TechnoServe: Business Solutions To Poverty

Landscape Study of Vitamins and Premix for Food Fortification in Nigeria

STUDY CONDUCTED BY TECHNOSERVE

NOV 2019

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BUSINESS SOLUTIONS TO POVERTY

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EXECUTIVE SUMMARY

Based on the currently reported premix costs to industry, the projected annual expenditure on premix will reach $42 million annually at full program scale, with an estimated $2 million generated in duties paid to the Government of Nigeria (assuming 5% tariffs).

$42M

Projected annual spend on fortification pre-mix at full scale

The current market, which could potentially generate $15-16 million annually, is dominated by international suppliers who have a competitive edge over the local premix suppliers in most parameters considered important by their food processing customers:

PRICE

In general, there is no difference between the composition of local and imported premix. However, international suppliers often provide lower prices to larger food companies with bulk discounts and the bundling of premix with other food additives like enzymes and colorants.

FOREX IMPACT

Fluctuating currency conversion rates affect both the local and imported suppliers. However, local players experience less impact as they can adjust their local retail prices and time their orders according to changing rates.

FLEXIBILITY

Local firms have an advantage in service and availability of supply due to their proximity to customers, dedicated local sales staff, quicker response time and ability to cater to fluctuating and ad-hoc orders from smaller producers.

QUALITY

Due to a range of factors, international companies are considered more likely to deliver a consistent product in compliance with standards:

- Technical Capacity: State of the art facilities, process controls, air-tight packaging and stringent quality standards provide more consistent quality than local premixes.
- Regulation: Surveys suggest that industry and premix suppliers do not have full confidence in the current monitoring of the premix supply.
- Analysis Capacity: External and in-house testing facilities are not available easily, restricting regular feedback and improvement to local companies.
- Quality Pressures: Local premix companies are more likely to supply smaller producers, who are extremely cost focused, often forcing suppliers to compromise on quality.

EXECUTIVE SUMMARY

The disparity between the actual fortificant purchase by the industry and projected demand at program scale demonstrates a significant gap in the current compliance with fortification.

The current reported fortificant supply is only 40%-60% of the estimated demand for vegetable oil, sugar and wheat flour. While this implies less than optimal compliance with current standards, it also suggests that sales of fortificants could nearly double when industries reach 100% compliance level with current fortification standards.

RECOMMENDATIONS FOR GOVERNMENT

- Develop more effective monitoring and regulation systems. Positive upgrade initiatives are underway, but government should strengthen monitoring at the point of entry, at the facilities of local premix suppliers and the inventory of food processing companies.
- Consider eliminating tariffs on premixes, component vitamins and minerals, as well as fortification-related consumables to provide support specifically targeting the local premix industries.
- Certification of premixes required for food fortification by regulatory agencies on an on-going basis subject to an annual review of standards.

RECOMMENDATIONS FOR NATIONAL PREMIX COMPANIES

- Promote and provide support for the development of a Premix Industry Association to ensure that industry concerns are adequately communicated, technical know-how is shared, and local premix is optimally marketed and promoted.
- Develop capacity for self-regulation including a Code of Practice for the local premix industry along with appropriate training, certification, quality testing and marketing programs.

RECOMMENDATIONS FOR DEVELOPMENT PARTNERS

- Promote engagement between various stakeholders to consider and/or implement government and industry initiatives outlined above.
- Extend the technical expertise, capacity building and grant support to local premix suppliers.
- Promote and aid initiatives for accreditation of labs aimed at creating a channel for the companies to perform rigorous checks affordably, reliably and on-time.

BACKGROUND

There is a broad consensus within the global health community of the enormity and public health significance of the problem of micronutrient deficiencies worldwide.

Estimates available in recent literature suggest that more than 2 billion people suffer from micronutrient deficiencies caused largely by a dietary deficiency of vitamins and minerals, with the most common forms being iron, iodine, vitamin A, zinc, and folate.

Reproductive-aged women, young children, and female adolescents, typically from resource poor, food insecure and vulnerable households in low-and-lower-middle income countries (LMICs) are widely considered to be the most vulnerable populations although there is a broad recognition that all population groups across all regions of the world are affected by micronutrient malnutrition to varying degrees. The negative long-term effects on health, learning ability and productivity, and by implication, socio-economic development is well documented. In Nigeria, the scale of micro-nutrient deficiencies is classified as severe.

Large-scale food fortification (LSFF) refers to the process whereby one or more essential micronutrients are deliberately added to a staple food or condiment during processing in order to improve its nutritional quality. Otherwise referred to as large-scale food fortification (LSFF), it is a nutrition-specific intervention that is typically initiated, mandated, and regulated by governments for the purpose of correcting or avoiding micronutrient deficiencies in populations that are at increased risk.

The Nigerian Government has adopted food fortification as a core part of its strategy to combat micronutrient malnutrition, mandating salt fortification by law in 1994 followed by instating mandatory fortification of selected staple foods –wheat flour, semolina flour, and maize flour with multiple micronutrients; and sugar and vegetable oil with vitamin A – in 2002. Despite the existence of legislation however, Nigeria is yet to fully realize the desired public health outcomes of its large-scale food fortification programs.

Three interrelated factors that contribute to the lack of success include insufficient micronutrient levels in the fortified products, inconsistent monitoring by regulatory authorities at food production facilities and border control sites, and limited enforcement of regulations and standards.

The availability and quality of fortificants (in the form of premixes for food vehicles that require incorporation of multiple micronutrients such as in cereal flour or single concentrated nutrients in the case of edible oil, sugar and salt) is a critical contributing factor that would influence the effectiveness of large-scale food fortification programs.

