Terms of Reference

CONTRACTING ORGARNIZATION	AFRICAN ORGANISATION FOR STANDARDISATION P. O. Box 57363 - 00200, NAROBI, KENYA 3rd Floor, International House, Mama Ngina Street Tel: +254 20 2224561/311608 E-mail: arso@arso-oran.org
CONSULTANCY TERMS OF REFERENCE	INSECTS FOR ANIMAL FEED— IDENTIFICATION, GOOD AGRICULTURAL AND WILD COLLECTION PRACTICES AND VALUE ADDITION PROCESSES
CONSULTANT	
	P. O. Box
Tel:	
Email:	
Duration:	
	Total Pay: To be Part of Financial Proposal

ARSO Central Secretariat
Nairobi, Kenya
September 2022

Insects for animal feed— Identification, good agricultural and wild collection practices and value addition processes

1. Background

As an integral part of any food supply chain, the animal feed industry has the potential to be perceived as either part of the problem in the challenge of delivering sustainable food supplies, or the source of meaningful and deliverable solutions (Hall *et al.*, 2021). The market served by the feed industry is diverse, including animals grown primarily for meat, dairy and egg production as well as feeds for domestic animals. Today the industry could be described as operating within the context of a perfect storm.

In 2020, combined world feed production was estimated at 1.2 billion tonnes, with revenue from global commercial feed manufacturing generating approximately US$4000 billion (IFIF, 2021; McCullough, 2022). There has been continued increase in the demand for animal protein worldwide, including for livestock, dairy and fish. Generally, there is a growth of production particularly in the developing world, with the developed world remaining more or less stable. The United Nations Food and Agriculture Organization (FAO) estimates that by 2050 the demand for food will grow by 60% and that between 2010 and 2050 production of animal proteins is expected to grow by around 1.7% per year, with meat production projected to rise by nearly 70%, aquaculture by 90% and dairy by 55%. This already marks a growth factor of almost two, however if we were to extrapolate the growth rates of the last forty years forward to 2050, this would in theory quadruple the needs. The feeds per sector are depicted in Figure 1.

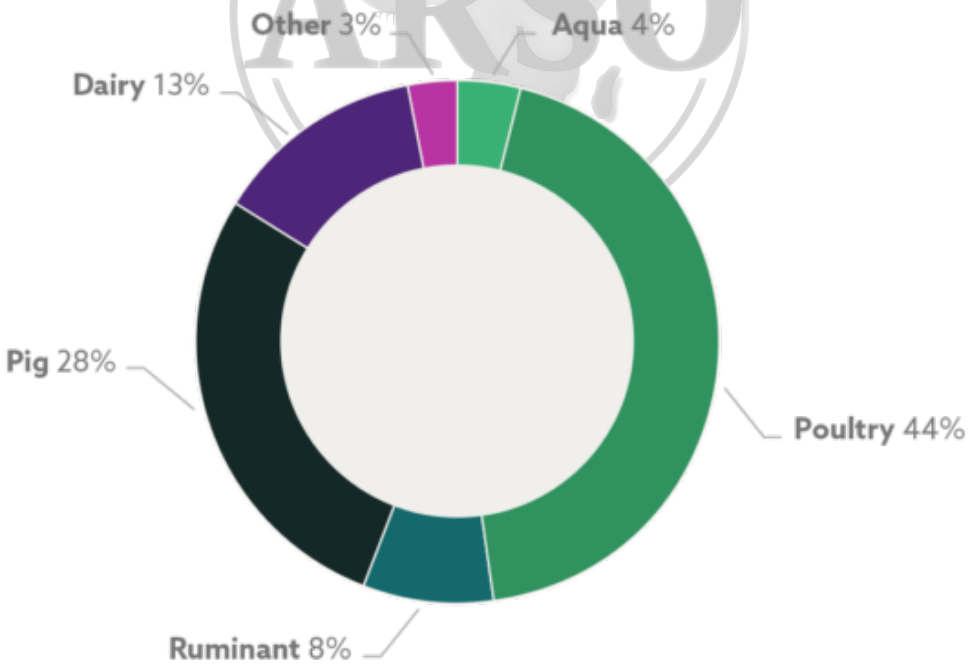

Figure 1: Global feed production as percentage by sector (IFIF, 2021)

At present, ingredients for both animal and fish feed include fishmeal, fish oil, soybeans and several other grains (Huis, 2013). A major constraint to further development are the prohibitive costs of feed, including meat meal, fishmeal and soybean meal, which represent 60–80 percent of production costs (Huis, 2013; Nyakeri *et al.*, 2017). Another problem is manure disposal, which is becoming a serious

environmental problem; it is not uncommon for large amounts of manure to be stockpiled in open-air lots, swarming with flies.

