale irrigation.”
sector. The factors that are inhibiting the growth of the manufacturing sector in Nigeria will similarly affect agricultural processors, from the erratic availability of power to the high costs of transportation.

**Top 1(0) exports**

Exports by value, US$

![Graph showing top exports by value, US$]

**Imports vs. exports, US$**

![Graph showing imports vs. exports, US$]

**Non-oil imports vs. exports, US$**

![Graph showing non-oil imports vs. exports, US$]

Aquaculture Profile

Supply and demand
Nigeria is both a large fish consumer and exporter. The product is still largely ‘hunted’ from natural sources rather than farmed.

In 2007, Nigeria imported over a $1 billion worth of fish. It imports about a half of what it consumes, between 600-700 tons a year. Exports are on the rise – growing by over 400 percent a year (albeit from a negligible base) – however, most exports are prawns and shrimp.

Fish deficit
Trade value, US$

![Bar chart showing fish deficit trade value in millions of US$]

Imports, US$

![Bar chart showing fish imports by type in millions of US$]

Source: ITC data, MARKETS II analysis.

Dwindling natural fish stocks, import substitution opportunities, and increased protein consumption with rising incomes, provide good growth opportunities for the local aquaculture sector. So aquaculture is on the rise, and fast, with production increasing 30 percent a year.

Catfish dominates production, but tilapia is also farmed in Nigeria. However, catfish has a number of competitive advantages of over tilapia, as it is:

- fast growing

1 International Trade Center database: http://www.trademap.org/
- a bottom feeder, so more costly floating fish feed is not necessary
- a hardy fish that can breathe air, it is easily transported live
- widely eaten and prized among Nigerian consumers.²

**Catch share**

<table>
<thead>
<tr>
<th>Catch volume, average 2003-07</th>
<th>Catch volume 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquaculture 38%</td>
<td>Captured fish 20%</td>
</tr>
<tr>
<td>Commercial trawlers 5%</td>
<td>Aquaculture prod. 80%</td>
</tr>
<tr>
<td>Distant water 5%</td>
<td></td>
</tr>
<tr>
<td>Artificial: Coastal 20%</td>
<td></td>
</tr>
<tr>
<td>Artificial: Inland 18%</td>
<td></td>
</tr>
</tbody>
</table>


**Value chain dynamics**

The heart of the aquaculture sector in Nigeria lies in production, with processing largely limited to smoking.

Setting up for production is relatively straight forward, requiring a limited amount of land. Producers can choose from a variety of pond investment options, including excavated earth ponds, concrete ponds, hard plastic and collapsible tanks. Costs vary widely, with a small-scale fish farm producing two tons a year requiring from N 35,000 ($ 220) if based on an earthen, flow-through system, to N 250,000-300,000 ($ 1,550-1,850) if based on concrete ponds (excluding the cost of the land).

The chief operating concern is fish feed, which can account for between 60 - 70 percent of all costs. A number of fish feed suppliers exist, from cottage industries to commercial operations, while fish farmers also produce their own feed. However, this sub-sector needs considerable focus, as it is still a comparatively young sector and one in which cost reductions can lead to important advantages for the whole aquaculture value chain (see more on feed below).

As a perishable product, transportation is critical for the fresh fish sector and by most accounts functions reasonably well. Due to the fact that catfish is comparatively easy to transport, this does not serve as a bottleneck, as may otherwise be expected for a fish sector. For the smoked product, transportation is simpler still. However, some sector respondents reported to the MARKETS II team that access to ice for transporting tilapia can be challenging, and may in part explain its relatively limited share of production.

Processing is largely restricted to smoking. Because it is not particularly complex, producers are increasingly forward integrating into processing, enabling them to trade in both fresh and smoked fish. It also increases their bargaining power when selling, as it allows them

alternatives if they are not happy with the prices that they are offered for their fresh fish. Producers’ forward integration has led some processors to report fresh fish supply challenges.

**Emerging Aquaculture Business Models**

On both the input supply and processing segments of the value chain, there are signs of producers backward and forward integrating, rather than building vertical linkages with third party feed suppliers and processors. This is driven both by a desire to manage quality, but also to save costs and capture additional margins.