BACKGROUND

This report examines the fortificant landscape in Nigeria to inform programmatic actions that need to be adopted by multiple stakeholders in order to achieve the country's national food fortification goals and realize impact at scale.

The following key elements and considerations around the demand and supply of fortificants are presented in this document:

- ☑ An analysis of the gaps in the supply and demand of fortificants (inputs) within the context of mandatory food fortification in Nigeria
- ☑ An evaluation of technical, commercial and business factors that drive the fortificant supply sector
- ☑ The regulatory and policy environment that influences the fortificant sector

FORTIFICATION AND PREMIXING: THE ORIGINS

Food fortification is the practice of adding micronutrients to various food vehicles during the processing stage. Adding essential vitamins and minerals to simple, affordable staple foods to improve the nutritional status of target populations in various countries especially in developing countries has been ongoing for decades. In Nigeria, staple food vehicles such as wheat flour, edible vegetable oil and sugar fortification became mandatory by law in February 2000 and enforcement commenced in September 2002. These efforts were made to replace nutrients lost through food processing, which resulted in deficiencies that have become significant to the public health status of the country.

However, going by the national standards set for the industry, observed compliance level of fortification has been inconsistent*. A report published in the Nigerian Food Journal presents the compliance levels for various food vehicles in 2013**. Although some improvements were observed from 2003 to 2013, the compliance levels were still found to be quite low. Given the inconsistencies in driving actual compliance, mandatory food fortification has been identified as a national strategy by the government of Nigeria with the aim of addressing micronutrient deficiencies (MNDs).

- For sugar, the Vitamin A compliance was 11.9% - 16.7%.
- For vegetable oil, the compliance was between 14.9% - 20.2%.
- The levels of compliance for vitamin A and Fe in flour were found to be between 12.2% - 33.3% and 1.0% - 21.0% respectively.

*Anon (2003) Micronutrient Initiative (MI) Nigeria Country Profile. Micronutrient Initiative. http://www.micronutrient.org/english/view.asp Accessed 30/05/2013

** Ogunmoyela, O. A., Adekoyeni, O., Aminu, F., Umunna, L. O. (2013) A critical evaluation of survey results of vitamin A and Fe levels in the mandatory fortified food vehicles and some selected processed foods in Nigeria. Nigerian Food Journal 31(2):52-62.

BACKGROUND

Premixes are a commercially prepared customized blend of vitamins and/or minerals where each nutrient component is pre-scaled, and precision blended into a form that is then added to staple food vehicles as mandated by standards. They can be easily administered to food vehicles during the processing stage to ensure compliance to mandatory food fortification standards.

While the food processors and regulators are important players in ensuring fortification compliance, the role of premix suppliers can't be undermined for the success of this program.

Hence, there is a need to deep dive into the dynamics of premix industry in Nigeria – the demand, supply, pricing, quality and relationships – to assess the challenges and look at possible interventions to drive this industry forward in a sustainable and compliant manner.

STUDY OBJECTIVES

The ultimate objectives of this study are as follows:

- Establish the size of fortificant market for mandatory food fortification in Nigeria, through an analysis of both quantitative and qualitative data
- Provide relevant information on the standards for premixes, their evolution and the state of overall regulatory structure
- Present an overview of the current food fortification supply, compliance, the key challenges and the linkages to fortificant quality and supply
- Suggest key actions for the various stakeholders to strengthen the fortificant sector and in contribution to the large-scale food fortification ecosystem

METHODOLOGY

STUDY DESIGN

This report was compiled utilizing qualitative and quantitative information and data from various documents, studies and interviews. The information presented in this report also includes qualitative insights and quantitative data gathered during the implementation of TechnoServe's Strengthening African Processors for Fortified Foods (SAPFF) program. The SAPFF team conducted qualitative validations via key stakeholder interviews, which provides a strong confidence on the data and the industry insights. Understanding the premix market and creating an action plan for its success is extremely critical to the success of SAPFF and the national food fortification program, since it feeds back into the technical assistance that SAPFF provides to the processors and impacts the outcome of Nigeria's large-scale food fortification program.

TARGET RESPONDENTS

In order to fully address the study objectives, TechnoServe has gathered information from the following categories of stakeholders:

FOOD PROCESSORS	Companies including flour millers, vegetable oil producers, and sugar refineries that produce fortified staple foods corresponding to regulations and NIS standards.
FORTIFICANT MANUFACTURERS AND SUPPLIERS	Players in the industry whether local manufacturers or distributors of imported fortificants in the form of premixes or concentrated micronutrients (vitamins and minerals) to food processors, including Biochemical Derivatives (BDL), BNSL Ltd, Vitachem, Frankbert, DSM, BASF, Muhlenchemie, Engrain.
GOVERNMENT INSTITUTIONS AND REGULATORS	Institutions/bodies providing the standards and policy framework for registration and regulation for the staple food industry including the National Agency for Food and Drug Administration and Control (NAFDAC) and Standards Organization of Nigeria (SON).
INTERNATIONAL DEVELOPMENT AGENCIES & DONORS	International non-governmental organizations/bodies that provide support to large-scale food fortification programs.
INDUSTRY EXPERTS	Individuals, experts and practitioners with long-term experience within the food processing industry.

METHODOLOGY

TABLE 1: SAMPLE SURVEY DISTRIBUTION

Target Respondents	Flour	Sugar	Oil
Food processors	3	3	4
Fortificant manufacturers and suppliers*	3	2	2
Government institutions*	2	2	2
International development agencies*	1	1	1
Industry experts*	2	2	2
TOTAL	11	10	11

* A total of 18 respondents were interviewed for the study, considering the overlapping questions asked across the staple food categories, respondents (except for the food processors), were asked questions that cut across the food vehicle categories.

