

WTO-STDF GRANT APPLICATION TO NIGERIA

APPENDIX 1

Description of Team Members, Role of Project Partners and International Collaborating Organizations

Introduction

This request for WTO-STDF grant assistance is being made to expand Nigeria's agricultural exports through capacity building for private and public sector institutions responsible for production, processing and exports of cereals and pulses, particularly sesame seeds and shea nuts/butter.

The project will be implemented by several organizations, divided into two main categories:

Core Group:

The core group is comprised of the National Agency for Food and Drugs Administration and Control (NAFDAC), Federal Ministry of Commerce and Industry, Federal Produce Inspection Service (FPIS), National Cereal Research Institute (NCRI), Forestry Research Institute of Nigeria (FRIN), Nigeria Stored Products Research Institute (NSPRI), Standards Organization of Nigeria (SON), International Institute of Tropical Agriculture (IITA) and the Nigerian Export Promotion Council (NEPC).

The grant request will directly benefit these organisations through budgetary provisions included in the grant over a period of two years.

Collaborating Institutions:

Collaborating institutions include the Sesame Seed Association, Shea Nut Producers Association, Department of Agricultural Extension Services, National Agricultural Quarantine Service (NAQS) and the All Farmers Association of Nigeria. These organisations will not receive direct funding from the WTO-STDF grant funds but will participate in capacity building and training programmes as well as collaborate with the core partner group in implementing key activities of the project.

The two categories of partner organisations will offer complementary sets of expertise, experience and research on the subject matter, as well as the human and material resources needed for the implementation and sustainability of the project.

Description of Each Partner Institution and Expected Roles

FEDERAL MINISTRY OF COMMERCE AND INDUSTRY

The Federal Ministry of Commerce and Industry is the lead agency representing Nigeria at the WTO and will manage the WTO-STDF grant funds on behalf of the core agencies. In the past, the Ministry has managed similar projects successfully and has the required experience and human capital to manage the present proposed project.

Specific obligations of the Federal Ministry of Commerce include:

- Ensuring prompt disbursement of the grant funds to core beneficiary institutions, according to the rules of WTO-STDF,
- Monitoring beneficiary organizations to ensure implementation of the project according to the project's terms of reference and in accordance with the project timetable,
- Reporting to the WTO-STDF Working Group on project implementation progress,

- Transmitting all relevant factual and financial information, including project reports and yearly statements of accounts and verifications, to the WTO-STDF. Ensuring that declared expenses in the yearly statement of accounts are supported by original documents (invoices, vouchers, contracts, order forms, tickets etc.), in the bookkeeping records of the beneficiary,
- Identifying problems as they arise and recommending steps to resolve them,
- Recommending changes in project design or timetable to accommodate emerging unforeseen situations as needed.

Key Federal Ministry of Commerce and Industry Staff Involved in the Project

Name	Educational Level/Function	Field of Expertise Related to the Project	Project Responsibility
Abdulsalam Usman	B.Sc. Economics	Trade Facilitation	Instructor
M.A. Abdulhamid	B.Sc. Pol. Sc, PGD Trade Policy, M.Sc. Econ. Analysis & Int. Dev.	WTO Agriculture, SPS and other WTO Issues	Coordinator 1
Kalu E.E.	B.Sc. (Bus. Admin.), MBA	Chief Trade Officer	Coordinator 2
Onyerikwu Simeon .A.	Dip. (Pub. Admin), HND (Bus. Admin) Dip. (Trade Policy)	TRIPS, TBT, Dispute Settlement	Facilitator
J.O. Apanisile	B.Sc. Agric. (Agronomy) MBA	Assistant Director	Produce Inspector

NAFDAC

The National Agency for Food and Drug Administration and Control is the agency that originally requested WTO-STDF Grant Funds. The agency's mandate is to regulate and control the manufacture, importation, exportation, distribution, advertisement, sale and use of foods and drugs. It is also the national regulatory authority for registration of food and drugs and certification of packaged, processed or semi-processed food commodities for export. NAFDAC activities include establishment inspection, sampling and laboratory analysis. NAFDAC also conducts import inspection of regulated products and ensures Good Manufacturing Practices (GMP) as well as Hazard Analysis and Critical Control Points (HACCP) standards meeting Codex and ISO standards. The agency also monitors and controls the advertisement of regulated products. Its laboratory for Food Quality and Safety Analysis is the main laboratory that trains and performs aflatoxin analysis of products destined for export. This laboratory will provide support for Nigerian sesame seed and shea nut/butter sampling and aflatoxin analysis.

Key NAFDAC Staff Involved in the Project

Name	Educational Level/Function	Field of Expertise related to the project	Project Responsibilities
Jane O. Omojokun (Mrs.)	B.Sc. (Micro), M.Sc. (Ind. Micro), Deputy Director (Regulatory Affairs)	Trained Food Scientist GMP/HACCP Facilitator	Coordinator
Stella Denloye	B. Sc. Biochemistry, M.Sc. Analytical Chemistry, Deputy Director / Head of Laboratory	Laboratory Analysis	Laboratory Component
Ivy Nkanor (Mrs)	B.Sc. Zoology, MSc (Applied parasitology-	Inspection of Port Exports	Enlightenment Sensitization of

Ogochukwu Mainasara	entomology - Chief Regulatory Officer) B.Sc. Micro; MBA, Deputy Director (Food Registration)	Food Scientist	Exporters, Issuance of Export Certificate Registration of Food Products
Mrs. Sinmidele Onabajo	B. Sc. Zoology, Chief Regulatory Officer	Establishment Inspection	Inspection of Warehouses and Establishments
Mr. A. O. Adegboye	B. Sc. (Food Tech.), M. Sc. Env. Resources Mgt, Assistant Chief Regulatory Officer (Codex)	Food Safety, Enquiries on SPS matters, Risk Assessment	Assisting the Scientific Coordinator in Technical and Documentation Functions
Mr. Nnamdi Ekweogu	Director of Admin and Finance	Budgeting, Monitoring, Reconciliation	Reconciling NAFDAC Expenses in the Project

FPIS

The Federal Produce Inspection Service is the organisation that certifies products on a standard 3% sample for quality, weight, fumigation and packaging (QWFP). The FPIS is located at the key ports of exit in Nigeria. Its certification system provides some ability to trace produce to storage warehouses and production sources. FPIS also assigns country of origin certification and links exporters to the Nigerian Export Promotion Council through the QWFP certification system. The FPIS will collaborate with NAFDAC in improving traceability for shea and sesame seeds as well as implementing the early warning system at field level required to control aflatoxin, pests and other contaminants in sesame seed and shea nut/butter production.

IITA

The International Institute for Tropical Agriculture (IITA) conducts research, training, germplasm development and information exchange activities in partnership with regional and national programs throughout sub-Saharan Africa. The research agenda addresses crop improvement, plant health and crop management and resources. IITA has worked over the past fifteen years on toxigenic fungi and resultant mycotoxin contamination in staple food and export crops in Africa. Research has focused on the impact of aflatoxin on child health and related socio-economic factors, the development and deployment of management practices for the control of aflatoxin, ecological factors influencing *A. flavus* infection, the control of *A. flavus* in the field with atoxigenic *A. flavus* strains and related economic studies looking at cost/benefit of aflatoxin-reducing technologies, awareness campaigns, information exchange through conferences and workshops, impact and uptake. IITA has recently succeeded in the development of antibodies for quantitative determination of aflatoxin. The methodology permits screening for aflatoxins at very low levels (4 ng/g). Benefits include reducing the cost of aflatoxins screening to as low as \$1, with excellent reproducibility and sensitivity.

IITA's contribution to the project will be in the form of training in ELISA and some research activities, particularly on *Aspergillus* identification, as well as assisting NAFDAC in the procurement of necessary materials and supplies for the ELISA technique. IITA Nigeria is also linked with its office in the Republic of Benin, which is involved in the WTO-STDF Grant Project on Shea nuts.

Key IITA Staff Involved in Project

Name	Educational Level/Function	Field of Expertise related to the project	Project Responsibilities
Ranajit Bandyopadhyay	Ph.D. Plant Pathologist and Mycotoxin Specialist	Management of Aflatoxin and Toxigenic Fungi	Training on aflatoxin analysis by ELISA, identification of <i>Aspergillus</i> species
P. Lava Kumar	Ph.D. Virologist	Diagnostics and Immunoassays	Training on aflatoxin analysis by ELISA

NSPRI

The Nigerian Stored Products Research Institute conducts research on bulk storage problems with export commodities and local food crops. In particular, NSPRI's research covers issues such as stored product pests, pesticide formulation, residue and mycotoxin surveys, development of storage techniques and specifications for top quality shea nuts and sesame seeds and cleaning and sorting procedures. NSPRI will develop manuals and provide training on recommended Good Storage Practices (GSP). NSPRI will also assist IITA in undertaking studies on aflatoxin levels in stored sesame seeds and shea nuts/butter. In addition, NSPRI will advise on actions required to incorporate new technologies into the production chain as well as other required advancements, such as remedies to inappropriate product handling (prototypes of warehouses, washing and drying equipment) and improved storage conditions during transport from production areas to ports.

NCRI

The National Cereals Research Institute is the national research institution for the genetic improvement of sesame (beniseed) as well as that of soybean, castor, rice, acha and sugarcane. The institute's mandate also includes agricultural resource management, research and extension in the central zone of Nigeria covering eight States - Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, Taraba States and the Federal Capital Territory, Abuja. The NCRI, through its oilseeds division, has carried out baseline surveys on sesame seed production, processing and utilization in Nassarawa, Kebbi and Yobe states.

Among the strategies and specific objectives of the Oilseeds Division are:

- To evaluate pest and disease monitoring and control methods in sesame seed production.
- To evaluate agronomic traits and conduct investigations into the input requirements of acceptable and promising varieties of sesame.
- To develop value-adding processing, utilization and storage technologies for these oilseeds.

Under the project, NCRI will undertake a study on the socio-economic characterization of sesame seed production and supply chain, as well as assist in developing HACCP, GAP and GMPs for sesame seed.

Key NCRI Staff Involved in the Project

Name	Educational Level/Functions	Field Expertise related to Project	Project Responsibilities
Afolabi Amosun	M.Sc. (Agronomy) M.Sc. (Soil Science) Chief Research Officer	Head, Sesame Research Programme	Coordinator
Julian C. Anuonye	B.Sc. Ph.D.	Food Scientist	Laboratories Studies (Quality control and quality assurance).

