E2854 v3

ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

FOR THE

SAMOA AGRICULTURE COMPETITIVENESS ENHANCEMENT PROJECT

2 December 2011

Acronyms

AESA	Agro-ecosystem analysis
ADB	Asian Development Bank
BORDA	Bremen Overseas Research and Development Association
CEAR	Comprehensive Environmental Assessment Report
COEP	Code of Environmental Practice
DEWATS	Decentralized Wastewater Treatment Systems
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMO	Environmental and Social Management Officer
ETL	Economic Threshold Limit
ET_0	Reference Crop Evapotranspiration
FAO	Food and Agriculture Organization
FFS	Farmers' Field Schools
F&V	Fruit and Vegetable
GEF	Global Environmental Facility
GOS	Government of Samoa
IDA	International Development Association
IP	Indigenous People
ICR	Implementation Completion Report
IPM	Integrated Pest Management
IPP	Indigenous Peoples Plan
KBA	Key Biodiversity Areas
LTA	Land Transport Authority
MAF	Ministry of Agriculture and Fisheries
masl	Mean altitude above sea level
METI	Matuaile Environmental Trust Incorporation
MIS	Management Information System
MNREM	Ministry of Natural Resources, Environment, and Meteorology
MOF	Ministry of Finance
NGO	Non-Governmental Organization
OD	Operational Directive
OLSSI	O Le Siosiomaga Society Incorporation
OP	Operational Policy
PCG	Project Coordination Group
PEAR	Preliminary Environmental Assessment Report
PMP	Pest Management Plan
POP	Persistent Organic Pollutants
PUMA	Planning and Urban Management Act
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SACEP	Samoa Agriculture Competitiveness Enhancement Project
SBEC	Small Business Enterprise Center
SDS	Strategy for the Development of Samoa 2008 – 2012
SIA	Social Impact Assessment
SPCZ	South Pacific Convergence Zone
TLB	Taro Leaf Blight

TNA	Training Needs Assessment
TOT	Training of Trainers
USD	US Dollars
WB	World Bank
WIBDI	Women in Business Development Incorporation
WHO	World Health Organization
WMP	Waste Management Plan

Executive Summary

This Environment and Social Management Framework (ESMF) has been prepared by the Ministry of Agriculture and Fisheries (MAF) of the Government of Samoa for the proposed Samoa Agriculture Competitiveness Enhancement Project (SACEP). The ESMF is the most appropriate instrument to identify and respond to the potential social and environmental impacts of the proposed project, instead of the normally used Environmental Impact Assessment (EIA) instrument, as the details and exact location of subprojects would only be identified during project implementation. The ESMF provides a framework for screening these subprojects to determine their environmental and social impacts, and ensure appropriate mitigating measures are incorporated into subproject design and during subproject implementation.

The Project

The project development objective would be that targeted fruit and vegetables (F&V) growers and livestock producers improve productivity and take greater advantage of market opportunities.

The project would be implemented over a period of five years, on both Upolu and Savaii islands, with targeted farming and livestock enterprises promoted in those areas considered by MAF and producer associations to have some comparative advantage. Household participation in the project would be demand-driven, with focus on households wanting to adopt a more commercial approach to farming and livestock production and those who want to produce more but remain operating at a subsistence level. As a part of the project, sector institutions would be strengthened in key areas such as supply-chain organization, as well as applied research and extension; improved technologies and agricultural practices would be promoted; improved livestock breeding animals and improved F&V planting material would be introduced; and investments both on-farm and in strategic agro-processing would be financed.

Project activities would focus on improving sustainable soil and land management; more effective service delivery to farmers; adoption of sustainable agricultural technologies; introduction of improved livestock breeding stock and plant material; and, increasing efficiency in input use and output marketing. The soil and land management activities would include rock removal, appropriate tillage, and prudent and efficient use of fertilizers and agrochemicals. Sustainable agricultural technologies would include aspects such as integrated pest management (IPM); more efficient water harvesting techniques connected to small-scale basic drip irrigation schemes; and, improved livestock production and pasture management. Activities to encourage increased efficiency in input use and output marketing, including selected processing of agricultural and livestock products (an abattoir and associated improved field slaughter arrangements), as well as improved arrangements for product marketing would also be funded.

Participants in SACEP would consist of farmers with access to at least one acre of land to develop for intensive F&V production, livestock producers, and smallholders with land for cassava production. Household participation in the project would be on a demand-driven basis.

Environment and Social Impacts

Given the nature of subprojects, i.e., small-scale and household-based with focus on the adoption of improved technologies, crop varieties and breeding stocks and sustainable soil

and land management, the environmental and social impacts of the project are assessed to be localized and manageable. Most subprojects, with the exception of the abattoir, would only require environmental and social screening. The environmental and social benefits of the project far outweigh the negative impacts because the project would:

- strengthen traditional systems of environmental and social governance through the use of a participatory approach;
- introduce high value crops to improve income levels within communities, lower the dependence on and degradation of natural resources and encourage conservation;
- increase the number of strategically-located small-scale water points for livestock, especially cattle leading to a more diffuse distribution of livestock pressures; and
- promote effective management and reversal of natural habitat degradation through pasture improvement that offers a positive impact on conservation of natural habitats and biodiversity.

There is however a risk that the project could contribute to negative impacts in rural areas because of the following circumstances:

- the project might lead to increased conversion of pasture land to agriculture, if not regulated or managed properly;
- even where traditional environmental or social governance is effective, incentives for village, and district level management of natural resources in a sustainable manner might be weak in comparison to incentives for unsustainable use;
- inadequate waste disposal from the abattoir; and
- inappropriate selection of land for agricultural development in areas not well suited for F&V and livestock development (absence or inadequate use of land evaluation for agricultural and livestock production).

The project is fully aware of these and has considered and addressed these risks in the preparation and design of the SACEP.

Environment and Social Screening

The process of environmental and social screening of subprojects has been made simple and informative, consisting of the following steps:

- Preparation of environmental and social profiles of each subproject;
- Assigning a category to each subproject;
- Scoping and public consultations;
- Conducting subproject specific environmental assessments, if necessary, based on the results of the screening;
- Review and approval of environmental assessment screening reports; and
- Disclosure and grievance procedures.

These steps have been described in details in the main document to enable extension officers and farmers/communities to understand the process involved. An environmental and social checklist by subproject types has been included to assist in undertaking the screening process.

Institutional Arrangements

To ensure that the requirements of the ESMF are followed, community participation would be strengthened. Trained agricultural extension officers, assisted by the Environmental and Social Management Officer (ESMO) would be responsible for preparing the subproject environmental and social screening reports and, where necessary, assist the communities in preparing the appropriate environmental document (either preliminary Environmental Impact Assessment [EIA], Environmental Management Plan [EMP] and Pest Management Plan [PMP]) for the concerned subproject. The ESMO based in the Project Coordination Group (PCG) would be responsible for reviewing the environmental and social screening reports, capacity building and supervision of implementation of subproject specific EMP and PMP. Agriculture extension officers and the Project Coordinator would also monitor and supervise the implementation of these plans.

Capacity Building

Capacity building and training are central to the effective implementation of the ESMF. This process should include: sensitization of MAF staff (mainly extension personnel) to the potential impacts of subprojects on the environment and training on the social and environmental screening process, Environmental and Social Impact Assessment (ESIA), costing mitigation measures and monitoring the implementation of mitigation measures; sensitization of communities and village leaders to the environmental and social screening and reporting systems and integrating local traditional knowledge as it relates to the protection and management of natural resources, into the screening process and mitigating measures.

Resources would be made available for training of extension officers and participating rural communities to identify and address environmental and social impacts related to the subprojects. The costs of capacity building for environmental assessment and social aspects shall be part of the project. Training modules on environmental assessments and social aspects would be prepared to provide the basis for developing subproject specific training modules. Training on World Bank safeguards would be included into the modules to be prepared by a social and environmental safeguards advisor recruited by the project.

Estimated Costs

The estimated cost of mainstreaming environment and social issues into SACEP spread over the five years of project implementation is US$ 889,000, plus costs related to the Environmental Management Plans (EMP) that would be finalized as the subprojects are better defined and identified. Included in this cost is an estimated US$ 153,000 for training and sensitization of MAF staff and farmers.

Some costs of environmental management and mitigation are directly integrated into the main project costs and are not included in the above figure.

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1. Introduction

The Government of Samoa (GOS) has requested World Bank financing of the Samoa Agriculture Competitiveness Enhancement Project (SACEP). This project corresponds with the central features of the Government Strategy for improving the agricultural sectors capacity to produce high quality livestock and fruits and vegetables primarily for the domestic market. The project is designed to fund a number of small-scale, household-based subprojects that would be identified and planned by the agricultural communities and farmer associations, with the support of Ministry of Agriculture and Fisheries (MAF) extension teams and the Small Business Enterprise Centre (SBEC), and then approved for funding by the Development Bank of Samoa and a project supported matching grant program. The *Environmental and Social Management Framework (ESMF)* was prepared for the IDA-funded SACEP to ensure that its small-scale subprojects would be implemented in an environmentally and socially sustainable manner. The objectives of this ESMF are:

- To assess the potential environmental and social impacts of the proposed project, whether positive or negative and propose mitigation measures which would effectively address these impacts;
- To establish clear procedures and methodologies for the environmental and social planning, review, approval and implementation of subprojects to be financed under the project;
- To inform the project preparation process of the potential impact of different alternatives, and relevant mitigation measures;
- To specify appropriate roles and responsibilities, and outline the necessary reporting procedures for managing and monitoring environmental and social concerns related to subprojects;
- To determine the training, capacity building and technical assistance needed to successfully implement the provisions of the ESMF; and
- To establish the project funding required to implement the ESMF.

This report provides guidelines for assessing possible environmental and social impacts of subprojects, and shows how determination should be made and appropriate mitigating measures incorporated into subproject reports. The guidelines specify institutional responsibilities for undertaking environmental assessment including the social aspects, implementation of preventive, mitigatory or compensatory measures, and monitoring and evaluation. Whenever feasible, preventive measures are favored over mitigatory or compensatory measures. The guidelines also set out the criteria by which a subproject would be disqualified for support as a result of likely adverse environmental or social impact.

2. Project Description

The project development objective would be that **fruit & vegetable growers and livestock producers improve productivity and take greater advantage of market opportunities.**

Experience elsewhere has shown that coordinated efforts by the public and private sectors to improve farm performance and market linkages are essential to establish competitiveness in local and export markets, enabling farmers to respond competitively to changing market demand. In the proposed project, this would be achieved through facilitation of industry dialogue and coordination; adoption of improved agricultural husbandry practices; organization of farmers and their closer integration into food supply chains; and targeted investments to improve farm and livestock productivity and remove critical market access constraints. The project would underpin the structural changes needed to support the transition from semi-subsistence agriculture towards more remunerative production and marketing

systems. At the institutional level, the project, in collaboration with other programs (AusAID in particular) would foster the transition of MAF and other agriculture sector institutions towards greater market orientation. The project would foster stakeholder coordination and strengthen local level organizations (farmer groups) as an important factor in sustaining the performance of selected supply chains.

Key indicators of success would include, inter alia:

a. an increase in the productivity and the value of sales of commercially-oriented farmers in the livestock and fruit & vegetable sub-sectors;
b. an increase in the productivity of subsistence-oriented households in the livestock and fruit & vegetable sub-sectors; and
c. an increase in the share of locally produced fruits and vegetables and meat sold by domestic retail and foodservice channels.

The project would be implemented over a period of five years, on both Upolu and Savaii islands, with targeted farming and livestock enterprises promoted in those areas of the islands where they are considered by MAF and producer associations to have some comparative advantage. Household participation in the project would be demand-driven, with focus not only those households wanting to adopt a more commercial approach to farming and livestock production, but also those households who want to produce more, but at the same time prefer to remain operating at a subsistence level.

The proposed project would assist fruit and vegetable farmers and livestock producers to improve enterprise productivity and take greater advantage of domestic and export market opportunities. Project objectives and the activities would be widely publicized at project inception and throughout implementation, and farmer participation in any aspect of the project would be purely demand-driven. Sector institutions would be strengthened in key areas such as supply-chain organization, applied research and extension.

The project would promote the adoption of improved technologies and agricultural practices; and finance investments both on-farm and in strategic marketing infrastructure. Project activities would be grouped into three components: (A) Livestock Production and Marketing; (B) Fruit and Vegetable Production and Marketing; and (C) Institutional Strengthening.

(A) Livestock Production and Marketing

The objective of this component would be to encourage interested livestock producers to upgrade livestock, improve husbandry practices and stock management, make productivity enhancing on-farm investments, and improve the quality of meat sold in the local market. The component would comprise a number of activities, including:

a. improving farmer access to *superior breeding stock* for cattle, pigs, sheep and poultry;

b. financing eligible *farm enterprise investments* to improve stock handling and livestock housing and provide start-up working capital, through a combination of demand-driven matching grants and bank loans;

c. providing *technical advice* on breed selection and breeding management, nutrition, animal health and improved husbandry practices;

d. improving *livestock nutrition* by fostering locally grown feedstuffs and upgrading pastures for cattle and sheep;

e. improving *meat quality and hygiene* initially through development of a field slaughter service on Upolu and Savaii, and subsequently through construction of an abattoir on Upolu', all with associated cold chains.

(B) Fruit and Vegetable Production and Marketing

The objective of this component would be to enable interested fruit and vegetable growers to have access to new, higher yielding varieties, adopt improved technology and production techniques, make productivity enhancing investments, and organize themselves to strengthen their presence in the market and meet the demands of local retailers and foodservice operators for year-round supplies of fresh fruits and vegetables. The component would be comprised of a number of interrelated activities, including:

a. enhancing farmer access to *planting material* of a broad range of improved fruit and vegetable varieties, shown in local trials to be suitable for Samoan conditions;

b. financing eligible *farm enterprise investments* to facilitate land preparation, address problems with seasonal rainfall excesses and shortfalls, increase mechanization and provide start-up working capital through a combination of demand-driven matching grants and bank loans;

c. providing *technical advice* on variety selection, crop nutrition, improved husbandry practices, and post harvest handling;

d. promoting the growth of organic products and fruit and vegetable exports through assistance in *market development* and arrangements for *certification*;

(C) Institutional Strengthening

The objective of this component would be to improve (a) the effectiveness of agricultural institutions (Government and non-government) providing extension and adaptive research services to Samoan farmers; and (b) the ability of these same institutions working individually or in collaboration with each other to implement and monitor the project effectively. This would be done by:

a. enhancing institutional technical and management capacity to address identified skill-gaps in staff and the operational procedures of implementing agencies, through (i) short-term local and overseas training and exposure visits for agency staff; (ii) targeted short-term technical assistance;

b. providing incremental staff needed to coordinate and administer the project effectively - specifically project coordination, procurement, financial management, environment/social screening, monitoring and evaluation, and facilitating and monitoring the matching grants program;

c. improving work facilities and providing adequate vehicles, equipment and operating expenditure to maximize operational effectiveness; and

d. designing and implementing a monitoring and evaluation system which is integrated into the existing Management Information System (MIS) of MAF.

2 Environmental and Social Management Framework Requirements

The project would finance a number of small-scale, household-based livestock development (cattle, sheep, pig, and poultry) and agricultural (fruit and vegetable production) production/marketing subprojects, and it is assessed that these would not have any significant adverse environmental and social impacts. Since the precise details and locations of the small scale fruit and vegetables and livestock development subprojects to be financed by SACEP are not yet known, it has been determined that the *Environmental and Social Management Framework* (ESMF) tool for environmental and social management of project activities is more appropriate than the commonly used EIA approach. As it is not possible to ascertain precise impacts of these subprojects at this stage, an ESMF is required which includes a list of possible subprojects that could be supported under the project, to ensure the proper screening of specific developments as they are identified.

The ESMF approach outlines institutional arrangements for the environmental and social screening of small-scale subprojects, the review and approval of subprojects, monitoring, and the strengthening of the requisite environmental management capacity under the project. Based on the screening results, the project would develop mitigation measures designed to introduce and expand sustainable land management and livestock development practices in project areas such as ecologically sound soil and water management, proper pest management plans relevant to each agricultural and livestock/pasture improvement subprojects, and the renewal of low quality and under grazed hillsides and pastures.

Notwithstanding, the ESMF checklists are designed to identify any potential social and environmental impacts and direct the communities and extension teams to practical ways of avoiding or mitigating such negative impacts. Although not foreseen, if the relevant line agencies determine that more detailed environmental planning work is required for any particular subproject, further EMP would have to be prepared before the subproject application can be considered further.

A number of proposed subprojects (particularly fruit and vegetable production) might result in the introduction or expansion of pest management activities in project participating farms. However, it is not anticipated that the project in general would result in the promotion of widespread pesticide use. The ESMF implementation tools and procedures would identify the potential for the introduction or expansion of pest management activities in subprojects and, this would trigger the need for preparation of a pest management plan. Subprojects involving the procurement of pesticides or pesticide application equipment, or increased pesticide use, would not be funded until appropriate training on proper use and application of agrochemical to minimize environmental and health and safety impacts has been conducted as a prerequisite, or experience demonstrates that the local capacity exists to adequately manage their environmental and social impacts. The introduction of integrated pest management would be promoted by the project, not only to reduce the negative impacts of pesticide application on the natural ecosystem, but to improve the marketability of agricultural produce.

The project would not support the development of new agricultural land that requires forest clearance. Any project that requires forest clearance or encroachment into natural habitats would be identified during environmental screening and would be included in the exclusion list and would not be eligible for financing by the project. Appropriate selection and screening criteria have been added to the ESMF checklist to address and identify such subprojects.

The project would require the services of one suitably qualified MAF staff to be trained as the Environmental and Social Management Officer (ESMO), co-opted to the Project Coordination Group (PCG) to implement and monitor these aspects of the project. He/she would be responsible for ensuring the ESMF is implemented effectively; liaising with the relevant agencies such as MNREM; and, providing support to the farmer groups, communities and villages on project related social and environmental issues, through information dissemination, training, workshops, and identify institutional needs.

2.1 Key Principles

This ESMF has been prepared on the basis of the following principles:

- It is assessed that the bulk of environmental and social inputs to this project are required at village, community and farmer group levels. At these levels, there is an opportunity to strengthen working relationship between all stakeholders, including agricultural, forestry, livestock, environmental, social and health officers, and improve the general awareness of the complexity of sustainable rural livelihoods.
- The ESMF is not proposed as an elaborate system of assessment for activities or subprojects within the SACEP components. Instead, it should facilitate environmental and social considerations being fully mainstreamed into the participatory process for identifying, screening, planning, implementing and monitoring of each subprojects, using the provided screening checklist for each subproject.

To ensure full implementation of ESMF requirements, it is imperative to train and involve crop and livestock extension officers at MAF on how to perform social and environmental impact assessment activities identified in this report and to undertake all the assessment work as part of their mainstream crop and livestock work activities.

3 Safeguard Screening Procedures

The proposed ESMF has been designed to fully comply with national environmental regulations and legislations in Samoa (2007) as a pursuant to Section 105 of the Planning and Urban Management Act (2004) and with the World Bank's environmental and social safeguard policies. This chapter sets out the key safeguard policies that provide the policy context to the ESMF including World Bank policies and Samoa's legal requirements on environmental assessment.

3.1 World Bank Safeguard Policies

SACEP is anticipated to have mostly beneficial impacts on communities by providing the much needed financial and small-scale infrastructure needed to promote increased productivity and introduction of new crops and livestock to ensure demand driven agricultural development to reduce import dependency and increase farmer income. Moreover, the subprojects proposed under the project would be small-scale investments, with the vast majority anticipated to fall below a cost US$ 20, 000, and are not likely to have significant negative environmental and social impacts.

However, experience elsewhere with agricultural and livestock development, has shown there is the possibility that some of the proposed project activities might result in negative impacts. Thus, SACEP has been rated as environmental Category B under the World Bank's policy on environmental assessment (Operational Policy (OP) 4.01), requiring a partial Environmental Assessment (EA) to assess the potential impacts associated with subprojects. In addition to the OP 4.01, SACEP would also trigger the Bank's Pest Management Policy (OP4.09) as indicated in Table 3.1.

Table 3.1: World Bank Safeguards Policies and their Applicability to SACEP

World Bank Policy/Directive	Applicability
Environmental Assessment (OP 4.01, BP 4.01)	Yes
Natural Habitats (OP 4.04, BP 4.04)	No
Forestry (OP4.36)	No
Pest Management (OP 4.09)	Yes
Cultural Property (OP 11.3)	No
Indigenous Peoples (OP 4.10)	No
Involuntary Resettlement (OP4.12, BP 4.12)	No
Safety of Dams (OP 4.37, BP 4.37)	No
Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)	No
Projects in Disputed Areas (OP 7.60, BP 7.60, OP 7.60)	No

This can be explained as follows:

OP 4.01 (Environmental Assessment)

The OP 4.01 has been triggered because there is the potential that implementation of the SACEP might lead to negative environmental impacts, although it is considered that there are no potential large-scale, significant or irreversible environmental impacts associated with the project. The potential impacts identified are mainly localized impacts associated with activities to be financed under the fruit and vegetable and livestock development components. The majority of these activities can be effectively mitigated and are addressed in the ESMF by using the screening and review procedures outlined in Chapter 5. The ESMF has also identified, in Chapter 5, a number of potential environmental and social issues that could arise as a result of project interventions and has proposed measures to be taken to mitigate these effects, including proposed training and monitoring measures in Chapters 6 and 7, Annex 1.

OP 4.04 (Natural Habitats)

The OP 4.04 has not been triggered since the SACEP activities would be concentrated on areas that have already been converted to pasture or agricultural land and would not have any significant impact on natural habitats. It has been agreed that the project would only concentrate on areas that are already used for such activities and no undeveloped areas would be used by subprojects funded by the project.

OP 4.12 (Involuntary Resettlement)

. OP 4.12 is not triggered. No involuntary resettlement impacts are anticipated as a result of this project.

OP 4.36 (Forestry)

None of the project activities would have direct impact on forest resources. Any project that might require forest clearing would be excluded.

OP 4.09 (Pest Management)

A number of small investments proposed under the project (i.e., fruit and vegetable production, livestock development and veterinary activities, and livestock markets/slaughter improvement) have the potential to result in the introduction of pesticide use in certain areas/villages in Samoa or might increase pesticide use. However, it is not anticipated that the project in general would result in promoting widespread pesticide use. The project would effectively promote the use of Integrated Pest Management (IPM) principles, such as application of pesticides only after reaching economic pest level thresholds, to minimize the use of agrochemicals such as pesticides and herbicides in favor of more environmental

friendly methods such as use of beneficial bacteria to combat plant diseases, beneficial insects, and organic (plant extracted) herbicides/pesticides. Thus, the project has at this stage provided appropriate criteria in the screening tools to address issues of pesticide use, and would require a mini-pest management plan for agricultural activities which trigger these criteria. During the first year of project implementation, technical assistance would be provided to MAF to develop an Integrated Pest Management Framework to address the induced effects of the project on pest management as a whole.

OP 11.03 (Cultural Property)

Apart from the abattoir, the proposed project does not include any major construction works. Therefore, potential impact on cultural properties is assessed to be minimal. To ensure that the project would not have any significant impact on cultural properties and to mitigate against any potential negative impacts on cultural property, screening for Physical Cultural Resources would be undertaken at two stages. The subproject screening (Components 1 and 2) would include screening of the sites to exclude any that could have an impact on cultural properties. Should any cultural resources were identified at a later stage (chance finding), chance finding procedures as per OP11.03 would be followed. The subprojects will not be implemented in areas where physical cultural resources will be impacted.

OP 4.10 (Indigenous Peoples)

It was confirmed that there are no indigenous peoples as per the Bank policies in Samoa. The ethnic structure in Samoa is predominantly ethnic Samoan (97.0%) with a 3% minority of Europeans and bi-racial European-Polynesian.

