AGROINDUSTRY

1. Agribusiness, main sector capable of increasing the agricultural production economy is still less developed in Western Africa despite efforts in this area. it involves a diverse array of industries which process raw agricultural products. The main agroindustry subsectors include agriculture (and horticulture), forestry, fisheries and shellfisheries. This section reviews the following industries: cotton ginning, palm oil, tea and coffee, tanneries, slaughterhouses and wool scouring. The West African Development Bank encourages the establishment of agro-industries. It recommends consideration of potential impacts of this industry on the environment and the human population. These guidelines set out the measures to be taken in this sector.

Potential Environmental Impacts

2. The major adverse impacts associated with agroindustry result from water and air pollution, disposal of solid wastes, and changes in land use.

3. Wastewater streams vary with the type and size of the agroindustrial operation. Effluents typically have high biochemical oxygen demand (DBO), chemical oxygen demand (DCO), and suspended and dissolved solids. Other contaminants such as pesticide residues, complex oils, alkaline or acidic compounds, and other organic constituents may also be present in wastewater. Discharges from feedlots, tanneries and slaughterhouses can be potential sources of disease among humans and animals.

4. Air emissions from agroindustrial operations commonly include particulate matter, sulphur di-oxides, nitrous oxides, hydrocarbons, and other organic compounds. Noxious and nuisance odors are often associated with agroindustries.

5. Land resources may be adversely affected by inappropriate storage of raw materials and disposal of solid waste at the facility property or on off-site disposal areas.

6. The production of raw materials to supply these agroindustries can have negative environmental effects through intensified agricultural activity. Conversion of forest lands to agriculture has the potential for causing the most profound environmental and social impacts. The nature and degree of the impact will depend upon existing land use practices, the quantity of raw materials needed by the agroindustry, the production system chosen, and land and water management systems. Potential environmental impacts from intensified agricultural use include increased erosion, contamination of surface and groundwater from agricultural inputs (e.g., fertilizers, pesticides), changes in physical and chemical characteristics of the soil, and impacts on wildlife and native vegetation. Potential social impacts include decreased access to resources (e.g., traditional cropping and grazing areas, water resources, forest products), displacement of people, and social disruptions (For further discussion of the potential negative environmental impacts asssociated with agroindustry projects and recommended measures to avoid or mitigate them, see Tableat the end of this section) Not all the impacts, however, are necessarily negative. Planting of tree crops on degraded lands, for example, can have a positive environmental effect. The agroindustry can introduce more efficient agricultural practices into an area, stimulate markets for products and provide jobs for local people.

7. Indirect effects of the installation of a large agroindustry include the development of transportation facilities for delivering the products to markets and migration into the area of people looking for land or jobs.

Palm Oil Industry

8. Palm oil is extracted from the outer pulpy portion of the oil palm fruit by a series of operations. The fruit is loosened in the bunches by steam sterilization. Strippers then separate the leaves and the empty bunches from the fruit. From the strippers, the fruit is conveyed to the digesters where it is heated and pulped. Free oil is drained from the digested pulp, then the pulp is squeezed and centrifuged to extract the remaining crude oil. The liquid is screened and clarified to produce purified oil. The extraction residues containing broken nuts and shells are further processed in a current of air to separate palm kernels from the shells. The palm kernels are dried, bagged, and stored for subsequent oil extraction, generally carried out at a different location.

9. Palm oil processing produces substantial quantities of solid wastes in the form of leaves, empty bunches, fibers, shells, and extraction residues. The bunch stalks contain significant quantities of recoverable nutrients and can create a major nuisance and disposal problem. Fibers, shells, and other solid residues are normally burned as fuel to produce steam. Uncontrolled burning of waste solids and release of air used to winnow the shell from the kernels contribute to air pollution.

10. Liquid wastes principally originate from sterilizers and oil clarification. The major pollutants are BOD, total suspended solids (TSS), COD, oil and grease (O/G), and organic nitrogen and ash.

Slaughterhouses

11. A simple slaughterhouse operation involves livestock holding pens, slaughtering, blood removal, hide removal or hog dehairing, evisceration, trimming and butchering for market. The main product of the operation is fresh meat as whole, half or quarter carcasses, or smaller meat cuts. The blood, hides, hair, and viscera are subject to further processing.