			Processing and storage studies. Development of predictive protocols etc.
Moh. Lyar	B.Sc.	Food Scientist	Laboratories Studies
Olumide Shokalu	B.Sc. M.Sc. (Plant Pathology)	Disease and Pest Monitoring	Field Evaluation
Mrs. O. Adeniji	B.Sc., M.Sc. (Entomology)	Pest Monitoring	Field Evaluation
Ijeoma, V. U.	M.B.A. Chartered Accountant	Budgeting, Monitoring and Reconciliation	Reconciling NCRI expenses of the project

FORESTRY RESEARCH INSTITUTE OF NIGERIA (FRIN)

The FRIN develops improved varieties of tree crops for use by agriculture and industry. This mandate includes shea tree development and other related product development. FRIN's contribution to the proposed project is to assist in the study on the socio-economic characterization of shea nuts/butter in Nigeria.

Key FRIN Staff Involved in the Project

Name	Education Level/Function	Field of Expertise	Project Responsibility
Dr. Aloysius Igboanugo	B.Sc. (Plant-Soil Science) M.Sc. Forestry Ph. D. (Eco-Physiology)	Head, Sustainable Forest Management; Seed Biology, Plant Propagation	Coordinator; Field Evaluation
Mr. Ibrahim Lawal	B.Sc. (Forest Resources Management) M.Sc. (Pharmacognosy)	Plant Products Analysis	Seed Biochemical Analysis
Mr. Oladayo Gbadebo	HND (Forestry)	Seed Biology & Monitoring	Seed Storage; Field Evaluation
Mr. A. O. Salami	HND (Forestry)	Seed Biology & Plant Propagation	Field Evaluation

NIGERIAN EXPORT PROMOTION COUNCIL (NEPC)

The Nigerian Export Promotion Council is the Federal Government Agency in charged of the development and promotion of non-oil exports. The Council was established in 1976 by Parliament Act 26 and further amended by Acts 64 and 65 of 1992.

The NEPC's major objective is to promote the development and diversification of Nigeria's export trade and provide technical assistance to local exporters in areas such as export procedures, quality controls, export packaging and certifications for export. The Council is responsible for creating appropriate export incentives and supports to make Nigerian products competitive in overseas markets.

The Council will assist in monitoring the project's impact on export values and volumes of sesame seeds and shea nut/butter products from Nigeria, as well as drawing attention to any constraints being faced by exporters of these two commodities. NEPC will also participate in the socio-economic study on shea and sesame seeds.

Key NEPC Staff Involved in Project

Name	Educational Level/Function	Field of Expertise Related to the project	Project responsibility
Aliyu M. Lawal	HND (Marketing) MBA (Marketing), General Manager, Market and Product Development	International Marketing	Coordinator for Socio-economics Survey
William A. Ezeagu	Diploma (Packaging) B.Sc. (Economics, Geography) OGD (Management) MBA (Marketing) Assistant General Manager, Product Development	SPS Issues, Packaging, Quality Assurance, Certification	Socio-economics survey of products, lead researcher
Samson B. Auta	B.Sc. (Business Administration) PGD (Project Management) Marketing Manager (Europe and Middle East)	Market Intelligence Report	Socio economics survey of shea nuts and sesame seeds
Evelyn I. Obidike	HND (Marketing) M.Sc. (International Marketing) MBA (Marketing)	Liaison with Exporters at Ports of shipment on SPS issues	Researcher
B.A. Ndammin	HND Statistics	Import-Export Statistics	Researcher on socio-economics survey of sesame seeds and shea nuts

APPENDIX 2

Overall Project Management

General Coordination

The Ministry of Commerce and Industry is the lead agency and will be responsible for the administration and coordination of grant funds allocated to the project by WTO-STDF. The Ministry will allocate funds to collaborating institutions and monitor their use. The Director of External Trade in the Ministry of Commerce and Industry will request funds from WTO as per schedule. Funds will be stored in a special account created for the project and controlled by a designated desk officer of the finance department of the Ministry of Commerce and Industry. The finance department has managed donor funds for similar projects in the past and has the required experience. The Lead Officer/ General Coordinator of the project will be Mr. Abdulsalam Usman.

General Scientific Coordination

General scientific coordination will be performed by Mrs. Jane O. Omojokun of NAFDAC, who will assist in the coordination of the follow-up, planning, progress reporting and dissemination of the results of the scientific activities. Mrs. Jane O. Omojokun made immense contributions to the preparatory project planning workshops for this project, held in Abuja in January 2008. NAFDAC has implemented international donor assisted projects in the areas of human capital capacity building in laboratory analyses and provision of equipment for NAFDAC laboratories in the six geo-political zones of Nigeria. NAFDAC also successfully managed projects from the Central Science Laboratory (CSL) in 2005, 2006 and 2007, International Atomic Energy Agency (IAEA) and UNICEF Vitamins Fortification Project (2007).

Procedure for release of funds

It is important that project activities should not be held up due to delayed release of funds. In this regard, it is proposed that a Memorandum of Understanding (MOU) will be signed between WTO-STDF and the Ministry of Commerce and Industry, and between Ministry of Commerce and Industry and beneficiary organizations, particularly NAFDAC, on the other. In the MOU, release of funds from the WTO-STDF Grant Funds should be controlled by a joint signatory from NAFDAC and the Ministry of Commerce.

Project and related information exchanges will occur on several levels:

1. Between General Project Coordinator and Participating Organizations:
Day-to-day information exchanges regarding project activities, decisions, scientific information, reporting, financial transactions and meetings will be performed mostly through Internet e-mail services. This communication will be supplemented by project meetings and workshops in the sesame and shea producing states of Nigeria.
2. Between Scientific Coordinator and Participating Organizations:
Periodic reports from team leaders of various organizations implementing scientific programs and activities will be sent to the scientific coordinator.
3. Between the overall project coordinator and financiers (STDF partner institutions):
Information on administrative and financial management matters and technical reports will also take place between the General Coordinator and the WTO-STDF Secretariat, mostly through internet e-mail services, fax and courier mail.

APPENDIX 3

Project Background and Rationale

Sesame Seed Production and Quality Control in Nigeria

Sesame (*Sesamum indicum* L., Pedaliaceae) is a very old cultivated crop. The Harmonized Tariff Schedule (HTS) Code for Sesame seeds, broken or unbroken, is HTS8 12074000.

In Africa, Nigeria ranks second to Sudan in production and export of sesame seed, earning US\$35 million¹ in 2005 from its exports. Annual sesame exports for Nigeria peaked at 42,000 metric tons in 2001. Sesame is mostly exported as seed and major destinations for export include China, Japan, Turkey, Republic of Syria, and South Korea. Sesame currently ranks second to cocoa in terms of agricultural exports in Nigeria and has the potential for earning additional foreign exchange for the country if opportunities in the European Union could be exploited.

Sesame production plays an important socio-economic role, particularly in the northern states of Nigeria. Sesame seeds have a high nutritional value (rich in proteins, fats, vitamins and selenium) and, in addition to their commercialisation, they are also an important source of food for local families. A significant part of the local population, mostly smallholders including women, directly or indirectly depend on production of sesame seed for local or export markets, thus generating employment and income. Its promotion will therefore impact the livelihoods of smallholders, reduce poverty and improve standards of living, as well as reduce of migration of people from rural to urban areas. Most sesame is produced in seven states in the north of Nigeria: Nasarawa, Jigawa, Benue, Kebbi, Taraba, Kogi, and Yobe.

Export estimates for sesame seed 2005 to 2007

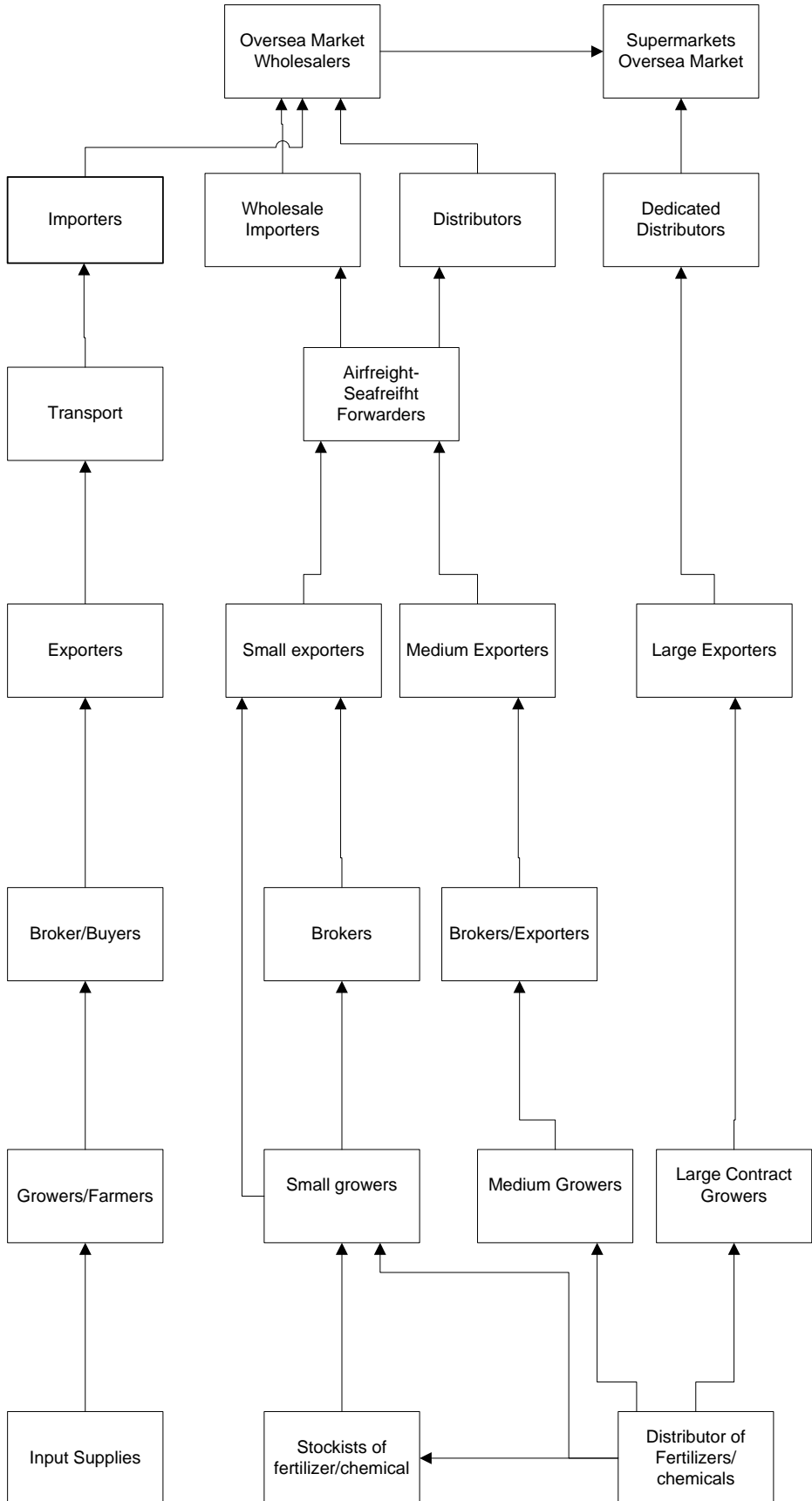
Year	Metric Ton	Export Value
2007	71,053	\$ 74,965,021
2006	51,412	\$ 39,090,483
2005	51,067.5	\$ 39,050,681

Source: Nigerian Export Promotion Council

It is estimated that with the improved quality control proposed under this current project, Nigeria could increase sesame exports to the Far East and make new entry into the EU markets, increasing exports by 50% in five years. This is projected to bring an additional annual foreign exchange of \$36 million dollars into the Nigerian economy, far exceeding the cost of investment into this project.