3.1.1 Mainstreaming of safeguard compliance into subproject screening

The screening criteria provided in the ESMF includes relevant questions on the safeguard policies including natural habitats and protected areas, involuntary resettlement and land acquisition, introduction of pesticides, impacts on forestry resources, and potential impacts on cultural property in subproject identification process. This would ensure that all concerns related to the Bank's safeguard policies are taken into account during the screening of subprojects for potential impacts, and that the appropriate mitigation measures can be adopted to address them.

3.2 Samoa's Legislation for Environmental Assessment

3.2.1 Subproject screening under Samoan law

Three Samoan legal and statutory documents need to be considered in relation to the project. The legal requirements are *Planning and Urban Management (Environmental Impact Assessment) Regulations 2007* (2007 Regulations) and the *Planning and Urban Management Act 2004* (2004 Act). The statutory requirement is the five year plan *Strategy for the Development of Samoa 2008 – 2012 (SDS).*

The 2004 Act was established '*to implement a framework for planning the use, development, management and protection of land in Samoa in the present and long-term interests of all Samoans and for related interests.'*

The 2007 Regulations, which are pursuant to section 105 of the 2004 Act, provide the requirements to undertake an Environmental Impact Assessment (EIA) whether as a preliminary or comprehensive assessment. The preparation of this ESMF has also taken into account the requirements for environmental assessment under Samoan law (EIA Regulations, 2007). The law requires that all projects which might have a negative impact on the environment undergo a preliminary or comprehensive EIA, depending on significance and complexity of potential environmental impacts. However, at present, the available ElA guideline appears to be somewhat general and its requirement as described in more detail below appear to be less stringent than that of Bank environmental and social safeguards. Therefore, it is assumed that following the requirements of the World Bank Policy 4.01

should provide an EIA that is responsive to both GOS and World Bank environmental regulations.

The main agency responsible for environmental protection in Samoa is the Planning and Urban Management Agency (PUMA), which is the regulatory agency within the Ministry of Natural Resources, Environment, and Meteorology (MNREM). This Ministry is responsible for reviewing and developing guidelines for EIAs. With these requirements in mind, for those subprojects that might require an EIA, as determined under the screening and review process, a copy of the EIA report would be submitted to the MNREM for approval. As per Samoa's EIA guideline, the MNREM would have two weeks to review and comment on the EIA before the subproject can be approved. This would ensure that subprojects that might have potentially significant impacts and require more detailed study receive national level approval as well as community level approval.

PUMA produced an EIA regulation in 2007 pursuant to section 105 of the Planning and Urban Management Act (2004). These regulations require the preparation of an EIA report for any public or private development proposal as set out in the EIA regulation and include PEAR (Preliminary Environmental Assessment Report).

Two forms of EIA have been envisaged in the Regulations:

- A Preliminary Environmental Assessment Report (PEAR) that might be required by the Agency for any development application to which any of the qualifying criteria specified in the EIA regulation apply, but which the agency considers is not likely to have a significant adverse impact on the environment; and
- A Comprehensive Environmental Assessment Report (CEAR) that might be required for any development application to which any of the qualifying criteria specified in the EIA regulations apply, and which the Agency considers is likely to have a significant adverse impact on the environment.

The proposed activities of SACEP do not appear to have any major adverse impacts in areas identified in the EIA regulation as qualifying criteria for an EIA, and therefore is assessed that a PEAR should suffice the Samoa EIA guideline requirements. The qualifying criteria for requirement of an EIA, specified in the guideline include adverse impacts:

- on people, an existing activity, building or land;
- on a place, species or habitat of environmental (including social and cultural) importance;
- in conjunction with natural hazard risks;
- on or in the coastal zone;
- on or in any waterway or aquifer;
- arising from the discharge of any contaminant or environmental pollutant;
- associated with land instability, coastal inundation, or flooding;
- on the landscape or amenity of an area;
- impacts on public infrastructure;
- on traffic or transportation; and
- on any other matter for consideration stated in Section 46 of the Act.

The vision for the *Strategy for the Development of Samoa 2008 – 2012 (SDS)* is – *'Improved Quality of Life for All'.* The SDS has three social goals; '*Improved Education Outcomes, Improved Health Outcomes, and Community Development: Improved Economic and Social Wellbeing and Improved Village Governance'.* The SDS goals have been incorporated in the project as it is proposed.

3.3 Proposed environmental and social screening processes

The environmental and social screening processes that would be responsive to the PUMA and Bank environmental and social safeguard requirements to be used in different project activities (sub-projects) are summarized in Table 3.2. A mechanism will be developed so that ESMO of SACEP be trained and accredited by PUMA so that they can review and approve/decline the proposed subprojects based on environmental and social concerns and send the completed reports to PUMA on a biannual basis for review. If any issues were raised during review by PUMA, the subprojects can then be reevaluated on the basis of expected environmental and social impacts.

Table 3.2: Proposed processes for determination of environmental and social impacts of sub-projects under SACEP

No.	Sub-project	Environmental and Social Review Process
1	Abattoir (Component 1)	Require preparation of site-specific EIA and EMP (Category B)
2	Grant-funded sub-projects (Components 1 & 2)	Use the relevant screening checklists (Annex 2)
3	Agriculture sub-projects (Component 1)	In addition to use of screening checklists (No.2 above), prepare subproject specific PMP and EMP, where necessary.
4	Nucleus Pig Farm	Requires environmental and social screening. Might require subproject specific EIA (Category B) and EMP/waste management plan.

4 Baseline Information

Samoa is an island country made up of two major islands (Upolu and Savaii), two smaller inhabited islands (Apolima and Manono), and five uninhabited islands. The project areas would be concentrated in the two main islands, Upolu and Savaii. The total land area is 2935 km^2 with a population of some 180,000 people (2005 estimates). The baseline information on physical, biological, and social environment of Samoa, as they relate to the SACEP objectives and target areas, are reviewed and summarized as Annex 1 of this report.

5 Typical Sub-projects and their Potential Overall Environmental and Social Impacts and Mitigation Measures

5.1 Introduction and Background

Under the proposed project, agricultural investments by rural households would focus on the following thematic areas:

- Improved land management for fruit and vegetable crop production;
- Agriculture technology for fruit & vegetables and livestock;
- Livestock development (cattle, sheep, pig, and poultry); and
- Output marketing.

The types of likely activities eligible for financing under this categorization, with some examples, are presented in Table 5.1 This list, however, is not exhaustive and other types of activities/subproject might be added in the future.

Table 5.1: Types of possible activities/subprojects eligible for financing by SACEP

Type	Possible Subproject	Examples of Activities
Land management	Improved land workability for intensive crop production	Rock removal, contour plowing, and construction of contour bunds on steep slopes.
	Improving soil fertility and soils conditions	Provision soil testing equipment, appropriate, soil quality based, fertilizer recommendation
Agriculture and livestock technologies	Increase land productivity and soil physical characteristics	Use of composted organic manure in combination with mineral fertilizer
	Integrated pest management (IPM)	Observation, preventive and intervention methods in vegetable and fruit production Safe use of pesticides in combinations with improved management related to IPM approaches
	Farm mechanization	Use of farm implements, such as two-wheel tractors, power tillers, rippers, weeders, and use of herbicides, etc.
	Increasing water supplies	Rainwater harvesting techniques for irrigation and livestock use
	More effective irrigation technology	Introduction of low cost drip irrigation
	Rain protection methodologies	Use of polyethylene/shadecloth tunnels for heavy rain protection
	Production of non-traditional crops to reduce agricultural import requirements	Introduction of new high yielding and adaptable fruit and vegetable crops to reduce agricultural import
	Improve infrastructure	Use of fencing, providing animal shed, improving or establishing new water troughs
	Improving livestock production	Introduction of high yielding and adaptable new breeds of poultry, sheep, pig, and cattle
	Veterinary laboratory rehabilitation	Rehabilitation of the existing laboratory building, procurement of new instrumentation and laboratory reagents.
	Reducing incidence of zoonotic diseases	Animal waste composting, animal vaccination

	Increasing availability of quality stock feed	Cassava processing for animal feed, fruit and vegetable processing, livestock slaughtering, chilling, packing, etc.
Output marketing	Improve slaughtering practices	Construction of a slaughterhouse (abattoir) in Upolu; and introduction of mobile, hygienic slaughtering equipment
	Improved market access for crops and livestock	Assist the farmer group to establish sustainable market linkages for new produce.

5.2 Benefits of SACEP Subprojects

The benefits of likely SACEP subprojects are both short and long-term, and should not necessarily be limited to project participants, but also flow in some degree to the members of village communities at large. Below are a few examples of environmentally and socially beneficial subprojects that would be financed by SACEP.

- *Soil fertility enhancement and better land management practices:* Improved soil fertility, soil physical and chemical characteristics would provide a better medium for crops, improve soil water and nutrient availability to plants and improve soil aeration, hence reducing environmental and social risks associated with crop failure.
- *Rock removal:* Removal of rocks from the fields allow for better management of agricultural land for crop production, allowing for development of larger parcels of land into cash crops, and providing the possibility of introducing low level mechanization such as use of two-wheel tractors for improved efficiency and reduced need for the highly valued labor force. The resulting benefits are decreased labor requirement, improved soil productivity, better long term production, higher soil moisture, improved water infiltration, decreased soil compaction, improved soil tilt, and more soil microbiological activity.
- *Integrated pest management* (IPM): This integrates management of all pests, in a holistic, ecologically based approach involving multiple pest management tactics (chemical, biological, cultural, mechanical) and management of multiple pests (insects, weeds, disease pathogens, nematodes, vertebrates, etc). IPM incorporates environmental and social concerns. The main goals are sustainable resource management (agricultural and natural over the long term), more rational use of pesticides, reduce environmental contamination and costs, utilize natural biological controls, minimize pesticides resistance problems, food safety (reduce residues of pesticides on food products) and worker safety (rely on pest management tactics that are safe for workers)
- *Rain harvesting/Crop Protection*: High intensity rains commonly cause devastating effects on the environment. Runoff arising from rainwater often causes erosion and crop failure with subsequent land degradation. Preventing and mitigating soil erosion and nutrient loss from plant root zone might achieve environmental conservation. One method to achieve this is through runoff control by rainwater harvesting methods. The other is by use of plastic sheet/shadecloth tunnels to protect the plants from physical damage from rainwater during high intensity storms. Surface and roof catchment are some of the most effective methods among the rainwater harvesting methods that could mitigate the possible environmental hazards caused by rain.
- *Improved quality breeding livestock and animal husbandry practices*: Current breeds of pigs and chicken are mostly local breeds, having lower carcass quality than the imported

products. Cattle and sheep are mainly imported breeds (or crosses with local breeds), but sources of improved breeding males are limited. In addition to breed issues, the current status of grazing areas for cattle and sheep (under grazed and sub-optimal quality) and quality of feed material for pig and poultry are believed to be some of the reasons for low quality and live weight of local animals. Import of improved breeding stock and introduction of better animal husbandry practices are believed to provide the environment for improving quality of local meat products and allow for a better use of natural resources in Samoa. These project activities would allow for a better use of natural resources and improve the grassland biodiversity and quality.

- *Improved animal slaughtering*: Currently, most cattle, sheep and pigs are slaughtered in unsanitary condition in the field, using methods that inhibit the draining of blood from the carcass. This practice, coupled with the lack of refrigerated transport, causes the quality of meat to deteriorate before reaching the market. In addition, the current practice of slaughtering the animal on the ground is, in itself, unhygienic and can result in the proliferation of pathogens in meat, leading potentially to zoonotic diseases. The proposed improved slaughtering practices, involving a combination of a fixed abattoir and an upgraded field slaughter/cold chain service promoted by the project should not only improve the sanitary condition and meat quality, but they should also reduce soil and water contamination and incidences epidemics of zoonotic diseases.
- *Rehabilitation of Veterinary Laboratory*. The lack of a working animal health laboratory in Samoa prevents the Livestock Department having access to necessary information with regard to animal diseases. The existing veterinary laboratory is in a state of disrepair and needs rehabilitation and restocking with new equipment and chemicals to allow it to perform its crucial function with regard to animal health and prevention of zoonotic diseases in Samoa. The proposed rehabilitation and restocking of the laboratory should allow the MAF veterinary staff to perform their duties more effectively.

5.3 Environmental and social impacts of SACEP subprojects and proposed mitigation measures

Subprojects might have impacts that change the environment and social characteristics of the project area and these impacts might be ambiguous or negative in their effects. The environmental and social screening process, therefore, would include questions pertaining to World Bank safeguard policy requirements. The subsequent EIA work required would be based on the screening results and related recommendations on subproject's category. For example, as a result of the environmental and social screening process, the resulting EIA work might include a subproject-specific Pest Management Plan based on Integrated Pest Management approaches.

5.3.1 Soil fertility and land management improvement/Soil erosion prevention

The project would support soil fertility improvement for fruit and vegetable development subprojects, including review of soil nutrient status, recommendation of proper approaches to soil fertility improvement for selected fruit and vegetable crops suitable for each land unit, provision of selective hybrid seeds/seedlings/planting materials required for high yielding crop production, and creation of awareness in soil and water resources conservation. Soil fertility improvement activities are undertaken for purposes consistent with sound environmental and social management, but they might also generate environmental and social impacts that warrant mitigation. These include changes in land, water, morphological and physical characteristics, as well as quality and quantity of these resources, changes in natural habitats, loss of biodiversity or changes in biodiversity characteristics of both fauna and flora, infringement of property rights, and possible, although unlikely, intrusion on social/cultural resources such as archaeological sites and religious shrines. One potential impact of intensive

agricultural production might be the extensive use of agrochemicals to achieve soil fertility improvement that can cause pollution of soil and water resources.

To minimize the potential negative impacts of this activity on natural resources it is proposed to develop and enforce subproject-specific pesticide management plans (PMP), based on IPM principles and approaches, including integrated weed management, proper fertilizer management, residue management, and selected use of organic manure to not only improve soil fertility, but to also improve soil physical characteristics.

Land management activities proposed under the fruit and vegetable component of the project also include rock removal from agricultural field to facilitate land management activities, especially in relation to irrigation and farm mechanization. Rock removal would improve soil workability. However, surface rocks, especially on sloping agricultural land work as a mulch and reduce potential accelerated soil erosion.

Considering the volcanic nature of majority of the soils in Samoa and their high erodability, it is important to include soil conservation measure in the project design as the mitigation measures to minimize soil erosion risk. Table 5.2 present a recommended soil erosion control measures that should be considered in farming areas that would require rock removal.

Table 5.2: Proposed soil conservation measure in rock removal areas used for vegetable crop production based on slope of the land

Slope Class of the farmland (%)	Proposed soil conservation measure
2 - 5	Use of contour plowing, introduction of grass strip on slopes over 2%, if soil is found to be highly susceptible to erosion.
5 - 15	In addition to contour plowing and use of grass strips that are highly encouraged, it is proposed to consider the use of biological soil conservation measures on contours. In farms where both livestock and fruits and vegetable are integrated, suitable biological conservation shrubs such as *Sesbania sesban*, suitable as feed material should be grown along the contour to minimize soil erosion.
15 - 30	Use of physical and/or biological soil conservation measures such as reverse bench terrace as well as biological measures such as *Sesbania sesban* should be considered.
>30	Land on slope over 30% should not be used for intensive farming purposes.

In areas where fruit tree production is planned, as long as undergrowth is left alone and/or use of cover crops such as leguminous runners are proposed, fruit trees can grow on steeper slopes (up to 30%) as long as appropriate soil conservation measures as mentioned in the table 5.2 are included. Use of removed rocks in construction of conservation bunds (reverse bench terraces) to minimize potential loss of soils due to accelerated water erosion on steep lands is highly recommended.

5.3.2 Irrigation and crop tunneling for reduced water pollution

The project would support introduction of supplementary irrigation during the dry season to allow farmers to produce two crops per year in each parcel of land. It would also provide funds for establishment of plastic sheet tunnels to protect the crops during the rainy season from rainwater damage. Although the above interventions should have positive impacts on crop yield, thus reducing pressure on land and natural environment, if certain elements are not managed correctly, impact can occur. Among potential impacts are over irrigation, increased use of agrochemicals, and potential increase in waste material due to loss, or disposal of plastic sheet material used for tunneling.

To minimize potential negative impacts of irrigation practices, use of appropriate irrigation rate for each crop, based on soil water holding capacity, crop water requirement and reference crop evapo-transpiration should be developed (irrigation scheduling). To minimize potential increase in soil loss and pollution of water resources, awareness raising and proper training of involved farmers on proper irrigation methodologies and best management practices such as irrigation scheduling, introduction of drip irrigation, and use and construction of plastic tunnels for crop protection should be promoted.

5.3.3 Introduction of improved livestock breeds

Introduction of new animal breeds could potentially increase the need for extra veterinary medicine; extra, higher quality feed material such as cassava as energy source that would require conversion of some agricultural and/or pasture land to cassava production fields and

soya bean/soya cake as protein source that most likely would have to be imported. Table 5.3 summarizes possible impacts and their mitigation measures.

Table 5.3: Typical Impacts and Mitigation Measures of introduction of improved livestock breeds and increase herds

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment: **Soils** **Water resources** **Air quality**	Land degradation at livestock watering points Contamination of stored water Siltation of water tanks	Awareness raising and training on safe handling and storage of water. Provision of safe watering points/structures for livestock Erosion control at watering points using grass strips and improving drainage to reduce trampling. Prepare soil silt trap before the entrance of irrigation water to the tank. Careful site selection for water harvesting sites in areas with good watershed cover. Provision of safe watering points/structures for livestock at paddocks, using concrete troughs.
Biological environment: **Fauna and flora**	Loss of natural habitats Loss of flora and fauna species Increased pest problems Introduction of exotic/alien weed species	Awareness raising and training on safe handling and storage of irrigation water. Biodiversity assessment and monitoring. Minimize removal of natural vegetation. Developing subproject specific EIA and related IPM plans. Develop weed monitoring plan by implementing weed control measures based on IPM principles.
Social Environment: **Aesthetics and landscape** **Human health** **Human settlements**	Health hazards such as water borne diseases. Child accidents	Improve field drainage system by use of interceptor drains, minimizing water leaks. Provide covers for water

	Infringement of property and access rights	harvesting structures Provide access routes/corridors. If not possible, relocate the site.

5.3.4 Increasing Crop productivity

Use of mineral fertilizers in combination with other agricultural chemicals would be supported by SACEP. Table 5.4 shows some typical impacts of increased use of plant nutrients in F&V component and relevant subprojects. All studies conducted in this regard in countries with the same agro-ecological conditions have indicated that the application of organic manures in combination with mineral fertilizer gives higher crop yield increases than when both are applied separately. In addition, studies have concluded that nitrogen and phosphorous applied in combination have resulted in significantly higher yields of fruit and vegetable crops, probably due to improved soil physical and water holding capacity due to organic manure application. In those subproject where farming community take advantage of both livestock and crop diversification activities, introduction of composted manure in combination of inorganic fertilizers should highly improve soil fertility, crop yields, and reduce potential soil and water contamination and incidence of zoonotic diseases in the surrounding areas. The potential impacts from these subprojects are contamination of surface and ground water, and loss of plant species.

SACEP would support integration of plant nutrition techniques and strategies through improvement of soil fertility in subprojects that employ rock removal and improved seed/planting material with the aim to address nutrient management, including improving organic matter in the soil, increasing plant available nitrogen, and combining organic and inorganic fertilizers. These interventions have the potential to increase and sustain production levels, increase the economic potential of a production system, and counteract and minimize environmental pollution. However, the interactions between nutrient applications and other agricultural activities and the likelihood of unforeseen problems such as environmental contamination of soil, surface and ground water should be a great concern and a monitoring system with key indicators should be developed.

Table 5.4: Typical impacts and mitigation measures of integrated plant nutrition techniques and strategies (use of composted manure and mineral fertilizers)

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment: **Soils** **Water resources** **Air quality**	Contamination/pollution of surface and groundwater, eutrophication of surface water bodies.	Conduct training on safe use of high grade fertilizers such as superphosphates and higher grade NPK than is currently used. Conduct soil studies to determine the optimum fertilizer application rates, timing, and split application to reduce surface and groundwater pollution and increase crop productivity/fertilizer use efficiency. Introduction of integrated soil fertility management principles. Training on safe and timely use of organic manure based on soil

		carrying capacity. Public awareness raising on appropriate use of bio-fertilizers.
Biological environment: **Fauna and flora**	Loss of plant species Loss of biodiversity Promoting weed growth Increased pest problems	Introduction of weed control measures, using targeted herbicides, manual weeding. Biodiversity assessment and monitoring. Use of targeted herbicides. Promoting IPM approaches. Developing subproject specific PMPs.
Social Environment: **Aesthetics and landscape** **Human health** **Human settlements**	Health risks	Awareness raising and training on safe use of agrochemicals and composted manure. Proper screening of herbicides to reduce use of broad spectrum agrochemicals. Training on and promotion of IPM approaches. Enforce use of protective gears.

5.3.5 Use of agrochemicals/Integrated pest management (IPM) techniques

Pest management under the proposed SACEP should be undertaken with thorough and informed planning and knowledge at all levels from national farm household levels. While the benefits of the proposed fruit and vegetable and livestock development components can be obvious and impressive, the adverse environmental and social impacts from pest management practices could be significant, and in some cases long-term, and perhaps even permanent.

The most significant environmental and social impacts arise from poor pesticide storage, handling and application by agrochemical dealers and smallholder farmers. The past and current PMP activities at MAF indicate that the widespread introduction of IPM-based PMP has not been achieved effectively due to a number of constraints or challenges including the departure from MAF of many extension officers who were trained in IPM in the past. This problem is due to various factors ranging from management and institutional issues to weak systems and processes, especially on law enforcement. Therefore, the proposed SACEP would make deliberate efforts to strengthen the IPM-related capacity of the agricultural extension section of MAF. The following are some of the impacts that might arise due to increased pesticides usage.

Human and Animal Poisoning

The 2005 agricultural survey (MOF/MAF, 2005) identified 77% of Samoan households to be involved in agricultural production, majority of them at subsistence level. This proportionately large population of subsistence farmers has to be protected from harmful pesticides and other agro-chemicals. Neglecting standards could result in human and animal poisoning or loss of life. In addition, inspection of pesticides distributor's premises in Apia has revealed substandard storage and handling facilities and practices. This poses a health hazard to human beings (particularly the farmers) and animals.

Excessive, Inadequate or Improper Use

The MAF agrochemical related regulation requires all agrochemicals being imported into the country to be registered and labeled in both English and Samoan languages. However, many unregistered pesticides, insecticides, rodenticides and many other agrochemicals find their way into the market illegally and are often re-packed to suit the purchasing requirements of the smallholder farmers. These re-packed units often do not have proper labeling or sufficient instructions for use.

Excessive pesticide application might result in accumulation of persistent pesticides in the soil and the environment and might continuously and cumulatively affect the food chain, water resources (rivers, lakes and groundwater), fauna and flora and ultimately human health. On the other hand, inadequate application due to ignorance and due to lack of funds might adversely affect crop production. Increased agricultural use of chemicals such as herbicides and insecticides would have a negative impact on the soils and subsequently on the quality of surface and ground water resources.

Risk of Contamination

Most of the subsistence farmers and agrochemical dealers in Samoa are not well trained in appropriate use of agrochemicals and use of proper protective gears. This results in poor and improper use and application of pesticides. Most of the farmers do not use the prescribed equipment and quantity of pesticides. This might lead to contamination of food, poisoning of applicators and contamination of the environment. Currently there is lack of proper disposal facilities for spent pesticides and their packaging. This culminates in pesticides stockpiles and subsequent contamination of the environment.

The above concerns justify the need for Integrated Pest Management practices to control and reduce the use of agro-chemicals.

Since SACEP would finance subprojects that potentally result in the increased use of pesticides, it is important to ensure that appropriate IPM-based practices are implemented so that application of pesticides can be minimized and other pest management practices such as field observation, preventive and intervention methods are also included in prevention of crop pest and diseases, particularly in vegetable and fruit production.