12. The main sources of pollutants are liquid effluents carrying varying amounts of solids. Odor from putrescible substances and organic decomposition is the only air pollutant but presents a continuous source of nuisance.

13. The most significant pollutants in the wastewater from slaughter houses are: DBO (biochemical oxygen demand), TSS, O/G and fecal coliform bacteria. Solid wastes are normally screened and reprocessed or disposed of in a landfill.

14. The main safety hazards associated with slaughterhouses are cuts and abrasions from knives and cutting tools, falls on slippery floors, burns and scalds from hot water and steam, injuries from lifting, electrical shock from improper use of electric tools or defective electrical insulation. The main health hazard potential is from animal diseases, such as brucellosis, anthrax, acute and chronic respiratory syndrome, skin diseases, erysipelas, glanders, tularemia and Q-fever.

Coffee (cacao) Production

15. Tea leaves are processed to yield either green or black tea. The manufacturing of black tea starts with the "withering" of the leaves either by natural drying or by hot air. Withering is followed by rolling to press out the juices and beating to break up the leaves. The broken leaves are sifted and fermented to achieve the final product quality. The fermented tea is dried, graded and sorted for packaging. Green tea is prepared by heating the leaves either in hot pans or by steam. The leaves are rolled, fired and rerolled to achieve the desired quality.

16. Tea production may result in some gaseous wastes from the drying operation. These emissions are considered to be unimportant in comparison with the discharges from coal or oil fed boilers used to produce heat. Liquid wastes from cleanup operations are also considered to be insignificant.

17. Freshly picked coffee cherries are processed initially either by the dry method or the wet method. The coffee cherry is sun-dried and then milled to remove in one process the outer skin, dried mucilage, the parchment and the silverskin layers. The milling process is undertaken in large installations. The waste products may be used for fuel, and also have on occasion been used for livestock feed.

18. The freshly picked coffee cherries can be processed by the dry method. Coffee cherries are naturally sun dried before being pounded to expel the envelope debris (balls) and separating in a single operation, the first skin, mucilage dried, the parchment and finally the film. Waste can be used as fuel, but sometimes they are used for livestock feed.

19. Health hazards from the final stages of preparing tea and coffee for the market may include irritation of bronchial passages and lungs from exposure to fine tea or coffee dust, and asthma from hypersensitivity to tea fluff.

Tanneries

Tanning is the process of converting animal hides into leather. The hides are dehaired, tanned by reacting with tanning agents, dyed and finished to produce finished leather. The four processes involved in tanning hides are: beamhouse, tanhouse, retanning and finishing.

20. In the beamhouse, hides are processed by degreasing, fleshing and dehairing in order to prepare them for the tanning operation. Wastewaters contain dirt, salt, blood, manure, oil, and grease, flesh, hair, etc. Much of the solids is recovered and sold to rendering plants. The waste is characterized by high alkalinity, sulfide, nitrogen, DBO, DCO, dissolved and suspended solids, and oil and grease.

21. The purpose of the tanning process is to produce durable material which is not subject to degradation by physical or biological mechanisms. Prior to tanning the hides are subjected to bating and pickling, both of which produce wastewaters high in acids and salts. Tanning is accomplished by leeching the hides with chrome, vegetable tannin, alum, metal salts or formaldehyde. Wastewaters from the operation are substantial. The spent chromium tanning solution is relatively low in DBO, DCO and TSS, but can contain significant concentrations of chromium, a toxic metal. On the other hand, vegetable tanning solution is high in both BOD and color.

22. Retan, color and fat liquor operations constitute the third major step in the tanning operation. The three operations are usually performed in one drum and involve addition of tanning solution (retan), dyes, and oils to replace natural oils of the hides (fat liquor). The process generates high-strength, low-volume discharges containing oil and color.

23. Finishing operations include drying, coating, staking, seeding, pasting and washing. The last two operation generate high-strength, low-volume wastewaters.