A significant but declining proportion of world fisheries production is processed into fishmeal and fish oil (FAO, 2022). Fishmeal is a protein-rich flour made by milling and drying fish or fish parts, while fish oil is obtained by pressing cooked fish and centrifuging the liquid extracted. Fishmeal and fish oil can be produced from whole fish, fish trimmings or other fish processing by-products. A number of different species are used as whole fish – mainly small pelagic fish, such as Peruvian anchoveta (accounting for the greatest proportion), menhaden, blue whiting, capelin, sardine, mackerel and herring. The amount utilized for reduction to fishmeal and fish oil peaked in 1994 at over 30 million tonnes and then declined to less than 14 million tonnes in 2014. In 2018, it rose to about 18 million tonnes due to increased catches of Peruvian anchoveta (see the section Capture fisheries production, p. 10) before declining in the subsequent two years to reach over 16 million tonnes in 2020. This corresponds to about 20 percent of capture fisheries in marine waters. This progressive reduction in supply has been coupled with a surging demand driven by a fast-growing aquaculture industry, as well as by pig and poultry farming, and the pet-food and pharmaceutical industries. According to the estimates of the Marine Ingredients Organisation (IFFO), in 2020 about 86 percent of fishmeal was used in aquaculture, while 9 percent was destined for pig farming, 4 percent for other uses (mainly pet food) and 1 percent for poultry.

2. Strategic Significance of Edible Insects in Africa

Currently, a large amount of fishmeal is used in livestock feed formulation for domesticated livestock such as fish and poultry. It is approximated that about 14% of the fish catch worldwide is used in the production of fishmeal (FAO, 2012). Fishmeal is however fast becoming depleted and increasingly scarce, amid continued rise in demand (FAO, 2022). This imbalance between supply and demand has led to fishmeal price increase throughout the world. Consequently, small scale poultry and fish farmers are suffering from the increasing cost of feed, which now accounts for nearly 70 to 80% of the total production costs. This situation is affecting meat, egg and fish production in addition to reducing family incomes, and necessitates a search for an alternative protein source.

Developing countries are now facing an acute shortage of animal protein. Consequently, prices of the few animal proteins in the market have soared beyond the reach of many (Schönfeldt & Gibson Hall, 2012). This has greatly reduced the protein intake level and consequently resulted in increased incidences of protein-energy malnutrition and its associated diseases. Small-scale farmers are desperate for an alternative substitute for fishmeal in animal feeds (Tschirner & Simon, 2015). Unfortunately, most of the readily and cheaply available fishmeal substitutes such as soybeans also serve as human food and are also nutritionally inferior to fishmeal in terms of protein digestibility and amino acid patterns (Tschirner & Simon, 2015).

Insects have a similar market to fishmeal; they are employed as feed in aquaculture and livestock and also used in the pet industry (Huis, 2013). Recent high demand and consequent high prices for fishmeal, together with increasing production pressure on aquaculture, has led to research into the development of insect proteins for aquaculture and livestock (which could eventually supplement fishmeal). Meanwhile, aquaculture is growing and fishmeal is declining rapidly as a source of feed because of decreased supplies of industrially caught fish due to tighter quotas, additional controls on unregulated fishing, and greater use of more cost-effective dietary fishmeal substitutes. The search for alternative and *sustainable* proteins is an issue of major importance that needs viable solutions in the short term, making insects an increasingly attractive feed option.

3. Problem Statement

Mass production of insects at an industrial scale is defined as producing one ton/day or more (FAO, 2012). Raising insects for livestock and fish feed is necessary as a matter of the urgency to find a replacement for increasingly expensive fish meal and soybeans. Insects are being recognized by the feed sector as a promising alternative protein source, which will likely lead to easy market acceptance. The challenges and concerns are: (i) selecting the most suitable insect species and strains, (ii) finding cheap and safe rearing substrate (if possible by utilizing organic waste side-streams), (iii) managing diseases and setting up sanitation procedures, (iv) reliability and maintaining a constant supply of high quality insects, (v) producing insect proteins cost effectively, (vi) producing a constant supply, (vii) developing innovative production technologies with cost-effective production systems, (viii) developing automated processing technologies to turn insects into feed, (ix) establishing a regulatory framework, (x) safeguarding animal welfare (ethical concerns), (xi) elaborating codes of practices/standards and finally, (xii) quality assurance, and (xiii) marketing and production.

4. Objectives for Identification of Insects for Feeds in Africa and their Value-Added Products and Uses

(1) Develop an inventory of insects used for animal feeds in Africa including the environments in which they occur, stages at which they are used, other uses and products commonly derived from the insects in a tabular format as shown in Table 1.

Table 1: Inventory of Insects for Animal Feeds in Africa and their Value-Added Products and Uses

No	Order	Species	Common Name	Environments/ Occurrence	Stage/ Part	Uses and products
1	Diptera: Stratiomyidae (Flies)	*Hermetia illucens*	Black Soldier Fly (BSF)	Adults are found near larval habitats, which are found in a wide array of locations, mostly in wetlands, damp places in soil, sod, under bark, in animal excrement, and in decaying organic matter	Larvae	

(2) Please provide clear illustrations of the insects for animal feeds through your own original photographs or copied photographs from other sources which are bibliographically referenced in respect of copyright regulations. Where possible, please indicate the various phases of growth and the stage at which the insects are ready for collection and preparation for animal feeds.