According to FAO definition, an IPM is a pest management approach that in the context of the associated environment and the population dynamics of pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains pest population at levels below those causing economically unacceptable damage or loss. Therefore, IPM involves a combination of various measures to ensure effective pest management without disturbing the ecosystem, reduce environmental pollution and eliminate direct and indirect health hazards to human beings. Since according to the SACEP design, the project is demand-driven, subsequent to the screening procedures, each subproject should develop its own case-specific Pest Management Plan based on the IPM approaches. The general PMP for the project, prepared at this stage, would be used as the starting point and would be re-formulated and used as a guide/reference document in the preparation of subproject-specific PMPs. Table 5.5 summarizes typical impacts and mitigation measures of IPM. Most of the IPM methods have little or no unwanted impacts at all, especially use of botanical pesticides like neem tree extracts, or biological control, such as intercropping, use of resistance varieties, etc. Typical negative impacts of inappropriate or indiscriminate use of agrochemicals include soil contamination, water resources pollution, and loss of animal and plant species.

Table 5.5: Typical impacts and mitigation measures of increasing use of agrochemicals/ use of IPM plan

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment:	Soil and groundwater contamination	Conduct training and awareness raising on safe use and handling of

Soils **Water resources**	Pollution of surface waters	agrochemicals. Adherence to provisions of subprojects specific PMPs. Awareness raising & training on IPM approaches. Minimize use of pesticides to levels required to reduce the pest population to economic threshold levels.
Biological Environment: **Fauna and flora**	Promoting weed growth Aggressive pest problems due to increased pesticides resistance Loss of natural plants and wildlife habitats and species Increased pest problem	Conduct training on safe and appropriate use and timing of fertilizer application to reduce loss to leaching and surface runoff. Effective screening of pesticides entering the market to ensure the availability of low toxicity and targeted pesticides. Promoting and adopting IPM approaches to pest control. Developing and implementing subproject specific PMPs. Enhanced the quality of crop protection research and extension support services. Biodiversity assessment and monitoring. Promote use of IPM approaches. Develop subproject specific PMPs.
Social environment: **Aesthetic and landscape** **Historical/cultural sites** **Human health** **Human settlements**	Health risks	Awareness raising and training on safe handling of pesticides. Adequately address pesticide related hazards. Develop and enforce pesticide related by-laws. Clean-up and proper disposal of pesticide containers. Provision of protective gears (safety goggles, masks, clothing, booths, etc). Proper screening of herbicides/pesticides to encourage use of targeted agrochemicals rather than broad spectrum types, currently in use.

5.3.6 Increased use of labor saving technologies

SACEP would support labor saving technologies and use of farm implements such as two-wheel tractors, ploughs, ridgers, rippers, weeders and power tillers. The objective of supporting these subprojects is to increase the marginal labor productivity in the existing farms. The project would not support use of labor saving technologies to open up new

currently non-agricultural areas for crop production for example in areas with high biodiversity or if it requires logging of pristine forest, old full canopy areas, or regenerating forests. Table 5.6 summarizes typical impacts and mitigation measures of increased use of labor saving technologies. The potential impacts of the inappropriate use of labor saving technologies are loss of soil fertility, loss of water sources as well as air and noise pollution.

Table 5.6: Possible impacts and mitigation measures of increased use of labor-saving technologies

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment: **Soils** **Water resources** **Air quality**	Loss of soil fertility. Soil structure deterioration and soil compaction. .	Employ soil management principles and best management practices promoted by the F&V component.
Biological environment: **Fauna and flora**	Loss of plant species due to use on non-selective weed killers (herbicides).	Biodiversity assessment and monitoring. Training on proper use and handling of agrochemicals. Use of selective, targeted herbicides/pesticides.
Social Environment: **Aesthetics and landscape** **Human health** **Human settlements**	Accidents due to farm machinery operations. Accidents due to unsafe handling of motorized sprayers.	Promotion and adherence to safety regulations on handling of the machinery.

5.3.7 Use of rainwater harvesting techniques

Potential environmental and social impacts of rainwater harvesting techniques are land degradation at livestock watering points, contamination of stored water, water and land use conflicts, loss of natural habitats and loss of fauna and flora.

SACEP would finance the construction of small scale water harvesting schemes through capture of roof top rainwater or construction of small household or community tanks. Irrigation and drainage systems would be designed, mainly using drip irrigation for fruit and vegetable (high value) crops to manage water for enhancing agriculture production. There is a wide range of irrigation schemes that can accommodate many variations in the source, and availability of water, types of climate, and form of agriculture. If subprojects would involve construction of small diversion of water tanks, subproject-specific EA would be carried out consistent with the Bank's safeguard policies.

Table 5.7 summarizes the most frequently encountered environmental and social impacts of small-scale irrigation and minor civil works subprojects. Irrigation subprojects intensify agricultural production and environmental and social problems might result from increasing use and concentrations of agrochemicals. Such agricultural intensification can also cause accelerated nutrient loading of receiving waters, resulting in algae blooms, proliferation of aquatic weeds, and deoxygenating (eutrophication). Other impacts from irrigation subprojects include potential water logging and leaching of soil nutrient, degradation of downstream

surface water systems, and biotic and chemical changes to aquatic ecosystems. Excess irrigation might also cause an increase in waterborne diseases, because disease vectors proliferate in irrigation fields and canals under some circumstances. However, since the proposed irrigation systems in SACEP are based on the use of drip systems, increase in water logging and increase in incident of water borne diseases is not anticipated.

Table 5.7: Typical impacts and mitigation measures of increased use of rainwater harvesting techniques for livestock and F&V production

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment: **Soils** **Water resources** **Air quality**	Contamination of stored water	Awareness and training on safe handling and storage of water for irrigation and livestock consumption.
	Land degradation at livestock watering points	Minimize water loss from irrigation tanks to prevent water logging and incidences of waterborne diseases. Provision of safe watering points and structures for livestock at paddocks, using concrete troughs. Minimize water loss around the structure to prevent water logging and increase in soil erosion.
	Potential flooding during heavy rains. Siltation due to erosion	Erosion control measures at the watering points and crop lands such as grassing the area and/or use of interceptor drains to minimize water logging and trampling.
Biological environment: **Fauna and flora**	Potential reduction of drinking areas for wildlife.	Awareness raising on need for provision of watering points for wildlife.
	Potential siltation of water harvesting structures.	Careful site selection for water holding structures to ensure minimum siltation (sites with well protected watersheds).
	Increase in pest problems	Developing subproject specific EMPs and PMPs.
	Potential increase of new/alien weed species	Develop weed monitoring plan and control measures.
Social Environment: **Aesthetics and landscape** **Human health**	Health hazards due to potential increase in water-borne disease	Improve field drainage system by introducing interceptor drains, grassed waterways, and other measures, as appropriate, to

Human settlements		minimize water logging. Improved drainage systems by introduction of grassed waterways, interceptor drains, etc. Use cover for the water harvesting schemes to prevent accidents.
	Child accidents (water harvesting structure).	

5.3.8 Improved livestock production practices

The proposed project would also finance subprojects related to improvement of cattle farming, pig production, sheep, and poultry, construction and rehabilitation of government livestock breeding farms, involving animal housing, fencing etc. Table 5.8 summarizes the most frequently encountered environmental and social impacts of improvement in livestock production. The potential impacts of improved livestock production are overgrazing, degradation of land and vegetation, soil erosion, gas emissions, and loss of natural habitats through overgrazing,

Table 5.8: Typical impacts and mitigation measures of improvement in livestock production

Environmental and Social Component	Impacts	Mitigation Measures
Physical environment: **Soils** **Water resources** **Air quality**	Overgrazing/under grazing	Awareness raising and training on proper use of pastures, rotational grazing, introduction of improved pasture, etc.
	Degradation of land and vegetation.	Observing and training on determining and observing grassland carrying capacity.
	Soil erosion	Improve pasture quality. Introduce rotational and areas of zero grazing.
	Gas emission (CH_4)	Introduction of biogas technology in areas with high number of penned livestock Introduce rotational and areas of zero grazing.
Biological environment: **Fauna and flora**	Loss of natural habitat due to overgrazing Wildlife replacement	Biodiversity assessment and monitoring. Integrated management of domesticated animals and wildlife.
Social Environment: **Aesthetics and landscape** **Human health**	Infringement of property and access rights Environmental risk of	Provide access routes/corridors. If not possible, relocate the site. Enactment and enforcement

Human settlements	disposing livestock waste into water bodies (including animal remains, blood, etc after field slaughter for fa' lavelave.	of Livestock Act and issues related to disposal of animal waste into water bodies.
	Potential diseases due to unsafe use of agrochemicals or animal drugs.	Training on safe handling of chemicals and animal drugs. Enforce use of protective gears during herbicide application.

In case of intensive animal production such as the possible nucleus piggery farm, it would be a requirement to include a waste treatment plan in the business and technical plan as part of the project design. Such plan might consist of a biogas production system (anaerobic digestion), or the use of deep straw bed and biological treatment of the effluent. In case of smaller piggery production units, proper composting of the refuse on concrete slabs or installation of household based biogas system can be considered.

5.3.9 Construction of abattoir

The proposed project would finance an abattoir with a capacity of slaughtering up to 2,500 animals per year. The proposed location for the abattoir is a 75 acre government owned land to the South-Southwest of the city of Apia, bordering to the south with Tafaigata Landfill and some 5 to 6 km north of Aleisa Road. The current land use at the proposed site is an old banana plantation which was subsequently grazed by cattle for a few years. Currently, around four acres of land is being used by a construction company from China to grow food for its workers. Another twelve acres is being used by the Crops Division in collaboration with the Chinese government for a demonstration vegetable. Figure 5.1 shows two satellite images, the first of Apia showing the approximate location of the proposed abattoir; the second image shows the abattoir site and surroundings in more detail. The site is currently under consideration and should be reviewed with regard to suitability, areal coverage, topographic location, soil depth, etc, using the procedures provided in the prepared COEP for slaughterhouses (2010). If the site was found unsuitable for physical characteristic or social reasons, selection of a new site would be warranted. In that case, the requirement for site selection as is provided in the COEP for slaughterhouse development should be strictly followed.

While the slaughtering of animals result in hygienic meat supply, livestock waste spills can introduce enteric pathogens and excess nutrients that can runoff into surface waters or leach into groundwater resources, potentially causing contamination of ground water resources (Meadows, 1995). These potential leachates from abattoir facilities might consist of solids, microbial organisms and in special situations chemicals. Such leachates can significantly pollute water resources in shallow wells like hand-dug wells and shallow aquifers.

Abattoir operations characteristically produce a highly organic waste with relatively high levels of suspended solid, liquid and fat. Although most of the meat and many of the internal organs would be consumed in Samoa and would not add to the abattoir waste, the solid wastes would still exist that include condemned meat, undigested ingesta, bones, horns, hairs and aborted fetuses. The liquid waste is usually composed of dissolved solids, blood, gut contents, urine and water. To ensure that abattoir operations does not cause any significant soil, air, or water contamination, a series of mitigation and monitoring activities are proposed. The potential environmental and social impacts include:

- air pollution such as odor, noise, ozone depletion, contamination;
- soil degradation such as solid and liquid waste; and

- water pollution such as effluent and liquid waste, solid waste.

Since construction of abattoir can potentially impact the neighboring communities due to foul odor, air and water pollution, it is essential to include early and regular consultation with neighboring households, communities, and authorities as a mandatory requirement of abattoir construction at currently selected site in an effort to share information on the project (including objectives, scope, potential impacts, timeline, etc.) and to share mitigation measures that have been put in place. These consultations should also include an opportunity for neighboring households, communities, and authorities to express their concerns and to receive responses to their concerns.

To minimize potential impact of the abattoir activities on social and natural environment, every effort should be made to reduce potential contamination of water resources by avoiding discharge of untreated wastewater and solids into neighboring drainage-ways. The abattoir, as part of its engineering design, should include a waste management facility to treat the liquid waste and allowing adequate retention time to reduce pathogen count to acceptable levels as is proposed by WHO (1971, 1995). The sizing of the liquid waste management facility should be adequate to allow for the high intensity rainfall or, preferably, the pond should be covered to prevent rainwater to enter the pond. Since the actual design of the abattoir, its capacity, and exact location within the 50 acre allocated land has not yet been finalized, the actual sizing of the waste management facilities for solid and liquid waste treatment, their location, and types cannot be provided at this point. However, it is important to emphasize that a final EIA report for the abattoir, using the provided template in this report should be completed with appropriately sized and designed waste treatment facility including the composting of slaughter waste for use as organic fertilizer, and subproject specific environmental and social management and monitoring plan, including the location of soil, air and water sampling for proposed environmental monitoring activities.

Some potential means to mitigate the environmental and social impacts of abattoir and minimize its effects on social and natural environment include:

- Use of effluent for production of alternative energy sources and configurations (biogas);
- Further processing of waste for commercial purposes (liquid/solid organic fertilizer, bone meal);
- Minimization strategies such as use of plant, technology and proper equipment design, systems review, process and work flow redesign; and
- Recycling, reuse and recovery of liquid and solid waste.

The environmental management plan might include:

- Consultation requirements with neighbouring communities and authorities;
- Use of qualitative assessment techniques;
- Development of sampling and measurement schedules, methods and requirements for routine monitoring of liquid and solid waste status; and
- Inclusion of sustainability targets in the operation process.

The different options to consider for waste water disposal include among others:

- Biological treatments of effluents;
- Disposal to surface waters after full treatment in aerobic or anaerobic ponds;
- Land disposal after treatment on aerobic or anaerobic ponds to remove pathogens as fertilizer/irrigation water;

Primary and secondary treatment process within the abattoir facilities such as decentralized wastewater treatment systems (DEWATS) and sanitation methodologies developed by BORDA[1];

- Screening, flotation, and evaporation of effluents;
- Sewer disposal; and
- Waste water recycling.

One of the major nuisances of abattoirs is the odour problems. To minimize odour that can have significant impact on people who live down wind of the facility include:

- Dry cleaning of carcass before wash down
- Improved manual plug change over for blood pit plug
- improved screening/filters in treatment plans, floor drains screens
- Use f aerobic/anaerobic ponds, purification and filtering; and
- Primary screening.

Air pollution due to abattoir operation might include:

- Noise due to on site operations, transport of animals, etc);
- Odours related to the production and transport cattle; and
- Vapours, gases (including greenhouse gases) and solids fallout.

Abattoir odours can be treated physically, biologically or chemically. The treatment might include:

- Use of activated carbon;
- Use of biofilters, bioscrubbers, etc;
- Chemical oxidation (wet chemical scrubbing or ozonisation);
- Dispersion of odour, using such installations as extraction hoods and dispersion stacks; and
- Thermal oxidation (incineration).

Solid waste produced due to abattoir operation might include:

- Animal waste including non-commercial value hides and manure;
- Meat and meat products such as fat, bone, and flesh;
- Packaging materials including cardboard cartons, paper/plastic liners, etc;
- Refuse from non processing operations such as workers' canteen, offices, other facilities;
- Processing by-products, rendering and further processing of wastes including fat, meat and meat product trimmings, rejects and returns, unused animal parts, stomach manure, etc; and
- Solids suspended in effluent.

Some possible methods that can be used to manage solid wastes from abattoirs might include:

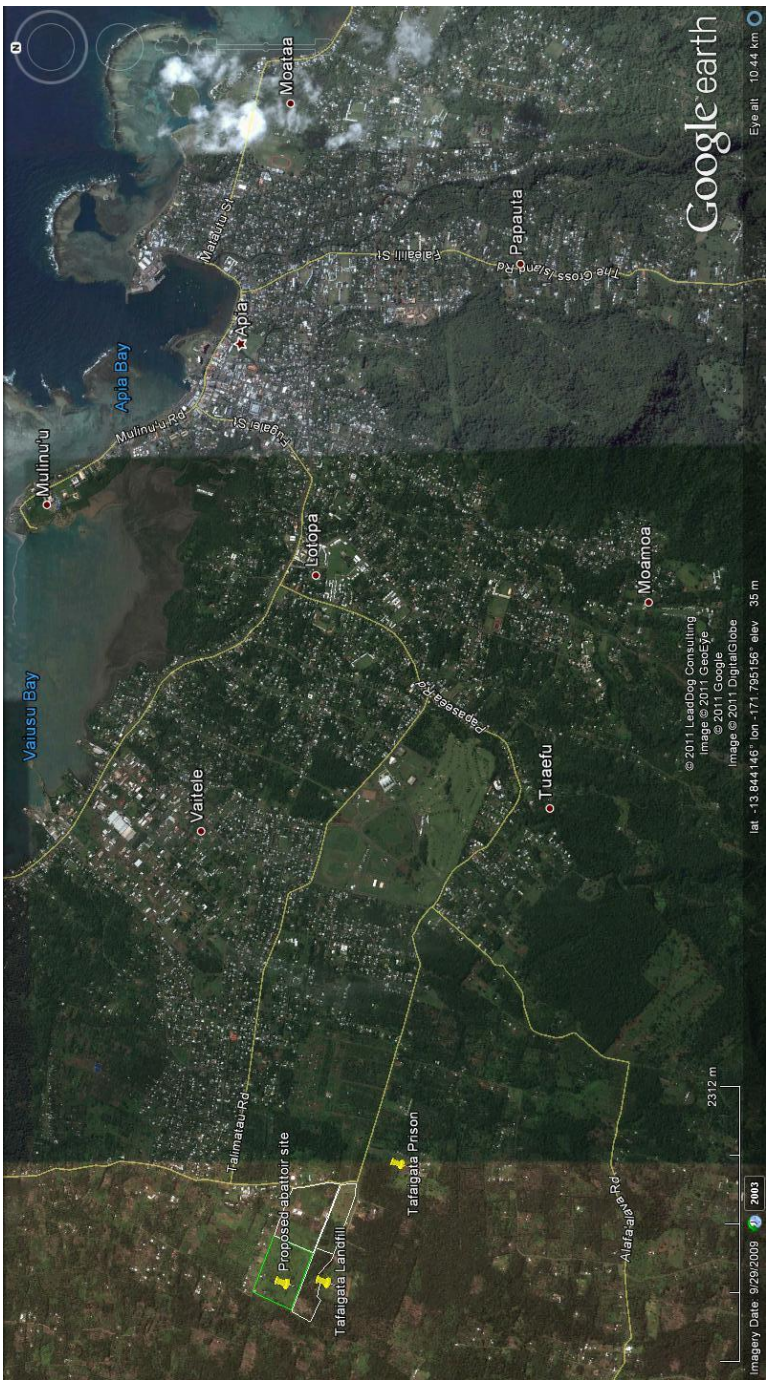
- Composting of the solid manure;
- Filtration, treatment of effluents in settling ponds;
- Incineration, potentially using coconut husk; and

[1] BORDA: Bremen Overseas Research and Development Association

- Burying of the solid waste in appropriately designed landfills.

Recently, the EU is assisting the waste management division of MNREM to construct two settling ponds for aerobic digestion of solid and liquid waste in the waste management facility located at Tafaigata . It is advisable to seek the possibility of using such facilities, especially for treatment of large solids such as animal head, feet, etc) to minimize the need for additional treatment plans within the abattoir sites. It is highly recommended that MAF carefully study the capacity of the facilities that are currently being constructed at waste management site and the economics of using those facilities instead of developing similar installation on site.

Figure 5.1: Satellite map of Apia, presenting the approximate location of abattoir



6 Reporting and Responsibilities in ESMF

6.1 Objectives of the ESMF

This chapter provides a format for the reporting systems and responsibilities of the PCG in implementing the ESMF including the details of issues that would be addressed by the ESMF, and the specific next steps to be taken. It elaborates on the various elements of the ESMF including:

- Flowchart for reporting and advice;
- Screening checklist for investment subprojects under *the Matching Grant Program*;
- Annual report forms for ESMO and the Environmental and Social Coordinators (trained agricultural extension officers);
- Explicit descriptions of roles, accompanied by terms of reference.

6.2 Reporting and Responsibilities in ESMF at Different Levels

SACEP would be coordinated through a newly established Project Coordination Group (PCG) staffed by MAF officers. An Environmental and Social Management Officer (ESMO) at a principal level would be appointed and join the PCG to oversee the activities identified in ESMF and requirements of other environmental and social reports prepared for SACEP project. The field monitoring and preparation/implementation of subproject preliminary EIA, EMP and PMP, as needed, would be the responsibility of the extension staff of MAF, who would be trained on preparation and implementation of subproject specific checklist templates presented in Annex 1 and other environmental and social issues and requirements of the project.

Figure 6.1 illustrates the environmental and social inputs and how they would be mainstreamed into the project; while Figure 6.2 sets out lines of reporting and advice in the system proposed here. It is proposed that this system should be merged with the mainstream project reporting system to be used for each of the project components.

Figure 6.1: Mainstreaming Environmental and Social Concerns into the Project Cycle

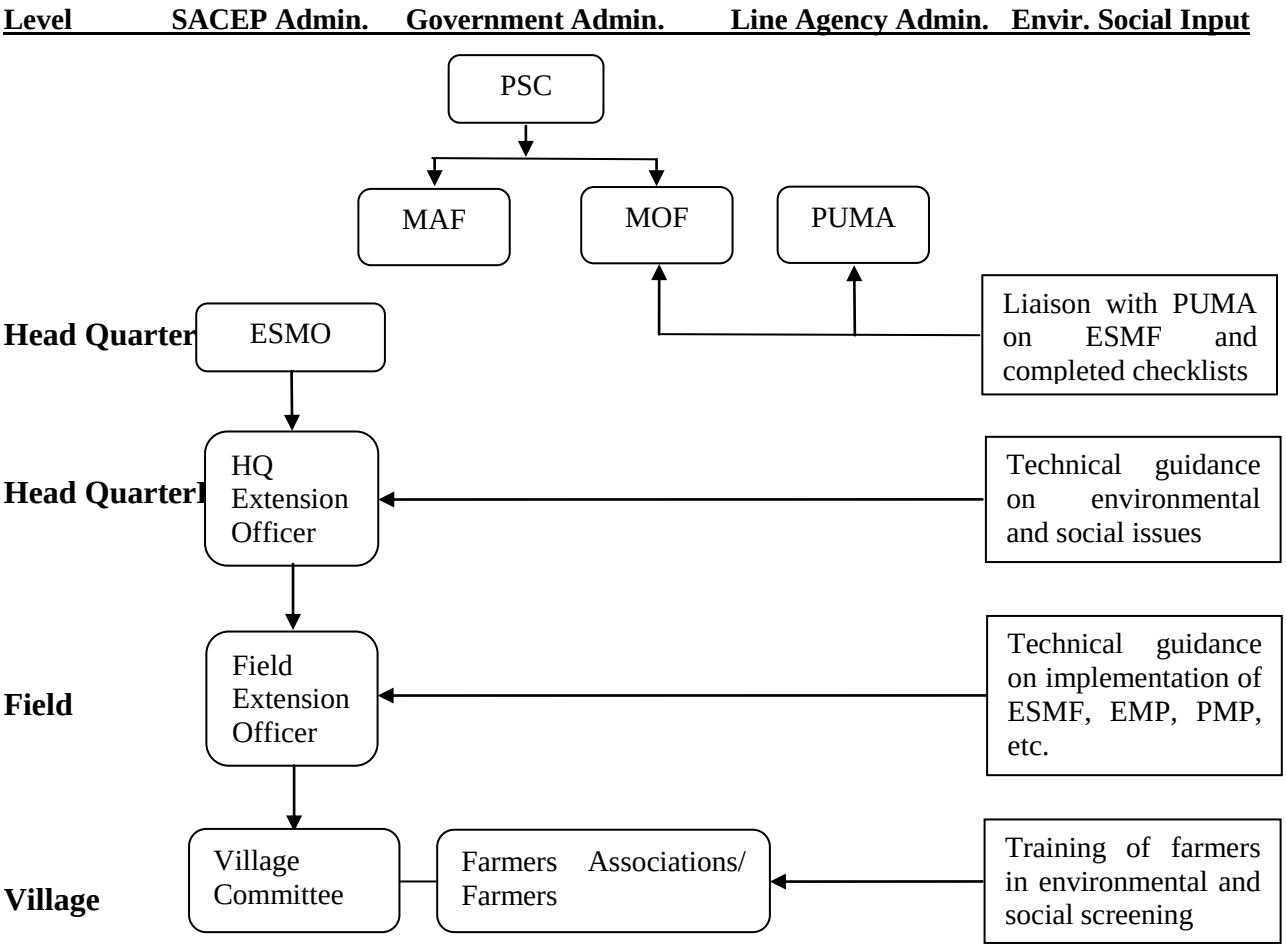
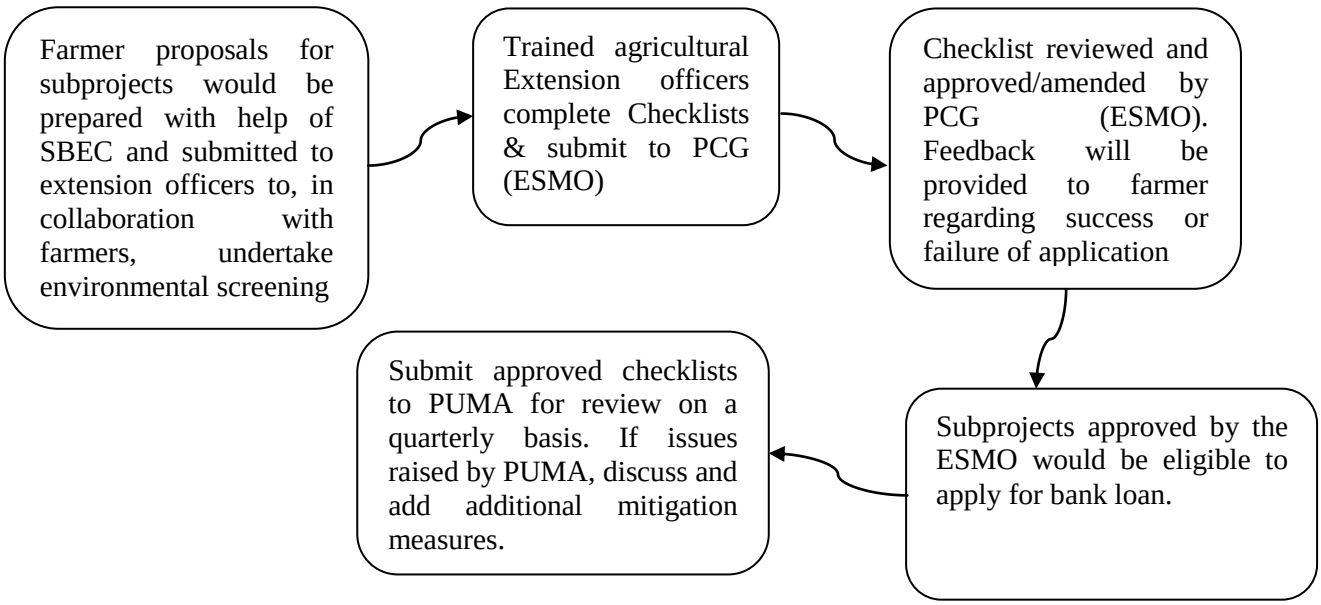


Figure 6.2: Line of Reporting and Advice with Regard to ESMF activities



6.3 Key Issues and Actions within the ESMF

Focal points for managing the implementation of the ESMF including application of the screening and review tools, and the training program are identified in *Table 6.1*; and the Sections 6.3.1 to 6.3.3 below provide terms of reference for the various focal points.