¹ Nigerian Export Promotion Council. *Blueprint for Sustainable Development of Sesame Seed Production and Marketing in Nasarawa State for Export*. 2006. Unpublished.

Supply chain Framework for Sesame Seeds and Shea Nuts



Food Safety and Aflatoxin Control and Monitoring for Sesame in Nigeria

Sesame seeds are frequently contaminated during storage by high levels of aflatoxins (B1, B2, G1, G2), which are toxic secondary metabolites produced by *Aspergillus flavus/A. parasiticus* when seeds and nuts are kept under favourable conditions for the development of these fungi. Contamination of sesame seeds along the supply chain is of major concern for public health because of the carcinogenic and genotoxic effects of aflatoxins in human beings. As Nigeria prepares to enter the EU market, aflatoxin control may become the largest impediment to sesame exports from Nigeria, especially to Europe where regulations on aflatoxin levels are very restrictive.

The Rapid Alert System for Foods and Feeds (RASFF) of the EU does not currently provide specific data on rejects and notifications from Nigeria for sesame imports into the EU. This is partly due to the low EU imports of Nigerian sesame seeds as well as the inclusion of sesame seeds in the Harmonized Tariff Schedule (HTS) under other pulses and seeds in the RASFF, without any specific mention of sesame seeds.

In 1999, the European Commission established maximum levels of 4 µg/kg for total aflatoxins and 2 µg/kg for aflatoxin B1 in seeds, nuts and derived products for direct human consumption or as an ingredient in food products, and 10 µg/kg for total aflatoxins and 5 µg/kg for aflatoxin B1 in nuts subject to sorting or other physical treatment before their human consumption or use as ingredient.

Most exports from Nigeria are destined for Middle and East Asian countries such as China, Japan, Turkey, Syria and South Korea, where requirements for quality standards are not very stringent. However, Nigeria is now considering entering the European Union (EU) market, where quality standards requirements are strict. The need for a strict quality control system for sesame is therefore a *sine qua non*.

The occurrence of fungi and aflatoxins along the supply chain, from collection of the seed to the final exported lots, may not only be favoured by conditions typical of a hot, wet, tropical climate but also by the low technological organization of the productive chain and inappropriate product handling. Transportation distances from the north of Nigeria to the ports in the south are very long. For these reasons the period between collection and final drying for safe storage of the seed varies greatly and can be up to several weeks. There is insufficient data on the effect of transportation time on the quality of seeds from the different producing states of Nigeria.

No national standards for total AF and AFB1 are available at present except for codex standards on peanut, which is high (15µg/kg). For cereals, nuts and seeds (unsorted and for direct consumption) Nigeria uses EU standards both for local consumption and also for export products. There is also no specific quality assurance package developed and tailored specifically for sesame seed field production through the supply chain to export. There is little evidence of GAP formulated, documented and extended by the Department of Agricultural Extension Services for sesame producers and neither is there evidence that a plan of Hazard Analysis and Critical Control Points (HACCP) is practiced by sesame seed processors and exporters.

The Federal Produce Inspection Service (FPIS), located at the ports, assesses sesame products on a standard 3% sample for quality, weight, fumigation and packaging (QWFP). Their tests have been mainly physico-visual tests such as % mouldy, % infestation and % shrivelled, and rapid moisture content tests using Rapid Test Kits. Inspectors provide a quality assurance certificate to accompany the goods. Each export product displays the name of the exporter, the weight, grade and the country of origin. The grader number identifies the grader and the warehouse to ensure traceability. The FPIS has no laboratories of its own, but it is planned that under the present project FPIS will be able to use

the laboratory facilities of NAFDAC. Exporters must be registered with the Nigerian Export Promotion Council (NEPC) in order to have a QWFP certificate. All of the above are performed largely by sight, and no proper equipment and laboratory analysis is undertaken for *aflatoxin* and other *mycotoxins* and pesticide residues, particularly at field level.

The resultant situation is that at the field level there is inadequate capacity for rapid and low-cost on site *aflatoxin* control. Diagnostic and analytical methods are not presently available that can be used throughout the Nigerian sesame production chain to monitor *aflatoxin* contamination and provide early warning of *aflatoxin* incidence. Also there are no such methods to aid the implementation of Hazard Analysis and Critical Control Point (HACCP) systems based on preventive and corrective measures. In addition, the operational platform to facilitate the collaborative efforts of all responsible agencies required to ensure export-quality production are missing. This proposal will address these sesame supply chain issues, particularly in the case of exports, by equipping field institutions and agencies such as FPIS and CRIN with the tools necessary to meet the import requirements of the EU.

NAFDAC has the capacity to undertake laboratory analyses on sesame seeds for microbiology, *mycotoxins* and analysis of pesticide residues. The laboratory has well trained staff with international exposure to current practices in mycotoxin assay. NAFDAC has well equipped laboratory complexes in all geographical zones of Nigeria i.e. Oshodi, Kaduna, Maidugari and Port Harcourt. Additional equipment and materials required for NAFDAC are only to meet the initial expected surge in demand for tests, training of staff of collaborating institutions and private operators following the implementation of an improved field quality control system.

Apart from NAFDAC, other collaborating institutions such as Standards Organization of Nigeria (SON) and IITA also have trained staff and laboratories equipped for mycotoxin assay and are at hand to meet any surge in demand from private sector operators. Part of the funding resource for laboratory equipment and materials will be directed to assist SON and IITA.

Shea Nut and Butter Production and Quality Control in Nigeria

Shea Trees are listed as *Butyrospermum parkii*. Other species are listed as *Vitellaria paradoxa*, which grows extensively in the agro-forestry parklands of semi-arid West Africa, including Nigeria. Shea is a native source of edible oil or fat traditionally used for frying, adding to sauces, as a skin pomade, for medicinal applications, to make soap, oil for lanterns and for cultural purposes at ceremonies, such as births, weddings and funerals. In Nigeria, the shea tree grows in Niger, Kwara, Kebbi, Kaduna and Oyo states.

Processing the fruits, which are gathered at the end of the rainy season, involves collection, selection, washing, drying and oil extraction. The extraction process has an important socio-economic role in Nigeria, since a significant part of the local women, many of whom are impoverished, directly or indirectly depend on shea nut collection and butter extraction for sale at local or export markets, which generates employment and income. Shea nut oil extraction also contributes to the socio-economic organization of large extractive areas and contributes to reducing rural-urban migration.

Over the past five years, demand for shea products has grown in the EU and the US, causing Nigeria and other West African countries to begin exporting shea products. Shea is now commonly used in the production of cocoa butter equivalents or improvers (up to 5% content by weight is allowed under EU regulations) in chocolate, other confectionaries and margarine. Nigeria exports shea butter mainly to the EU and US, with an increase in recent years as cosmetic and personal care companies have increased the use of shea butter in their products.

Estimated Export Volumes and Values for Shea nut and Sheabutter

Years	Shea nut		Shea Butter	
	Metric ton	Value	Metric Ton	Value
2007	1,294	\$ 516,045.60	179	\$ 277,575
2006	N/A	N/A	20	\$ 19,500.
2005	717	\$ 133,571	N/A	N/A

Source: Nigerian Export Promotion Council

Importantly, the EU market for shea butter exceeds that of the US market, as regulatory authorities allow shea butter as an ingredient in food products, particularly in confectionary products, such as biscuits and chocolates, and also in pastries, margarine and other products containing vegetable fat. Chocolate producers use shea butter as a substitute for cocoa butter in their products.

Being a recent export phenomenon, importing country quality requirements for shea products vary widely and need to be studied. For example, according to industry sources, the US will most likely not permit use of shea butter in chocolate manufacturing in the medium-term or imports of European chocolate with any shea butter content. The US does not import shea butter as a source of vegetable oil for use in processed food products, although the Food and Drug Administration has approved it for importation. Many competing types of vegetable oil, such as canola, peanut oil, sunflower seed oil, sesame oil, maize oil, cottonseed oil and coconut oil already crowd the US market.

Research on the EU RASFF did not indicate any cases of rejections due to aflatoxin in shea.² The opportunity to expand exports of shea butter exists³, if technical quality and shipping constraints are resolved in a cost-competitive manner. The value per MT of shea butter exceeds that for shea kernels, so that expanding shea butter exports can contribute proportionally more to export earnings than greater levels of shea kernel exports.

The current market prefers the following kernel quality (for mechanical extraction and later refinement in EU): Free Fatty Acids (FFA) <6%, kernel fat content 45-55%, water content < 7% and impurities < 1%. The preferred demand for butter quality for the cosmetic industry, however, varies depending on end use, although discussions have revealed some preferences, like non-solvent extraction, natural source (organic certification if possible), low FFA, 'clean' white to yellow colour (not grey), filtered to remove impurities, low water content, low odour, low melting point, and high unsaponifiable fraction of 3-12% of total extract.

Certification of shea kernel and butter has become increasingly important for a number of reasons. Beginning January 1, 2005, the EU has demanded that all agricultural products, including shea nuts are traceable from source (Reg. 178, Jan 2002). Furthermore, a number of cosmetic companies are asking for organically certified shea butter for the formulation of organically labelled 'botanical' products. Demand for consistent '**Quality @ Quantity**' is increasing the need for quality assurance. A number of buyers also hope to obtain 'fairly traded' supplies, and the Fair-trade Labelling Organisation (FLO) is currently developing a set of guidelines specific to shea butter.