24. The tanning process generates significant airborne particulate matter and hydrogen sulfide discharges. Other gaseous emissions occur from ammonia stripping and utility boilers. The process also generates solid wastes in the form of fleshing, sanding dust, hide trimmings, sludges, greases, etc., which are normally recovered and sold to rendering plants. Hair is sold as a separate by-product.

25. The main health hazard, aside from accidents, is dermatitis from contact with chemicals and hides. Other health risks result from exposure to excessive dusts, toxic chemicals, noise and anthrax.

Wool Scouring

26. Wool scouring is a wet process used to remove natural and acquired impurities from the fibers. The process uses soap alkali or non-ionic detergents to scour the woollen fibers. As a final step the fibers are rinsed and dried.

27. Part of the water used in the process is recycled and the rest is discharged. The discharged effluent contains wool grease, urine, faeces, sweat, blood and other impurities which makes the wool scouring effluent one of the strongest industrial wastes in terms of DBO. The raw effluent is also high in oil and grease and may contain sulfur, phenols and pesticides.

Cotton Ginning

28. Modern cotton ginning is a continuous process spanning the unloading of raw cotton to baling of processed cotton fibers. Ginning of cotton produces large quantities of solid wastes in the form of cottonseeds (which may used in animal feed) and gin trash, and releases air pollutants in the form of cotton dust and lint. To minimize the source of pink bollworm in gin waste, movement and disposal of cottonseed and trash may be tightly regulated in certain countries. Where regulations permit, cottonseed is sent to oil mills for extraction of oil. Gin trash may be disposed of by composting, fumigation, sterilization and incineration. In some countries open burning is practiced which creates nuisance, air pollution and odor problems.

29. The main health related issue in cotton ginning involves cotton dust. Exposure to excessive levels of cotton dust leads to byssinosis, a serious respiratory disease. Excessive noise can also be a problem in this industry.

Special Issues

Environmental Effects of the Production of Raw Materials

30. As already discussed, conversion of large areas of natural vegetation to crop or livestock production, or the intensification of agriculture have potential negative environmental and social impacts on a region. These factors must be considered in decisions on whether to finance a proposed project and on siting. Following are some examples relating to the agroindustries considered.

31. Planting of large plantations of oil palms, coffee, cacao and other cash crops in tropical forests is a concern, particularly in west African costal countries. Conversion of the natural forest to another forest crop is less disruptive ecologically than conversion to an annual crop, yet still poses the risk of species loss and the problems arising from monocultures and agricultural production in general.

32. Large-scale cotton cultivation is becoming controversial in some areas because of its serious environmental impacts. The rapid growth of cotton production in parts of West Africais linked with deforestation, erosion and declining soil fertility. Cotton often is grown in ecologically poorer areas which have higher susceptibility to degradation. Soil exhaustion was less evident in traditional systems in West Africa which provided for a long fallow period. Under more intensive systems the fallow period has been shortened or eliminated.

Facility Siting

33. Site location plays an important role in determining the environmental impact of wastewater discharges and solid waste disposal and the costs and methods used

for pollution control. The capacity of a site to absorb waste will depend on the quality and quantity of waste and the ambient conditions. Many agroindustries, such as slaughterhouses and tanneries, which are heavy waste producers and polluters, should not be located in environmentally sensitive areas or at locations where their wastes (after proper treatment) cannot be assimilated without environmental degradation. Conversely, food producing agroindustries should not be sited in areas heavily affected by industrial discharges because of the risk of food contamination.

34. Facility siting is a highly complex and often time consuming process involving developers, special interest groups, politicians and local and national authorities. Developing countries are becoming more sophisticated in facility siting programs. Local regulations must be factored into the selection of an appropriate site for the proposed agroindustry.

Residue Utilization

35. The generation of residues and their potential use or sale depends on the raw materials, the production processes, output specifications, the cost of raw materials and products, the regulations affecting product quality and use, and the constraints, if any, imposed on residue discharge or disposal. The residues may be liquid, gas or solid or a combination of the three. Using, recycling or commercializing residues have two advantages: increasing the productivity and thus the economic performance of the industry, and reducing wastes which are potential sources of pollution.