In summary, the main measures to address these issues are:

- At headquarters, an *Environmental and Social Management Officer (ESMO)* would be appointed within the PCG with a specific responsibility for addressing environmental and social issues, in line with the World Bank's safeguard policies and PUMA environmental Act requirements.
- At field level, the project would train the MAF agricultural and livestock extension officers in the basics of environmental and social impact assessment and implementation of activities proposed in ESMF, as well completion of provided checklists and environmental and social monitoring during project operation. They would receive full assistance from the ESMO, who would provide technical backstopping on all aspects of environmental and social mitigation, in line with the ESMF.
- The trained agricultural extension officers would also be responsible to support villages and farmers groups who would be involved in the project activities in planning, screening and implementing environmental and social review of subprojects. They would provide vital support to village committees and nucleus farmer groups to ensure all ESMF related activities and proposed mitigation measures are implemented. However, the ultimate responsibility of completing the screening checklist would be the responsibility of the trained agricultural and livestock extension officers.
- An environmental and social audit would be carried out by independent environmental and social auditor to be submitted to the PCG every other year.

Examples of terms of reference for the proposed environmental and social screening specialists are provided as Annex 7 to this report.

6.4 Screening Process for Subprojects

Since the subprojects supported by SACEP are small and because rural people would be the drivers of the projects, the process of environmental and social screening must be simple and informative. The process would consist of the following steps:

Step 1: Preparation of environmental profiles

The preparation of an environmental profile (EP) of subprojects is an important phase in subproject planning in general and in the environmental and social screening of subprojects in particular. An EP is a description of the socio-economic, physical and environmental and social characteristics of the subproject area. The information would be collected as a part of the subproject checklist preparation and does not require any additional data collection. The EP describes the subproject area's development environment situation and relationships, recognizing the relationship among resources, resource users, institutions, socio-economic and cultural setting. The preparation of an EP should be as participatory as possible, drawing on the knowledge of and using the knowledge of local farmers and project proponent. If necessary, transect walk by the trained extension officer, accompanied by local farmers is a great tool to be used for preparation of EP.

Step 2: Assigning category to a subproject

After basic information is collected, subprojects should normally be screened and categorized according to their likely environmental and social impact. Screening serves two purposes:

- To determine which projects, of all those proposed at the identification phase of the project cycle of SACEP, need further environmental and social consideration, and to eliminate those likely to have harmful environmental and social impacts; and
- To indicate the level of environmental and social appraisal that a project would require.

In brief, the SACEP process with regard to environmental and social screening is as follows. The agricultural extension officer, trained in environmental and social requirement and use of the provided checklists (Annex 2) would assist farmers to fill the relevant environmental and social checklist(s).

Category B projects are those with less adverse potential environmental impacts on human populations or environmentally important areas, including wetlands, forests, grasslands, and other natural habitats. These impacts are normally site-specific; few if any of them are irreversible, and in most cases simple mitigatory measures can be designed to minimize the negative impacts and maximize the positives. The provided checklists would be used to determine the project's potential negative and positive environmental impacts, compare~~s~~ them with those of feasible alternatives (including the "without project" option), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. Provisions for treatment of agricultural chemicals, particularly pesticides, would be included in the subproject-specific PMP based on IPM approach that is presented in the IPMP annex to this report.

Category C projects are those which are likely to have minimal or no adverse environmental impacts such as training activities or environmental improvement projects. Beyond screening, no further EA action is required for a Category C project. However, currently PUMA does not have any exclusion list and all projects should go through preliminary or comprehensive EIA. As such, even if SACEP was going to finance a sub-project that falls in the Bank's Category C , it would still need to obtain environmental clearance from PUMA.

Subprojects which are likely to result in a significant conversion of natural habitats, forest resources, the destruction of cultural property, and or subprojects that might require changes in access to land or changes in ownership and use of land and property that might be detrimental to the society would fall in project's exclusion list and would not be financed by the project. When a proposed subproject is classified as category B, the relevant environmental and social sample checklists, provided in this report, should be used for preparation of preliminary EIA/EMP reports, if needed.

6.4.1 Application of screening forms at farmer group level subprojects

Following identification of subprojects by village communities, farmers associations or individual farmers and submission of application for funding, with the assistance of the PCG, the proposed subproject would be checked against a simple screening checklist provided in this report as Annex 2.

The PCG and trained agricultural extension staff should work with the applicants and jointly complete the relevant screening checklists. However, the ultimate responsibility for the form to be appropriately completed and submitted for approval is the responsibility of the trained extension officers.

The ESMO would be responsible to review and approve/reject project applicants based on environmental and social feasibility of subprojects. He/she is also responsible for liaison with PUMA to ensure that decisions made are in line with PUMA environmental requirements. During project implementation, he/she, assisted by the trained agricultural extension staff, would be responsible to follow up and ensure that mitigation measures proposed and agreed in the screening checklists are implemented.

6.5 Annual Reporting Format

A format should be developed by ESMO for annual progress report on effectiveness of ESMF. The annual report should provide:

- A means of communication not only within the PCG, but also between the PCG and PUMA/World bank;
- A paper trail of experience and issues in relation to environmental and social impacts of the project as it runs from year to year throughout the project life;
- Information on weakness of screening checklists and necessary information to improve the provided checklists; and
- Practical information from which the agricultural extension officers trained in environmental and social impact management and monitoring and the independent consultant used to carry out the performance audit can draw on.

6.6 Monitoring and Evaluation

The key environmental and social issues to be monitored in SACEP include water quality, biodiversity indicators, fruit and vegetable and livestock production, marketing, and income generation. The goals of monitoring are to measure the success rate of the project, determine whether proposed mitigation measures and interventions have dealt with negative impacts, whether further interventions are needed or monitoring is to be extended in some areas. Monitoring indicators would be very much dependent on the specific project context. Monitoring and surveillance of SACEP subprojects would take place on a "spot check" basis at it would be impossible to monitor all the subprojects to be financed under the project. It is not recommended to collect large amounts of data, but rather to base monitoring on observations by project technicians and stakeholders to determine the trends in indicators.

Environmental and social monitoring and evaluation (M&E) would be mainstreamed in the monitoring and evaluation system of the whole project. As for the whole project, it would take place at several levels and be the responsibility of local MAF staff. To allow for a participatory monitoring of the project, trained agricultural extension officers would be in charge of M&E at the local level in cooperation with the ESMO in relation to the environmental and social mitigation issues and with the support of PUMA officers and the consultant to be contracted to undertake the biennual performance review. The environmental and social data would be imported into the main project M&E system. It would also be important to include the village community, farmer association and/or nucleus farmer groups, as relevant, in the M&E process and ensure that results and issues are reported back to them in a timely manner.

Ideally, monitoring and evaluation reporting should occur on a monthly basis and be the primary responsibility of the trained agricultural extension officers. The ESMO should ensure that these monthly reports be made available to the consultant responsible for annual environmental and social audit for evaluation and inclusion in the annual performance review.

6.6.1 Monitoring of implementation of mitigation measures identified in EMP

The following are indicators that are proposed for monitoring of the implementation of mitigation plans.

Environmental Indicators:

- Air quality - particulate pollution, noise pollution (proposed abattoir only);
- Water quality - chemical content, sediment load and bacterial counts (abattoir)
- Vegetation change

- Wildlife change

Social Indicators:

- Agriculture output and income of affected peoples
- Traffic safety (abattoir)
- Involvement of local authorities in project-related activities
- Employment of local people on site
- Population influx in the project area

Evaluation of Results: The evaluation of results of environmental and social mitigation can be carried out by comparing baseline data collected in the planning phases with targets and post-project situations.

7 Capacity Building and Training Requirements

Successful implementation of the SACEP partly depends partly on the effective implementation of the environmental and social management measures and subproject specific EIA, EMP, and PMP outlined in the ESMF. Training and capacity building is therefore necessary for the key stakeholders to ensure that they have the appropriate skills to implement the environmental and social requirement of the project. This section outlines the types of capacity building and training initiatives that must be implemented as part of SACEP, to ensure that the environmental and social management requirements outlined in the ESMF are fully implemented.

7.1 Proposed Environmental and Social Training and Sensitization Program

7.1.1 Training Objectives

The objectives of the environmental and social training program for MAF extension staff and ESMO is to enable the PCG and agricultural and livestock extension personnel at MAF responsible for implementation of EMP to strengthen their capability and to implement the mitigation and monitoring plans specified in EIA during final sub-project design, implementation and operation of the project. The trainees could also include environmental officers from MNREM's district offices and the government breeding farms in both Upolu and Savaii.

In order to ensure the success of the intensive training courses and the implementation of EMP, it is required that MAF staff who would be assigned as the environmental officers should have university degrees from accredited universities in one of the relevant natural resource areas (grassland management, water resources, agronomy, animal husbandry, etc.) and should have a minimum of three to five years of field experience..

The following courses would be included in the environmental and social training program in both Upolu and Savaii:

- Understanding and applying of laws, regulations, standards and norms of the Samoa government as stipulated in the 2007 Act concerning environmental protection;
- Understanding the requirements of newly introduced waste management Act (2010) and its relevance to SACEP project activities (Veterinary laboratory, animal waste management, composting, slaughterhouse facilities, etc);
- Environmental and social management criteria and environmental and social safeguard policies utilized by the World Bank; and
- Environmental technology and environmental monitoring techniques including: (1) status of surface waters, principles of groundwater distribution; (2) basic knowledge of

environmental and social monitoring; (3) basic understanding of identifying degree of grassland degradation and different types of grasslands; (4) Pollution control technologies; (5) basics of water sampling and sample treatment for analysis of different elements identified in EMP; and (6) preparation of reports on environmental and social monitoring.

The University of South Pacific (USP), and MNREM subject matter specialist should be asked to cooperate with the project environmental/social management TA specialist to provide this training. In order to reduce the training cost, Upolu and Savaii staffs to be included in training program have the option and could decide to arrange for combined training courses for the PCG and senior agricultural and livestock extension staff of respective islands. If the second option (combined option) is selected, the training program would somewhat be modified and take the "training of the trainers" format. The trained staff should then train the local farmers involved in project activities on the need for environmental stewardship and use their services in collecting environmental and social baseline data.

The training program should ensure all staff and farming communities have a good understanding of environmental laws and regulations and the methodologies to implement environmental and social monitoring activities stipulated in the EMP. The training program is envisaged to require some four months of international TA during the first two years of the project. In addition, local subject matter specialist from USP, SROS, and MNREM are potential candidate to be requested to provide training to the PCG and MAF extension staff in the areas of environmental and social impact assessment, soil and water sampling, pasture quality identification and improvement, environmental pollution prevention should be secured. It is envisaged that in average the services of some four local subject matter specialists, each for about two months would be required to prepare the training materials and present the training to the participants in the first two years of the project.

7.1.2 Awareness raising

The general objective of the awareness raising programs for implementation of the ESMF is to:

- Sensitize the various stakeholders on the linkages between environment and social impacts and agricultural productivity;
- Demonstrate the role of the various players in implementation and monitoring of the EMP;
- Sensitize representatives and leaders of Village Development Committees, community groups and farmer associations (who would in turn relay the message to their members) on the implementation and management of the mitigation measures; and on their roles in achieving environmental and social sustainability;
- Ensure that MAF field staff are able to supervise the implementation of their components in the EMP; and
- Strengthen local NGOs and extension teams to provide technical support to the farmers.

The stakeholders have different training needs for awareness, sensitization, and in-depth training as follows:

- Awareness-raising for participants who need to appreciate the significance or relevance of environmental and social issues;
- Sensitization for participants who need to be familiar with the EMP and PMP, and to monitor its implementation; and
- In-depth training for participants who would need to understand the potential adverse environmental and social impacts and who would at times supervise implementation of mitigation measures and report to relevant authorities.

The training would be at three levels i.e. national, field and village levels as outlined below.

National Level Awareness Raising

At national level the following were identified for short awareness-raising to enable them to appreciate the significance and relevance of the ESMF related activities to the success and sustainability of SACEP:

- ACEO for crops and principal officers (MAF);
- ACEO for livestock and principal officers (MAF);
- ACEO of PUMA and principal officers (to be involved in awareness raising);
- ACEOs at Ministry of Women Affairs and Social Development and principal officers;
- ACEO for Quarantine and principal officers (MAF);
- ACEO for Planning (MAF) and principal officers; and
- ACEO at Ministry of Health.

Field Level Training

Agriculture extension officers at MAF would be trained on preparation of mini-PMP, mini-EMP, and in filling the environmental and social checklists for different projects as well as the World bank operational policies and their relevance to the project activities and PUMA regulations in relation to environmental and social screening of agricultural development projects.

Community Level Training

At community level, in-depth training on the implementation of the EMP for the EIA, preparation of subproject specific checklists, and implementation of EMMP for the SACEP would be required for the Extension Workers in the Extension Planning Areas (EPAs), representatives of Village Development Committees (VDCs), farmer leaders, and NGOs working in the target areas**.**

The proposed areas of training for the above would be based on the topics outlined in Table 7.1 and the depth of training for each topic would be designed to suit the different levels.

Table 7.1: ESMF Related Training Areas for Stakeholders of the SACEP

Awareness raising training areas
Introduction to the SACEP Introduction to ESMF, EIA, and EMP for the SACEP Relevant Samoa environmental legislation and the World Bank Safeguards and compliance requirements
Environmental, social and economic impacts of SACEP SACEP and implications on land ownership and compensation
Gender, Nutrition and the SACEP Mitigation measures for the negative impacts of SACEP Implementation and monitoring of the EMP Roles of various sectors in components of the EMP
The Pesticides Act and Requirements of the World Bank Safeguard Policy OP 4.09 Pest Management Use, management and disposal of pesticides in relation to the Pesticides Act

Integrated Pest Management
Good environment and natural resources management practices
Case studies

7.2 Capacity Building

The current institutional capacity of MAF staff to implement most of the measures outlined in this ESMF is considered to be weak, particularly due to lack of staff in the natural resources, soils, and social sciences and inadequate resources to implement and monitor the envisaged environmental and social management requirements of project related activities.

The agriculture and livestock extension officers are the main MAF agents that relate directly with the farmers and, therefore, are best suited for successful implementation of the environmental and social management and monitoring activities and to provide assistance to project beneficiaries in preparing the relevant checklists and mini-EMPs and PMPs for subproject related activities. Therefore, it is important that these extension officers be trained and for MAF to recruit a qualified ESMO at the principal officer level. Currently, extension officers are trained at crop production and/or livestock improvement and veterinary services. Very few have training on integrated pest management or in the areas of natural resources management of specific importance to the project success, such as soil mapping, soil fertility management, and soil conservation. Environmental and social training is of direct relevance to the implementation of the EMP. Hence extension officers with this training would be appropriate for implementation of the EIA related activities, mitigation measures identified in EMP, and environmental and social monitoring activities.

From the public consultations, it was noted that the extension officers are more biased towards agricultural productivity with less attention given to integrated pest management or soil conservation, fertility management. This might lead to gaps in the implementation of soil conservation and land management activities. The extension group, therefore, needs to be conversant with soil and land conservation and management practices. This is more so because good soil and land conservation and management is a direct mitigation measure to a number of environmental and social impacts that are bound to arise from implementation of the SACEP such as irrigation and rock removal.

Although Samoa has the appropriate legislation and the Pesticides Control and Quarantine unit of MAF, through the Pesticide Registrar is trying to ensure all agrochemicals are registered and labeled in both English and Samoan, control and monitor importation and accumulation of obsolete pesticides, which can threaten human health and the environment is proving difficult. There is need therefore, to build and enhance the capacity of the pesticide control section to monitor pesticides imports and management.

8 Estimated Costs

The proposed cost estimates for the national level awareness, district sensitization and community level training would include transport costs, accommodation, venue and meals, per diems, stationery, production of training material and communication costs.

8.1 Proposed Budget for ESMF Related Activities

Table 8.1 presents cost estimates for salaries of PCG and extension staff at MAF at various levels in Upolu and Savaii for implementation of ESMF and related monitoring activities at USD 735,000. Table 8.2 presents estimated budget of USD 153,488 for the environmental and social training program for SACEP and Table 8.3 provide the estimated budget for environmental and social monitoring requirement of the project. Table 8.4 presents the overall environmental and social management requirements of the project. However, since the location of subprojects are not yet known, the exact cost, type, and location of monitoring

activities cannot be finalized at this point and should be determined by the ESMO as the location of subprojects are firmed. *If the incremental salary costs of involved MAF staff are not included in the total cost, the actual additional ESMF implementation cost would reduce by USD 640,000.*

Table 8.1 Salary Cost of Environment Management Staff and MAF extension staff involved in EMP activities

Personnel	ESMF Implementation (5 years)		Operation (M&E) (5 years)	
	Total m/m	Total Cost, USD	Total m/m	Total Cost, USD
ESMO[1,2]	12	95,000		
Extension staff (National)[2]	96	240,000	64	160,000
Extension staff (regional/district)[2]	72	144,000	48	96,000
Sub total	**479,000**		**256,000**	
Grand total	**735,000**			

Notes:

1. The ESMO is will be a fulltime principal officer level staff recruited for the PCG2. Estimated cost of national extension officer cost is averaged at USD 2500 Per month for 8 officers, and regional and district extension officer is averaged at 2000USD per month for estimated 6 officers involved in EMP).These are existing MAF staff.

Table 8.2 Cost for Environment Training/capacity building of SACEP

Training Plan	No. of Personnel	Training Contents	Time	Daily cost	DSA	Total cost
1. Classroom training		As per Environmental and Social Training Program	Days	USD	USD	USD
1.1 International	1		54	600	242	45,468
1.2 Local Trainers	4		40	160	50	33,600
1.3 PCG/MAF Personnel	15		40		50	30,000
1.4 Facilities & management			40	592		23680
Subtotal						132,748
2. Field/practical training		Field Trips				
2.1 International trainer	1		10	600	242	8420
2.2 Local Trainers	2		10	160	50	4,200
2.3 PCG/MAF Personnel	15		10		50	7500
Transport			10		62	620
Subtotal						20,740
Total						153,488

8.2 Monitoring Budget

Table 8.3 outlines the potential monitoring requirements of the SACEP. However, since the project is demand driven and none of the project sites have yet been identified and even the first subproject locations would not be known until the last quarter of Year 1, the scale of environmental and social management and monitoring requirements cannot be specified at

this stage. Two laboratories have been identified; the USP soils laboratory and SROS laboratories. They are both well capable of performing most of the required tests for the activities identified in livestock and F&V components (Components 1 and 2). The cost of type of analysis that might be needed, especially for such subproject activities as slaughterhouse and large scale (nucleus) piggery, are presented in Annex 5.

Table 8.3 Cost Estimation of Environment Monitoring of SACEP

Monitoring Phase	Monitoring Contents	Cost, USD
Pre-implementation (once)	Surface Water quality (only on major rivers within project influence, if any)	TBD*
	Groundwater Quality within areas with signs of groundwater shortage, if any	TBD
	Quality of natural grassland and variation of grazing capacity	TBD
	Sub-total	TBD
Implementation	Surface Water quality (only on major rivers within project influence)	TBD
	Groundwater quality (only within project areas with signs of water deficiency)	TBD
	Air and Acoustic Environment (if needed)	TBD
	Sub-total	TBD
Operation (once every year for 3 years after completion of implementation phase of each sub-project)	Quality of surface water	TBD
	Quality of groundwater	TBD
	Quality of natural grassland and variation of grazing capacity	TBD
	Microbiological analysis for abattoir (E Coli, total coliform, fecal coliform)	TBD
	Sub-total	TBD
Total		TBD

* Since subprojects have not yet been identified, the scale of environmental and social monitoring needs cannot be determined at this stage. The unit costs for performing the required tests at USP and SROS soil and water analysis laboratories are provided in Annex 5.

Table 8.4 Total cost estimation for Environment Management and Training

Item	Reference	Implementation	Operation	Subtotal*
		USD		
ESMO	Table 8.1	95,000	Costs included under implementation	95,000
Incremental staff cost	Table 8.1	384,000*	256,000*	640,000*
Training and capacity building	Table 8.2	153,488	-	153,488
EMP	Table 8.3	TBD	TBD	TBD
Sub-Total		632,488+EMP cost	256,000+EMP cost	888,488+EMP cost
Contingency, 10%				
Total				

* The figures presented are the assumed salaries of full-time employees (opportunity cost) of MAF extension staffs involved in EMP activities for the period that they should work on environmental and social issues.

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Annexes

Annex 1: Baseline Information for Samoa's natural and Social Environment

Table of Content

1 Introduction

The following chapter provides a summary of the environmental and socioeconomic baseline data as it relates to the SACEP objectives and target areas. A more detailed account of the relevant environmental and social baseline information is presented in the SIA and EIA that have been prepared separately.