Exporters interviewed during this study indicated that the main problem encountered during the export of shea products is the Free Fatty Acid (FFA) and *aflatoxin* content in the nut while in storage.

² www.sheastandards.net/downloads/RTC_SHEA_KERNEL.doc

³ Dr. Lovett, Peter. "The Shea Butter Value Chain" West Africa Trade Hub, 2004.

For the butter, the main problem is both the FFA and impurities. Labelling must have the company name and address, date of production, SON Registration and NAFDAC Registration Number. Exporters are in the process of registering an Association of Shea Product Exporters, which should be completed by June 2008. The association is expected to play a self-regulatory role in quality control.

Quality assurance for shea products to meet importers requirements is a very complicated and a highly technical issue for which Nigeria needs to develop expertise in order to increase shea market penetration. NAFDAC has no specific quality assurance package for exports of shea butter and therefore needs to improve its laboratory analysis for shea products in order to assist exporters meet international import requirements.

Further investigation is required to identify and confirm the Critical Control Points (CCP) and factors along the Nigeria shea nut and butter production chain and to estimate the probability of contamination at the different stages of the production chain through the establishment of critical limits for pesticide residue and other contaminants. The definition and publication of good practices and the development of post-harvest technologies such as warehousing, washing and drying equipment is also required.

Training courses in good practices, as well as in sampling methods according to the relevant European Directives for inspection and sanitary and phytosanitary certification, need to be implemented in the Shea nut production and supply chain, since these extension activities are still in their early stages and consequently need to be reinforced. Finally, to improve the capacity of inspection staff, there is need for training courses in GAP and HACCP sampling methods according to the European Directive 98/53/EC for *aflatoxin* inspection and sanitary certification.

The present project will address the shortcomings indicated above with the aim of reducing and controlling contamination in the supply chain to levels that meet international sanitary and phytosanitary standards, in particular the stricter European regulation. This will involve the Nigerian government and its executive services, research institutes, universities, private sector, and non-governmental organizations, among others, in initiating a series of actions in partnership with the stakeholders in the shea nut and butter production chain in Nigeria.

General Information on Past and On-going Quality Assurance Programmes for the Nigerian Agricultural Sector and ECOWAS Sub-region

To avoid duplication of efforts, maximise use of resources and create synergies through collaborative effort, it is important to find out whether there are or have been similar projects which have been funded by other donors or funding agencies.

Initial research revealed no specific donor-funded SPS work in relation to sesame and shea quality improvement in Nigeria. There have, however, been general studies and programmes on quality improvement for general agricultural products in the past, while some programmes to develop and expand Nigeria's food exports are ongoing.

The Commonwealth Secretariat, as part of its technical assistance program to Nigeria, organised a training workshop on "Food Safety Standards, Regulations and Export Trade", incorporating HACCP and Traceability Principles and Practice in Abuja Nigeria from 2 to 12 May 2006⁴. The request was

⁴ Commonwealth Secretariat 2006: Nigerian Food Safety and Quality Control Review, Final Report of a Commonwealth Secretariat Funded Study- Special Advisory Services Division Enterprise and Agriculture Section.

made from the Federal Ministry of Commerce and Industry and the objective was to increase the ability of Nigeria to meet the requirements of the WTO Agreement on Technical Barriers to Trade (TBT). The study focused on reviewing the regulatory framework for food safety and quality control of key specified agricultural export products with recommendations for remedial actions to improve it. The Commonwealth Secretariat commissioned Food Surveys, Ltd. to carry out the study. This training workshop attracted 35 participants including policy advisors from the Federal Ministries of Commerce, Agriculture and Health, food regulators and inspectors from SON, NAFDAC, NPQS and FPIS, farmers, exporters representing the All Farmers Association of Nigeria, and commodity specific national associations for cassava, ginger, sesame and shea butter. At this workshop, the recommendations from an earlier stakeholders' workshop of 29 September 2005 on the formation of a National Food Safety Management Committee was revisited, and a concrete six point action plan proposed and discussed with the Federal Minister of Commerce.

The Food and Agricultural Organisation (FAO) has organised training on Food Sanitation for grassroots SMEs under the auspices of the Federal Ministry of Environment. No specific quality improvement programmes are planned for Nigeria in 2008.

The EU has sponsored training in UK laboratories, the Central Science Laboratory (CSL) in 2005, 2006 and 2007 and the International Atomic Energy Agency (IAEA) Siebersdorf Laboratory in Austria, for technicians on sampling and analytical tests for mycotoxins on products destined for the EU. UNICEF also sponsored training under the Vitamins Fortification Project (2007). No specific quality improvement programmes are planned for 2008.

USAID Nigeria has not programmed any specific quality improvement activities for Nigeria in 2008 to 2009. However, they are willing to consider requests if received from the Nigerian Government.

The USAID⁵ also provided funding for the production of shea butter in the sub-region. This is in response to the recognized potential of the shea sub-sector to benefit the rural poor, tackle dry land environmental concerns and assist with the overall development in the sub-region.

ProKarité – is a project managed by the World Agro-forestry Centre (ICRAF) and the FAO, financially supported by the Common Fund for Commodities (CFC) and the Dutch government. This project aims to establish international quality standards, support a network of testing facilities and offer the methods needed to achieve quality standards of the different markets.

WTO-STDF also granted a project to the Republic of Benin for quality control for shea nuts. IITA in Nigeria is closely linked with the IITA office in Benin for the preparation and implementation of this project. Knowledge gained from the Benin project could be easily made available to IITA Nigeria for the implementation of the proposed project.

IITA Nigeria was also involved in a special study⁶ on aflatoxin in maize kernels from three agro-ecological zones in Nigeria. Results of this study, as well as those of other joint studies carried out by researchers in Senegal and IITA on sesame, could be of use to the current study proposed for shea and sesame in Nigeria.

5 Dr. Lovett, Peter. "The Shea Butter Value Chain – Production, Transformation, and Marketing in West Africa." West Africa Trade Hub, for USAID. 2004.

6 Atehnkeng et al. *Distribution and Toxigenicity of Aspergillus species isolated from Maize Kernels from three agro-ecological zones in Nigeria*. International Journal of Food Microbiology 122, 74-84. 2008.

<http://www.sciencedirect.com>

General Observations

From information so far available, the following shortcomings affect field-level quality control for sesame seeds and shea products:

- The current process of the shea and sesame collection, transport, processing and export is poorly defined and varies significantly between producing states.
- The crucial points of aflatoxin and other chemical contamination are not well known.
- There is currently inadequate research and fieldwork to identify at which stage in the process and in relation to which variables such as moisture content, time, temperature and chemical contamination that contamination from *Aspergillus flavus/A. parasiticus* and aflatoxin occurs.
- Quality Guides are in their early stages of development and lack the required scientific background. Actions are needed to develop and disseminate guides for Good Extractive Practices (GEP), Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP).
- Quality Control agencies only take samples for *aflatoxin* analysis prior to export instead of systematic quality control checks all along the production chain.
- There is currently no adequate traceability system in place for shea nuts and sesame seeds, either during the production chain or as part of export procedures and certification.
- There are no rapid, robust and low-cost on site aflatoxin analytical methods that can be used throughout the Nigerian shea and sesame production chains to monitor aflatoxin contamination and aid the implementation of the HACPP system.

Current Surveillance Systems for Food Quality and Aflatoxin Control in Nigeria

Food quality and *aflatoxin* surveillance along the sesame and shea production and supply chain is not sufficiently developed to verify the effectiveness and safety of the management system. Rather, reliance is on end-point food quality and *aflatoxin* analysis just prior to export.

Conventional analysis of *aflatoxins* is performed by laboratory methods such as High Performance Liquid Chromatography (HPLC). The HPLC method EN 14123 is validated for *aflatoxin* B₁ and the sum of *aflatoxin* B₁, B₂, G₁ and G₂ provides the total *aflatoxins* in sesame seeds and shea nuts. This method uses immunoaffinity columns for cleanup of sample extracts and HPLC with fluorescence detection after post column derivation for *aflatoxin* identification and quantification. Whilst this method meets legislative requirements, it is time consuming, expensive, requires very specialized equipment and uses large volumes of organic solvents. The Nigerian sesame and shea industries require access to inexpensive and robust methods for the implementation of a HACCP-type control system and to meet the legislative limits for *aflatoxins*.

Immunoassays, in particular the Enzyme-Linked ImmunoSorbent Assay (ELISA), have won wide acceptance over the past 25 years in both clinical and non-clinical fields. In summary, immunoassays utilise highly specific and sensitive antibodies to detect the target analyte. The presence of the analyte is then visualised using an enzyme-substrate system and read on a 96 well plate reader. Through the production of specific antibodies, R-Biopharm AG (RBAG) has developed an ELISA system for aflatoxins that overcomes many of the problems associated with HPLC but must still be carried out in a laboratory type situation. Very recently, RBAG has developed a one step, on-site and robust Lateral Flow Device (LFD) that only takes a few minutes to analyze for total aflatoxins (sensitivity down to 4ppb) which will be brought in to the project.

A competitive LFD relies upon the competition for binding sites on specific *aflatoxin* antibodies linked to gold or latex particles. This competition is between *aflatoxin* in the sample and that in the test line on a nitro-cellulose-based membrane. Next to the test line another line that acts as a control

to ensure that the test is working correctly. After the addition of a few drops of sample extracts to the well and release pad, the competition reaction begins. The ELISA systems have previously been successfully used on cereals and pulses but further basic evaluations will be performed to verify this. The LFDs are at the prototype stage and will need to be linked with suitable sample extraction regimes and undergo validation before use. However this is not expected to pose any specific problems and would provide a means for an inexpensive (~\$50) test for sesame seed and shea nuts throughout the production chain. Recently, IITA has produced antibodies for the immunoassay for quantitative determination of aflatoxins. The ELISA methodology using in-house antibodies has been validated to quantify aflatoxins at very low levels (1 ng/g). The benefits include an ultra-low cost (~\$1/sample), rapid analysis turn around time (high throughput), availability of antisera from IITA in Nigeria and the fact that the researchers are always on hand in Ibadan for training and problem solving. The project will therefore explore IITA training on the rapid aflatoxin assays and equally transfer the technology to the trainees. This has been successfully achieved in Malawi through the assistance of International Crop Research Institute for Semi Arid Tropics (ICRISAT). This methodology has now been developed in IITA Ibadan by Drs Lava Kumar and Ranajit Bandyopadhyay.