DATA COLLECTION

Data collection was conducted through reviews of existing publications, project monitoring-evaluation-learning (MEL) data and in-depth interviews with the various respondents. was established.

Due to the sensitivity of data, some of the information presented in this document was collected through verbal conversations. It should be noted that representatives from the premix sector expressed general apprehension in some cases in order to protect competitive interests. Informal measures were taken in order to ensure that a level of comfort with study objectives was established.

The objective of this assessment is for the sole purpose of informing enhanced large-scale food fortification outcomes and to enable actions to be pursued by various stakeholders and not intended to be a regulatory exercise.

TechnoServe further acknowledges that while all attempts to validate the information presented in this report were made to ensure objectivity, there may be some limitations or inaccuracies in the data that are unavoidable, as highlighted below.

METHODOLOGY

LIMITATIONS AND ASSUMPTIONS

i. The nature of the research and interpretations were limited by the quality and quantity of information available, hence, the interpretation of the findings cannot be validated beyond any reasonable doubt.

ii. The sensitivity of the questions around pricing, quality and market share created concern for respondents thereby leading to unavailability of key quantitative data. There were instances where respondents ceased to provide any information citing the confidentiality of data.

iii. All respondents requested for anonymity of their identity and presenting specific company names, hence limited profile data in some cases is presented.

iv. The study combines a set of initial interviews conducted by Biovensis across multiple stakeholders, along with a set of validating interviews reconducted by TechnoServe's SAPFF team. Though there is a paucity of data, the key findings are assumed to reflect the general industry sentiments and have been extrapolated to draw out key conclusions for the premix landscape.

v. The dearth of key quantitative data has been compensated by drawing out key conclusions with TechnoServe's ongoing SAPFF project implementation data.

vi. The report assumes the observations from various interviews as generally authentic if cross-verified by multiple stakeholders

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

The legal framework for the regulation of large-scale food fortification in Nigeria is set within the country's broader food safety legislation. Nigeria's major food legislation include:

- The Food and Drug Act Cap F32 Laws of the Federal Republic of Nigeria, 2004 - formerly the Food and Drugs Act (Cap 150) of 1990 as amended by Decree 21 of 1999, and prior to that, the Food and Drugs Decree 35 of 1974;
- The National Agency for Food and Drugs Administration and Control (NAFDAC) Act CAP N1 Laws of the Federal Republic of Nigeria, 2004 – formerly the NAFDAC Decree No 15 of 1993;
- The Marketing (Breastmilk) Act Cap M5 LFN 2004 – formerly the Marketing of Breast Milk Substitute Decree No. 41 of 1990;
- The Food, Drugs & Related Products (Registration etc) Act Cap F33 Laws of the Federal Republic of Nigeria (LFN), 2004: formerly the Food, Drug and Related Products (Registration etc) Decree No 19 of 1993;
- The Counterfeit & Fake Drugs and Unwholesome Processed Foods (Miscellaneous Provisions) Act Cap C34 LFN 2004: formerly the Counterfeit and Fake Drugs and Unwholesome Processed Food Act No 25 of 1999;
- The Standards Organization of Nigeria Act 2015: formerly the Standards Organization of Nigeria Act, Cap S9 Laws of the Federal Republic of Nigeria 2004, and prior to that, the Standards Organization of Nigeria Decree No. 56 of 1971;
- The Federal Competition and Consumer Protection Act 2018: formerly the Consumer Protection Act, Cap C25, Laws of the Federal Republic of Nigeria 2004, and prior to that, the Consumer Protection Council Decree 66 of 1992; and
- The Animal Disease Control Decree 10 of 1988.

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

Within Nigeria's food safety laws, legally mandated fortification of selected food products is currently achieved by two sets of related regulations:

1. The issuance of Industrial Standards for specific food products, with the approval of the Standards Council of Nigeria, which is legally established in Part II of the Standards Organisation of Nigeria Act of 2015, and assigned the responsibility to develop and issue a wide range of industrial standards (including food standards) through a defined process established and enshrined in Part VI of the same law.

2. The periodic issuance of specific Food Fortification Regulations by the National Agency for Food and Drugs Administration and Control (NAFDAC) in exercise of the powers conferred on the Governing Council of the Agency in Sections 5 and 30 of the National Agency for Food and Drug Administration and Control Act of 2004.

On the strength of the assignment of specific responsibilities directly related to developing and enforcing food quality standards, and their subsequent exercise of these functions in relation to Nigeria's food fortification programs, the Standards Organisation of Nigeria (SON), and the National Agency for Food and Drug Administration and Control (NAFDAC) are the two principal regulatory actors on food fortification in Nigeria. Their role as core regulators for LSFF is also formally acknowledged within the National Guidelines on Micronutrients Deficiencies Control in Nigeria, developed in 2005 and updated in 2013, as a cardinal policy document to guide the implementation and coordination of interventions to eliminate or reduce the prevalence of vitamin and mineral deficiencies in Nigeria.

In addition to SON and NAFDAC, the Federal Competition and Consumer Protection Commission (FCCPC), known until very recently as the Consumer Protection Commission (CPC), is a third regulatory actor on LSFF in Nigeria. Although its enabling legislation does not include specific language on food fortification, its legally defined functions empower it to act in the interest of consumers generally (including consumers of food products) to ensure or enforce standards of consumer goods and ensure that service providers comply with local and international standards of quality and service delivery. It is also legally mandated to exercise a range of enforcement powers over manufacturers and distributors of consumer products (including food products) on issues pertaining to quality, in defence of consumer rights, or to deter anti- competitive practices, all of which are relevant to varying degrees to ensuring the availability and regular consumption of mandatorily fortified foods.