However, during the stakeholder validation workshop, participants expressed a desire to create aquaculture parks or clusters. Doing so would allow different individuals or firms to specialize in a particular aspect of the value chain, building high degrees of technical and operational skills that enable them to improve quality and drive down costs. Proximity to suppliers and buyers in the cluster will enable them to build understanding of their respective needs, and ensure that each supplier is able to better meet their buyers’ requirements.

Therefore, different aquaculture business models are emerging as the sector grows and matures, from the fully integrated firm that makes its own feed, farms, processes and distributes fish, to the cluster-based, aquaculture park model, that is based on specialization and strong inter-firm ties. The latter will be modeled and supported as part of the investment focused strategic priority undertaken by MARKETS II (see below).

Most of the aquaculture sector’s production is for the local market, for which there is ample demand. However, some firms are also exporting, to the USA, UK and Dubai, requiring certification from Nigeria’s Federal Department of Fisheries.³

³ MARKETS II field research and interviews.

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**Key value chain actors**

![Diagram of the aquaculture value chain](image)
Value share

MARKETS II conducted an analysis of typical production costs and profit margins across the aquaculture value chain, based on the model of an earthen pond, which is most commonly used by the sector. This means that fish feed costs are somewhat lower than with other types of ponds, as the fish also consume naturally occurring feed.

Fish farming can be a highly profitable enterprise, with one ton of fish fetching above N200,000 ($1,250) for the producer. To put this in context, many fish farmers visited by the MARKETS II field team worked on plots that were about one-quarter of the size of a football pitch, from which they could generate 1 ton of fish per cycle, averaging 2 cycles per year.

Fish smoking is relatively straightforward, and does not require great investment. Yet good margins exist in smoking, leading, as mentioned above, to increased forward integration by producers.

Fish feed sub-sector

While inputs are critical for all agricultural sectors, fish feed is particularly important for aquaculture. As a relatively new sector, the fish feed sub-sector is still underdeveloped. Opportunities must be explored for developing a variety of fish feed products that are optimized for locally available inputs and the fish species commonly farmed in Nigeria.
Fish feed producers must balance cost with convertibility – the ratio of feed required to produce one kg of fish flesh. The overriding concern with feed composition is protein content, which can be derived from numerous sources, decisions which are driven mainly by cost and availability. For fry, the protein comes almost exclusively from fish meal and other animal protein sources, but as the fish become larger this can be substituted for oil seed-based proteins, most commonly from soybean meal but also peanut and cottonseed meal.

Beyond protein, fish feed must respond to energy needs, derived mainly from maize. Maize also plays in important roll in the floatability of feed.

In Nigeria, farmers and feed makers are also experimenting with cassava peel as a substitute carbohydrate source to maize. However, it has a much higher (and so worse) conversion ratio: one kg of fish flesh requires between 10-20 kg of cassava peel versus 4-6 kg of maize. That said, maize prices are about five times the price of cassava peel.

Building the competitiveness of the fish feed sub-sector will require developing a menu of locally-optimized products that meet fish farmers’ range of needs at a minimum cost to them. This will require product development and trial, substituting inputs to achieve as low a conversion ratio as possible at the lowest possible price.

As crucial ingredients in fish feed, both the maize and soybean sectors directly impact the competitiveness of the aquaculture sector, as fish feed accounts for 60-70 percent of all aquaculture production costs. The fish feed sector, therefore, offers great commercial opportunities for maize and soybean producers. In addition to fish feed, there are also excellent opportunities in poultry feed, with Nigeria’s poultry sector growing at 25 percent or higher a year. Fish feed also provides opportunities for the cassava sector, and potentially for the sorghum sector, as initial trials with the latter in poultry feed have shown solid results.

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*Catfish feed formulations (% share of feed)*

| Source: Mississippi State University, “Catfish nutrition: Feeds and feed formulation,” July 2006; % indicates protein content’ MARKETS II field research and interviews. |

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Note: Approximate prices for the different products per kg are N190 for fry feed, N100 for fingerling feed, and between N90-70 for fish feed, depending on the protein content.