Choice of Sesame and Shea

Sesame and shea-butter were chosen as priority agricultural export products with potential for growth, foreign exchange earnings and international market penetration. These products were chosen by stakeholder institutions at a specially convened focus group discussion convened by the Ministry of Commerce and Industry and Consultants of CARANA Corporation on 8th January 2008 in Abuja, Nigeria.

Project Objectives

The overall objective of the project is to expand Nigeria's food exports of sesame seeds and shea nuts/butter through improved SPS capacity building for private and public sector organizations and improved quality control along the supply chain.

The project will focus on developing an effective *aflatoxin* control system for sesame seeds and sheanut exports as well as an effective FFA and impurities control system for shea butter exports. The quality control system established is expected to be able to provide quality control for all stored cereals and pulses both for local consumption and for export.

The specific objectives of the project are:

1. Undertake studies on the current practices of quality control for sesame seed and shea products, with a focus on field level production, processing, storage and transport to ports of export, and make recommendations for improvements required to meet importing country standards.
2. (a). Implement a robust field quality control system for sesame and shea products for exports, to include a rapid *aflatoxin* surveillance system and a HACCP and traceability system within the Nigeria shea nut and sesame seed production and supply chain.

(b). Implement an improved laboratory analysis and certification process for quality control of sesame and shea products to meet importing country standard requirements.
3. Train staff to implement the improved Food Quality Management System.

4. Disseminate project information, studies and results to all stakeholders.
5. To strengthen the public-private dialogue and partnership in the Nigeria shea nut and sesame seed sector.

Appendix 4

Detailed Work Plan

Project Components and Activities

The work plan is organised into five main component activities.

Component 1

This component responds directly to objective 1 of the project, “to improve documentation for current practices of quality control for sesame seed and shea products for exports with a focus on field level production, processing, storage, transport to ports of export and to make recommendations for improvement to meet importing country standards”.

Activities

The following activities are planned under the above component.

1.1.1 Preparation of Terms of Reference and Procurement of Consultant Services

The General Coordinator and the Scientific Coordinator will be responsible for organising the study in the Nigerian States where shea and sesame are produced. A detailed Terms of Reference (TOR) for the study will be prepared for procurement of the services of any one or more of the following: FRI, FPIS, NSPRI and NCRI for the study. Data will be collected from published and unpublished internal reports, literature, and complemented by field surveys on information gaps.

Two studies will be undertaken, one for shea and the other for sesame. The composition of each consulting team will reflect a multi-disciplinary team with relevant competences including microbiology, chemistry, post-harvest technology, agronomy, food science, quality and safety management in the food production chain.

The General and Scientific coordinators will sign a contract agreement for consultancy services and release of funds as per schedule in contract agreement.

The Scientific Coordinator will exercise oversight control over fieldwork of consultants by reviewing the inception report, reviewing draft and final reports and recommending release of funds for the next schedule. He/she will consult with international partners as required. Two study teams will be deployed, one for shea and the other for sesame seed research. Each team will comprise a minimum of two consultants and two researchers. The shea team will work in Niger, Kwara, Kebbi, Kaduna and Oyo states, while the sesame team will work in Nasarawa, Jigawa, Benue, Kebbi, Taraba, Kogi and Yobe states.

The study will be conducted in two phases:

Study of the Socio-economic characterization of shea and sesame production and supply chain in Nigeria

The TOR shall include:

- Identifying production areas, volumes produced and local consumption and export levels.
- Documentation of current production and manufacturing practices as well as the organization of production and supply chains.
- Identification of critical hazard control points in the supply chain, such as collection points, warehouse storage and handling, etc.
- Conduct laboratory analysis of samples from various locations and stages along supply chain.

The NFRI will undertake the study on shea, while the NCRI is proposed to undertake the study on sesame seeds. The two organizations will work with the NEPC in conducting the socio economic studies.

1.1.3 Deliverables

Two reports will be produced, one for sesame seed and the other for shea products. The reports will document current conditions in Nigeria for sesame and shea nut production and commercialization, quality control issues and recommendations for implementing an improved quality control system for sesame seed and shea products for export.

1.1.4 Milestones and expected results

- Research methodology defined – **month 2**
- Secondary and primary data collected, and an Info Gap Matrix constructed – **month 4**
- Data processing, analysis and synthesis completed – **month 5**
- Current conditions of Nigeria sesame seed and shea butter production and commercialization and opportunities described – **month 6**
- Organizational and incentive strategies formulated – **month 6**

The second part of the study involves more scientific aspects, as follows:

1.2.1 Collection of Scientific Data on Sesame Seeds and Shea Nuts/Butter

- a) Collect data on *A. flavus/A. parasiticus*, aflatoxins, water activity, moisture content, relative humidity, temperature, insect infestation
 - Definition of sampling plans for the selected Nigeria sesame and shea nut production chains.
 - Collection of Nigerian sesame seed and shea nut samples from the final site for exportation, using the European sampling procedure (Directive 98/53/EC).
 - Sample screening for *A. flavus/A. parasiticus* using AFPA agar plate methodology.
 - Sample screening for aflatoxins using ELISA technology.
 - Water activity and moisture content in seed and nut samples, air relative humidity and temperature measured through the production chain from tree to final site for exportation, in order to investigate favourable conditions for fungal growth and aflatoxin production.
 - Investigate the occurrence of insect pests.

IITA has the experts and capacity to train implementing agencies' staff to carry out the identification of *Aspergillus flavus*, *parasiticus* and other *A.* species. This involves a series of isolations, culture handling procedures and appropriate culture identification protocols, amongst others.

One person each for sesame and shea can conduct the analysis at the IITA laboratory and could complete the analysis (from sample preparation to completing an analysis of 150 samples) in three

months (90 days). Another option is estimated to cost approximately \$14,000 per person and includes a stay at an IITA hotel, IITA-approved living costs, research supplies and staff cost for training, etc.

Under the circumstances and considering the presently inadequate facilities in the institutional laboratories, option 2 is recommended for the training of 2 staff (one for shea and another for sesame) at an estimated cost of US\$28,000.

b) Establish Standards, Testing and a Certification System for Shea Nuts and Butter

Establish the standards and a system for certification of shea butter products for export in Nigeria.

This analysis includes:

- Free Fatty Acids (FFA) <6%,
- Kernel fat content 45-55%,
- Water content < 7%,
- Impurities < 1%,
- Non-solvent extraction, natural source (organic certification if possible),
- Clean white to yellow colour (not grey),
- Low odour, low melting point, and high unsaponifiable fraction (the portion with therapeutic properties, 3-12% of total extract).

The Standards Organization for Nigeria (SON) is proposed to undertake this study.

c) Establish a Traceability System for Shea Nut/Butter and Sesame Seed Supply Chain

The FPIS and NAFDAC will establish a traceability system for sesame seed and shea nut/butter exports that will satisfy importing country requirements. This will be achieved in collaboration with producers associations and other stakeholders.

d) Formulate Recommendations to Update the Existing Manual of Safety and Quality in Nigerian Sesame and Shea

- Identification of critical control points using the information and model developed above.
- Draft recommendations to update the existing manual of safety and quality in Nigerian sesame and shea, including the development of appropriate post-harvest technologies and traceability system, and circulation to the key stakeholders for comments on feasibility of suggested changes.
- Finalise the recommendations and the manual.

1.2.2 Deliverables

- Publish laboratory report on field data,
- Publish report on simulated predictive modelling,
- Produce charts for guidelines on critical control points,
- Establish traceability system for sesame seed and shea nuts/butter.

1.2.3 Milestones and Expected Results

- Published laboratory report on field data – **month 12**
- Published report on simulated predictive modelling – **month 14**

- Production of charts for guidelines on critical control points – **month 16**
- Traceability system established for sesame seed and shea nuts/butter – **month 16**

Component 2

This component responds directly to objective 2 (a) and (b) of the proposed project:

- To implement a robust field-level quality control system for sesame and shea products for exports, to include a rapid *afatoxin* surveillance system and a HACCP and traceability system within the Nigeria shea nut and sesame seed production and supply chain.
- Implement an improved laboratory analysis and certification process for quality control for sesame and shea products, to meet importing country standard requirements.

Activities

2.1 Procure Equipment and Materials for Implementing a Rapid Aflatoxin Surveillance System in Nigeria

The Coordinating Unit of the project will meet and review proposals for the purchase of equipment required for implementation of a field-level aflatoxin surveillance and HACCP system along the supply chain.

2.1.2 Adapt and Validate Existing Rapid ELISA Brought into the Project for Aflatoxin Control in Nigerian Sesame and Shea Nuts and Establish Sampling Protocols.

Existing rapid ELISA systems for the detection of aflatoxins will be brought in to the project by R-Biopharm AG (RBAG).

The DAC-ELISA protocol of IITA using antisera produced in-house at IITA works very well for the analysis of aflatoxins with several cereals (maize, sorghum, millet, etc.) and oilseeds. The RBAG and IITA protocols will be adapted for use on shea and sesame, compared and validated with HPLC to determine its suitability and cost-effectiveness in analyzing sesame and shea samples using these two methods. This will involve the comparison of data obtained from these assays (using samples fortified with various amount of aflatoxin as repeated analysis of the same samples) with that from the already implemented and validated standard HPLC method, data obtained from R-Biopharm and also results in the literature on their use on Nigerian sesame and shea nuts. About 300 samples are required for analysis in this activity. The estimated DAC-ELISA cost is \$10, including staff cost, reagents equipment, and overhead costs, \$50 for LFD and \$100 per sample for HPLC.

In order to cut costs, it is proposed that the on-site Lateral Flow Device (LFD) and ELISA can be compared together in the same activity.

2.1.3 Establish a Rapid On-site LFD for Aflatoxins for Nigerian Sesame and Shea Production Areas and One Processing Plant, and Compare with HPLC and Other Best Immunoassays (e.g. ELISA)

The LFD would be set up in two field stations in Nigeria. As the LFD is a very simple one-step assay taking only a few minutes to perform, training would be very straightforward. NAFDAC would like to acquire capacity to produce the reagents (consumable, kits) for the field rapid tests as a way of reducing the cost of tests and ensuring sustainability of the project. During the use of this assay in the

project, there will be ongoing quality control checks against the already implemented and validated standard HPLC method.

(A list of equipment and chemicals required is presented at the end of the appendices.)