1.1 Background Information

Samoa is an island country surrounded by the Pacific Ocean. It includes two major islands (Upolu and Savaii), two smaller inhabited islands (Apolima and Manono), and five uninhabited islands. The project areas would be concentrated in the two main islands, Upolu and Savaii. The total land area is 2935 km^2 with a population of some 180,000 people (2005 estimates).

The general demographic data available include:

- Population density is 61 persons per km^2 of total area or 63.7 persons per km^2 of inhabited area
- The annual demographic growth rate has been declining since 2001, indicating continued outflow of Samoans to overseas countries. This outflow has resulted in a loss of good people in the labor force, but a larger source of remittances from those overseas.
- There is only one ethnic group in Samoa (97% Polynesian) and more than 79% of the population are living in rural areas working either as farmers or are partially involved in farming activities.
- The population of Samoa is ethnically quite uniform and includes 97% Polynesian and 3% non-Polynesian.

2 Description of Project Islands

The SACEP would be implemented in both Upolu and Savaii islands. The general characteristics of project islands are presented below.

2.1 Population

In 2006[2] the total population of Samoa was 180,741 of which 97 percent were Samoan (Polynesian) and 3 percent non-Samoan, 52% being male and 48% female. The Samoan population is one indigenous group. The 2006 census indicates that 20 percent or 2,769 of households were female headed households.

The basic demographic data on the two islands, based on the MAF/MOF agricultural survey data (2005) are presented in Table 1. Total population of agriculturally active household population by age and sex group is presented in Table 2.

[2] Report of the Population and Housing Census 2006

Table 1: Key demographic data on population distribution in the two islands

Region	Age Group								
	All Age Groups			Under 15 Years			15 Years and Over		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total	198,598	102,078	96,520	80,021	41,627	38,394	118,577	60,452	58,126
Apia Urban Area	43,683	21,564	22,119	16,694	8,130	8,564	26,989	13,435	13,554
North West Upolu	60,563	31,408	29,154	24,151	12,612	11,540	36,412	18,796	17,615
Rest of Upolu	46,791	24,569	22,223	19,125	10,422	8,704	27,666	14,147	13,519
Savaii	47,561	24,537	23,024	20,051	10,464	9,587	27,511	14,073	13,437

Source: MAF/MOF Agriculture Survey (2005)

Table 2: Total population of agriculturally active households by age group, sex and region

Region	Age Group								
	All Age Groups			Under 15 Years			15 Years and Over		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Samoa	157,909	82,036	75,873	64,347	33,860	30,487	93,561	48,175	45,386
Apia Urban Area	19,676	9,836	9,840	7,402	3,573	3,829	12,274	6,263	6,010
North West Upolu	47,014	24,578	22,436	18,849	9,882	8,967	28,166	14,697	13,469
Rest of Upolu	44,981	23,685	21,296	18,510	10,144	8,366	26,471	13,542	12,930
Savaii	46,237	23,936	22,301	19,586	10,262	9,324	26,652	13,674	12,977

Source: MAF/MOF Agriculture Survey (2005)

2.2 Education

Only 2 percent of the population had never been to school. The majority had achieved education at secondary level, 55 percent, and 11 percent tertiary level. A goal of the Millennium Development Project for Samoa is to achieve universal primary education in the country by 2015.

2.3 Poverty

Concerning the basic needs poverty line, the 2008 Household Income and Expenditure Survey (HIES) indicated 20.1% that shows an increase of 1% from 19.1% in 2002. However the percentage for 2008 is thought not to reflect the economic downturn and that it should have been much higher.

2.4 Economic Activities

The economy of Samoa is primarily based on agriculture, traditional bush-fallow and mixed cropping techniques are used for the subsistence and/or cash crop farming.

2.5 Division of labor by gender

The main economic activities for persons 15 years and older in 2006 indicate that 32 percent of females were actively involved in economic activities and 65 percent mainly involved in non-economic activities. The reverse was the case for males with 68 percent being active and 35 percent not active. This pattern reflects the traditional Samoan household where men deal mostly with the heavier work outside the house such as farming, planting and fishing and income generating activities whereas women are more involved in lighter work and household work.

Table 3 shows interesting trends in the economically active population in the 2006 and 2001 censuses.

Table 3: Economically active population 2006 & 2001

	2006		**2001**	
Economically Active	**Total**	**%**	**Total**	**%**
Paid job	28179	51.6	24468	46.2
Subsistence for sale	1219	2.2	1831	3.5
Subsistence for family use	15652	28.6	23408	44.2
Subsistence for sale & family use	8878	16.2	612	1.2
Looking for work	707	1.3	2620	5.0
Total	**54,635**	**100**	**52,954**	**100**

Between 2001 and 2006 the percentage of people in paid work increased by 5 percent, and the percentage of those working for family use decreased by 15 percent. However the latter decrease was supplemented by the same percentage increase in people working for family use and to earn money. These changes were indicative of increased numbers working for money and the increase in job opportunities especially with the South Pacific Games in 2007 and infrastructure.

Paid work

Of those in paid work in 2006, 60 percent were female. It is of note that only 7 percent of females worked for family use and sale compared to 21 percent of males.

2.6 Agriculture Population

Agriculture households

The Agriculture Survey 2005[3] indicated that of the 23,964 households in Samoa, 17,962, or 75 percent, were agriculturally active households (that is, for home consumptions only, mainly for home consumption and for commercial use). Savaii was the most agriculturally active region with 96 percent agriculturally active and AUA the least with 69 percent agriculturally active.

Holdings

Households that were agriculturally active had a holding[4] with an average of 2 parcels per holding in each region except for Savaii with had an average of 3.

Major crops

The major crops consumed and sold by hhs are coconuts, cocoa, bananas, taro, taro palagi and taamu.

Livestock and poultry

Concerning cattle, 16 percent of households had cows, 10 percent heifers, 9 percent bulls, 5 percent steers and 10 percent calves. These hhs raised a total of 49.000 cattle of which 12,300 were slaughtered mostly for fa'alavelave, 1,700 were sold live and just over half the total were reared in an 'enclosed own' system.

Concerning pigs, 51 of hhs had sows, 36, breeding boars, 28 gilts, 24 barrows and 48 piglets. They raised 258,000 pigs of which 88,700 were slaughtered mostly for fa'alavelave, 8,200 live pigs were sold, and just over half the total were reared 'free range'.

Concerning chickens, 69 percent of households (16,400hhs) reared 497,000 chickens of which 233,800 chickens slaughtered and used mostly for consumption, and 98 percent were reared by 'free range'.

2.7 Livestock Production

In Samoa, the family farms normally raise small livestock (pigs and/or chicken) that are normally either grazing freely or are tended by women and children. The cattle is normally tended by men and young male and are free grazing in fenced pastures. The estimated livestock numbers in the two islands as of 2005 agricultural survey are presented in Table 4.

Current livestock production is scattered throughout Samoan islands with Upolu having the highest concentration of livestock and poultry. Table 4 presents the livestock distribution by region as per the agricultural survey data (2005).

[3] 2005 Agriculture Survey, Ministry of Agriculture and Fisheries and Ministry of Finance, Government of Samoa. Note that the agricultural survey data is for 2005 whereas the population statistical data discussed above is for 2006.

[4] An agricultural holding is an economic unit of agricultural production under single management without regard to title, legal form or size. Single management may be by an individual or household, jointly by individuals or households by a clan, tribe or a juridical person such as a corporation, co-operative or government agency. The holding may consist of parcels not in the same locality provided they share the same production means such as labour, farm, buildings or machinery (2005 Agriculture Survey Ministry of Agriculture and fisheries and Ministry of Finance, Government of Samoa)

Table 4: Estimated number of livestock and poultry in different regions of Samoa.

Type of Livestock	REGION				
	Samoa	**Apia Urban Area**	**N.W. Upolu**	**Rest of Upolu**	**Savaii**
CATTLE					
Cows	16	1	2	7	6
Heifers	10	1	2	4	3
Bulls	9	1	1	4	3
Steers	5	0.5	0.5	2	2
Calves	10	1	1	4	4
PIG					
Sows	51	5	12	15	19
Breeding Boars	36	3	9	11	13
Gilts	28	2	6	9	11
Barrows	24	2	5	8	9
Piglets	48	4	12	15	17
CHICKEN	69	10	20	18	21

Source: MAF/MOF, Agriculture Survey (2005)

2.8 Agriculture Production

Agriculture production is varied and diversified. Approximately 60,000 ha or 21% of the total land area is under crops or grazing regimes. Cropping areas are closely aligned with the undulating coastal and alluvial soils close to village settlements. Pastoral and grazing areas are restricted to the steeper slopes where water supply is adequate. The cultivated land per capita is estimated at 0.65 ha, and the average farm size at about nine ha.

The national food demand rises by about 2.3 percent annually, largely because of population growth and changes in population structure. The main food crops are taro, banana, coconut, cocoa, fruit trees, vegetables and other root crops. The composition, stability and reliability of local food supplies have been negatively influenced by natural disasters like cyclones and the recent tsunami and the devastation of taro by Taro Leaf Blight (TLB) that seriously reduced taro production.

Local consumption and export of Taro has increased significantly over the last four years, which reflects the improvement of the blight resistant varieties and the increase in the availability of planting material. Taro would therefore continue to be the most important crop in Samoa not only because it is the staple crop but due to its high return to labor input.

The main crops grown in the two islands as per the statistical data collected by MAF and published by MOF in 2005 are provided in Table 5.

Table 5: Estimated single crop equivalent area by major crops and region in acres

Type of Crops Grown	Region				
	Total	**Apia Urban Area**	**N.W. Upolu**	**Rest of Upolu**	**Savaii**
Total	45,056	2,760	11,309	12,057	15,213
Cocoa Samoa	6,945	230	1,758	1,454	2,877
Cocoa Solomon	263	1	51	75	125
Taro	11,932	546	1,988	3,983	3,738
Ta'amu	6,142	187	1,648	1,331	2,631
Cassava	101	3	15	3	29
Kava	110	2	28	3	72
Banana	19,563	1,791	5,821	5,208	5,741

Source: MAF/MOF, Agriculture Survey (2005)

2.9 Potable water

According to available statistical data 80% of the population of the four regions has access to safe drinking water. There is still a large percentage of the population without metered water. For drinking water, 48 percent had drinking water from metered water, 36 percent used tap water, 8 percent used stored rainwater, 5 percent bought purified water and 2.5 percent used well or spring water. Many farm households, especially in Savaii are harvesting rooftop rainwater for drinking, using concrete and/or plastic tanks.

2.10 Access to credit

Lack of access to credit is a problem for both rural men and women, due to high interest rates and collateral requirements. The Development Bank of Samoa is using high interest rate of around 14% for agricultural and rural development loans that makes use of credit for agricultural development quite difficult. Some NGOs such as WIBDI have been involved in providing access to fund to local farmers by purchasing their certified organic produce at the farm gate and providing the needed cash to the farmers. However, such funds are available only after farmers are certified and have spent their own or borrowed capital to finance their farming activities.

2.11 Distribution of electricity in rural areas

Around 97% of total households have access to electricity with only a small percentage using benzene and kerosene for lighting.

Around 81 percent of households used firewood for cooking (often in combination with another source such as gas, kerosene or electricity).

3 Bio-Physical Environment

The Samoan islands are of volcanic origin dominated by olivine basaltic rocks. Most soils of the two larger Samoan islands are classified as belonging to the Inceptisols soil order as per Soil Taxonomy and Cambisols according to the Word Soil Resource classification system.

The area is generally mountainous and consists of relatively few areas of flat or undulating land suitable for agriculture or village settlements, mainly in the lowland areas. Settlements on both major inhabited islands of Upolu and Savaii are concentrated on the coastal plains and rolling slopes. The non-arable land area is estimated to account for approximately 43% of the total land area. A further 4% is unsuitable for cultivation due to lava flows, especially on Savaii.

3.1 Land Tenure

The Fa'a Samoa or Samoan way is the complicated set of social rules that define every aspect of life, including land tenure, in Samoa. Key elements of the fa's Samoa are the aiga, the matai, fa'alavelave, and traditional land tenure. The Samoan land tenure system is derived from the system of family organization. A village is divided into a number of extended family groups (aiga), each with its own elected heads of family (matai). The matai takes the pule (authority, responsibility, privilege) and mamalu (dignity, respect, honor) associated with the title that includes control over the family-land (Lockwood, 1971).

The productivity of each aiga is dependent on the capability, initiative, and motivation of the matai who has complete control and jurisdiction over the entire village. The fono is responsible for the socio-economic welfare of the village and instructs the untitled men (labor force) to carry out various activities. An additional position in the village is that of the pulenuu, an elected official, whose responsibility is to interact with the Government. In lieu of his services, the pulenuu is paid an honorarium by the government.

Holmes (1970) summarized the customary land tenure system in Samoa into five different categories:

- **Village House Lots:** Each village is divided into family household lots, with boundaries marked often by some natural features such as trees, rocks, etc. Breadfruit (*Artocarpus altitus*), coconuts (*Cocos nucifera* L.), papaya (*Carica papaya* L.), banana (*Musa* spp.), taro (*Colocasia esculenta* L. Schott), taamu (*Alocasia* sp.), and cocoa (*Theobroma cacao* L.) might be found on these lands.
- **Plantation Lots:** The plantation lots lie around the village. Cutomary lands average approximately 500 acres per village. It is normally from the plantation lots that the family produces the most of its food requirement.
- **Family Reserves:** Beyond the plantation lots and higher on the mountain slopes is the land associated with different families of the village. Only part of this land is cultivated at any one time (shifting cultivation) to prevent soil fertility exhaustion of the whole area.
- **Village Land:** The village land lies within the village boundaries, mostly stretching from the sea to the mountain ridge, but does not belong to individual families. On bush lands, individuals might be allowed to clear new areas for plantation purposes with the permission of village council.
- **District Land:** The district lands are claimed by the traditional district councils and have mostly political significance. These lands, located high on the mountains, are little used except for hunting or collection of forest products.

Out of the total land of Samoa, according to the 2005 agricultural survey (MOF, 2005), some 93.5% is owned by village under the traditional land tenure system. The rest are leased customary lands (0.4%), leased government land (2.4%), owned freehold land (3%), leased freehold land (04%), and other land tenure (0.3%). Renewable, 20 year long, leasing arrangement can be made on freehold and government land. Under the traditional social structure, customary lands cannot be sold. Previously there were no provisions for individual use and development of land, causing lack of security of tenure. In recent years, however, such customary land can be leased, if matai approves, and have been availed for leasing.

3.2 Geography and Geology

Samoa lies in the South Pacific Ocean within the 480 km long Samoan archipelago in a west north-west to east south-east orientation. Samoa is located between 13° 15' and 14° 5' South latitude and 171° 23' and 172° 48' West longitude. It is comprised of two large islands of Savaii (approximately 1,700 km^2) and Upolu (approximately 1115 km^2), two small inhabited islands of Manono and Apolima, and five smaller uninhabited islands. The total area of the two major islands is about 2820 km^2. It is part of the Samoan archipelago. The other smaller islands, being Tutuila, Ofu, Olosega, Ta'u, and Rose, are all part of American Samoa.

In Upolu, the main mountain ridge runs along the length of the island with mountains rising as high as 1,500 msal. Savaii ridge also lies along the length of island, but since the island is wider, there are several smaller mountain ranges that converge to the main ridge. The highest point in Savaii (and Samoa) is Mt. Silisili near the middle of the island with an approximate height of some 2,000 masl.

The Samoan islands are of recent volcanic origin, the oldest lavas on the islands are about one million years old (Tarling, 1962). The two main islands are composed almost entirely of basic volcanic rocks (olivine basalt), picrite basalt, and somewhat more acidic olivine dolerite.

3.3 Land Use Pattern

The existing agricultural land use pattern is either based on subsistence farming or plantation cropping and is generally confined to the lowland and foothill areas up to about 230 masl (Pak-Poy and Kneebone, 1981). In areas of gentle slope and higher population pressure such as North-west Upolu, agricultural development extends to elevations of as high as 300 masl. Most of the high intensity agricultural production lands are within the 75 masl and within the coastal lowland physiographic unit of both islands. The "typical" distribution of crops relative to elevation and slope in Upolu is summarized in Table 6.

Table 6: Cropping pattern (land use) in Samoa by physiographic position

Elevation (masl)	Crop Classification	Main crop types
0-30	Food crops	**Coconuts[5], food crops, pineapples, breadfruit, taro**, pasture &cattle
30-150	Cash & plantation crops	**Cocoa, coconut**, taro (main coconut plantations)
150-225		**Banana and cocoa plantations** (mainly banana plantations)
225-300	Selected root crops	**Ta'amu**, coconut, pasture and cattle, taro
>300	Primary and close canopy secondary forest	Sporadic pasture and cattle

Source: Fox and Cumberland, 1972.

ADB (1985) produced a land use pattern and the area under trees crops based on aerial photo interpretation that is presented in Table 7 that estimated the total area under tree crops in the two islands to be 77,211 ha.

[5] Crops that have shown in bold are the main crops within each unit divided by elevation and dominant slope.

Table 7: Major area of tree crops in Islands of Upolu and Savaii based on API

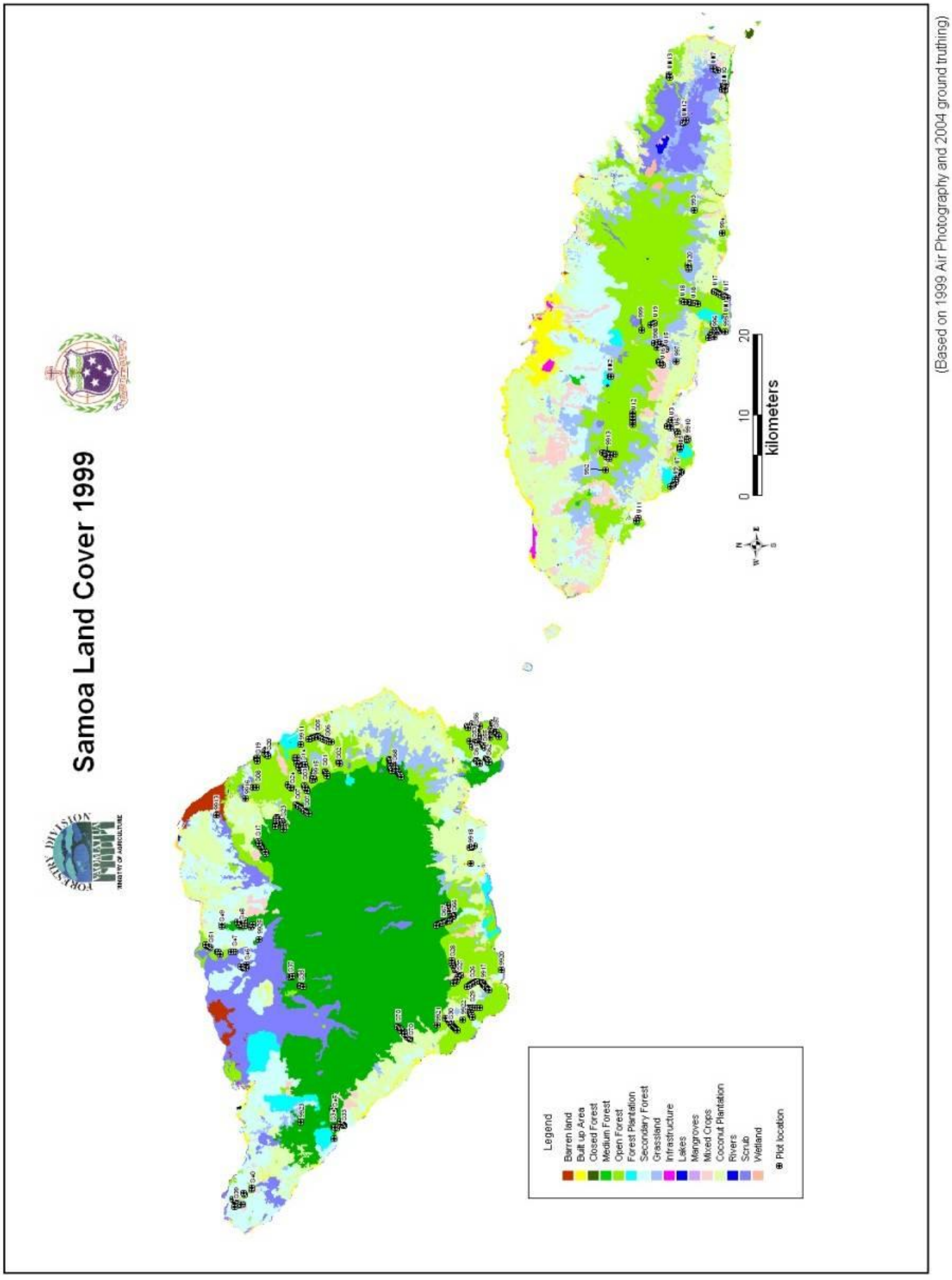
Island	Coconut	Coconut + Cocoa	Cocoa	Coconut + Cocoa + Banana	Coconut + Banana	Cocoa + Banana	Total
Upolu	21,190	11,324	3,496	3,598	3,617	2,152	45,377
Savaii	15,616	8,332	2,546	4,556	156	628	31,838
Total	36,806	19,656	6,042	8,154	3,773	2,780	77,211

Most recently FAO in cooperation with then MAFFM (2004) prepared an inventory of Samoa land cover with emphasis on forest types using the 1999 aerial photography and spatial analysis, using GIS based SamFRIS program. The results, although does not provide full distribution of land use due to concentrating on forestry inventory, is very useful in identifying major tree crops and forest types in all Samoan islands. Figures 1 presents the FAO/MAFFRA produced land cover map of Upolu and Savaii, respectively. Table 8 presents the major vegetation types in the two major islands.

Table 8: Major vegetation types in the two islands of Upolu and Savaii based on API and ground-truthing by FAO/MAFFM (2004)

Main Vegetation type	Savaii	Upolu	Grand Total	Percent of Samoa
Barren land (B)	1973.4	30.3	2004.7	0.71
Bush (BU)	1771.8	5291.4	7098.0	2.50
Medium Forest (FM)	72151.0	402.5	72563.0	25.53
Open Forest (FO)	22271.9	33049.4	55348.0	19.48
Primary Forest (FP)	3797.7	1304.9	5102.5	1.80
Secondary forest (FS)	19800.0	17296.0	37173.0	13.08
Grassland (G)	5193.0	12299.2	17494.0	6.16
Infrastructure (I)	31.8	431.7	463.5	0.16
Lakes (L)	16.1	202.7	218.8	0.08
Mangroves (M)	16.4	353.2	396.6	0.13
Mixed crops (MC)	2463.0	7706.3	10228.0	3.60
Coconut plantation (P)	26157.9	26770.2	53114.0	18.69
Rivers (R)	22.5	42.0	64.4	0.02
Scrubs (SC)	15065.6	7000.1	22115.0	7.78
Wetlands (WL)	147.8	597.4	745.1	0.26
Grand Total	170879.4	112776.9	284184	100

Figure 1: Land use map of Samoa



3.4 Physiographic Units

The main physiographic units identified in Samoa include low land and foothills where elevation is generally below 650 masl and the upland physiographic unit above 650 masl.

The sub units under the lowland and foothills physiographic unit include:

- Marine marsh physiographic unit with poorly drained soils and aquic moisture regime forming in estuaries and marine marshes;
- Beach areas and coastal margins physiographic unit with excessively well drained (beach sand units) to poorly drained (peaty or mottled loamy sand in low land physiographic areas);
- Valley floors and depressions with varying moisture characteristics from poorly drained units in peaty parent material in organic residues to well to excessively drained units formed in mafic alluvial material; and
- Hill country physiographic unit that can be divided to subunits with moderate dry season (less than 4 cumulative months of dry soil moisture regime) and units with no or weak dry season (less than 4 cumulative months with dry soil moisture characteristic). Each of the subunits can be further divided to (i) very slightly dissected landscape with somewhat to excessively drained soil units, (ii) slightly dissected landscape with well drained soils, (iii) moderately dissected with well drained soils, and strongly dissected landscapes with well drained soils.