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

PREMIX STANDARDS

The premix standards are determined by the Standards Organization of Nigeria (SON) that publishes the Nigerian Industrial Standard (NIS):

- Standard for Wheat Flour NIS 212:2015
- Standard for Refined White Sugar NIS 90:2000
- Standard for Edible Oil NIS 388:2000 and
- Standard for Food Grade Salt NIS 168:2004)
- Fortificants (NIS Standard for fortificants Premix NIS 475:2015)

Over recent years, Nigeria has made significant progress in aligning with globally recognized standards, and the latest revision addresses several of the concerns and ambiguity within the standards. The last four years, specifically, has set the tone for the mandatory food fortification program, leading up to the establishment of appropriate standards that inform the clearly outlined guidelines for the industry.

In the mid 90's, Nigeria already had an ongoing nutrient supplementation program. However, there were persisting critical micronutrient deficiencies (MNDs) and hence there was a need to have a targeted micronutrient deficiency redressal program. Vitamin A Deficiency (VAD), Iodine Deficiency Disorder (IDD) and Iron Deficiency Anemia, (IDA) were identified to be prioritized following national micronutrient deficiency surveys in the late 1990s.

Thus, food fortification was adopted as an intervention, being the most cost-effective option for addressing the aforementioned health crisis. The fortification program was signed into law in 2000 and moratorium was given to the industry to set up their plants and process for commencement on 1st October 2002. There were several prohibitive challenges experienced by the industry in meeting up with compliance, including access to quality fortificants, functional properties of micronutrients to be added to staple foods and cost.

The standards have been continuously adapted since then, with support from international partners like the World Health Organization (WHO), Codex Alimentarius, Food Fortification Initiative (FFI) and the Global Iodine Network (IGN) who have conducted several validation exercises/reports. For instance, 2010 saw the first major revision of standards when the suggested form of iron in cereal flour fortification was changed from electrolytic iron to sodium iron ethylenediaminetetraacetic acid (NaFeEDTA) owing to its better bioavailability. This was followed by another major revision in 2015 when components like folic acid and zinc were added as a part of flour premix standards and quantity of vitamin A revised from 10mg/kg to 2mg/kg. The latest revision in 2019 adds an acceptable range of micronutrients rather than a single number, making it more realistic to follow the standards.

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

FIGURE A: EVOLUTION OF FORTIFICATION STANDARDS IN NIGERIA

Following staple fortification establishment, the need to set standards for vitamin premixes was initiated and signed into law shortly after.

The first major review of premix standards was done, such as the revision of the form of iron to EDTA.

Subsequent revision completed, with addition of other components like zinc and folic acid to flour standards.

Latest revision of standards, with acceptable ranges, presented and approved.

The standards established by SON also consider the stability of micronutrients such as vitamin A in wheat flour and edible oil. For instance, there is an estimated 15% loss of the vitamin A during handling and storage of flour, as well as food preparation. Oil that is extensively exposed to light is the major factor affecting vitamin A stability resulting in greater than a 50% loss within 4 weeks. Similarly, adequate packaging of edible oil that ensures that the product is protected can retain anywhere from 78% to 100% vitamin A after 24 weeks of storage.

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

The latest NIS standards for the food vehicles and premixes are summarized in Table 2 and Table 3 respectively.

TABLE 2: MANDATORY FORTIFICATION STANDARDS FOR THE RESPECTIVE FOOD VEHICLES

Food Vehicle	Micronutrient (Chemical Form)	Level
Micronutrient Requirements in Wheat Flour	Vitamin A (dry vitamin A palmitate 250 CWS)	2.0 mg/kg
	Vitamin B9 (folic acid food grade)	2.6 mg/kg
	Vitamin B12 (vitamin B12 0.1% CWS)	0.02 mg/kg
	Iron (NaFeEDTA)	40.0 mg/kg
	Vitamin B2 (riboflavin fine powder)	5.0 mg/kg
	Zinc (zinc oxide)	50.0 mg/kg
	Vitamin B1 (thiamine mononitrate)	6.0 mg/kg
	Vitamin B3 (niacinamide)	45.0 mg/kg
	Vitamin B6 (pyridoxine hydrochloride)	6.0 mg/kg
Vegetable Oil	Vitamin A (palmitate)	⩾20,000 I.U./kg
White Sugar	Vitamin A	⩾25,000 I.U./kg
Salt	Iodine (potassium iodate)	50.0 mg/kg

FORTIFICATION REGULATORY ENVIRONMENT IN NIGERIA

TABLE 3: MANDATORY FORTIFICATION STANDARDS FOR PREMIXES

Food Vehicle	Micronutrient (Chemical Form)	Level
Wheat FlourSemolina Maize Flour	Vitamin A (dry vitamin A palmitate 250 CWS)	48.9-53.79 g/kg
	Vitamin B9 (folic acid food grade)	4.8-5.28 g/kg
	Vitamin B12 (vitamin B12 0.1% CWS)	30-33 g/kg
	Iron (NaFeEDTA)	512.8-564.08 g/kg
	Vitamin B2 (riboflavin fine powder)	8.3–9.13 g/kg
	Zinc (zinc oxide)	104.2-114.62 g/kg
	Vitamin B1 (thiamine mononitrate)	12.3-13.53 g/kg
	Vitamin B3 (niacinamide)	75.8-83.38 g/kg
	Vitamin B6 (pyridoxine hydrochloride)	12.2-13.42 g/kg
Vegetable Oil	Vitamin A (palmitate 1.7 million IU)	13.53g/1000L
	Vitamin A (palmitate 1.0 million IU)	23.00g/1000L
Refined Sugar	Sugar pre-blend composition • Sugar (kg): 86.63 • Peanut/Coconut oil (kg): 2.0 • Vitamin A palmitate 250 SN/cws/cwd (kg) 25.0 • Antioxidant (kg): 0.009	The pre-blend is added to sugar in a ratio 1:1000
Salt	Iodine (potassium iodate, KIO)	FCC Grade KIO (min 99% KIO)