2.1.4 Deliverables

- Train NAFDAC staff in the production of consumable kits for rapid ELISA tests,
- Produce a report documenting the adapted and validated ELISA for aflatoxins in Nigerian sesame and shea nuts, detailing the standard operating procedures,
- Produce a report documenting the adapted and validated rapid on-site LFD for aflatoxins in Nigerian sesame and shea nuts, detailing the standard operating procedures,
- ELISA and LFD methods set up and validated in Nigeria in the laboratory, Nigerian sesame seed and shea nut production areas and one processing plant.

2.1.5 Milestones and Expected Results

- Training of staff of implementing organizations – **month 14**
- Rapid ELISA set up for aflatoxins in Nigerian sesame and shea nuts in the laboratory, the Nigerian sesame and shea nut production area and one processing plant, in conjunction with Specific Objective 2 (b) – **month 6**
- Testing and validation of rapid on-site LFD, and comparison with HPLC and best other immunoassays (e.g. ELISA) completed – **month 12**
- Equipping NAFDAC laboratory as a training center for aflatoxin and FFA analysis – **month 12**
- Evaluation of results obtained from the analysis of samples taken over the Nigerian sesame and shea nut production chain, in conjunction with Specific objective 2 – **month 20**

Component 3

This component responds directly to objective 3 of the proposed project, to train staff to implement the improved Food Quality Control System. The results of the field studies will be disseminated through training of field personnel for improved quality control.

Activities

3.1.1 Training for Aflatoxin Analysis

Two training courses will be organized in Nigeria: the first one for ELISA and the second one for LFD. The training course in AFPA agar plate methodology and IITA ELISA methods will take place at IITA, while Biopharm will also organize a similar training course in ELISA and LFD techniques. Both rapid methods will be offered not only to the project partners, in order that they can use them to carry out the project research activities, but also to all key stakeholders of the Nigerian sesame and shea production chain as an aflatoxin management tool. It is important that all people involved in the Nigerian sesame and shea nut industry should have the opportunity to be trained in both methods. Those stakeholders that have basic laboratory facilities will have the choice of using both methods.

The surveillance systems for both the causative fungi and the rapid methods for aflatoxin analysis provide tools for the management of aflatoxins in Nigerian sesame and shea nuts. These will be used at crucial testing points identified during the course of the project. These points likely, but not necessarily, will include the critical control points for the control of aflatoxins throughout Nigeria's sesame and shea supply chain. Of particular relevance to the sesame and shea industry are the logistical considerations due to the very long and difficult transport of the nuts for distribution and export. It is envisaged that the rapid and inexpensive assays will enable real time local decisions (in conjunction with the predictive model) to be made if it is worth transporting a consignment. For example if aflatoxin levels are less than 4 ppb then the decision is likely to be that it is worth the time, effort and cost for transport with a view to export. If levels are between 4 and 30 ppb then it might be decided to divert a consignment intended for export to local markets, or if the levels are higher, to animal feed. Likewise, these sorts of "on the spot" decisions can be made all along the supply chain and would lead to much greater efficiency in the use of resources, enhance the health of the local population, and will also facilitate compliance with legislation and reduce the chances of possible rejection of a consignment after expensive export. Following discussions with stakeholders in the commodity chains, appropriate institutional arrangements will be made for the use of ELISA in quality control at local levels.

For enforcement, rapid methods would enable a large number of samples to be screened for low or negative amounts of aflatoxins. Confirmation of positive samples containing high amounts of aflatoxins would be by conventional standard methods such as HPLC.

Rapid and inexpensive methods for aflatoxin analysis would facilitate research and provide the information to evaluate control measures to be implemented and to update codes of practice and the "Manual of Safety and Quality for Nigerian Sesame and Shea Nut Production". However, regulatory decisions would need to be formulated by the individual state's internal authorities; this project would be able to encourage and assist this process. Recommendations concerning this effort, however, will be formulated at the workshops.

At present, conventional methods of aflatoxin analysis, such as HPLC, although very accurate and extremely important as a method for reference and confirmation, is prohibitively expensive and too slow for the uses outline above. Rapid methods would overcome some of these barriers and aid

informative, on-the-spot decisions to be reached at the local level. Nevertheless, the standard HPLC method will be used for final certification of products prior to export, but the number of samples requiring analysis can be reduced by initial screenings of a large number of samples by ELISA.

In relation to the rapid methods, there will be continued support after the completion of the project by the R-Biopharm local network in Nigeria. Training manuals and other literature emanating from the project would be available to the whole of the sesame and shea nut industry to assist in the long-term sustainability of the project outputs

3.1.2 Implementing a Training Course in Good Manufacturing Practises in the Nigerian Sesame and Shea Nut Production Chain

On the basis of the results of the Specific Objectives 1 and 2, training courses in the updated and validated good practices in the Nigerian sesame seed and shea nut production chains will be offered to collectors, processors, transporters, and other key stakeholders as well as extension agents of the local government executive agencies. This course will consider the following aspects:

- Introduction to aflatoxin-producing fungi and aflatoxin contamination, and their risk for human health,
- Aflatoxin contamination in the sesame and shea nut production chain and its socio-economic and environmental impact,
- Characterization of the Nigerian sesame and shea nut production chains,
- Description of the critical control points along the Nigerian sesame and shea nut production chains,
- Description of the good practices updated and validated in the project,
- In-field demonstration sessions,
- Demonstration of the rapid assays (LFD and ELISA) updated and validated in the project for aflatoxin analyses to be used at the best testing points identified in the production chain.

The core group of the Nigerian sesame and shea nut production chain agents that was involved in the project validation and updating on the good practices will act as trainers/consultancies and serve as pilot examples/demonstration for the other stakeholders during and after the end of the project. The trained extension agents will ensure knowledge and technology transfer continuity after the end of the project.

3.1.3 Training Course in ELISA and Lateral Flow Device (LFD), AFPA Agar Plate Methodology for the Identification of Aflatoxin-producing Fungi in Sesame and Shea

Two training courses will be organized in Nigeria: the first one for ELISA and the second one for LFD. The training course in AFPA agar plate methodology and IITA ELISA methods will take place at IITA while Biopharm will also organize a similar training course in ELISA and LFD techniques. Each training session will be for eight trainees for a period of 15 days each.

- Training on the identification and quantification of *Aspergillus flavus/parasiticus*, using AFPA agar plate methodology, which is a simple, low cost and validated standard methodology (Method No. 177, Nordic Committee on Food Analysis), will be undertaken. This methodology is rapid (48 hrs) compared to other conventional agar plate methods.

IITA can conduct this training on the theory, including practical demonstrations on how antiserum is developed. Establishment of an onsite aflatoxin-testing facility for farmer-produced shea and sesame will allow farmers, agricultural officers and traders to assess the quality of the product and contribute

to production and promotion of aflatoxin-free shea and sesame. Any assay that is selected for this purpose should be simple, cost-effective, accurate and allow fast testing of farmer samples to penetrate high-value markets. A simple and cost-effective ELISA-based aflatoxin procedure, amenable for high-throughput analysis developed at IITA, is ideally suited for this purpose. This procedure is simple, requires minimal equipment and its utility in establishing dedicated aflatoxin testing facilities has been demonstrated in Malawi and other Sub-Saharan African countries. The low-cost ELISA technology for quantitative determination of aflatoxin levels will be made available to the project by IITA. Project key personnel will be trained on the use of the ELISA technique using the in-house produced aflatoxin antiserum, which antiserum will be provided to the testing labs in the future by IITA as and when required at minimal cost. Initially, the procedure will be demonstrated to the participants, and later they will perform the analysis independently using samples brought by them. The curriculum would include several of the following:

- Aflatoxins
 - Risk to health
 - *Aspergillus* infection and aflatoxin contamination
 - Occurrence
 - Limits and regulations
 - Aflatoxin analysis in sesame and shea
 - Sampling
 - Sample preparation
 - Methods for analysis
- Immunological methods for aflatoxins
 - Principles of antibody production
 - Structure of immunoglobulins and function
 - Polyclonal antibodies
 - Monoclonal antibodies
 - Production of polyclonal antibodies (choice of animals, immunization, blood collection and serum preparation – demo only)
 - Storage of antisera
- ELISA
 - Principles
 - Conjugation
 - Test procedure (sample extraction and actual test)
 - Test quality control
 - Troubleshooting
 - Data analysis and reporting.
- AFPA medium to distinguish species
 - Different types *Aspergillus* species and their significance
 - Identification of different *Aspergillus* species using type strains
 - AFPA medium and its preparation
 - Clean culture techniques
 - Various fungal isolation and culture protocols
 - Inoculation, incubation and identification
 - Colony and fungal morphology to distinguish *A. flavus* and *A. parasiticus*.
 - Data analysis and reporting
- Chemotyping of *Aspergillus* cultures to distinguish species and their toxin producing capacity.
 - Various types of aflatoxins
 - Relation between species identity and aflatoxin production

- Methods of chemotyping
 - Culture techniques (using cyclodextrin amended media)
 - Chemical assays (TLC)
- Importance of chemotyping in aflatoxin contamination

A training manual containing the details of the course curricula would be provided to each participant. Adequate quantities of antisera would be provided to those participants who would set up their labs, and if necessary, equipment and reagents would be provided to two labs (IITA would procure these from overseas using its duty-free privileges). These labs would also be provided with technical backstopping in future.

3.1.4 Deliverables

- HPLC for NAFDAC Laboratory for Confirmatory Tests
- Training materials for the technical transfer of AFPA agar plate methodology, ELISA, LFD and good practices in Nigerian sesame and shea nut production chains
- Training courses in AFPA agar plate methodology, ELISA, LFD and good practices in Nigerian sesame and shea nut production chains completed

3.1.5 Milestones and Expected Results

- Complete preparation of materials for training course in AFPA agar plate methodology and ensure trainers are fully prepared – **month 5**
- Complete preparation of material for training course in ELISA, and ensure trainers are fully prepared – **month 5**
- Complete preparation of material for training course in LFD, and ensure trainers are fully prepared – **month 13**
- Complete preparation of material for training course in good practices in Nigerian sesame and shea nut production chains, and ensure trainers are fully prepared – **month 21**

Component 4

This component responds directly to project Objective 4, to disseminate and communicate project information, studies and results to all stakeholders.

Appropriate dissemination of knowledge delivered by the project is a major issue for its success. For this reason, a project component (Specific Objective 4) is dedicated only to this activity, and Specific Objective 5 will also contribute through the organisation of project meetings and workshops.

The project outputs will be disseminated to the following:

- All participants of the project, including “active” private and public co-participants,
- Different key stakeholders of the Nigerian sesame and shea nut production chains,
- The scientific community, including universities and research centres,
- Non-governmental organizations,
- Regulatory authorities,
- Official institutes as the national linking with European Union.