36. A review of options for residue utilization should be included during project preparation. The following commodities and their by-products are good candidates for such a review:
    - palm oil residues (for nutrient recovery and fuel)
    - palm kernels (for oil and animal feed)
    - slaughterhouse by-products (for rendering and animal feed additives)

- cotton seeds (for oil, animal feed additives, and fuel)
- animal oil (for cosmetics)
- animal by-products and wastes (including hair)

Existing Pollution Regulations

37. A number of countries and BOAD have established effluent guidelines for many sectors of agroindustry. Contaminants which are regulated under U.S. Environmental Protection Agency (EPA) standards, for example, include pH, TSS, DBO, DCO, and heavy metals. Standards for oil and grease, fecal coliform, and ammonia have also been established for slaughterhouses and seafood processing industries.

38. Regulations vary by country and industry type and are highly subjective. In countries having no regulations, BOAD guidelines should be followed; where regulations do exist, the more stringent standards should apply.

39. Air quality standards exist for particulates, sulfur dioxides, and some organic compounds in many developed countries; fewer ambient standards exist in developing countries.

Project Alternatives

40. The main areas where alternatives exist for decreasing the potential for negative environmental impacts are in facility siting and operation.

Siting

41. Selection of a site for an agroindustrial facility is dependent on a number of economic, ecologic and sociopolitical concerns. Regardless of the product manufactured or processed, an environmentally ideal site is one which satisfies the following criteria:
    - . availability of local land and water resources adequate to supply the required quality and quantity of raw materials without causing unacceptable environmental impact (e.g., clearing of primary forests, wetlands or critical wildlife habitat; and intensification of agriculture which will result in loss of soil fertility, increased erosion, etc.);
    - sufficient land area to provide planned and expanded facilities for storage of raw materials, processing and waste disposal;
    - minimal displacement of people and houses;
    - minimal conflicts with higher valued land uses such as agriculture, especially in marginal land areas where prime agricultural land may be at a premium.
    - proximity to receiving waters capable of handling effluent discharge without significant impact on the biophysical and aquatic environment.
    - easy access to social and physical infrastructures such as skilled labor pool, support industries, transportation network, energy supply, raw materials and potential market areas.
    - adequate distance from tourist or recreational areas, office buildings and housing complexes to minimize the impacts of odors, noise, and pollutants.
    - minimal construction and operational impact of the facilities on rare, threatened or endangered species, their habitats, or other sensitive ecosystems.

Operation of the Facility

42. Agroindustrial operations employ a variety of processes and equipment. The type of product processed and the size of the operation determine the type of equipment used, the quality and the quantity of the effluent or waste produced,

and thereby the needs for pollution control equipment. The type of equipment used in pollution abatement cannot be specified for all possible agroindustries. Generally, pollution control measures employ the following processes:

(a) Water Pollution

- lagoons
- neutralization
- sedimentation
- filtration
- flocculation
- activated sludge treatment
- spray irrigation

(b) Air Pollution

- electrostatic precipitators and baghouses
- activated charcoal filtration
- scrubbing with sodium hypochlorite (for odor control)
- compost filters (to reduce nuisance from odors)

Management and Training

43. The need for management and training pervades all aspects of agroindustrial projects in developing countries. The technical capability of industry personnel and government officials responsible for monitoring pollution abatement performance frequently needs strengthening. The number of in-country consultants qualified to prepare detailed environmental assessments (EAs) is usually small and many of these are academics who lack project or industrial experience.

44. The issue of environmental management for development projects is complex. Many countries have just begun work on developing screening and review procedures for projects, compiling environmental databases, and matching and adapting to local priorities and requirements the multitude of environmental

regulations and technical guidelines now on the market. Many central and provincial governments do not have trained staff, adequate budgets, or adequate natural resource databases to keep pace with the numbers of projects being offered by development agencies to host governments.

45. Use of an Environmental Management Plan during project implementation offers one way to establish ground rules for environmental protection and provide guidance to the host country managers. At a minimum, the plan should focus on mitigative measures and the means for their implementation. These measures should be incorporated into the work plans of the project office and other associated government agencies.