DEMAND AND SUPPLY ANALYSIS OF THE FORTIFICANT MARKET IN NIGERIA

THEORETICAL FORTIFICANT/PREMIX REQUIREMENT FOR NIGERIA

Nigeria has a population estimated at 196 million people (2018)* of which 42% are women of reproductive age and 17% are children under five years. The estimated consumption of the targeted food vehicles is tabulated below:

TABLE 4: NIGERIA'S DOMESTIC CONSUMPTION OF TARGETED FOOD COMMODITIES

Food Vehicle	Estimated National Annual Consumption (MT/annum)**	Per capita consumption (g/person/day)	Source
Wheat Flour	4,600,000	60	https://www.world-grain.com/articles/11643-focus-on-nigeria
Edible Oil	2,400,000	34	https://www.proshareng.com/news/AGRICULTURE/Fact-File-on-Crude-Palm-Oil--CPO--in-Nigeria--Cote-d%E2%80%99Ivoire-and-Ecowas/39032
Salt	780,000	11	Industry data
Sugar	1,600,000	22	https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Sugar%20Annual_Lagos_Nigeria_5-8-2018.pdf

* https://www.worldometers.info/world-population/nigeria-population/
**Figure is presented as wheat flour, total estimated grain consumption amounts to 5.6 million metric tons in 2018, extraction rate is assumed at 78%.

DEMAND AND SUPPLY ANALYSIS OF THE FORTIFICANT MARKET IN NIGERIA

Utilizing the estimated total consumption of the food vehicles and standards for food fortification and fortificants, the theoretical fortificant requirements for the various food vehicles can be calculated. The collective amount of fortificant required to adequately supply the respective food industries assuming that the Standard Operating Procedures (SOPs) include a consistent incorporation rate, one can deduce an estimated amount of fortificant that would be required for each food vehicle to meet the minimum standards. This is tabulated below in Table 5, which leads to following theoretical market sizes for various food vehicles:

- Vegetable oil: 33 MT vitamin A palmitate (1.7M IU) to fortify 2.4 million MT of estimated annual consumption
- Salt: 65.5 MT of KIO3 for fortify 0.8 million MT of salt consumption
- Sugar: 351 MT of vitamin A palmitate to fortify 1.6 million MT
- Flour, 2760 MT of multiple micronutrient premix to fortify 4.6 million MT

TABLE 5: TOTAL MARKET SIZE (DEMAND) OF THE PREMIX MARKET

Food Vehicle	Estimated National Annual Consumption (MT/annum)	Fortificant	Incorporation rate	Premix market size (MT)
Wheat Flour	4,600,000	Premix	600g premix /MT flour	2760 MT premix
Vegetable Oil	2,400,000	Vitamin A Palmitate (1.7 million IU/g)	13.5g /1000L oil or 13.5 g/MT oil	33 MT of VAP
		Vitamin A (palmitate 1.0 million IU/g)	23 g/1000L oil or 23g/MT oil	55.2 MT of VAP
Salt	780,000	KIO	84g KIO/MT salt	65.5 MT KIO
Sugar	1,600,000	25 kg Vitamin A Palmitate per 114 kg pre-blend diluted 1:1000	0.22 kg VAP/MT sugar	351 MT Vitamin A Palmitate

DEMAND AND SUPPLY ANALYSIS OF THE FORTIFICANT MARKET IN NIGERIA

FORTIFICANT MARKET GAP IN NIGERIA

There is a lack of sufficient and publicly accessible information related to the imported and distributed quantity of fortificants across the four major food vehicles.

The gap between the expected requirement and estimated utilization is therefore difficult to establish precisely. For the purpose of this report, this gap is estimated by calculating the theoretical requirement (demand) from the total consumption of each food vehicle and multiplying this by the incorporation rate required to achieve 100% compliance against National standards as calculated in Table 5.

The actual utilization rate of premix is projected from compliance estimates of food fortification that was established by the baseline study conducted under the SAPFF program. The adequately fortified volume from key processors was assumed to incorporate 100% of the theoretical fortificant dosage, while partially fortified processors were assumed to incorporate 50% of the theoretical fortificant requirement.

As seen below in Table 6, a comparison of theoretical requirements against estimated actual utilization clearly indicates that there is a significant potential for the fortificant market to grow by 40-60% for vegetable oil, sugar and wheat flour if the current industries were to reach 100% compliance level as per the current fortification standards. The salt iodization is almost at 100% compliance owing to the program maturity and market dominance by a couple of major players. It also indicates that there is enough to be done by various stakeholders to create an enabling environment for addressing this supply gap in a sustainable manner.