  The subunits under the upland physiographic unit include:

- Upland swamps and depressions unit with poorly drained units formed in recent alluvium, colluviums, and organic residues with aquic moisture regime; and
- Soils of the upland hill country physiographic unit have a perudic soil moisture regime, indicating that the cumulative dry soil moisture is less than 4 months. They are further subdivided to (i) very slightly dissected landscape with moderately well drained to excessively well drained character, (ii) slightly dissected landscape with well to moderately well drained character, and (iii) moderately dissected landscape with moderately well drained to well drained character.

3.5 Soils

The Samoan islands are formed from basic volcanic rocks and their derived soils are rich in mafic minerals such as olivine basalt and andesite causing a variation in soil texture that ranges from sandy loam to clay loam. In the coastal areas sandy loam soils are dominant. Taxonimcally, soils of the two major islands are dominated by Inceptisols (Humitropepts and Dystrandepts), with smaller areas of Oxisols (Acroorthox and Umbriorthox), and Mollisols (Hapludolls).

The estimated water holding capacity is less than 120 mm per meter of soil depth. The main limiting factors of Samoan soils for crop production, based on limited data available in maps at the scale of 1:31,680 for Upolu and 1:100,000 for Samoa developed by Wright (1963) can be summarized as follows:

- Depth of soil that appears to be generally shallow that makes tree crops prone to wind damage;
- Stoniness and rockiness of the soil (approximately 75% of the area under tree crops) which results in high labor requirements and makes mechanization in most areas impossible; and
- The unstable nature of land on steep slopes particularly on the central upland and upland regions of both islands that can limit the cultivation of crops and removal of rocks that can significantly induce accelerated soil erosion in such areas.

In general the soil temperature regime, an indication of soil suitability for production of different crops changes at approximate elevation of 650 m from isohyperthermic (average soil temperature at 50 cm depth of >22^{o}C with an annual variation in soil temperature of less than 5^{o}C) in lowlands and foothills physiographic units to isothermic (average soil temperature at 50 cm depth of 15-22^{o}C with an annual variation in soil temperature of less than 5^{o}C) in upland physiographic unit.

3.6 Topography

The overall topography of the two major islands are classified into four general categories by Wright (1963). The topographic categories are assigned based on elevation and overall landscape position. The main categories include: (i) lowlands; (ii) foothills; (iii) uplands; and (iv) highlands. However, the topography is quite variable and landscape position is probably the best method of determining the effect of topography on soil and vegetation development and land use planning.

The original lava flows, indicated by most recent lava flows in the island of Savaii, have a rolling surface to a highly irregular surface with abrupt depressions and mounds. Steep hills and ridges are created by individual streams of lava, and steep slopes exist on the sides of cones. The overall slope of island varies from nearly level along the coastal areas (shoreline) to moderately sloping, following the slopes of the original lava flows. However, in some areas, geologic erosion has cut steep sloping valleys into the original slopes, creating some very steep backslopes or abrupt cliffs, and occasionally a nearly level valley floors. All these conditions have significant effect on soil formation, its depth and rockiness.

3.7 Climate

Samoa is characterized by a tropical rain-forest climate and is generally hot and wet. Mean lowland and upland temperatures range from 26 - 28°C and 20 - 22°C respectively. There is relatively little seasonal variation in both temperature and relative humidity. There is generally a decrease in average annual temperature from coastal areas toward the center of the islands (inland), mainly due to rise in elevation. Analysis of diurnal fluctuations at the Apia observatory by Kammer (1978) indicates that the mean maximum temperature occurs between 11:00 and 15:00 hours and the minimum around 05:00 hours. The mean daily temperature is highest during the dry season when cloud cover is lowest, highest temperatures occurring between January and April. The lowest temperatures occur during the winter months of July and August. Annual rainfall is about 3000 mm which exceeds significantly the annual evapotranspiration (ETo), which is estimated to be in the range of 1480 mm. 60 % of the precipitation occurs between November and March while the driest months are June – August. Annual variations in other parts of the islands show a similar pattern to that of Apia with mean annual temperature falling lower due to increase in elevation inland. Mean annual air temperatures ranges from 27.4^{o}C in coastal areas to less than 15^{o}C in the highest elevation of Savaii Island. The T_{max} and T_{min} officially recorded in Samoa are 35.3^{o}C recorded at Asau station on 24th December 1968, and 11.1^{o}C recorded at Afiamalu station in Savaii on 29th September 1971 (Saifaleupolu, 1986). Table 9 presents the climatic norms for the period of 1971 – 2000 for Apia based on the available data.

Southeasterly surface winds, better known as trade winds, blow more than 50% of the time during the year (Kammer, 1978). During the dry seasons of May to October, the south-east winds blow for more than 80% of the time. During the wet season, however, the wind direction is less consistent, but the south-easterlies still prevail for more than 30% of the time. The change in wind direction in Samoan islands is contributed to the migration of the South Pacific Convergence Zone (SPCZ).

Table 9: Climatic Norms 1971 – 2000, Station Apia (Meteorology Division data, Apia)

Norms	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Rainfall (mm)	489	389	352	211	193	121	121	113	154	224	262	358	2965
Pressure (bar)	1009	1010	1010	1011	1012	1013	1013	1013	10 13	1012	1011	1008	
Sunshine (h)	149	160	173	186	193	197	213	219	207	199	181	154	2230
Tmax °C	30	31	31	31	30	30	30	30	30	30	30	31	
Tmin °C	23.9	24.2	24.0	23.8	23.4	23.2	22.6	22.8	23.1	23.4	23.6	23.8	
Tmean °C	27.1	27.4	27.3	27.2	26.9	26.6	26.1	26.2	26.5	26.8	26.9	27.2	
ETmax °C	33.4	34.0	33.7	33.2	33.6	32.5	31.7	32.1	32.8	32.4	33.1	34.9	
Etmin °C	19.4	21.1	21.2	19.5	17.9	17.6	18.9	18.1	18.1	19.4	19.2	20.7	

Due to the favorable rainfall and temperature, all year-round crop cultivation is possible. However, there are (even in the wet season) long dry periods between rainfall events that can last up to 22 days. These dry spells emphasize the need for introduction of supplementary irrigation if crop intensification (two crops per year) is going to be promoted, especially for shallow rooted crops.

The reference crop evapotranspirartion (ETo) was calculated by FAO for Samoa (2004) by means of the modified Penman-Monthien formula using FAO Irrigation and Drainage Paper No 52 procedures. The necessary data were obtained by the consultant from the Meteorological Station in Apia, being the only station that measures wind speed and relative humidity in Samoa. However, since the mean temperature, wind speed and humidity fluctuate very little in the coastal and low-lying areas of Samoa where most suitable land for farming are located, it is believed that the calculated data for Apia, presented in Table 11, can also be used with adequate accuracy for other locations within agricultural areas.

Table 11: Values of ET_o for Apia (mm/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ETo mm/d	4.1	4.4	4.0	3.7	3.5	3.8	3.4	4.2	4.5	4.6	4.5	4.2	1483 (mm/y)

3.6 Vegetation Classification

Vegetation of the West Samoan islands is divided to five major units through the work of whistler (1980):

- Strand vegetation;
- Vegetation of the plains and lower montane region;
- Forest of the upper montane region, rainforest and fern forest;
- Ridge forest vegetation; and
- Vegetation of recent lava flows.

The natural vegetation, specific to these islands, consists of cloud forest and smaller amount of lava flow scrub and herbaceous vegetation of cinder and ash deposits, and montane meadows, especially in Savaii. Many species of animals and plants found are endemic to Savaii and occur only in the highlands (Whistler, 1978).

Considering the scarcity of published work on flora and fauna of Samoa, it is difficult to provide a classification system that can satisfy plant cover of the main regions or major fauna in each agro-ecological zone. Whistler (1980) prepared a plant community classification system, based on his extensive work in American Samoa and determined 16 climax communities under five main vegetation categories. According to Whistler, this classification system is also applicable to Samoa with more plant communities being present in Samoa due to its sheer size and variation in topography. The proposed vegetation classification is presented below:

- **Littoral Vegetation**
  - ✓ *Lepturus* rock strand
  - ✓ *Ipomoea* sand strand
  - ✓ *Littoral* shrubland
  - ✓ *Pandanus* littoral strand

- ✓ *Barringtonia* littoral forest

- **Wetland Vegetation**
  - ✓ Costal marsh
  - ✓ Mangrove forest
- **Rain Forest Vegetation**
  - ✓ "Au'auli" (*Diospyros* spp., *Syzygium* spp.) coastal forest
  - ✓ Asi (*Syzygium inophylloides*) ridge forest
  - ✓ Mamala (*Dysoxylum samoense*) lowland forest
  - ✓ Tava (*Poemtia pinnata*) lowland forest
  - ✓ Maota-mea (*Dysoxylum huntii*) montane forest
  - ✓ Fega-vao (*Syzygium samoense*) cloud forest
- **Scrubby Summit Vegetation**
  - ✓ Montane scrub
- **Disturbed Vegetation**
  - ✓ Managed land
  - ✓ Kula (*Dicranopeteris*) fernland
  - ✓ Disturbed forest
  - ✓ *Rhus* secondary forest

A relatively recent attempt by FAO and MAFFM (2004) to map the land cover, using API and groundtruthing has provided an inventory of major land uses related to forestry and forest cover. This mapping, produced based on 1999 aerial photography, although is not providing with a taxonomic classification or cataloguing of flora and fauna, provide a good visual representation of the forest cover and to a lesser extent agro forestry activities in the two main islands (Figure 1).

3.7 Biodiversity National Parks and nature Reserves

According to the newly prepared publication by CI, MNREM, and SCREP (2010), terrestrial fauna of Samoa include more than 2,500 species of insect, 770 species of native plants, 64 native land snails, 31 breeding birds, 14 reptiles and 3 native mammals. Marine diversity is also high with 890 coral reef fish, over 200 corals and several turtles, whales and dolphins. It is interesting to note that approximately 30% of Samoa's native biodiversity is endemic to Samoa and are not found anywhere else.

Samoa is a very rich country in biodiversity of flora and fauna. She has more native species of ferns and butterflies than New Zealand, a country 85 times bigger than Samoa!

Manumea or Tooth-billed Pigeon, the national bird of Samoa (endangered, *Didinculus strigirostris*) is now very rare and restricted to mature native forests. In total, 76 species from Samoa are included on the 2009 IUCN Redlist as threatened species include 52 corals, 11 marine fish, 7 birds, 2 turtles, 2 plants, a land snail and a mammal. Many more species are believed threatened but have not yet made it onto the IUCN Redlist, or are on the Redlist but not classified as threatened.

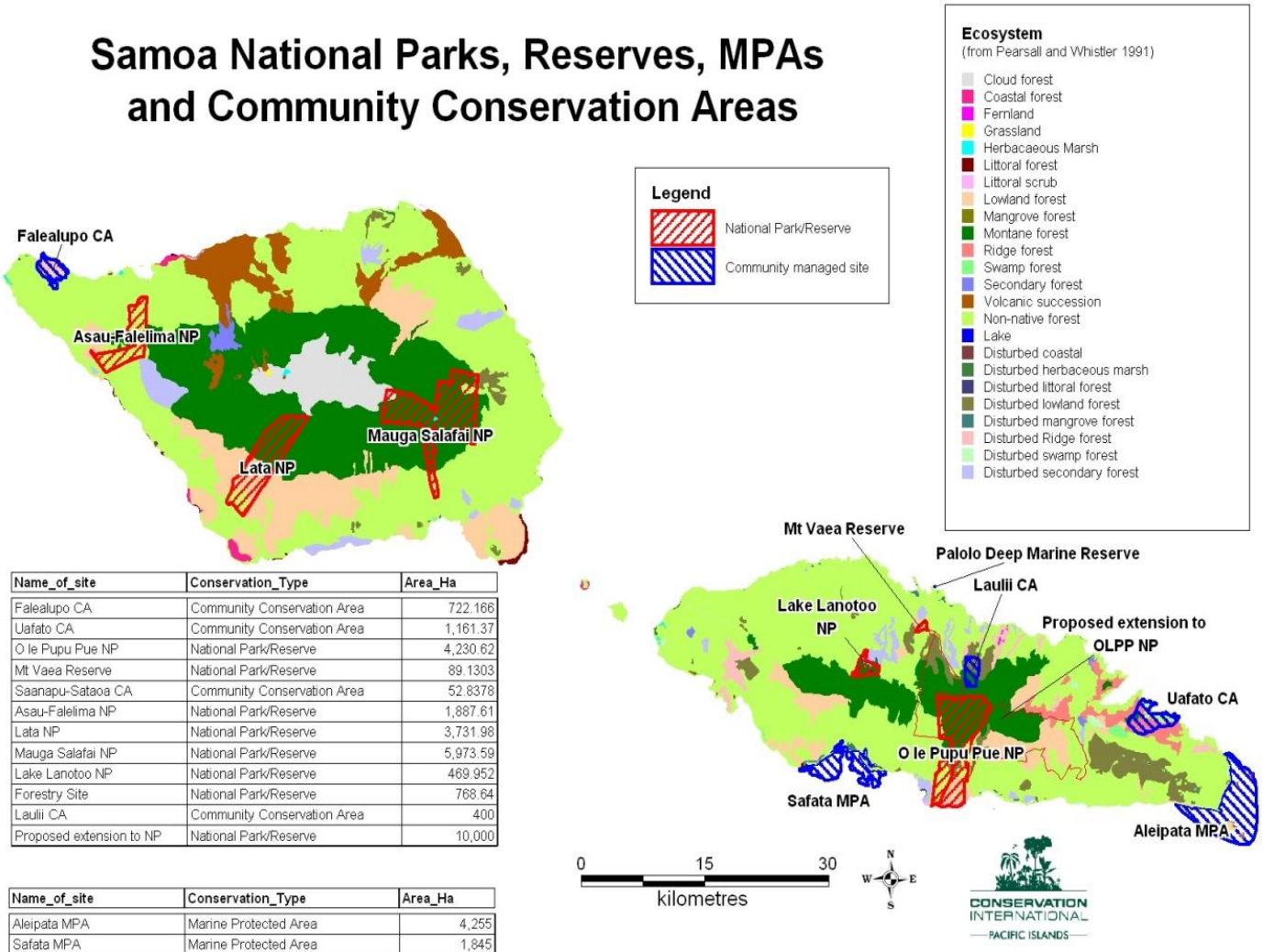
In 2003, the Conservation International–Pacific Islands Program initiated a process to identify data-driven conservation targets for the Polynesia-Micronesia region including Samoa. In total, six key biodiversity areas (KBAs) were identified in Samoa through this study. Later, in 2008, through a GEF funded project, CI in association with MNREM, SCREP identified another 8 terrestrial and 7 marine KBAs in Samoa.

Currently 11 terrestrial species present in Samoa are classified as threatened in the 2009 IUCN redlist. In addition to the mentioned 11 terrestrial species, an additional three species known to be threatened in Samoa were added as "trigger" species (species that trigger a KBA) including *ifilele* (Mollucan ironwood) and *taio* (Polynesian Storm Petrel) that are both classified as vulnerable, but are not recorded for Samoa on the IUCN Redlist, and *pea vao* (Samoan flying fox), recorded as near threatened on the Redlist that is actually highly threatened in Samoa.

The biggest threats to Samoa's biodiversity, as stated in the recent publication by CI/SCREP (2010) are habitat destruction due to agricultural development, housing and other development, the over-harvest of resources and the impact of invasive species of pests and weeds. It is important to ensure that project activities do not include areas identified as KBAs, national parks, nature reserves and their buffer zones.

The areas identified as nature reserve and national parks are demarcated by MNREM department of Forestry and the most recent map is presented in Figure 2.

Figure 2: Map of Upolu and Savaii showing the nature reserve and national parks (Source: Forestry Division, MNREM)



Name_of_site	Conservation_Type	Area_Ha
Falealupo CA	Community Conservation Area	722.166
Uafato CA	Community Conservation Area	1,161.37
O le Pupu Pue NP	National Park/Reserve	4,230.62
Mt Vaea Reserve	National Park/Reserve	89.1303
Saanapu-Sataoa CA	Community Conservation Area	52.8378
Asau-Falelima NP	National Park/Reserve	1,887.61
Lata NP	National Park/Reserve	3,731.98
Mauga Salafai NP	National Park/Reserve	5,973.59
Lake Lanotoo NP	National Park/Reserve	469.952
Forestry Site	National Park/Reserve	768.64
Laulii CA	Community Conservation Area	400
Proposed extension to NP	National Park/Reserve	10,000

Name_of_site	Conservation_Type	Area_Ha
Aleipata MPA	Marine Protected Area	4,255
Safata MPA	Marine Protected Area	1,845
Palolo Deep Marine Reserve	Marine Protected Area	22

Major conservation sites identified in Figure 4.2 are further explained in Table 12.

Table 12: List of Major Conservation/Nature reserve sites in Samoa

Name of Reserve	Conservation type	Area (ha)	Terrestrial
Aleipata MPA	Marine Protected Area	4,255.00	Marine
Assau-Falelima NP	National Park/Reserve	1,887.61	Terrestrial
Falealupo CA	Community Conservation area	722.17	Terrestrial
Forestry Site	National Park/Reserve	768.64	Terrestrial
Lake Lanotoo NP	National Park/Reserve	469.95	Terrestrial
Lata NP	National Park/Reserve	3,731.98	Terrestrial
Laulii CA	Community Conservation Area	400.00	Terrestrial
Mauga Salafai NP	National Park/Reserve	5,973.59	Terrestrial
Mt. Vaea Reserve	National Park/Reserve	89.13	Terrestrial
O le Pupu Pue NP	National Park/Reserve	4,230.62	Terrestrial
Proposed extension to NP	National Park/Reserve	10,000.00	Terrestrial
Saanapu-Sataoa CA	Community Conservation Area	52.84	Terrestrial
Safata MPA	Marine Protected Area	1,845.00	Marine
Uafato CA	Community Conservation Area	1,161.37	Terrestrial
Palolo Deep Marine Reserve	Marine Protected Area	22.00	Marine

3.8 Forests

More than 60% of the country is forested with primary forest covering 1.8% of the highland areas, especially in the island of Savaii. According to the 2004 forest survey data produced by FAO and MAFFRA indicated that 46.8% of Upolu and 69.1% of Savaii were covered by some type of forest cover.

The majority of rural population, at various levels, relies on forest products for food, medicine, firewood and construction materials. Samoa is blessed with a variety of tropical forests. Unfortunately, currently there are no government laws to prevent logging of primary native forests that can potentially impact the floral and indirectly faunal biodiversity in Samoa. Currently most of the primary forests in the higher elevations in both islands are protected from logging due to lack of access roads. Project activities should ensure that no access roads would be improved or expand into the areas close to the primary forest buffer zone.

(Forest types such as natural, gazette, National park/reserves, customary forests, plantation forests, etc.)

5 Livelihood – Environmental-Social Linkages

5.1 Logging

Logging operations among the villagers and clear cutting by internationals logging companies used to result in extensive deforestation exposing the soils to various agents of erosion. Since three years ago, commercial logging has been banned in Samoa and clear cutting has been stopped. However, cutting of

trees, even old forest stands by individual villagers for use or to convert the land to other uses is not regulated and is ongoing.

5.2 Soil Erosion

Currently due to presence of a good ground cover, soil erosion is not considered as a major source of concern in Samoa. However, if intensive agricultural and livestock production is promoted and land cover is reduced or removed, there would be a danger of increasing accelerated soil erosion, considering the volcanic nature of the land and high erodibility of most soils on steep slopes in the islands. Continuous/intensive cropping, rock removal, and irrigation can all lead to increase in accelerated soil erosion if appropriate soil conservation measures are not also included in agricultural production packages.

Annex 2: List of environmental and Social Screening Checklists for each Subproject

The following tables provide a series of recommended checklist to determine potential environmental and social impact of each subproject and their potential need for development of subproject specific mini-EMP, mini-PMP, and/or mini-WMP. ESMS and extension staffs should assist the applicants in completing the relevant checklists to ensure that proposed subprojects would not have significant negative environmental or social impacts.

The checklists are a simple yes/no checklist, resulting in whether specific advice to the community on environmental and social mitigation, environmental assessment (EA), mini-Waste Management Plans (Mini-WMP) and mini-Pest Management Plans (mini-PMP) are necessary. This decision is based on likely impacts. Trained extension officers are responsible to visit the sites and fill the appropriate checklists in presence and assistance of local farmers to ensure local knowledge is incorporated in the completion of the checklists. In certain cases where more complicated environmental social issues are raised, the trained extension officer should call upon EMS/SMS for specific technical advice. It is not anticipated that a full EIA would be warranted for any of the subprojects that can be included for financing by SACEP. Screening forms should be reviewed quarterly at PCG by the EMS/SMS to determine their usefulness and adequacy and can be modified to better reflect the actual environmental and social conditions of the subprojects.

There are several aspects to the rationale for the design of this checklist:

- Numerous subprojects would be financed by SACEP, while there are only one ESMS at PCG and a small number of trained agricultural extension officers at regional/district offices. Therefore a system that is streamlined is required, and as far as is feasible, communities must be responsible for completion of screening;
- In most cases, communities would have very little knowledge of environmental and social screening, hence, for the first years of their involvement in the program, PCG and extension staffs would be required to assist communities in using the screening forms;
- The screening prompts a list of yes/no answers in relation to questions on the location of the project and the anticipated impacts; if there are 'yes' answers to any of these questions, then the farmer, village development committee or farmer association is obliged to make sure that adequate mitigation measures are included in the project design and/or recommend a course of action (specific advice, EIA, RAP, mini-WMP and mini-PMP);
- This action can be for the community itself to manage or avoid impacts, extension staffs and ESMS should provide specific advice, or if necessary, technical advice to be sought from elsewhere:
- The forms would be reviewed at the quarterly PCG by the ESMS before financial assistance and subproject implementation can begin.

  In addition, the subproject application document (to which the completed screening checklist would be attached) should have a section on "Environmental and Social Concerns" wherein, if needed, design features to avoid negative impacts and capture benefits are described, and any "Yes" responses on the form are discussed and justified. The format should require those preparing applications to be very descriptive as to what they want to do, where, when and how. This would give the information needed to independently determine if the screening checklist has been properly completed.

Sample Screening Checklists for all Subprojects

Every subproject that is considered for financing by the SACEP project must go through the following environmental and social screening process to ensure no significant environmental or social impact is foreseen. The first screening checklist is applied to all subprojects since it would determine whether operational policies related to land resettlement would be triggered. Since the project is not supporting such subprojects, this screening checklist is introduced t o determine whether the subproject should be rejected. The rest of the screening checklists are subproject specific and determine the mitigation measures to minimize potential environmental impacts and assist in development of subproject specific EMPs.

Resettlement, Land Acquisition, and forest encroachment exclusion list

Sample Checklist Questions	Yes	No	Action
Would the sub-project require the involuntary acquisition of land, involuntary resettlement of people and/or the destruction of physical and/or economic assets?			If yes, project is excluded
Are there other users of the land on which the sub-project would be located?			If yes, get a signed agreement to the use of land for the purposes of the proposed sub-project. If not possible, relocate the subproject/find a new site otherwise subproject would be excluded.
Are women using the land on which the sub-project would be located for planting household crops and/or other activities?			If yes, relocate the subproject or find a new site, otherwise subproject would be excluded.
Is the site of the proposed sub-project under dispute?			If yes, resolve the dispute or exclude the project.
Is the site of the proposed sub-project on land owned or customarily understood/agreed to be used by the project proponent?			If yes, include description of the agreement with relevant signatures. If not, exclude.
Are there any cultural heritage sites, archaeological sites, or religious sites such as cemeteries, ceremonial grounds, etc at or in close vicinity of the project that could potentially be impacted by the proposed subproject activities?			If yes, project is excluded and new site should be selected.
Would the project result in clearing of forested areas with a canopy cover of more than 10%?			If yes, project is excluded and new site should be selected.