46. Training may be needed among the following groups.
    (a) Government professional staff: in design and evaluation of EAs; collection, analysis and interpretation of pollution and related health data; plant safety and health procedures for key agroindustries; inspection and enforcement procedures.
    (b) Industry employees: in environmental issues relevent to their operation; government regulations; evaluation of pollution data, treatment options and operational data; air and water pollution control options; operation and maintenance of the specific equipment used at their facility; plant safety, sanitation and health procedures.
    (c) Local professionals not associated with government and industry: in providing adequate consulting services and/or independent review for EAs and pollution abatement.

47. All of the above people should be provided with some means of keeping abreast of developing technology so as to incorporate the best and most cost effective pollution abatement systems.

Monitoring

48. Air and liquid effluent and solid waste management must be monitored to determine if the project is adhering to the environmental standards and practices agreed upon. The following factors should be monitored for any given agroindustrial facility:
    - . Waste streams and gaseous and particulate emissions for appropriate parameters. (Where a particular discharge is consistently above the established emissions limits or the standard for the industry, corrective action should be taken. These actions could involve process or equipment modification, upgrading, and housekeeping changes.)
    - Quality of receiving water downstream and air downwind of the plant.
    - Effects of solid waste management practices on soils, groundwater and surface water resources.
    - Implementation of health and safety plan by periodic site inspections to assure that training protocols and personal protective equipment such as dust masks are being employed in the work place. (Standard industry practices should be used. Documentation and records should reflect periodic review and corrective actions taken.)

49. An important factor in the abatement of pollution in agroindustrial development projects is the simultaneous strengthening of both in-plant and government monitoring capabilities. It should not be assumed that industrial facilities in the developing countries will develop and undertake air and water monitoring programs and install treatment technologies without effective government surveillance and legal and regulatory enforcement. Likewise, improved monitoring does not result in the reduction of wastewater discharges or air emissions unless the technical capability to comply with the effluent standards is also improved. To operate a successful monitoring program, it may be necessary to introduce sampling equipment and laboratory protocols (or the analytical laboratory) to the host country.

Table : Summary of potential impact and mitigation measures

Potential Negative Impacts	MITIGATION MEASURES
Direct Impacts: siting	
1. Installation of an institution or an industrial complex in sensitive areas or near such areas	Install the establishment in a rural area that is away from the estuaries, wetlands or other ecologically sensitive or important areas, or in an industrial sector to reduce or concentrate pressure on the local environment and services. • Appeal to agencies managing natural resources to examine alternatives.
2. Installation of an agro-industrial plant along a stream may result in its degradation.	Choose the location by examining alternatives and drawing the following guidelines to reduce impacts on the environment and not compromise the beneficial use of water: • on a river whose dilution and waste absorption is maximum; • in an area where wastewater can be recycled for agricultural or industrial purposes after minimal treatment; • in a municipality whose sewer system is adapted to receive waste.
3. 3. Installation of an agro-industrial establishment increasing the problems of air pollution.	3. Place the property in a location that overlooks the area, in an area that is not subject to temperature inversions and where prevailing winds push away the pollution of residential neighborhoods.
direct Impacts: agricultural	

practices	
4 Environmental degradation (erosion, contamination of water and soil, low soil fertility, disruption of wildlife habitat, deforestation etc..) Generated by the intensification of agriculture	4. Control agricultural inputs, agricultural and pastoral practices to reduce environmental problems. Encourage reforestation
direct Impacts: plant operation	
5. Worsening problems of solid waste in the region.	5. Incorporate the following guidelines in choosing the location when it comes to an agro-industrial plant producing large amounts of waste: • extent of land sufficient to contain a landfill or waste disposal site; • near a landfill or adequate waste disposal facility; • facilitating access to the collection and disposal of solid waste by public or private companies responsible for their evacuation.
6. . Water pollution caused by waste water discharges : • Factory: MES, temperature, pH ; • runoff from stored products : MES and pH.	6. Check the temperature of the stored waste and analyze laboratory liquid effluent (including the flow of cooling water) to determine their properties (H / G , SSTT , TSS , DBO and DCO) . For all types of plants , unless otherwise indicated : no discharge of cooling water (If recycling is not possible, they will be discharged , provided that the temperature of the receiving water rises no