DEMAND AND SUPPLY ANALYSIS OF THE FORTIFICANT MARKET IN NIGERIA

TABLE 6: ESTIMATED MARKET SUPPLY FOR NIGERIA FORTIFICANT MARKET

Food Vehicle	Estimated National Annual Consumption (MT/annum)	Fortificant	Incorporation rate	Premix market size (MT)
Wheat Flour	4,600,000	Premix	600g premix /MT flour	2760 MT premix
Vegetable Oil	2,400,000	Vitamin A Palmitate (1.7 million IU/g)	13.5g /1000L oil or 13.5 g/MT oil	33 MT of VAP
		Vitamin A (palmitate 1.0 million IU/g)	23 g/1000L oil or 23g/MT oil	55.2 MT of VAP
Salt	780,000	KIO	84g KIO/MT salt	65.5 MT KIO
Sugar	1,600,000	25 kg Vitamin A Palmitate per 114 kg pre-blend diluted 1:1000	0.22 kg VAP/MT sugar	351 MT Vitamin A Palmitate

FORTIFICANT SUPPLIERS AND QUALITY OF FORTIFICANTS

WHEAT FLOUR FORTIFICATION

Flour is required to be fortified with multiple nutrients. These nutrients are not incorporated individually as flour millers utilize a premix of these nutrients that is incorporated into flour at a rate of 600g per metric ton.

The preparation of flour premix requires the mixing of multiple vitamins and minerals, making this premix. The premix contains nutrient compounds together with necessary fillers, stabilizers and anticaking agents to ensure that premix stability and the correct characteristics for incorporation into flour. Manufacturing of flour premix is therefore a complex process requiring sophisticated operations and quality control measures that follow strict pharmaceutical manufacturing practices. Since premix is highly concentrated and the dilution ratio when added to flour is high (1:1667), variation in the premix quality can have a high impact on achieving the final product specifications as per the food fortification standards.

As of now, none of the flour millers prepare their own premixes although OLAM in Nigeria is embarking on an investment for blending its own premix. Premix in Nigeria is supplied by global manufacturers as well as local premix blenders that import base nutrient compounds and blend premix locally. The local premix manufacturing companies in Nigeria do not manufacture the base nutrients (chemical compounds) and rely on importing these from various international companies, which sometime includes companies that also blend and market premix for Nigeria and the international market. Due to the global volumes of premix required being relatively low, the complex nature of the business and the high investment costs required to operate sophisticated chemical plants, there are very few global manufacturers and suppliers of chemical compounds and premixes since larger volumes are required for such businesses to be profitable.

The major premix suppliers (local and international) in the Nigerian market are listed below.

TABLE 7: MAJOR PREMIX SUPPLIERS/DISTRIBUTORS IN NIGERIA FOR FLOUR

Imported Premixes	Local Producers
• Muhlenchemie marketed by Vitachem • Hexagon marketed by Melvin Nickson Ltd.	• Biochemical Derivatives Limited (BDL) (importing the compounds from DSM) • Franbert • BNSL Limited

FORTIFICANT SUPPLIERS AND QUALITY OF FORTIFICANTS

SUGAR AND EDIBLE OIL FORTIFICATION

Sugar and oil are fortified with single nutrients (vitamin A) in the form of either Vitamin A palmitate or Vitamin A acetate. Edible oil (with the exception of hardened fats) is a liquid product and since Vitamin A is a fat-soluble compound, edible oil is fortified with concentrated Vitamin A palmitate oily liquid that is usually sold as either 1.7 million IU/g or 1.0 million IU/g versions. The 1.7 million IU/g concentrate is more potent requiring a lesser incorporation rate. The two versions are usually proportionately priced and do not affect the cost of fortification directly, the concentrated version reduces the amount of bulk handled by the oil processors and would reduce importation and handling costs such as shipping, clearance and forwarding. Duty would be unaffected since this is paid on the value of the shipment and not on volume. Interviews conducted with suppliers in Nigeria confirm that the majority of Vitamin A concentrate used in edible oil fortification is in the form of Vitamin A palmitate 1.7M IU/g supplied by three major companies - BASF, DSM and Piramal.

For the sugar industry, almost all the companies procure the Vitamin A palmitate, coconut oil, antioxidant and retinyl palmitate and prepare the pre-blend in house as tabulated below. This pre-blend is then incorporated into refined sugar at a ratio of 1:1000.

SUGAR PRE-BLEND COMPOSITION

Sugar (kg)	86.63
Peanut/Coconut oil (kg)	2.0
Vitamin A palmitate 250 SN/cws/cwd (kg)	25.0
Antioxidant (kg)	0.009

All the sugar refineries in Nigeria Vitamin A palmitate for the preparation of the pre-blend. The two major suppliers are BASF and DSM.

FORTIFICANT SUPPLIERS AND QUALITY OF FORTIFICANTS

PRICE AND QUALITY OF FORTIFICANTS

Table 8 below presents an average price for each of the premixes, as collected through multiple interviews. They key findings on the price are as follows:

- The fortificant prices are subject to a variation of 0% - 25% across companies for all the suppliers (except the local flour premix blenders). This depends on several factors like the long-term contracts, volume of imports, the size of the premix supplier, the international prices and forex fluctuations at the time of importation. The prices below are average current rates, when the product is directly sourced from the market. For instance, smaller companies end up paying 5-10% more for premixes because of smaller volumes and ad-hoc orders.
- The current duties on importation of individual fortificant compounds is 5%, while that on the ready-made premixes varies from 5% to 10%. The duties are based on the classification of imported components as raw materials or finished components. The variation in duties presents a potential gap area wherein the HSC codes and classification are not adequately monitored, thereby leading to conflicting numbers reported by the various interviewees. There is hence a need to ensure adequate monitoring and classification for enforcing stricter controls.