Activities

Activities under this component are intended to disseminate the results of the studies and control systems established to key stakeholders through implementation of information systems, training courses, website development, scientific and other publications.

4.1.1 Develop a project specific website

The project website would present a brief overview of the project, partner information, contact points, links to the various partners, a calendar of forthcoming workshops, seminars and conferences and the presentation of the main results and publications. The project website will provide the study results together with explanations to make it understood by any audience. This website will also include the logos of the supporting organisations within the STDF programme and hyperlinks to their websites and those of other stakeholders.

4.1.2 Scientific Publications and Information Brochures and Posters

A leaflet describing the project will be produced and distributed. This publication will be easily readable and understood by non-specialists.

There will be two meetings and two workshops during project implementation. The first will be at the start for the technical transfer of information and materials (such as assays). The second will occur during the second year of the project to update information from the first meeting and for the dissemination of current results. After the end of the project there will be a final dissemination workshop, where all activities and results of the project will be reported, with participation not only of the core group and co-participants of the project, but also of the federal and international communities.

Dissemination of the project information and results will occur through NAFDAC, through the organization of interactive satellite TV programmes for all states of Nigeria. These programs will include public questions asked by free phone calls, fax or emails which will be answered by

specialists. Such a TV programme has been already used for the dissemination of good practices in the Nigerian sesame and shea nut productive chain, with the support of NAFDAC.

Scientific and technical results will be channelled through the NGO networks and newsletters active in Nigeria.

Every effort will be made to inform the general public, Nigerian sesame and shea associations, industry and national food agencies of the results and their implications.

Progress will be reported orally and as posters at scientific seminars, conferences and symposia and published as abstracts or proceedings.

The results will be published in prominent international scientific journals.

Each leaflet, book and other publication coming out of this project will provide full reference to support received from the STDF. A copy of each of these publications will be provided to the STDF together with the relevant annual and final reports and suitable information to be included on the project website.

4.2 Deliverables

- Project-specific website developed – **month 4**
- Scientific and specific studies and results published – **month 22**

Component 5

This component responds directly to Objective 5 of the project - to strengthen public-private dialogues and partnerships in the Nigeria shea nut and sesame seed sectors.

Activities

5.1 Project Coordination and Monitoring

This activity includes organisation and implementation of project meetings and workshops over the duration of the project. Four major meetings are planned: start-up meeting, first workshop, mid-term progress meeting, and a final end of project evaluation workshop. These will be undertaken to coordinate the implementation and execution of the project activities by the different partners as well as follow-up on the progress of project activities to ensure the effective execution of the work plan. This will include a review of the scientific results and possible bottlenecks to be addressed.

5.1.1 Start-up Meeting and First Workshop with Key Stakeholders

A two-day kick-off meeting will be organized in Abuja at the beginning of the project with the participation of key representatives of the project partners. The objective of this meeting is to plan and organize the implementation and execution of the project activities by the different partners, including administrative, financial and scientific issues.

The kick-off meeting will be preceded by a one-day workshop aiming at the following:

- a) A brief presentation by the EU on quality standards required by the EU for shea nuts/butter and sesame seeds,
- b) Discussion of the project proposal, roles of different stakeholders, component activities and targets, budget allocations and disbursement methods. The workshop will involve project partners, key stakeholders and public and private sector entities, and will be an opportunity for the different teams to meet and get to know each other as well as each others' respective activities.

5.1.2 Mid-term Evaluation

At the mid point of the project, a two-day progress meeting will be organized in Abuja with the participation of the project partners and stakeholders of the Nigerian sesame and shea nut production chain that have been involved in the project activities. This meeting is aimed at following-up on the progress of the activities and evaluating the effectiveness of the execution of the work plan, to reinforce the knowledge of the Nigeria sesame and shea nut situation between the participants and, if necessary, to agree on adjustments to the direction of research. The scientific and technical results will be reviewed, analyzed and interpreted, and solutions to possible production chain bottlenecks discussed. Administrative and financial issues will also be addressed.

At this mid-term workshop, it will be important to find a way to develop and institutionalise a process or system of quality control in the value chain with participation of key stakeholders. The session will also be used to brainstorm and identify ways of making the established system of quality control self-sustaining, including traceability, as a culture of excellence in providing high value products to clients. For the purpose of sustainability, it is important that an income stream be generated to maintain the process. The workshop will decide what fees could be charged for every test that will be

performed on samples of sesame seed and shea butter for export. Income from testing fees will be earmarked for sustaining the quality control system.

5.1.3 Final End of Project Workshop with Key Stakeholders

Consultants will be engaged to assist the project in preparing an end of project report identifying milestone achievements, including project impact on food quality, initial impacts of increased exports, lessons learned and strategies for sustainability of project key activities in ensuring good quality of sesame and shea products in Nigeria.

A three-day final workshop will be organized at the end of the project with the participation of all project partners and other key stakeholders of the Nigerian sesame and shea nut production chain. The objective of this workshop is to disseminate and report all the results and conclusions of the project to the federal and international communities. The participation of a European Commission expert and a representative of the STDF partner institutions is planned. Two days of demonstration sessions on the safety management tools, including good practices and fungi and aflatoxin rapid analytical methods, tested and validated during the project will be organized.

All the meetings and workshops will stimulate networking between the project participants and contribute to strengthen the public-private dialogue and partnership in the Nigerian sesame and shea nut/butter sector.

5.1.4 Ex - Post Evaluation of the Project

WTO – STDF and the Federal Republic of Nigeria have joint responsibility for organising an ex-post evaluation of the project at least two to three years after project completion. The objective will be to evaluate the sustainability of project impact in terms of expected incremental capacity of field institutions for aflatoxin control as a result of project implementation. A lump sum of thirty thousand dollars (US\$30,000) is allocated for engaging consultants for the ex-post evaluation.

5.2 Deliverables

- Start up meeting and first workshop,
- Mid-term progress meeting,
- End of project evaluation workshop.
- Ex-post evaluation report

5.3 Milestones and Expected Results

- Start up meeting and first workshop organized – **month 1**
- Mid-term progress meeting organized – **month 13**
- Final end of project workshop organized – **month 23**
- Ex-post evaluation Survey Report – **month 48**

5.4 Evaluation Plan

5.4.1 Achievement of Project Objectives

The delivery of original project objectives and outputs as defined in the proposal will be evaluated.

5.4.2 Performance Summary

The performance of the project will be assessed using the following criteria:

Baseline Start Date:	Actual Start Date:	Start Variance:
Baseline Finish Date:	Actual Finish Date:	Finish Variance:
Baseline Budget:	Actual Cost:	Cost Variance:
Baseline Work Days:	Actual Work Days:	Work Variance:

Any key variances will be identified.

5.4.3 Achievement of Expected Results

Results, outputs and deliverables will be examined to determine if the expected benefits have been achieved. For example have the project outputs led to the reformulation of the Manual of Safety and Quality in Nigeria Sesame and Shea Nuts?

5.4.4 Project Management and Planning

The management of the project will be reviewed and a critical look taken at the planning process, the frequency that plans were updated and their accuracy. The effectiveness of the team and their degree of engagement with and by the other key stakeholders will also be examined.

5.4.5 Recommended Actions

Recommendations will be proposed and will focus on positives rather than negatives, with a view to assisting other STDF projects or their management.

5.4.6 Future Priorities

Any future priorities identified from the project will be recommended and actions to ensure project sustainability proposed.

APPENDIX 5

Work planning

The work plan is based on the assumption that the project will be approved by WTO-STDF to start on 1st October 2008.

Year	2008				2009												2010								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Month Number	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	
1.1 Start-up meeting and first workshop with key stakeholders	x																								
1.2 Preparation of TOR and procurement of consultancy services		x	X																						
1.3 Socio-economic study to characterize shea and sesame production and supply chain in Nigeria				X	X	x	x	x	x																
1.4 Formulate organizational incentives and strategies for improving quality control for sesame and shea										x	x	x	x												
1.5 Collect data on <i>A. flavus/A. parasiticus</i> , aflatoxins, water activity, moisture content, relative humidity, temperature, insect infestation									x	x	x	x	x												
1.6 Collect data on FFA, impurities, etc. for shea nut and butter								x	x	x	x	x	x												
1.7 Formulate recommendations to update the existing manual of safety and quality in Nigerian sesame and shea																x	x	x							
1.8 Procure equipment and materials required for implementing rapid aflatoxin surveillance system in Nigeria.															x										
1.9 Set up a rapid on-site LFD for aflatoxins in the laboratory, the Nigeria sesame and shea production area and one processing plant, and compare with HPLC and best other immunoassays (e.g. ELISA)														x											
2.0 Additional equipment for NAFDAC, IITA and SON Laboratories to meet incremental training needs for aflatoxin analysis															x										
2.1 Results obtained from the analysis of samples taken over the Nigeria sesame and shea nut production chain																			x	x					
2.2 Implement a training course in good manufacturing practises in the Nigeria sesame and shea nut production chain														x	x	x									
2.3 Implement training course in AFPA agar plate methodology for the identification of aflatoxin producing fungi in sesame and shea															x	x	x								
2.4 Implement training courses in ELISA and LFD for aflatoxins in Nigeria nuts																	x	x	x						
2.7 Develop a project specific website																				x					
2.8 Prepare Scientific Publications and Information Brochures and Posters																						x			
2.9 Organize Mid Term Review Workshop															x										
2.10 Organize Final end of project workshop with the participation of key stakeholders																							x		

APPENDIX 6

Detailed Budget and Proposed Uses of WTO-STDF Grant Funds

The total cost of the proposed project amounts to US\$824,680 out of which Grant Funds requested from **WTO-STDF amounts to US\$567,680 representing 69% of total cost.** The Federal Government of Nigeria (FGN) will be responsible for a total cost of US\$257,000 representing 31 % of total cost mainly in the form of remuneration to full time and part time officers involved in the implementation of the project.

No alternative funding sources have been identified and quantified in the present budget. It is noted that USAID West Africa Trade Hub is already involved in the promotion of quality standards for shea butter products. With respect to sesame, USAID has not offered any concrete interventions for quality improvement for this product though this might be considered in the future.