	more than 3 ° C); • maintaining the pH level of effluent discharge between 6.0 and 9.0 ; • effluent control by the standards of the EPA (Environmental Protection Agency) for the process in question; • spreading of manure, if deemed appropriate (It is recommended to consult the guidelines of " Industrial risk management " which prescribes standards for these substances).
7. Air emissions of particulate matter from all activities of the institution	7. Control particles by installing electrostatic precipitators and fabric filters collectors.
8. Gas and odors emissions from processing operations.	8. Control alkaline substances through natural purification method. An analysis of raw materials, during the pre-project phase can determine the amount of sulfur emitted that can design an appropriate control equipment against air pollution.
9. Accidental release of potentially hazardous solvents, acids and alkalis.	9. Maintain places for storage and disposal of substances to eliminate spills and provide a spill control equipment.
indirect Impacts	
10. Risks to the health of workers due to fugitive dust , noise , handling materials or	10 Develop a plan for health and safety within the plant to identify, assess and fight against the risks to the health and safety of workers and sets

manufacturing processes. • Accident frequency higher than average, due to a lack of knowledge and skills.	out in detail how to respond and specifies the rules for their protection, or mentioning the following points: • characterization and site analysis ; • controls on the location ; • training; • medical surveillance; • engineering controls , work practices and personal protective equipment ; • monitoring; • information programs ; • handling of raw materials and processed products; • decontamination procedures; • emergency measures; • lighting; • regular meetings on security ; • sanitation in temporary and permanent premises.
11 Increased regional solid waste problem due to improper storage of the site.	11. Provide waste disposal areas on the site, given the characteristics of leachate considered hazardous. Support remediation actions in the area
12. Disruption of transportation routes, noise emissions and increased traffic, increased risk of accidents incurred by pedestrians caused by the passage of trucks bringing raw	12. If the choice of location can help eliminate a number of problems, specific studies on transport should still be performed during the pre-project study, which would determine the safest trips, provide transportation regulations and develop contingency plans for responding to hazards and

materials to the plant or carrying engineered products.	to reduce the risk of accidents.
13. Diseases transmitted by improper method of waste disposal	. 13 . Establish technical standards for the preparation or processing of raw materials and waste disposal; monitor fecal coliform or other bacteria and require documentation describing the monitoring of waste disposal facilities

Leather Tanning and Finishing

Settings waste

washing and rinsing water	DBO5, TSS
degreasing	DBO5, SS, H / G
unhairing	DBO5, TSS, pH, sulfide, nitrogen
curing	Ammonia nitrogen
pickling	acids, salts
tanning	chromium, vegetable tannin
Re-tanning, dyeing	dye, oil
finishing	neither

Appendix: plants Categories by primary manufacturing process:

A. Chevalage - hair pulping, chrome tanning, finishing

B. Chevalage - hair conservation, chrome tanning, finishing

C. Chevalage - hair conservation, vegetable-tanning, finishing

D. Chevalage - prior hair removal, earlier tanning, finishing

E. Chevalage - prior removal or retention of hair, chrome tanning, finishing

Table 1 Agroindustry (continuation)

Potential Negative Impacts	**MITIGATION MEASURES**
Palm oil mills	Effluent control issued by the palm oil mills
Waste streams contain acids and high levels of TSS, H / L and BOD5.	Restrictions on emissions of liquid effluents include: pH, DBO, DCO, TSS conform to national standards or those recommended by the BOAD. Achieve a 100% reduction of pollutants and effluents discharged into surface waters is possible, thanks to one of the following actions: • Sprinkler irrigation; • land application; • evaporation ponds; • discharge into municipal wastewater treatment plants.
The most important liquid effluent parameters are: DBO5, SS, H / G, pH and fecal coliform.	Upper limits of the amounts of effluents emitted daily by slaughterhouses Plant type DBO (a) MES (b) H / G PH Sinple 0.12 0.20 0.06 6-9 complex 0.21 0.25 0.08 6-9 Weight before slaughter) per kg b) per ton MPN fecal coliform count <400 per 100 ml

wool unhairing Biodegradability is a particular problem when it comes to raw waste which contains significant quantities of H / G. Sulfur, phenol and organic components that accompany the treatment of wool may be discharged to the outlets	 The recovery operation of fat is essential to reduce the risk of pollution caused by H / G Standards for Effluent t = ton, mg = milligram. BOD5 5 kg / t product MY 4 kg / t product DCO H / G total chromium phenol sulfur pesticides