TABLE 8: AVERAGE PRICES OF FORTIFICANTS FOR VARIOUS FOOD VEHICLES

Incorporation rate	Average price (₦/kg)
Vitamin A palmitate 1.7M IU for vegetable oil	55000 - 70000
Vitamin A palmitate for sugar	7800
Imported flour premix	2800 - 3600
Local flour premix	3600 - 4000

FORTIFICANT SUPPLIERS AND QUALITY OF FORTIFICANTS

In the course of this study, it proved difficult to gather substantial objective information on the premix quality. However, the premix samples collected from the various millers and the interviews revealed the following key insights about quality:

- In general, imported premix suppliers have strong quality standards and regarded as high-quality premixes in the market. This was confirmed from internal TechnoServe analysis of samples of premix from various food processors.
- The internal sampling analysis of local flour premixes presents a mixed bag, with some samples meeting the standards whilst some not. This is also consistent with the views of the industry who feel that premix suppliers need to slightly up their quality quotient and be more consistent with the quality standards.

MARKET SHARE AND SUPPLY DATA

While there are long term relationships that the bigger processors maintain with one or more fortificant suppliers, most of the companies buy from multiple sources depending on their business needs, risk mitigation strategy, supply flexibility and for better negotiation power.

The regulatory agencies like Customs, NAFDAC and SON are encouraged to record and compile data on the actual supply of fortificants in Nigeria. The total supply quantity would be the sum of annual production numbers from the local manufacturers and imports. The total tally of premix supplied to the Nigerian market against total production of the various food vehicles would allow for a more accurate estimation of compliance to food fortification.

Additionally, these bodies perform the registration and monitoring of premix suppliers and food processors for compliance to standards. Thus, they would also be able to deduce how much of this supply meets the fortificant quality specifications as stipulated in the Nigerian standards. Such data would greatly assist development partners supporting food fortification efforts in the country as well.

Given the lack of access to fortificant utilization data, this study has used the data collected from TechnoServe SAPFF projects' engagement with major processors of each food vehicle to estimate the supply quantity of premix market.

FORTIFICANT SUPPLIERS AND QUALITY OF FORTIFICANTS

Though the actual supply data for most of the companies could not be accurately determined due to respondents not willing to share figures and being sensitive around confidentiality of such information, the estimated market share for the major premix suppliers based on interviews for each food vehicle is listed in Table 9.

As seen, Muhlenchemie is the clear leader in flour industry owning around 70% share. For edible oil, BASF is estimated to account for 65-70% share. In sugar, the volume is shared between BASF and DSM for the three major producers, with BASF leading in terms of market share.

The fortificant market is dominated by the imported suppliers accounting for almost three-quarter (3/4) of the market. A comparative analysis of the competitiveness of imported and local manufacturers of fortificants is presented in the following section.

TABLE 9: ESTIMATED MARKET SHARES FOR MAJOR PREMIX SUPPLIERS FOR ALL FOOD VEHICLES

Food Vehicle	Premix Supplier	Market Share
Wheat Flour	Muhlenchemie (Germany)	65%
	DSM/BDL (Netherlands/National	10%
	Hexagon (India)	10%
	Franbert (National)	10%
	BNSL (National)	10%
Sugar	DSM (Netherlands)	30%
	BASF (Germany)	70%
Vegetable Oil	DSM (Netherlands)	15%
	Piramal (India)	10%
	NHU (China)	5%
	BASF (Germany)	70%

COMPETITIVENESS OF LOCAL AND IMPORTED FORTIFICANT SUPPLIERS

Imported fortificant suppliers have a competitive edge over the local blenders in most of the categories considered important by the industry. Imported fortificant suppliers score better over their local counterparts in price, quality and economy of scale. Local blenders have competitive advantage on shorter delivery times, ability to supply smaller quantities and lower shipping and handling costs. Overall, imported fortificant suppliers have higher market shares compared to local blenders and fortificant suppliers.

PRICE

There is little difference in price between the local and imported fortificant suppliers is insignificant. Imported suppliers provide better bulk deals to the companies and offer slightly lower price. The imported suppliers also have diversified product portfolios, usually supplying other food additives and enzymes to their clients and therefore able to offer bundled discounts unlike the local fortificant manufacturers.

One of the additional factors contributing to the pricing difference is the duties and taxes on premixes. The current duties are same for premixes and each of the individual vitamins and mineral compounds since both could be classified as raw materials, owing to the lack of clarity and gaps in classification of imported compounds.

This puts the local premix blenders at a disadvantage in terms of price since they end up paying 5% duties on each of the imported components, which trickles down to their production costs as a price disadvantage. Local premix manufacturers also need to import multiple vitamin and mineral compounds that creates multiple transactions and additional clearing and forwarding effort while imported premix suppliers have lower transactional and distributional costs.

Poor manufacturing infrastructure in Nigeria including electricity supply challenges, skilled labour shortages and low volumes further exacerbate lower competitiveness within local premix blenders.

COMPETITIVENESS OF LOCAL AND IMPORTED FORTIFICANT SUPPLIERS

QUALITY

Manufacturing of premix requires highly sophisticated quality assurance and control measures and expensive laboratory equipment for product validation and testing. Imported premix therefore has a competitive advantage on quality due to several reasons:

- The imported suppliers have state of the art manufacturing facilities with adequate process controls, quality testing and stricter standards since they have to comply to several international regulations as they supply premix globally. Local premix manufacturers face multiple challenges including lack of access to the latest technology, lack of trained professionals and lack of testing equipment and laboratories.
- The storage and distribution network of international suppliers is well established to ensure fortificants are stored appropriately with limited exposure to the environment.
- Regulatory enforcement in Nigeria is inadequate, with no documented evidence of strict actions against the non-compliant actors. Though there is a MANCAP seal for premixes and some monitoring is done, the general state of confidence amongst the industry is low. Similarly, quality testing facilities available in Nigeria in the form of external labs and in-house testing facilities are not available easily and are costly, which is disadvantageous to local premix manufacturers.