(3) By reference to authoritative, provide the nutritional composition per selected measure of the animal feed product prepared from each insect in relation to a substitutable similar feed product from other sources such as fishmeal and soybean. Comparison parameters include at least: proteins, fats and essential amino acids in comparison to at least common feed products such as meat meal, fishmeal and soybean meal.

(4) What are their environmental conditions in which the insects occur?

(5) What is the geographical distribution of the insect under consideration?

A map showing the geographical distribution of the insect from an authoritative source shall be inserted.

(6) What are the guidelines for their sustainable collection from the wild? What are the good agricultural practices for rearing the insects for animal feeds for optimal production? What types of substrates are used for rearing the insects for animal feeds in each case?

The collection and agricultural practices shall be accompanied by illustrations to promote better understanding.

(7) What are the value added products, their procedures, hygiene, quality and marketing requirements? What are the food safety, quality and environmental concerns?

This section shall demonstrate the procedures for value added products obtained or potentially obtainable from the various African insects for feeds. Bearing in mind that the products might be localized and traditionally processed, the consultant shall explore the areas of improvement to achieve hygiene, quality, safety and market compliance of the value-added products.

It is recommended that the consultant combines process charts for product development as aids to understand the process and product pictorials as a means of enhancing comprehension.

(8) What is the potential for standardization and conformity assessment of the primary and value-added products?

From a selection of the most significant value-added products, the consultant shall establish the criteria for the products to have standards and conformity assessment procedures established to facilitate certification and trade facilitation. If the value-added products are composites, this shall be illustrated clearly.

(9) What are the regulatory factors which need to be established to safeguard, quality, safety and environmental requirements and the processed feed ingredients for insects for animal feeds?

5. Nature of the Compilation

The consultant shall prepare the compilation in the form of a compendium of monographs with sufficient details and illustrations of high clarity/resolution.

6. Value Addition Procedures

Value addition procedures shall be the core deliverables of the consultancy. The guidance provided in the preceding sections shall be utilized in addition to the best industry practices obtained from authoritative referenced sources. The value addition shall lead to standardization and certification of the products for placing in the market.

7. Implementation Methodology and Assignment Duration

In undertaking the tasks described above, the consultants will employ a combination of desk research, review of research articles and publications and telephone or web interviews with relevant stakeholders.

The consultancy shall be for a period of 6 months and the key deliverables are outlined below:

— Output 1: Inception report outlining the understanding of the task, issues to be addressed, methodology and sources of information; an annotated outline of the study (within 3 weeks after signing the contract)
— Output 2: Draft Compilation (by the end of month 3)
— Output 3: Final Compilation incorporating feedback from the validation workshop (by the end of month 6)
— Output 4: PowerPoint Presentation

8. Consultant Qualifications

- At least a Master's degree or equivalent in Animal Production/Nutrition, Veterinary Sciences, Animal Health, Biology, Zoological Sciences, Entomology, Food Sciences, or related areas.
- Track record and proof of research and publication in the area of scope of this assignment.
- Minimum of 5 years of professional experience working in Animal Production/Nutrition, Veterinary Sciences, Animal Health, Biology, Zoological Sciences, Entomology, Food Sciences, or related areas.
- Proven working experience on standardization and /or value addition will confer distinct advantage.
- Knowledgeable on the different GAP programmes being implemented worldwide, including the those implemented in African Union Member States.
- Demonstrated involvement in policy formulation in the agricultural value chains, food security, as well as experience working with governments of the AU Member States and other relevant stakeholders is an asset.
- Thorough understanding and good knowledge of information, education and communication (IEC) approaches, and training methods/tools suitable for non-native English speakers.
- Proven good track record in relevant consultancy work in African Union Member States, particularly in the areas of agriculture, horticulture, biology, natural sciences, zoological sciences, entomology, food sciences and trade.
- Understanding of the African Continental Free Trade Area (AfCFTA) Agreement and its work on economic community building will be an added advantage.
- Good computer skills with adequate knowledge of multi-media presentation and dissemination of outputs and documentation
- For this specific job opening fluency in English and/or French is required. Knowledge of the other is an asset.

9. Application process

Interested and qualified consultants should submit their applications and the application should include the following:

1. A CV and demonstration of accomplishment of similar assignments
2. A technical proposal for implementing the assignment highlighting the consultant understanding of the scope of the work, methodology of Exclusivity and Availability for the duration of the assignment.
3. An outline of the compilation.
4. Financial proposal for completing the assignment highlighting the cost and its breakdowns.

10. Payment Schedules

The total payment shall be in two instalments as follows:
40% upon delivery of Draft Compilation (by the end of month 3).
60% upon delivering the Final Compilation and PowerPoint Presentations at the end of six months.

Formal application shall be done latest by **18th November 2022 before 5:00 p.m.**

Applications should be addressed to:

Secretary General
African Organisation for Standardisation (ARSO) Central Secretariat
International House 3rd Floor
P.O. Box 57363-00200 Nairobi-Kenya
Tel. +254-20-2224561, +254-20-311608

Preferably by e-mail to: info@arso-oran.org , arso@arso-oran.org and arsopit@arso-oran.org

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