**Voice from the Field: Turning Challenges to Opportunities**

Inadequate access to quality fish feed is a major barrier to the Nigerian fish farmer. A successful fish farming enterprise in the country is estimated to invest between 60-70 percent of its total production cost on fish feed alone.

Although more expensive, floating fish feed pellets are gaining popularity with catfish farmers, but supply in Nigeria is low. So De Ideal Agro Allied Service Limited, a firm owned and run by Shonoiki, a young woman, saw a clear business opportunity.

The Ideal Fish Feed factory started production in 2004, initially in Lagos before moving to Abuja. The company started out producing both sinking fish feed and poultry feed, but soon fish feed production became its core focus. Increased demand in floating fish feed prompted Ideal to enter into a milling contract with the Nigeria Institute for Oceanography and Marine Research and NUCA Feeds. Recognizing the need to expand even further, Ideal Fish Feed invested an additional N 5,000,000 ($ 31,000) into floating fish feed production of various sizes: 3mm, 4mm and 8mm. As demand steadily increased, the company invested further in a dryer, extruder, and a generator through lease financing.

All of Ideal's loans have been paid in full, however, Shonoiki still faces challenges. The dryer is not working as well as planned, which reduces the shelf-life of Ideal's feed. Costs for raw materials and bagging are high, as are transportation costs, limiting profitability and reducing margins.

Despite these issues, Shonoiki feels blessed. She saw a clear gap in the aquaculture sector, and then took on the risk and invested in the work required to turn it to her advantage.

**Summary**

- The aquaculture value chain has a large and captive market in Nigeria. With rising incomes, and so higher protein consumption, and opportunities for import substitution, the sector has been enjoying growth of 30 percent a year.
- However, feed costs remain high, and account for a large portion of total production costs. Building the competitiveness of this sub-sector will help to fuel even greater growth.
- Critical to the success of the feed sector are the soybean and maize sectors, as they form the bulk of the inputs. New opportunities in fish feed also exist for cassava and potentially sorghum.
- Growth will require investment: in feed production, fish farms, and processing and packaging facilities.

**Aquaculture sector survey**

MARKETS II conducted a survey of the Nigerian aquaculture sector between August and September 2012, spending over 20 days in the field interviewing 62 sector participants involved in aquaculture production, processing, input and other service supply, and policy formulation. The survey also included 14 focus group discussions with about 50 participants.
10 participants per session. The results of the field survey are reviewed below.

**Producers**
Requiring limited land and proximity to markets, many producers were located around Abuja and Lagos, and the west. Most own their land, making investment easier, with tanks being mainly earthen or concrete.

**Investments**

![Pie chart showing land tenure: 24% Own, 68% Rent, 9% Family.]

**Type of tank**

![Pie chart showing tank types: 24% Flow through, 19% Earthen, 43% Concrete, 14% Other.]

![Bar chart showing investments (past year): Land, Feed, Water, Machinery, Rent, Security, Processing.]

Source: MARKETS II aquaculture sector survey; n=62 for whole aquaculture survey set

The majority farm for production, selling primarily to traders, though some also farm for fry production. All but 2 belong to associations, deriving benefits in marketing, capacity building and access to inputs.

**Purpose and association membership**

![Farming purpose: For sale, Fry production, Recreation, Household consumption.]

![Association benefits: Marketing, Capacity bldg, Inputs access, Other.]

Source: MARKETS II aquaculture sector survey; n=62 for whole aquaculture survey set

A few farmers trade directly with processors, but most sell to traders.

In line with reported industry trends, survey respondents output has been growing over 30 percent a year. Price growth has lagged behind this, but has still been a very healthy 15 percent a year. So while aquaculture farmers have been enjoying excellent income growth opportunities, the slowdown in price increases indicates that competition in the sector is increasing as output is starting to satisfy more of Nigeria’s pent up demand.
When asked about sector constraints, the message is very clear: feed cost.