ECONOMIES OF SCALE

The larger international premix suppliers enjoy economies of scale due to their diversified portfolio, international presence and manufacturing in more favourable manufacturing locations like China. For example, Muhlenchemie not only supplies the vitamin premixes but also enzymes and other additives for the industry. This helps them operate more efficient production facilities and maintain lower overhead and distribution costs compared to their local counterparts. They are hence able to strike extremely cost competitive bundled deals with the processors and thereby command a larger market share.

Many food processors in Nigeria have long-term contracts with international premix suppliers that secures demand. This in turn regularizes their production and distribution cycles. Better demand predictability also brings costs down. On the contrary, majority of the demand for premix from local suppliers is ad-hoc in nature, leading to erratic production cycles and higher fixed costs.

COMPETITIVENESS OF LOCAL AND IMPORTED FORTIFICANT SUPPLIERS

FLEXIBILITY

Flexibility is one of the factors in which the local premix suppliers provide a better value proposition to the customers. While most deals with imported suppliers are annual and based on a fixed volume and price per order cycle, the demand for local suppliers is more ad-hoc. This enables local premix manufacturers to reduce inventory and storage costs, minimizes expiry and wastage and doesn't require them to commit cash at the start of the fiscal year.

Given the fluctuating demand, some food processors do not mind paying a marginally higher price for increased flexibility offered by local suppliers of premix in return for single day deliveries. Though most imported premix suppliers also supply ad-hoc volumes, the response time of local suppliers is much shorter on average. Local manufacturers can service their clients more rapidly and regularly through on-ground technical sales personnel and therefore are more flexible compared to global premix suppliers.

FOREX IMPACT

The fluctuating currency conversion charges also trickle down to the final retail prices of premixes, vitamins and minerals. Hence, it affects both the local and imported premix suppliers. However, the impact on local players is slightly less pronounced than imported suppliers since they sell on ad-hoc basis and can vary their retail prices according to the live rates. Additionally, the individual vitamins and minerals have a better shelf life than premixes and hence they can import bulk quantities when the forex rate is favourable. The imported suppliers, on the contrary, are generally bound by long term contracts and can't respond to the currency fluctuations immediately.

Figure B presents the trending of NGN vs USD over the last one year. The currency fluctuation from USD to NGN ranges from a minimum of ₦ 358.8 to a maximum of ₦ 365.7 which roughly translates to just a 2% fluctuation in prices. Prima facie, this doesn't look huge.

However, for a major international premix supplier like Muhlenchemie, this could translate into huge amounts of positive gain or losses attributed to currency fluctuations. As an example, let us consider the premix price as $10/ kg of premix, and an annual contract price of selling at 3600 ₦/ kg by Muhlenchemie. Given that Muhlenchemie holds roughly 65% of the flour premix market of 2760 MT, this could translate into a gain of 33 million ₦ if the currency trades at 358.8 ₦ or a loss of 157 million ₦ if the currency trades at 365.7 ₦. Given the overall volumes for Muhlenchemie traded at a 3600 ₦/ kg price, this translates to 0.5% and -2.4% of the revenues respectively, which is a significant number.

COMPETITIVENESS OF LOCAL AND IMPORTED FORTIFICANT SUPPLIERS

FIGURE B: USD TO NGN CURRENCY RATES FOR ONE YEAR

TABLE 10: IMPACT OF CURRENCY FLUCTUATIONS ON REVENUES OF IMPORTED SUPPLIERS

Currency Rate	NGN to USD @ 358.8	NGN to USD @ 358.8
Revenue Impact (million ₦)	33	-157
% impact on revenue	0.5%	0.5%

Owing to long-term contracts, the time when the importation happens for such large imported suppliers is cyclical and pre-determined. The analysis above shows that depending on the actual currency rates when the importation happens, it creates a significant impact on their revenues and bottom-line. On the contrary, the local premix suppliers can import bulk quantities of raw materials when the currency rates are favourable and store them for future use. They can also pass on the price changes and negative currency connotations to the customer on a real time basis, thereby minimizing the currency fluctuation impact on their financials and profitability.

RECOMMENDATIONS

RECOMMENDATIONS FOR GOVERNMENT

- Develop more effective monitoring and regulation systems. Positive upgrade initiatives are underway, but government should strengthen monitoring at the point of entry, at the facilities of local premix suppliers and the inventory of food processing companies.
- Consider eliminating tariffs on premixes, component vitamins and minerals, as well as fortification-related consumables to provide support specifically targeting the local premix industries.
- Certification of premixes required for food fortification by regulatory agencies on an on-going basis subject to an annual review of standards.

RECOMMENDATIONS FOR NATIONAL PREMIX COMPANIES

- Promote and provide support for the development of a Premix Industry Association to ensure that industry concerns are adequately communicated, technical know-how is shared, and local premix is optimally marketed and promoted.
- Develop capacity for self-regulation including a Code of Practice for the local premix industry along with appropriate training, certification, quality testing and marketing programs.

RECOMMENDATIONS FOR DEVELOPMENT PARTNERS

- Promote engagement between various stakeholders to consider and/or implement government and industry initiatives outlined above.
- Extend the technical expertise, capacity building and grant support to local premix suppliers.
- Promote and aid initiatives for accreditation of labs aimed at creating a channel for the companies to perform rigorous checks affordably, reliably and on-time.