ANNEX 1

Sample Terms of Reference (TOR)

An Environmental Assessment of Agroindustry

1. Task 1. Description of the Project.

(a) Characteristics of the processing plant(s): location, general layout, size, capacity and life-span.

(b) Preconstruction and construction activities of plant(s) as well as any marine terminals, deepwater ports, pipelines, or roads required.

(c) Operation and maintenance activities, including:

- Handling operations for raw materials and the form in which they are to be introduced into the facility process, as well as the off-loading, conveying, pretreatment, and storage operations. Whenever possible, information should be supplied on the source and quantities of the pollutants likely to be produced during each operation.
- Types of processing operations. For example, process control measures should be specified, as variations in the process may result in different amounts and quality of polluting substances being released to the environment.
- Waste disposal and pollution control measures categorized by continuous, batch, intermittent and emergency (spills, accidents), especially waste minimization (source reduction or recycling) schemes.
- Transportation requirements and extent, to which facilities are owned, operated or supported by the proposed agroindustry. Transportation requirements for raw materials (e.g., live animals, vegetables and fruits, plant residues) should be evaluated.
- Supply source for raw materials and the extent to which this source is owned, operated or supported by the proposed agroindustry.

2. Task 2. Description of the Environment.

Biological environment: fauna, including aquatic organisms (particularly fish); ecologically important or sensitive habitats, including parks or preserves, significant natural, cultural or historic sites, etc.; any biological factors likely to influence the supply of raw materials to the facility (e.g., pests).

3. Task 3. Determination of the Potential Impacts of the Proposed Project.

Special studies may be necessary to obtain the following information:

(a) Effluent studies to define the extent of potential pollutant loading to receiving waters and to develop alternatives for providing appropriate levels of treatment. The quality and quantity of potential effluents and water pollutants - processing waters, cooling waters, sanitary waters, leachates from solid waste disposal areas, stormwater runoff -should be determined. Chemical characterization depends on the food products being produced, but at a minimum should include: temperature, pH, total suspended solids (TSS), oil and grease biological oxygen demand (BOD), and chemical oxygen demand (COD). Sanitary wastewater and waters from slaughterhouses should be characterized for nitrates and fecal coliform.

(b) The quality and quantity of air emissions, including sulfur dioxide, carbon dioxide, nitrous oxides, toxic pollutants and particulate matter.

(c) The quality and quantity of solid wastes and the potential impacts from their disposal.

(d) Potential noise levels from the facility.

(e) The potential impacts from transportation should be assessed. When the plant is to be sited in a remote or sparsely populated area, the impacts from planned and unplanned in-migration into the area. This should include effects on the natural resources of the area (e.g., clearing of forests for agriculture) and socio-economic impacts.

(f) The effects of facility development on aesthetics and visual quality.

(g) Ability of the community or government to provide emergency response services for accidental release of dangerous chemicals (in most instances agroindustries pose no significant threat of this), and availability of medical facilities and trained personnel to respond to medical emergencies.

(h) Raw material handling and waste disposal specifications (to minimize the potential for disease transmission, especially in slaughterhouses and tanneries).

(i) Potential for unplanned development to result from project and the possible environmental and socio- economic effects of this.

4. Consulting Team. Members of the team might consist of people with the following specializations: environmental impact assessment; sanitary engineering for the evaluation of air and water quality, estimation of potential pollution problems from the processing plant and planning for water and air pollution control systems; acquatic ecology; plant ecology, wildlife and conservation ecology (if there is potential for negative impacts on important species or habitats); rural sociology; agronomy/livestock management, as appropriate for assessment of the impact ofthe production system for raw materials.