Detailed cost tables are shown in table below:

BUDGET NAFDAC AFLATOXIN, FFA QUALITY CONTROL PROJECT							
			UNIT COST	QTY	TOTAL	WTO STDF	FGN
COMPONENT 1		UNIT					
1.1	<u>Preparation of TOR & Procurement of Consultant Services</u>	-					
	Return Air Ticket NAFDAC rep from Lagos to Abuja	Person	300	1	300	300	-
	Return Air Ticket IITA Rep to Abuja	Person	300	1	300	300	-
	Return Air Ticket NFRI Rep to Abuja		300	1	300	300	-
	Return Air Ticket NCRI Rep to Abuja		300	1	300	300	-
	Per diem \$150 per officer x 2 days x 4 officers	Day	300	4	1,200	1,200	-
	Hire of Meeting Room, snacks etc & Misc expenses	Day	2000	1	2,000	-	2,000
	sub-total				4,400	2,400	2,000
1.2 (a)	<u>Study to characterise Shea value Chain by Nigeria Forestry Research Institute (NFRI)</u>						
	Questionnaire preparation & research instruments	State	200	6	1,200	1,200	-
	Workshop to brief field team	Day	500	1	500	500	-
	Field Work: Per diem @ \$200 per team x 5 days per state x 6 states	State	3000	6	18,000	18,000	-
	Transport for field team @\$200/day x 30 days	Day	200	30	6,000	6,000	-
	Mycological analysis of samples at IITA by project staff	Set	14000	1	14,000	14,000	-
	Cost of chemicals required for testing at IITA	Set	4500	1	4,500	4,500	-
	Workshop to discuss results of field work	Day	10000	1	10,000	10,000	-
	sub-total				54,200	54,200	-
1.2 (b)	<u>Study to characterise Sesame value Chain by Nigeria Cereal Research Institute (NCRI) and Nigerian Stored Products Research Institute (NSPRI)</u>						
	Questionnaire preparation & research instruments	State	200	9	1,800	1,800	-

	Meeting to brief 4 member field team	Day	500	1	500	500	-
	Field Work: Per diem @ \$200 per team x 5 days per state x 9 states	State	3000	9	27,000	27,000	-
	Transport for field team @\$200/day x 30 days	Day	200	30	6,000	6,000	-
	Mycological analysis of samples at IITA by project staff	Set	14000	1	14,000	14,000	-
	Cost of chemicals required for testing at IITA	Set	4500	1	4,500	4,500	-
	Workshop to review results of field study		3000	1	3,000	3,000	-
	sub-total				56,800	56,800	-
1.3	<u>Data Entry and Analysis & Summary Report SHEA & SESAME</u>						
	4 man team of data analysts @\$400 per team x 10 days SHEA team	Person Days	400	10	4,000	4,000	-
	4 man team of data analysts @\$400 per team x 12 days SESAME	Person Days	400	12	4,800	4,800	-
	sub-total				8,800	8,800	-
1.4	Honorarium 3 teams of 3 researchers each @ \$10000	Team	10000	3	30,000	30,000	-
	sub total				30,000	30,000	-
1.5	<u>Establish a Traceability System for sesame seed and sheanut/butter Supply Chain (FPIS, NEPC, NSPRI and Producers/Exporters)</u>						
	Workshop to establish modalities of traceability system 20 parts.	Dollars	500	20	10,000	10,000	-
	Documentation of traceability system		1000	1	1,000	1,000	-
	sub-total		1500	21	11000	11000	0
	TOTAL FOR COMPONENT 1				165,200	163,200	2,000
	COMPONENT 2						
	Procurement of Equipment and Chemicals						
2.1	Equipment purchase ELISA for field surveillance (see list attached)	Set	40000	3	120,000	120,000	-
2.2	Chemicals required for AFB1 Estimation by ELISA (see list attached)	Set	4500	3	13,500	13,500	-
2.3	DAC-ELISA and LFD of samples	Set	60	300	18,000	18,000	-
2.4	HPLC of samples for comparison testing	Set	100	300	30,000	30,000	-
2.5	Additional equipment for FFA shea butter testing (SON)	Set	20000	1	20,000	20,000	-
2.5	Cost of chemicals for testing fatty acids in shea butter by SON	Set	4500	1	4,500	4,500	-
2.5	Contingency and misc expenses	Set	2000	1	2,000	2,000	-
	TOTAL FOR COMPONENT 2				208,000	208,000	-

	COMPONENT 3						
	Training in ELISA and LFD by BioPharm, IITA						
3.1	Training by IITA in AFPA Agar Plate, ELISA and LFD for 8 participants for 15 days	Dollar	3280	8	26,240	26,240	-
3.2	Training by BioPharm in AFPA Agar Plate, ELISA, for 8 trainees for 15 days	Dollar	3280	8	26,240	26,240	-
3.3	Travel BioPharm Rep to Nigeria & return	Dollar	10000	1	10,000	10,000	-
	Training in HACCP, GMP, GAP for 30 producers, processors						
3.4	Training manuals and teaching materials	Dollar	3000	1	3,000	3,000	-
3.5	Training for 30 producers etc in HACCP, GMP and GAP 5 days including air ticket, ground transport, per diem, hotel etc	Dollar	600	30	18,000	18,000	-
3.6	Hire of training room & snacks, lunch & facilities x 5 days	Dollar	3000	5	15,000	15,000	-
3.7	Contingencies	Dollar	1000	1	1,000	1,000	-
	TOTAL FOR COMPONENT 3				99,480	99,480	-
	COMPONENT 4						
4.1	Website development	Lump sum	5000	1	5,000	5,000	-
4.2	Website maintenance and ISP fees	Month	300	24	7,200	-	7,200
4.3	Publications	Lump sum	15000	1	15,000	15,000	-
4.4	Adverts	Lump sum	6000	1	6,000	6,000	-
4.5	TV and radio programmes	Lump sum	10000	1	10,000	10,000	-
	TOTAL FOR COMPONENT 4				43,200	36,000	7,200
	COMPONENT 5						
	Project Coordination Meetings						
5.1	start-up meeting for 20 participants @ \$200 x 2 days	Number	400	20	8,000	8,000	-
5.2	Return air ticket for 8 Lagos participants	Number	250	8	2,000	2,000	-
5.3	Mid-term progress meeting x 20 participants @\$200 x 2 days	Number	400	20	8,000	8,000	-
5.4	Return air ticket for 8 Lagos participants	Number	250	8	2,000	2,000	-
5.5	Project Completion Evaluation meeting x 20 participants @\$100 x 2 days	Number	200	20	4,000	4,000	-
5.6	Preparation of end of project report	Lump sum	2000	1	2,000	2,000	-
5.7	Hire of conference room and misc coordination expenses	Lump sum	15000	1	15,000	15,000	-
5.8	Remuneration of Project Coordinator @\$1,500/month	Month	1500	24	36,000	-	36,000
5.9	Remuneration of Scientific Coordinator @\$1,500/month	Month	1500	24	36,000	-	36,000
5.10	Remuneration of Project Accountant @\$700/month	Month	700	24	16,800	-	16,800
5.11	Remuneration of 20 institutional part time staff @\$300/month	Month	6000	24			

					144,000	-	144,000
5.12	Stationery, office equipment misc	Lump sum	5000	1	5,000	-	5,000
5.13	EX post Evaluation costs	Lump sum	30,000	1	30,000	20,000	10,000
	TOTAL FOR COMPONENT 5				308,800	61,000	247,800
	TOTAL PROJECT COST				824,680	567,680	257,000
	Percentage Cost Sharing					0.69	0.31

I. Equipment required for aflatoxin detection by ELISA

S. No.		Equipment name	Suppliers Address
1	51118170	ELISA reader, with external printer; Multiscan EX, 220V, 50Hz, 400-750 nm, with three filters (405, 450,620 nm)	1 or 2
2	4600110	Finnpipette focus vol. 0.5-5 ul	1 or 2
3	4600090	Finnpipette focus vol. 5-50 ul	1 or 2
4	4600040	Finnpipette focus vol. 30-300 ul	1 or 2
5	4600050	Finnpipette focus vol. 100-1000 ul	1 or 2
6	4610050	Finnpipette focus 12channel vol. 40-300 ul	1 or 2
7	8292H52	Microtiter shaker, 2 plate, 203 V	3
8	3392B85	Blender Drive unit,240 V	3
9	3292N15	Mini Jar, 110 ml, (for blender)	3
10	3292N20	Mini Jar, 250 ml, (for blender)	3
11	6118L60	Economy Incubator, 230 V	3
12	Local	Refrigerator	
13	8294G23	Vortex Mixer, 220 V	3
14	8290F07	Shaker, open air orbital, 240 V	3
15	8290F56	Platform, 10 flasks 250 ml, 3523-6	3
16	8614L45	Magnetic stirrer	3
17	3915L41	Water Still, distillation unit, Model MP-3A, 240 V	3
18	4130A02	pH meter, model 8005, with stand, electrode, 220V	3
19	1320H50	Balance, Mettler Toledo, PL-S, 200g, 0.01	3

Equipments Suppliers Address

1. The Indian Chemical & Instruments, 26-28, Sri Dattasai Complex, Opp. Sapthagiri Theater, RTC Cross Road, Hyderabad 500 020, India. Email: alex@theindianchemicals.info Fax: 91-40-27600162

2. Labsystems OY, Microplate instrumentation division, P.O.Box 208, FIN-00811 Helsinki, Finland. (www.labsystems.fi)

3. Thomas scientific, 99 High hill road, 1-295, PO Box 99, Swedesboro, NJ, 08085, USA. (www.thomassci.com)

II. List of chemicals required for AFB1 estimation by ELISA

S.No	Cat No.	Chemical name	Quantity required
1	A-6636	Aflatoxin B1	1
2	A-6655	Aflatoxin B1-BSA conjugate	1
3	S-9625	Sodium chloride	2
4	S-0876	Sodium phosphate	1
5	P-4505	Potassium chloride	1
6	P-5379	Potassium phosphate (monobasic)	1
7	N-2640	p-Nitrophenyl phosphate Tablets 15 mg	1
8	N-9389	p-Nitrophenyl phosphate Tablets 5 mg	1
9	A-7906	Albumine, bovine serum	1
10	D-8885	Diethanolamine	1
11	P-1379	Polyoxyethylenesorbitan (Tween 20)	1
12	S-2127	Sodium carbonate	1
13	S-8875	Sodium bicarbonate	1
14	A-3687	Anti Rabbit IgG-Alkaline phosphatase conjugate	1
15	M-9410	ELISA plates (Maxi-sorp; from Nunc)	2
16	B-4770	Buffer reference standard pH 7.0	1
17	B-4895	Buffer reference standard pH 10	1
18	P-7668	Parafilm M	2

Supplier: Sigma-Aldrich corporation, Box 14508, St. Louis, MISSOURI 63178, USA

(www.sigma-aldrich.com)

(Distributors available in India)