On the sales front, price bites as do trader margins, but so does increased competition. When the issue of challenges was addressed again (the MARKETS II field team probed the issue again, in a separate part of the survey) fish feed remained the top concern but access to quality fry/fingerlings also appeared.
Constraints II

Marketing/sales constraints

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>8</td>
</tr>
<tr>
<td>Traders</td>
<td>6</td>
</tr>
<tr>
<td>Competition</td>
<td>4</td>
</tr>
<tr>
<td>Storage</td>
<td>2</td>
</tr>
<tr>
<td>Processing</td>
<td>1</td>
</tr>
</tbody>
</table>

Challenges

- Feed
- Fry/Frying
- Power
- Water
- Labour

Source: MARKETS II aquaculture sector survey; n=62 for whole aquaculture survey set

Processors

All of the processors that MARKETS II interviewed smoked fish, with over two-thirds being women. The vast majority belonged to associations, mainly benefiting from lower priced inputs through bulk purchases as a group.

Overview

- Smoking kilns are processors' largest investment, on which respondents spent on average N240,000 ($1,500), with improved kiln varieties most commonly purchased. Larger kilns are the most common, with a smoking capacity of over 150 kg. However, most respondents reported no access to commercial loans for their investments.
The processors interviewed supply a wide range of customers, from wholesalers to end consumers. However, exports barely feature – not unexpected in light of the sector’s relative newness and high levels of local demand.

Processors’ challenges are wide reaching. Some representative challenges are quoted below, covering a range of issues from the desire to move into new, higher-end markets, to the unpleasantness of the actual fish smoking process.
Voice from the field: Processing challenges

“Inability to access high-end markets, like supermarkets and foreign countries. Procedures are cumbersome and the cost of certification too high.”

“The drudgery of the work, with the smoke affecting your eyes.”

“Health hazard because of the smoke. The smoke also affects the neighbors.”

“The high cost of energy (charcoal) and the high cost of processing equipment for small-scale processors.”

Input dealers

Most suppliers supply the full range of inputs, from feed to equipment. They are predictably concerned with the cost and speed of transportation.

Summary

- Not requiring much land, aquaculture is almost a ‘suburban crop.’
- Main expenditures are in land and ponds, but fuel is also a notable cost.
- Growth has been very good at 30 percent but price increases are flagging – though still strong.
- Input costs are the major constraint; however, fingerlings also feature as a challenge.
• Processors’ main investments are their kilns, with improved varieties being commonly used. However, the unpleasantness and potential adverse health effects of the process are cause for concern.

• Input suppliers offer a wide range of products, and see transportation as their biggest issue.

**Focus group findings: Concerns**

• Inaccessibility to land and water resources, including insecure land tenure which hampers investment.

• Poor quality feed and feed ingredients, and high feed costs.

• Limited knowledge of culturable fish species, specifically for Nigeria.

• Limited knowledge of pond design and construction.

• High cost of electricity and gas.

• Lack of access to insurance and credit facilities, and where there is access other hurdles exists, from high interest rates to complex procedures.

**Strategic focus**

The preceding analysis was presented to aquaculture sector stakeholders – producers, processors, input and service providers, and policy-makers – during a half-day workshop.

The objective was to develop a common understanding of the current status of Nigeria’s aquaculture sector and jointly develop a core set of strategic priorities around which MARKETS II could focus its efforts in support of the sector.

These strategic priorities are presented below, and mapped to thematic focus areas against which MARKETS II has committed resources. These thematic areas are: inputs, finance, technology development and deployment, water and soil management, capacity building, climate change, information and communication technology (ICT), and women and youth.