1. All answers to the checklist questions are "No". There is no need for further action.

Pesticides and Waste Management

Sample Checklist Questions	Yes	No	Action
Would the subproject result in the introduction of pesticides or an increase of pesticide use if use of such products currently exists?			Introduce IPMP
Would the subproject result in the production of solid or liquid waste (e.g. water, medical, domestic or construction waste), or result in an increase in waste production, during construction or operation?			Identify sites for proper disposal. Minimize waste production using 3R principle[6].
Would the subproject result in the production of large amount of solid and liquid organic waste that requires treatment before disposal or secondary use such as large intensive livestock production or abattoir facilities?			Prepare appropriate waste management system for solid/liquid manure as part of the subproject. Prepare and implement EMP.

Circle screening conclusion 1, or circle 2 and/or 3 below:

l. All answers to the checklist questions are "No", There is no need for further action.

2. Question 1 was answered "Yes" and a mini Pest Management Plan must be prepared.

3. Question 2 was answered "Yes" and a mini Waste Management Plan must be prepared.

SIGNATURE of Extension officer: DATE:

SIGNATURE of Applicant: DATE:

SIGNATURE of Village Council member: DATE:

[6] The 3R principle promotes “reducing” the waste production, “reusing” the waste and “recycling” the waste, if possible.

Sample checklist to increase fruits and vegetables production subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigations
Location				
	Are there environmentally sensitive areas (Pristine, primary forests, major rivers, wetlands) or threatened species that could be affected by the project?			Relocate the subproject. Current location unacceptable. Otherwise subproject would be excluded.
	Does the subproject area occur close to any protected areas designated by government (national park, forest reserve, world heritage site, etc.)?			Ensure project activities do not encroach into protected areas. Use BMP to minimize potential impacts.
	Is the project in an area where people access to the pasture, water, public services or other resources that they depend on?			Relocate the subproject or make provisions for access corridor.
	Does the project alters any cultural heritage sites, encounter chance find of such sites, or require construction work near such a site?			Relocate the subproject or use chance finds procedures[7].
Impacts	Would the subproject be likely to:			
	Lead to soil degradation or erosion in the area, say due to rock removal or tillage practices?			Implement measures proposed in Table 5.2 of ESMF.
	Lead to application of organic manure?			Use BMP, Prevent over application beyond soil carrying capacity.
	Require significantly increased use of water?			Use drip irrigation. Enforce irrigation scheduling.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Require use of new or unfamiliar agricultural chemicals?			Use IPMP.
	Lead to acidification of soils?			Use lime, use non-

[7] Chance find procedure is a procedure that outlines what will happen if previously unknown physical resources are encountered during project construction or operation. The procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to the finds. It is a process that prevents chance finds from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements of finding archaeological sites is implemented. Chance find procedures are presented as Appendix 1 to this Annex.

				acidifying fertilizers.
	Would the project have adverse impacts on natural habitats that would not have acceptable mitigation measures?			Relocate the subproject or exclude the subproject.
	Lead to contamination/pollution of surface and/or groundwater?			Use split application method for fertilizer application and BMP principles.
	Would the project increase women's and/or youth employment in agriculture?			If no, explore women's increased engagement through consultation with women's committee and/or church group and/or civil society organization such as WIBDI
	Would the project increase women and/or youth access to improved farming practices?			If no, explore women's increased engagement through consultation with women's committee and/or church group and/or civil society organization such as WIBDI
	Introduction of new pests?			Use IPMP. Strengthen quarantine measures.
Alternatives				
	Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts?			Use the alternative approach/site.
General mitigation measures				
Use Soil testing to improve fertilizer recommendation rate and timing.				
Ensure public awareness and trainings in IPM approaches are provided.				
Ensure soil, water and pests are being monitored.				
Ensure IPM approaches are being adopted.				
Ensure crop protection group develops/implement subproject-specific IPMP.				
Ensure agro-chemical-related hazards being addressed by agricultural extension.				
Ensure PMPs based on IPM approaches are in place.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for production of non-traditional crops subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Location				
	Are there environmentally sensitive areas (significant forests, rivers, or wetlands) or threatened species that could be affected by the project?			Relocate the subproject. Minimize impact.
	Does the subproject area occurs within or adjacent to any protected areas designated by government (national park, forest reserve, world heritage site, etc.)?			Prevent encroachment. Fence animals.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Might the project alter any historical, archaeological or cultural heritage site (chance find)?			Relocate the subproject or use chance find procedures.
Impacts	Would the subproject be likely to:			
	Entail reduce access to or use of land by present landholders and/or users?			Provide access routes/corridors. If not possible, relocate the site.
	Would the project increase women's and/or youth employment in agriculture?			If no, explore women's increased engagement through consultation with women's committee and/or church group and/or civil society organization such as WIBDI
	Would the project increase women and/or youth access to improved farming practices?			If no, explore women's increased engagement through consultation with women's committee and/or church group and/or civil society organization such as WIBDI
	Contribute to deterioration in soil quality?			Apply proposed soil erosion control measures (Table 5.2 of ESMF).
	Entail introduction of new pests?			Use IPMP.
Alternatives				

	Is it possible to achieve the project objectives in a different way, with fewer environmental and social impacts?			Consider use of the alternative.
General mitigation measures				
Is public awareness and training program in place? If not introduce awareness raising on intensive agriculture and required BMPs.				
Is a pest monitoring and surveillance in plan in place? If not introduce IPM principles and project specific PMP.				
Are PMP based on IPM approaches in place? If not, provide awareness/training and ensure IPM principle and approach is followed.				
Are IPM approaches adopted? If not, introduce and encourage its use.				
Are agrochemicals-related hazards addressed? If not, ensure protective gears are available and their use is enforced.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for rehabilitation of farm infrastructure sub-projects

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Location				
	Are there environmentally sensitive areas (significant primary forests, major rivers, or wetlands) or threatened species that could be affected by the project?			If yes, relocate the subproject.
	Does the subproject area occurs within or adjacent to any protected areas designated by government (national park, forest reserve, world heritage site, etc.)?			If yes, relocate the subproject.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Might the project alter any historical, archaeological or cultural heritage site (chance find)?			Relocate the subproject or use chance find procedures.
Impacts	**Would the subproject be likely to:**			
	Generates excessive dust and noise?			Water the area, use noise silencer.
	Leads to creation of open pits?			Fill and grade the open pit area.
	Leads to construction wastes?			Minimize waste, reuse if possible, or send to dump sites.
	Leads to loss of vegetation?			Minimize removal of vegetation.
General mitigation measures				
Are protective gear provided? If not enforce use of protective gears.				
Landfill arrangements in place? If not ensure procedures are in place to fill the open pits and grade them.				
Construction wastes management in place? If not prepare a construction waste management plan.				
Training on safety and precautionary measures planned? If not, ensure that H&S is in place.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for use of rainwater harvesting techniques subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Location				
	Are there environmentally sensitive areas (significant primary forests, major rivers, or wetlands) or threatened species that could be affected by the project?			If yes, relocate the subproject.
	Does the subproject area occurs within or adjacent to any protected areas designated by government (national park, forest reserve, world heritage site, etc.)?			If yes, relocate the subproject.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Might the project alter any historical, archaeological or cultural heritage site (chance find)?			Relocate the subproject or use chance find procedures.
Impacts				
	Lead to increase in incidence of water-borne diseases?			Use cover for water source, Reduce water logging by preventing tank overflow (proper sizing). Use drainage improvement practices such as introduction of surface drains, grassed waterways, etc.
	Lead to land degradation at livestock watering point or due to water harvesting structure?			Reduce water logging and trampling by minimizing overflow from watering structures.
	Would the project increase women’s and/or youth employment in agriculture?			If no, explore women’s increased engagement through consultation with women’s committee and/or church group and/or civil society organization such as

				WIBDI
	Would the project increase women and/or youth access to improved farming practices?			If no, explore women's increased engagement through consultation with women's committee and/or church group and/or civil society organization such as WIBDI
	Increase risk of flooding during heavy rain?			Ensure appropriate sizing of the water harvesting structure to minimize overflow.
	Lead to siltation due to erosion?			Provide silt trap, minimize overflow.
Alternatives				
	Is it possible to achieve the project objectives using a different approach to water harvesting, with fewer environmental and social impacts?			Use the alternative method.
General mitigation measures				
Is awareness and training plan in place? If not, provide training on water harvesting and irrigation techniques to maximize irrigation efficiency and minimize soil erosion and irrigation water loss.				
Are there plans to plant protective vegetation? If not consider use of biological erosion control measures, grass strips and interceptor drains, especially on sloping land to minimize soil erosion and water logging.				
Are design specifications able to withstand reasonable risks of flooding? Ensure that proper sizing of water harvesting tanks are selected to prevent overflow, water logging and flooding.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for subprojects requiring farm inputs/integrated pest management (IPM) subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Impacts	Would the subproject be likely to:			
	Does the project provide access to funds to women and other disadvantaged people?			If no, ensure procedure exist to allow for their involvement.
	Entail loss of access to or use of land by current land holders and/or users?			Provide access routes/corridors. If not possible, relocate the site.
	Entail local storage of agricultural chemicals?			If yes, ensure storage site has secure locking mechanism.
	Entail use of new or unfamiliar agricultural chemicals?			Use IPMP. Train on use of IPMP approach.
	Enhance risk of robbery or theft?			Ensure secure locking mechanism is in place.
	Adversely affect micro organisms in soil?			Minimize application of broad spectrum pesticides. Use bio-pesticides
	Adversely affect surface and groundwater (terrestrial or aquatic ecosystems)?			Use split application of agrochemicals. Follow BMP principles (F&V Component).
	Adversely affect consumers' crops (residues in vegetables and fruits)?			Reduce application rate of agrochemicals to economic threshold levels. Use IPM approach.
	Soil contamination?			Reduce application rate. Use IPM approach.
	Water resources pollution?			Reduce pesticide application rate. Use IPM approach.
General mitigation measures				
Has awareness campaign and training in IPM approaches been done? If no, introduce FFS training				
Is there good storage facility of agricultural chemicals and seeds? If not ensure that a shed with secure locking mechanism is in place.				
Has security for chemicals and farming goods (locks) been provided? If not ensure availability of secure locking mechanism.				
Has public awareness been raised? If not, ensure training and awareness raising on proper use of agrochemicals and IPM is provided.				
Is there adequate capacity for proper handling and storage of agrochemicals? If not, provide training and				

capacity building.
Have IPM approaches been adopted? If not introduce/ adopt IPM.
Are subproject-specific PMP developed? If not, develop crop specific PMP.
Are agro-chemical-related hazards addressed? If not address WHO hazard ratings and enforce use of narrow spectrum low hazard pesticides.
Is the PMP based on IPM approaches? If not ensure that IPM approach is implemented.

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for increased use of labor saving technology subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Impacts	Would the subproject be likely to:			
	Lead to reduction in access to or use of land by present landholders or users?			Provide access routes/corridors. If not possible, relocate the site.
	Does the project reduce the time that women spend working on farming activities?			If no, review arrangements for adoption and use of labor saving technology.
	Does the project increase female laborers access to technology?			If no, review arrangements for adoption and use of labor saving technology.
	Entail production of more manure?			Provide training on composting, use of manure as organic fertilizer.
	Introduce increased risk of accidents to humans?			Implement proposed health & safety (H&S) practices as proposed in ESMF.
Alternatives				
	Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts?			Use the best alternative approach.
General mitigation measures				
Has awareness raising and training on safe use and handling of herbicides been available? If not, provide awareness raising and applied training.				
Is proper storage and use of manure and composting facilities in place? If not provide assistance to introduce such facilities.				
Are IPM approaches adopted? If not provide awareness raising and training and strongly promote IPM approach.				
Are herbicides-related hazards addressed? If not provide training and enforce health and safety related issues.				
Are PMP based on IPM approaches in place? If not provide training and awareness raising on use of IPM approach.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for improvement in livestock production subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Location				
	Are there environmentally sensitive areas (significant forests, rivers, or wetlands) or threatened species that could be affected by the project?			Relocate. The subproject Minimize impact.
	Does the subproject area occurs within or adjacent to any protected areas designated by government (national park, forest reserve, etc.)?			Prevent encroachment. Fence animals.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Might the project alter any historical, archaeological or cultural heritage site (chance find)?			Relocate the subproject or use chance find procedures.
Impacts	Would the subproject be likely to:			
	Create conflicts with customs/traditions of local communities with respect to livestock keeping?			Respect traditional customs, if any.
	Increase quantities of manure?			Introduce composting of manure before its use as organic manure in agricultural fields. Use solid and liquid waste management facilities for large pig nucleus farms.
	Lead to overgrazing?			Use proper pasture land per animal. Improve pasture.
	Increase exposure of humans to animal borne disease?			Use appropriate handling and composting of manure. Inspect and vaccinate animals.
	Increase exposure to agricultural chemicals			Use IPM approach
Alternatives				
	Is it possible to achieve the above objectives, using a process with fewer environmental and social impacts?			Consider using the alternative approach.
General mitigation measures				

Are the grazing arrangements rotational? If not and if land is available, use rotational grazing.
Is public awareness and training planned? If not ensure that training and awareness raising on principles of good practices and animal husbandry is in place.
Are the arrangements for handling and storage of manure and chemicals in place? If not train farmers on appropriate treatment of manure and use as organic fertilizer on agricultural land.

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Sample checklist for initial processing of agricultural and livestock products subproject

Name of Sub-project:

Proposed Environmental Category:

EIA Needs	Sample checklist questions	Yes	No	If yes, mitigation
Location				
	Are there environmentally sensitive areas (significant forests, rivers, or wetlands) or threatened species that could be affected by the project?			Relocate the subproject. Minimize impact.
	Does the project increase female laborers access to technology?			If no, review arrangements for adoption and use of labor saving technology.
	Does the project increase female laborers access to technology?			If no, review arrangements for adoption and use of labor saving technology.
	Would the project reduce people's access to the pasture, water, public services or other resources that they depend on?			Provide access routes/corridors. If not possible, relocate the site.
	Might the project alter any historical, archaeological or cultural heritage site (chance find)?			Relocate the subproject or use chance find procedures.
Impacts	**Would the subproject be likely to:**			
	Increase production of by-products?			Introduce proper disposal mechanism.
	Contribute to soil contamination?			Provide barriers (concrete patch, etc).
	Create unpleasant odors?			Ensure site is located away from, schools, hospitals and housings. Ensure that the site is downwind of the developed areas.
	Affect water quality?			Prevent leaching of material to surface and groundwater. Keep refuse and/or by-products behind berms or in sealed tanks.
	Does the project provide access to funds to women and other disadvantaged people?			If no, ensure procedure exist to allow for their involvement.
	Lead to contamination of products?			Use of hygienic methods for post harvest technologies or animal slaughtering.
Alternatives				
	Is it possible to achieve the objectives above in a			Consider using the

	different way, with fewer environmental and social impacts?			alternative approach.
General mitigation measures				
Is there proper disposal of wastes planned? If not, develop appropriate waste management protocols. Follow the requirements of Samoan Waste Management Act (August, 2010).				
Is the site appropriate? If not, find a different site for post harvesting/slaughterhouse.				
Is training and public awareness plan in place? If not, ensure that appropriate training as been provided through FFS, structured training, awareness raising is provided.				

Al. All answers to the checklist questions are "No". There is no need for further action.

A2. For all issues indicated by 'Yes" answers, adequate mitigation measures are included in the project design. No further planning action is required. Implementation of the mitigation measures would require supervision by the applicant and the appropriate local authority.

A3. For the following issues Indicated by "Yes" answers (specify questions numbers): the applicant has not provided adequate mitigation measures. The applicant must revise the proposed project plan to provide adequate mitigation. Specialist advice might be required in the following areas_____.

A4. For the following issues indicated by "Yes" answers (specify questions numbers):

_____the applicant has not provided adequate mitigation measures. The applicant must prepare an environmental assessment of the proposed project, and revise the project plan according to the results of that assessment. Specialist advice would be required in the following areas:_____.

Comments by extension officer:

Recommendation on the proposal:

Signature of extension officer: Date:

Signature of Applicant: Date:

Signature of ESMS: Date:

Appendix 1: Procedure to be followed in case of chance find

Sites that are buried or not located by the survey might be discovered during project implementation, especially in the course of construction or mining. Such unanticipated discoveries of remains of an archaeological and/or historical nature, termed archaeological chance finds, are frequently found within 0-3 meters of the present surface. Examples of such chance finds include graves, ceremonial grounds, old artefacts, etc. Most often they are concentrations of pottery, worked stone, and human and animal bones, without commercial value, but of significance to archaeologists, historians, anthropologists and palaeontologists. In general, the following archaeological chance find procedures should be adopted in project design and construction contracts:

1. Stop work in the vicinity of the find;
2. Notification of the relevant department of antiquities;
3. Request for a representative to make a site inspection;
4. Request for the decision by relevant government institution responsible for safeguard of antiquities and archaeological sites on possible salvage or excavation within 48-72 hours of notification.
5. Continue work stoppage at the vicinity of the site until the visit of a representative; and
6. Follow the recommendations of the relevant government institution (removal of the artefacts or relocation of project activities, as per recommendations) before commencing the project activities within the chance find area.

This process should strictly be followed as soon as a chance find of relics or archaeological sites are found at the project site.

Annex 3: List of Public Consulted

List of people interviewed during public consultation

1. Government Organizations

Name	Institution	Position
Taito Dr. Tumaalii	SROS	Chief Executive Officer
Czavina Iese	MNREM	Senior Officer, Environment& Conservation Division
Philip Tuivavalagi	MAF	Principal Officer, Crop Protection, Nu'u
Fuifatu Billy Enosa	MAF	Senior Research Officer, Crop Protection, Nu'u
Faalelei Laiti	MAF	Research Officer, Fruit fly Research, Nu'u
Aleni Uelese	MAF	Senior Officer, Crop Protection, Nu'u
Juvita Tone	MAF	Research Officer, Crop Protection, Nu'u
Parate Matalavea	MAF	Principal Research Officer, Crop Research, Nu'u
Mike Furrong	MAF	Australian Volunteer, Crop Protection, Nuu
Ofeira Vitoria Faasau	MNREM	Acting ACEO, PUMA & Principal Sustainable Development Officer
Tuulima Laiti	MAF	Project Coordinator, ICCRAHSS
Josephine Stowers-Fiu	MNREM	ACEO, Legal Consultant
Lagomauitumua Sunny Seuseu	MNREM	Principal Climate Officer
Ann Rasmussen	MNREM	Project Coordinator, GEF Climate Change
Pau Ioane	MNREM	Principal Officer, Land management Division
Tony Tipamaa	MNREM	ACEO, Environment & Conservation Division
Katenia Rasch	MNREM	Senior Chemist & Hazardous Waste Management Officer, Environment and Conservation Division
Maiava Pimalolo	MAF	Registrar of Pesticides (Agrochemicals)
Frank Fong	MAF	ACEO, Policy Planning & Communication Division
Taimalientone Matatumua	MAF	Principal Officer, Planning
Pueata Tanielu	MAF	Principal Officer, Crop Development, Nuu
Sina Moala	MAF	Principal Officer, Livestock Division
Amele Ainuru	MAF	Principal Officer, Agriculture Extension

Louise Apelu	Ministry of Women, community and social development	ACEO, Women Division
Fata	MAF	
Maulolo Tavita Assistant	Ministry of Women, community and social development	CEO

2. Non-Government Organizations

Name	Institution	Position
Bruce Russel	Women in Business Development Samoa	Misiluki Project Advisor
Fiu Mataese Elisara	Ole Siosiomaga Society Incorporated (OLSSI)	Executive Director
Walter Vermeulen	Matualleoa Environmental Trust Inc. (METI)	Director
Bruce Kussel	WIBDI	
Canandra Wiles	WIBDI	Organic Rop Development Officer
Sooalo A. Peters	WIBDI	Technical Officer
Manita Ah San	WIBDI	Project Officer
	WIBDI	Director
Alatina Ioelu	SBEC	Financial Officer
Tusitina Nuuvali	WIBDI	Project Officer

3. International Organizations/Universities

Name	Institution	Position
Mareko P. Tofinga	USP	Associate Professor, Agriculture
Adama A. Ebenebe	USP	Lecturer, Crop Protection
Mohammed Umar	USP	Director, IRETA
David Hunter	USP	Professor, Soil Science
Daya Perera	USP	Soil Laboratory Technician
Aru Mathias	FAO	Forestry Officer, Sub-Regional Office for the Pacific Islands
Peter Murgatroyd	SPREP	IRC Manager, Pacific Environmental Information Network Coordinator
Ugar Lualupu	USP	University Livestock Supervisor
Michael Furlong	University of Queensland, Australia	Senior Lecturer, School of Biological Sciences (IPM)

4. Affected, beneficiary, and interested People

Name	Institution	Position
Peter Pigagoala	Aggies Farms, Afiamalu	Farm Manager
Sefo Loia	Aggies Farms, Afiamalu	Assistant Farm Manager
Orlando Huaman	Private Consultant, Farmer	Agronomist
Charles Wright	Samoan Association of	Farmer, Association Leader

	Manufacturers & Exporters	
Grant Perciva	Samoan Association of Manufacturers & Exporters	Farmer, Association member
Saiete Panipasa	Taro Farmer	S.E. Upolu
Patisefa Masi	Cattle owner	S.E. Upolu
Poalaga Losefa	Cattle owner/Taro Farmer	E. Upolu
Piitolu Leota	Vegetable garden	N. Upolu
Lesa Elia	Cattle Owner/Taro Farmer	N. Upolu

Annex 4: PUMA environmental Impact Assessment Regulations (2007)

Planning and Urban Management (Environmental Impact Assessment) Regulations 2007

SAMOA
Arrangement of provisions

Schedule

Content of an EIA

Pursuant to section 105 of the Planning and Urban Management Act 2004, **I, TUI ATUA TUPUA TAMASESE EFI**, Head of State of the Independent State of Samoa, acting by and with the advice of Cabinet, **MAKE** the following Regulations.

DATED at Apia this ….. day of ……..……. 2007.

_____

(Tui Atua Tupua Tamasese Efi)

HEAD OF STATE

REGULATIONS

1. Title and Commencement - (1) These Regulations might be cited as the Planning and Urban Management (Environmental Impact Assessment) Regulations 2007.

(2) These Regulations commence on the day they are made.

2. Interpretation - In these Regulations, unless the contrary intention appears:

"EIA" means an Environmental Impact Assessment, required for public and private development proposals as set out in these Regulations, and includes a PEAR;

"PEAR" means the form of EIA referred to in subregulation 4(2) as a Preliminary Environmental Assessment Report, and applied in accordance with these Regulations;

"proponent" means the person proposing and assuming responsibility for any development proposal;

"the Act" means the Planning and Urban Management Act 2004.

3. When an EIA is required - (1) If, as part of any development consent application made pursuant to section 37 of the Act, an EIA is required by the Agency pursuant to section 42 of the Act, the EIA must be prepared and provided in the manner prescribed under these regulations, unless the Agency directs otherwise in writing.

(2) In deciding whether to require an EIA, the Agency would take into consideration all the information and documentation provided with the application.

4. Forms of EIA - (1) A Preliminary Environmental Assessment Report (PEAR) and a Comprehensive Environmental Assessment Report (CEAR) are the two forms of EIA.

(2) A Preliminary Environmental Assessment Report might be required by the Agency for any development application to which any of the qualifying criteria specified in these Regulations apply, but which the Agency considers is not likely to have a significant adverse impact on the environment.

(3) A Comprehensive EIA might be required by the Agency for any development application to which any of the qualifying criteria specified in these Regulations apply, and which the Agency considers is likely to have a significant adverse impact on the environment.

(4) As a consequence of learning more about any particular development the Agency might, within 1 month of issuing any such requirement, alter its requirement, including changing its requirement from a PEAR to a CEAR or vice-versa.

(5) A requirement or alteration under this Part shall be notified in writing to the proponent.