These strategic priorities and many of the actions listed for each will form the foundation for MARKETS II’s implementation activities in the aquaculture value chain.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Justification / Business case</th>
<th>Suggested actions</th>
<th>Thematic focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Build the competitiveness of the input sector</td>
<td>• Fish feed is a major cost • Ensuring availability of high quality inputs at competitive prices is crucial to ensuring the competitiveness of the aquaculture sector</td>
<td>• Research feed product options, and input optimization for the Nigerian context • Train fish feed producers and farmers on feed optimization • Encourage women and youth participation in feed businesses • Compile an online/CD toolkit on feed • Research fish species and support development of broodstock bank</td>
<td>• Inputs • Technology • Capacity building • ICT • Women and youth</td>
</tr>
<tr>
<td>Area</td>
<td>Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Build fish farmers' technical and operational capacities | • As a comparatively new sector, many producers can still build their skills and the technologies they deploy  
• Introducing best practice techniques will help to control costs and raise output and profits                     |
| Develop training on all elements of fish farming, from pond design and cage technologies to water quality and business planning | • Compile an online/CD fish-farming toolkit  
• Support fish-farmer associations and local chapters |
| Technology                                             | • Water and soil management  
• Capacity building  
• ICT  
• Women and youth |
| Support business start-ups and growth of existing investments | • Supporting investment will help to grow supply and ensure that capital is used efficiently  
• Assess barriers to access to finance for aquaculture and assess viability of an aquaculture investment fund  
• Implement findings, including training financial institutions on aquaculture business models and opportunities  
• Develop business plans for different elements of the chain and train on usage, ensuring focus on women and youth  
• Compile an online/CD business planning  
• Develop concept of aquaculture business parks and support uptake |
| Finance                                                | • Capacity building  
• ICT  
• Women and youth |
| Support product development and market access           | • Opportunities for growth in local and export markets for new products are not known  
• Linking processors to their customers will help to fuel product improvement and development  
• Conduct market study  
• Conduct and disseminate research into new products  
• Support launch of new products by private firms  
• Link farmers to processors and processors to end-consumers  
• Develop buyer contact database for management by association |
| Technology                                             | • Water and soil management  
• Capacity building  
• ICT  
• Women and youth |
Annex I: Project Background

The MARKETS II project began in late April 2012 with the objective to increase the competitiveness of selected agricultural commodity value chains by strengthening linkages between value chain actors, improving access to inputs and finance, deploying and disseminating technologies to new users, and by building the capacity of all value chain actors through technical assistance.

MARKETS II builds off the success of the MARKETS (2005 – 2010) and Bridge to MARKETS II (2011 – 2012) projects. It is designed to go deeper in fewer value chains (four to five), and achieve greater impact. Furthermore, MARKETS II is expected to concentrate its efforts in up to ten key states. By concentrating its resources on a reduced number of value chains and states, USAID will be better able to assess its impact on targeted value chains and beneficiaries.

In May 2012, a number of selection criteria were developed to select value chains for further analysis. These criteria included low-entry threshold for women, youth, and vulnerable groups; the geographical spread of the commodity; the importance of the commodity in the GON Agricultural Transformation Agenda; the possibility of deploying new, low-cost technologies; and whether the commodity falls within the MARKETS II smallholder farmer mandate.

Based on this selection process, the following value chains were selected for further analysis: cassava, sorghum, rice, cocoa, and aquaculture. Maize and soybean were also selected as they are the main ingredients of fish feed, and the lack of quality fish feed is one of the primary constraints of the aquaculture value chain.

Teams of MARKETS II staff and locally hired value chain experts conducted field research using questionnaires with key informants and holding open ended focus group discussions with a large number of stakeholders including producers, processors, traders, input suppliers, service providers, and policy makers.6

A series of half day validation work shops were organized with participation of a cross-section of the stakeholders surveyed. The methodology is described in further detail in Annex II.

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6 A detailed description of the survey methodology can be found in Annex II.
Annex II: Survey methodology

Timing
The Value Chain Analysis survey for seven commodities was carried out between August 14th and September 7th, 2012. The survey was preceded by a weeklong training on value chain principles, MARKETS II intervention areas, and survey administration. During this period survey questionnaires were developed. Data analysis began on September 10th and continued through October 10th. Seven half day validation workshops were organized between September 17th and 20th and included active participation by of a cross section of the stakeholders interviewed during the survey.

The team
The entire MARKETS II technical team, including subcontractors, participated in the study. Seven senior Nigerian consultants served as value chain team leaders. A total of 25 people were involved in the survey work with administrative and management support from MARKETS II. Two international consultants also assisted a key phases of the process—one for training and start-up and one for data analysis, stakeholder validation and final document preparation.

Value chain teams and states covered.
Eleven teams were formed to cover the seven commodities across 20 states. Each team contained at least one female staff member to make sure that gender-sensitive questions could be addressed in mixed or all female focus groups without problems.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Number of teams</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava</td>
<td>1</td>
<td>Oyo, Ondo, Edo, Ogun</td>
</tr>
<tr>
<td>Cocoa</td>
<td>2</td>
<td>Cross River, Ondo, Oyo, Osun</td>
</tr>
<tr>
<td>Rice</td>
<td>2</td>
<td>Kano, Jigawa, Kebbi, Ebonyi, Anambra, Benue</td>
</tr>
<tr>
<td>Sorghum</td>
<td>2</td>
<td>Kano, Katsina, Kaduna</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>1</td>
<td>Edo, Osun, Oyo, FCT, Lagos, Ogun</td>
</tr>
<tr>
<td>Maize</td>
<td>2</td>
<td>Kaduna, Plateau, Nassarawa</td>
</tr>
<tr>
<td>Soybean</td>
<td>1</td>
<td>Nassarawa, Kaduna, Niger, Benue</td>
</tr>
</tbody>
</table>

Target value chain stakeholders
The following stakeholders were targeted:

Producers (small and large scale)
Processors (small and large scale)
Service providers (mechanization, spraying, transporters, etc)
Policy makers (MARD, ADP)
Input dealers
Traders
Survey tools

The teams used both structured key informant interviews and focus group discussions to carry out the research. The table below presents the number of people interviewed through both key informant interviews and focus group discussions.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>65</td>
</tr>
<tr>
<td>Rice</td>
<td>89</td>
</tr>
<tr>
<td>Soybean</td>
<td>40</td>
</tr>
<tr>
<td>Cocoa</td>
<td>85</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>78</td>
</tr>
<tr>
<td>Sorghum</td>
<td>89</td>
</tr>
<tr>
<td>Cassava7</td>
<td>41</td>
</tr>
</tbody>
</table>

Service providers

All the MARKETS II service providers (5) were subcontracted to assist the value chain teams with setting up meetings with key informants and focus groups and to help with translation where necessary. They were specifically instructed to identify key informants among crop association members, non-associated farmers, marketers, processors, input dealers, extension agents, grain purchasers, women and youth groups, technology and service providers, financial institutions and wholesalers and retailers and to assemble focus groups consisting of male and female farmers, youth, extension agents, small processors, cooperative groups, traders etc. Due to time constraints, it is possible that the selection of producers was skewed towards producers that worked with MARKETS and BtM2 before. The service providers played a key role in the survey process and made rapid progress possible.

Data input and analysis

Data input was done by a team of three people and supervised by a data analyst. Value chain teams sent completed questionnaires on a weekly basis to Abuja so that data input was a continuous process during the survey. However, template development and data input took longer than expected and, in some cases, delayed data analysis.

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7 The number of actual interviews for cassava is disappointing but can be explained by the fact that it was a single team covering a large area. The same is true for the soybean value chain team.
Annex III: References

The core source of data and insight that drives this value chain analysis is a aquaculture field survey conducted during August and September 2012, during which 62 sector participants were interviewed, and 14 focus group discussions held (with approximately 10 participants per session).

In addition, detailed input from sector stakeholders was solicited during a half-day workshop at which the initial findings were discussed and the strategic priorities jointly developed.

Finally, the following reports and research were also drawn upon:

- The Economist, “Whatever happened to the food crisis,” June 2009
- The Economist, “If food were words, nobody would go hungry,” Nov. 2009
- The Economist, “How to feed the world,” Nov. 2009
- International Trade Center database: http://www.trademap.org/
- Mississippi State University, “Catfish nutrition: Feeds and feed formulation,” July 2006
- Value Chain Development Wiki: http://apps.develebridge.net/amap/index.php/Value_Chain_Development
Annex IV: Source of Growth

Analysis by the McKinsey Global Institute of GDP growth by industry sector found that Nigeria was more diversified than other oil exporting countries in Africa. While oil accounted for 31 percent of all growth, agriculture accounted for 27 percent of GDP growth. However, manufacturing accounted for only 1 percent of all growth, which does not bode well for the development of the agricultural processing sector. The factors that are inhibiting the growth of the manufacturing sector in Nigeria will similarly affect agricultural processors, from the sporadic availability of power to the high cost of transportation.

Source of growth
(Real GDP growth, 2002-07)