5. Qualifying Criteria for an EIA - An EIA might be required where the Agency considers that the development application and its associated activities could give rise to any of the following:

(a) adverse impacts on people, an existing activity, building or land;

(b) adverse impacts on a place, species or habitat of environmental (including social and cultural) importance;

(c) adverse impacts in conjunction with natural hazard risks;

(d) adverse impacts on or in the coastal zone;

(e) adverse impacts on or in any waterway or aquifer;

(f) adverse impacts arising from the discharge of any contaminant or environmental pollutant;

(g) adverse impacts associated with land instability, coastal inundation, or flooding;

(h) adverse impacts on the landscape or amenity of an area;

(i) adverse impacts on public infrastructure;

(j) adverse impacts on traffic or transportation; and

(k) any other matter for consideration stated in section 46 of the Act.

6. Content of Preliminary Environmental Assessment Report - The PEAR shall be submitted in accordance with:

(a) the Act; and

(b) any EIA guidelines, development standards or planning provisions approved for this purpose by the Board; and

(c) any form specified or provided by the Agency; and

(d) any direction made in writing by the Agency; and

(e) Part 1 of the Schedule, unless otherwise directed by the Agency in writing.

7. Content of Comprehensive EIA - The EIA shall be submitted in accordance with:

(a) the Act; and

(b) any EIA guidelines, development standards or planning provisions approved for this purpose by the Board; and

(c) any form specified or provided by the Agency; and

(d) any direction made in writing by the Agency; and

(e) Part 2 of the Schedule, unless otherwise directed by the Agency in writing.

8. **Baseline and Compliance Monitoring Schedule** - (1) In addition to the requirements stated in regulations 6 and 7 above, an EIA shall be accompanied by a Schedule outlining a programme of baseline and compliance monitoring, appropriate to the nature and scale of the application.

(2) The Schedule referred to in subregulation (1) shall outline the baseline monitoring proposed to be undertaken and also any subsequent monitoring (together with its proposed frequency and methodology) intended to ensure compliance.

9. Review of PEAR and comprehensive EIA - (1) The Agency shall review, or cause to be reviewed, any PEAR or comprehensive EIA required and submitted as part of a development consent process.

(2) In undertaking the review referred to in subregulation (1), the Agency shall, as part of that review:

(a) circulate the EIA to all other agencies known to have, or to be likely to have, a statutory or functional interest in the application, for their written comment; and

(b) specify such period for the receipt of any comments as is reasonable in the circumstance, taking into account the nature and scale of the application and its associated documentation.

(3) The Agency shall prepare a written review report to be considered, pursuant to section 46 of the Act with other relevant material before a decision on any development consent application is made.

10. External Review might be undertaken - (1) The Agency might determine that it does not possess, or has not currently available to it, the necessary specialist skills to appropriately review an EIA and in such a circumstance it might identify a suitable external reviewer and commission a report from that person.

(2) Prior to commissioning any report under subregulation (1) and where the Agency intends to recover the associated costs from the proponent, agreement to that course of action must be obtained in writing from the proponent.

(3) If the proponent does not agree to the course of action proposed by the Agency, and fails to provide an alternate option to the satisfaction of the Agency, the development application shall be deemed to be suspended until such time as this matter is resolved.

11. Public Consultation - (1) The Agency might determine that further public consultation on an EIA is required either:

(a) by the applicant; or

(b) by the Agency.

(2) The Agency must advise the proponent in writing of any such determination within 2 weeks of receiving the EIA, including full details of the public process it proposes the applicant or the Agency undertake and the reasons for that determination.

(3) Any public consultation proposed under this Part must be consistent with any Board-approved guideline and shall be completed before a decision is taken on the development application pursuant to section 47 of the Act.

SCHEDULE - CONTENT OF AN EIA (regulations 6 and 7)

Part 1:

(1) A PEAR shall contain the following particulars:

(a) a brief description of the development proposal;

(b) a brief description of the area to be affected and the nature of the proposed change to the area (including a location map and site plan);

(c) a brief justification for the development proposal;

(d) a summary of the stakeholder consultation undertaken, the general issues raised, and responses to those issues;

(e) an assessment of all reasonably foreseeable adverse and positive environmental impacts, including long-term and short-term, primary and secondary consequences;

(f) an indication of possible alternatives to mitigate any identified adverse environmental impacts; and

(g) an indication of measures that the proponent intends to take to mitigate or avoid identified adverse environmental impacts.

Part 2:

(1) A comprehensive EIA shall, where relevant, contain the following particulars:

(a) **Summary** - each EIA shall contain a summary of the development proposal and its consequences. The summary shall include:

(i) a statement of all major conclusions and recommendations; and

(ii) an outline of any issues that are controversial; and

(iii) an outline of issues that remain to be resolved; and

(iv) a summary of the stakeholder consultation undertaken, the general issues raised, and responses to those issues; and

(v) an outline of the preferred choice among any alternatives; and

(vi) details of any proposals to mitigate significant adverse impacts.

(b) **Description and purpose of activity** - each EIA shall include a description of the development proposal (including any phasing or sequencing of activities), a statement of its underlying purpose, and the long-term and short-term objectives sought by the proponent. The statement shall further:

(i) generally describe the proposal's technical, economic, and environmental characteristics, taking into consideration current engineering and supporting utility / infrastructural data;

(ii) show the precise location and boundaries of the proposal on a detailed map; and

(iii) provide a justification of the rationale for the proposal including such supporting information as is appropriate.

(c) **Alternatives** - each EIA shall review the environmental impacts of the development proposal and any practical alternatives to the proposal. In this section the proponent shall:

(i) review and evaluate all reasonable alternatives, including locations and methods and the alternative of no action; and

(ii) identify the proponent's preferred alternative or alternatives;

(d) **Affected environment** - each EIA shall:

(i) describe the local environment in the vicinity of the proposal as it exists before commencement of the proposal;

(ii) review and evaluate possible conflicts or inconsistencies between the development proposal and relevant applicable objectives of national, regional or local land use and marine / coastal plans (including Development Plans) and policies.

(e) **Environmental consequences** - each EIA shall include an analysis of the environmental consequences of the development proposal and, to the extent relevant, might include the following:

(i) a review of direct and indirect environmental effects, their significance, and risks;

(ii) a consideration of any potential cumulative environmental impacts that might arise in conjunction with other activities in the location;

(iii) a consideration of the environmental effects of alternatives;

(iv) an assessment of the likely need for additional infrastructure, including energy and public utilities;

(v) an assessment of impacts on the area's physical locality and amenity (including visual quality), its historic and cultural resources, and the design of the built environment;

(vi) an assessment of social impacts on the local population and its uses of the land;

(vii) an assessment of the implications of the use of potential environmental pollutants;

(viii) a review of options proposed to mitigate adverse environmental impacts;

(ix) a description of any unavoidable adverse environmental impacts, including any permanent change in the physical, biological, social or cultural characteristics of the affected environment or in the possible future use of that environment;

(x) an analysis of the costs and benefits that might result from the development proposal;

(xi) the identification of any irreversible or irretrievable commitments of resources required for the development proposal.

(f) **Mitigation and conditions** – each EIA shall:

(i) identify any significant environmental impacts that cannot be avoided;

(ii) identify appropriate mitigation measures to minimise any significant environmental impacts arising from the preferred alternative; and

(iii) recommend any proposed conditions.

Annex 5: Price list for soil, water and Nutrient Analysis

Soil Science Laboratory (USP)[8]

Analytical Service Charges in SAT

Test	Charge per Sample
Soil Analyses	
Sample Preparation - grinding only	$6
Sample Prep - drying and grinding	$11
Moisture Factor	$5
pH (water)	$5
Total Nitrogen	$20
Total Carbon	$20
Olsen P	$20
Exchangeable Bases Ca, Mg & K (per element)	$15
DTPA Extractable Fe, Mn, Cu & Zn (per element)	$15
Plant Analyses	
Sample Preparation - drying & grinding	$10
Grinding only	$6
Moisture content	$5
Total Nitrogen	$20
Total Phosphorus	$20
Total Potassium	$15
Ca, Mg, Na, Fe, Mn, Zn, & Cu (per element)	$15
Animal Feed Analysis	
Sample Preparation - Grinding only	$6
sample Preparation - Drying & Grinding	$10
Moisture Content	$5
Total Nitrogen	$20
Total Ash	$8
Crude Fibre	$20
Crude Fat	$20
Energy	$20
Total Phosphorus	$20
Total Potassium	$15
Ca, Mg, Na, Fe, Mn, Zn, & Cu (per element)	$15
Water Analysis	
pH	$5
Ca, Mg & K (per element)	$15
Ammonium-Nitrogen	$20
Phosphorus	$30

[8] The University of the South Pacific

Analytical Price List (SROS)[9]

Analytical Service charges in SAT

Test	Charge per Sample
Soil Analyses	
Sample Preparation - grinding only	$50
Sample Prep - drying and grinding	$70
Moisture Factor	$20
pH (water)	$20
pH (KCl)	$20
Cation Exchange Capacity	$75
Total Nitrogen	$75
Total Carbon	$20
Olsen P (by UV-Vis)	$30
Exchangeable Bases Ca, Mg & K	$20
DTPA Extractable Fe, Mn, Cu & Zn	$20
Particle Size (by Sieve Method)	$20
Microbial Analyses	
Total Plate Count	$100
E. Coli	$100
Total Coliforms	$100
Listeria	$200
Salmonella	$200
Vibrio	$200
Yeast & Mould	$100
Fecal Coliforms	$100
Fatty Acids	
Saturated Fatty Acids	
Lauric	$30
Myristic	$30
Palmitic	$30
Stearic	$30
Monosaturated	
Palmitleic	$30
Oleic	$30
Linoleic	$30
Polysaturated	
EPA	$30
DHA	$30
Available Carbohydrates Analysis	
Starch	$75
Simple Sugar	
Fructose	$20
Glucose	$20
Sucrose	$20
Maltose	$20
Lactose	$20
Macronutrients	
Moisture Content	$20
Fat Content (by Soxhlet)	$50
Ash Content	$30
Protein Content (as total N)	$75

[9] Scientific Research Organization of Samoa

Fibre	$75
Cholesterol	$75
Energy	$75
Miscellaneous Analysis	
pH	$20
Titratable Acidity	$30
^{o} Brix	$30
Total Soluble Solids	$20
Reducing Value	$30
Iodine Value	$50
Residual Chloride	$20
Amino Acids	$75

Annex 6: General Terms of Reference (TOR) for Environmental and Social Management Staff for the project

ToR for Environmental and Social Management Officer (ESMO)

Objectives

To ensure full compliance of the project to the social and environmental requirement of the project as is stipulated in the ESMF, PMP, EMP, and COEPs, it is required to recruit an ESMO. The terms of reference for the position of ESMO is presented here and is based on the following requirements:

- Regularly update and integrate the system of ESMF screening checklists and reporting forms set out in the ESMF report and submitting the revised checklist to the Bank for approval;
- Develop specific impact guidelines and mitigation measures for subprojects to be financed with SACEP support;
- Prepare necessary framework and guidelines for the preparation of subproject specific agricultural chemicals (pesticide) management plan using such agrochemicals (see Example A attached);
- Mentoring and regular training of extension staff on relevant environmental and social issues, implementation of screening forms, and environmental and social monitoring of approved subprojects;
- Manage the subproject approval process including regular liaison with PUMA to obtain the final environmental/social approval; and
- Prepare the necessary TORs for environmental and social screening of the abattoir design and construction and to ensure that all environmental and social requirements of the Bank and PUMA have been met.

During year 1 of the project, develop and deliver a set of sensitization workshops, primarily to senior MAF staff, SBEC and other institutions responsible for screening, reviewing and approving of the funding of subprojects, for the above.

Input

Approximately 5 years of full-time input as presented in Chapter 8 of this report (project duration) would be required by the ESMO to ensure SACEP safeguard requirements are met. At the end of the project cycle, it is strongly recommended that MAF continues to use the services of the assigned environmental and social management on a permanent basis for use in other development projects that would be implemented by the ministry.

Terms of Reference for Development of Guidelines for mini-Pesticide (Agriculture Chemicals) Management Plan (subproject specific PMPs)

Objective:

To provide technical assistance and advice to the SACEP to develop guidelines for mini-Pesticide (Agriculture Chemicals) Management Plans.

Background:

Small-scale agricultural projects would involve strengthening existing practices, introducing, diversifying or the intensification of crop production. Support for the development of small-scale agriculture and livestock activities that might lead to the introduction or increased use of pesticides and other agricultural chemicals such as herbicides and inorganic fertilizers.

It is critical that appropriate planning, design and management be adopted for the handling, use and management of all agricultural chemicals, including pesticides, to avoid potential negative environmental impacts. SACEP would support the development of smaller-scale or subprojects therefore it is anticipated that mini-pest (or chemical) management plans would satisfy local needs. This plan should include the following:

- Proper use of agricultural chemicals such as fertilizers to avoid reduction in soil and groundwater quality;
- Prevent fertilizer runoff into surface water sources to avoid negative impact on aquatic environments;
- Proper use of pesticides and herbicides to avoid contamination of crops, soils and water;
- Proper use, handling and storage of all agricultural chemicals to avoid adverse health impacts on rural population;
- Ensure that banned (WHO category I_a) or unauthorized agricultural chemicals are not used; and
- Ensure proper handling and disposal of unused agricultural chemicals and packaging materials (e.g. sacks, plastic containers, etc.).

Tasks:

- Review and compile a comprehensive inventory of agricultural chemicals that are currently used or could be introduced under the project;
- Classify the above chemicals according to their inherent risks with clear instructions on safe handling, use and storage;
- Develop overall preparation guidelines or criteria that can be employed at the island/district and village level to develop mini-pesticide (or agricultural chemical) management plans; and
- Test these guidelines on a representative sample of provinces/villages and revise as necessary.

Outputs:

- Comprehensive agricultural chemical inventory with safe handling, use and storage instructions; and
- Mini-pesticide (agricultural chemical) management plan preparation guidelines presented in the form of a manual.

Schedule:

It is believed that this assignment can be included as a part of the coordinating officer responsibilities if he has the required expertise. Otherwise, the services of a subject-specific consultant for a 2 to 3 month period would be required.

TOR for Environmental and Social Screening Mitigation Responsibilities for existing MAF extension staff

Objective

To assist village communities and farmer groups in applying the screening and review forms to assess proposed subprojects for potential environmental and social impacts and to support communities in managing basic environmental and social mitigation and monitoring for their community development needs.

Tasks

- Advise potential subproject proponents on environmental and social requirements;
- Undertake subproject screening in close collaboration with the subproject proponent using the provided screening forms;
- Provide specific technical guidance and support to village committees and farmer groups on environmental and social issues;
- Report monthly to ESMS and assist with annual performance review as required; and
- Perform regular environmental and social monitoring of the approved subprojects.

TOR for biennial performance review

Objective

To review the performance of the SACEP in integrating natural resources and environmental management and mitigation measures into the operation of the project, and make practical recommendations for improving performance. This biennial performance review should be undertaken by an independent consultant and would satisfy most monitoring and evaluation requirements.

Tasks

- Review of the paper trail of screening checklists and EIA reports/RAPs, and review of reports on wider issues of natural resources and environmental management;
- On the basis of this review, select a number of community sub-projects for field visits to investigate compliance with proposed mitigation measures, and identification of potential impacts that are not being adequately identified or dealt with by trained agricultural extension officers;
- Recommend practical improvements to the ESMF (e.g. roles, responsibilities, screening checklist, operation of METs) in order to fine-tune the operation of the ESMF based on practical experience;
- Discuss SACEP activities in agricultural and livestock development with Environmental and Social Coordinator and trained agricultural extension officers;
- Recommend additional assessment studies to be carried out to complement development of the project's approach to natural resources and environmental management.

Outputs

- A report of the annual performance review delivered to the PCG, the PUMA and the World Bank, setting out:
- Summary of the numbers of subprojects (i) carried out, (ii) screened for environmental and social impacts, (iii) provided with technical advice from (iv) assessed with a full EIA, RAP etc;
- Description of the actual operation of the Trained agricultural extension officers, ESMF as it has occurred in practice;
- Identification of environmental and social risks that are not being fully addressed or mitigated;
- Conclusions on whether the project is maximising its positive contribution to natural resources and environmental management:
- Areas for improvement and practical recommendations.

Annex 7: SACEP Integrated Pest Management Plan

LIST OF ACRONYMS

AESA	Agro-ecosystem analysis
ADB	Asian Development Bank
BORDA	Bremen Overseas Research and Development Association
CEAR	Comprehensive Environmental Assessment Report
COEP	Code of Environmental Practice
DEWATS	Decentralized Wastewater Treatment Systems
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMO	Environmental and Social Management Officer
ETL	Economic Threshold Limit
ET_0	Reference Crop Evapotranspiration
FAO	Food and Agriculture Organization
FFS	Farmers' Field Schools
F&V	Fruit and Vegetable
GEF	Global Environmental Facility
GOS	Government of Samoa
IDA	International Development Association
IP	Indigenous People
ICR	Implementation Completion Report
IPM	Integrated Pest Management
IPP	Indigenous Peoples Plan
KBA	Key Biodiversity Areas
LTA	Land Transport Authority
MAF	Ministry of Agriculture and Fisheries
MAFFRA	
masl	Mean altitude above sea level
METI	Matuaile Environmental Trust Incorporation
MIS	Management Information System
MNREM	Ministry of Natural Resources, Environment, and
Meteorology	
MOF	Ministry of Finance
NGO	Non-Governmental Organization
OD	Operational Directive
OLSSI	O Le Siosiomaga Society Incorporation
OP	Operational Policy
PCG	Project Coordination Group
PEAR	Preliminary Environmental Assessment Report
PMP	Pest Management Plan
POP	Persistent Organic Pollutants
PUMA	Planning and Urban Management Act
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SACEP	Samoa Agriculture Competitiveness Enhancement Project
SBEC	Small Business Enterprise Center
SCREP	
SDS	Strategy for the Development of Samoa 2008 – 2012

SIA	Social Impact Assessment
SPCZ	South Pacific Convergence Zone
TLB	Taro Leaf Blight
TNA	Training Needs Assessment
TOT	Training of Trainers
USD	US Dollars
WB	World Bank
WIBDI	Women in Business Development Incorporation
WHO	World Health Organization
WMP	Waste Management Plans

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1 Introduction

Project activities include the introduction of new fruit and vegetable (F&V) crops and crop diversification and crop development is promoted where there is a comparative advantage to reduce imports. Feed crop production for livestock can also potentially require increase in use of pesticides.

Since the project environmental and social management framework (ESMF) has identified that the project activities would trigger the Bank's Pest management policy (OP4.09, the two technical components of this project (F&V and livestock development) should include ecologically sound integrated pest management (IPM) strategies in their crop production planning. According to the ESMF, a pest management plan is needed in the project interventions within the production chain approach to impact:

- Change in cultivation and management practices and the use of newly improved cultivars and crops that might have better pest tolerance;
- Potential increased use of pesticide with agricultural intensification in both the production and post harvest and marketing sections of the F&V production chain; and
- Potential use in the livestock-related sector of continued use of broad spectrum chemicals and pesticides that are expected to be reduced and gradually replaced with pest specific pesticides.

Losses in crop production from weeds, insect pests, and plant diseases are found to be significant and sometimes disastrous as taro blight of the 1980s being the case in point. The report by the crop protection department of the MAF indicates that a pest attack in vegetables such as cabbages is more severe than in case of other tree crops. Further, resistances to pesticide have also been reported in some places, probably due to the popular non-selective pesticides that are often available and promoted at the government operated Agriculture Stores. Therefore, crop protection should be considered as an important aspect of fruit and vegetable production component of the project.

Since the project promotes enhanced cropping intensity and mono-cropping, the likelihood of increase in the population of weeds, insect pests and plant diseases is significant. Project's crop production activities and introduction of new crops might lead to a tendency for farmers and agricultural extension workers to promote excessive use of chemicals in agriculture, causing soil and water pollution. Such potential negative environmental impacts can be avoided through the implementation of Integrated Pest Management (IPM).

The Inter-Center Working Group on IPM (IRRI, 2000) defined IPM as "an approach to enhancing crop production, based on an understanding of ecological principles, that empowers farmers to promote the health of crops and animals within a well-balanced agro-ecosystem, making full use of available technologies, especially host resistance, biological control and cultural control methods". IPM promotes use of chemical pesticides only when the above measures fail to keep pests below acceptable levels, and when assessment of associated risks and benefits, considering effects on human and environmental health, as well as profitability (social and economic impacts) indicates that the benefits of their use outweigh the costs. Interventions would be need-based and re applied based on economic thresholds to minimize undesirable side-effects.

The project would use the World Bank listings and procedures on "Integrated Pest Management" (IPM) including IPM components (biological control, cultural practices and development of pest resilient or tolerant varieties). If pesticides are to be used, the proposed IPM approach proposed in this report should be applied, which amongst others promotes use of:

- pesticides not harmful to human health;
- their effectiveness against target pest species known;
- Ensuring negligible effect on non-target species and their habitat;
- Ensure use of pesticides to prevent the development of pesticide resilience; and

- Ensure pesticide packaging, labelling, storage, disposal and application must be performed according to acceptable standards that are in force in Samoa.

This Integrated Pest Management Plan (IPMP) provides a framework for ensuring that the Samoa Agriculture Competitiveness Enhancement Project (SACEP) supports environmentally sound pest management procedures. It directly addresses World Bank Policy OP 4.09: Pest Management, and should be considered as an annex to the Environmental Management and Social Framework (EMSF) report for the project.

The SACEP is executed by the Ministry of Agriculture and Fisheries (MAF), with funding from the World Bank. As per the World Bank's OP4.09 requirement, the project would not finance procurement of any pesticides that are classified as Category I_a or I_b according to the WHO classification of pesticides hazard levels.

1.1 Project Overview

The Government of Samoa has requested World Bank financing of the Samoa Agriculture Competitiveness Enhancement Project (SACEP). This project is one of the Government's programs contributing towards the goals of GoS on reducing dependence on agricultural imports, improving the opportunities of exporting agricultural commodities to neighboring countries, improving food quality and safety, and improving the livelihoods of vegetable and livestock farmers in Samoa. SACEP corresponds with the central features of the Government Strategy for improving the agricultural sector's capacity to produce high quality livestock and agricultural produce, focusing on the fruits and vegetables and livestock sectors, as specified in its Agriculture productivity improvement strategy. The project is designed to fund a number of small-scale, community-based subprojects that would be identified and planned by the agricultural communities and farmer associations, with the support of project financed extension teams.

The focus of the SACEP is on improving the fruit and vegetable (F&V) production and livestock sectors, given their strategic importance for the rural economy, to improve rural incomes and reduce agricultural commodity imports. Within these two major sectors, the proposed SACEP would provide, over five years, the predictable and continued support required to implement some of the structural changes necessary to improve their performance and sustainability – and maintain their competitiveness - by strengthening core institutions and improving the delivery of support services and infrastructure for smallholders.

The development objective of the proposed project would be that fruit & vegetable growers and livestock producers improve productivity and take greater advantage of market opportunities .. It would also focus on high value niche products (building on Samoa's comparative advantage for organic products and other specialty products) giving specific attention to the sustainability of farming systems and increased returns for farmers.

This would be achieved through strengthening industry coordination and institutions, expanding and strengthening linkages between smallholder farmers and agribusiness for the provision of technologies and services, and through the provision of critical market infrastructure.

The proposed project would include the following components:

Component 1: Livestock Production and Marketing. The objective of this component would be to encourage interested livestock producers to upgrade livestock, improve husbandry practices and stock management, make productivity enhancing on-farm investments, and improve the quality of meat sold in the local market. The component would comprise a number of activities, including:

a. improving farmer access to *superior breeding stock* for cattle, pigs, sheep and poultry;

b. financing eligible *farm enterprise investments* to improve stock handling and livestock housing and provide start-up working capital, through a combination of demand-driven matching grants and bank loans;

c. providing *technical advice* on breed selection and breeding management, nutrition, animal health and improved husbandry practices;

d. improving *livestock nutrition* by fostering locally grown feedstuffs and upgrading pastures for cattle and sheep; and

e. improving *meat quality and hygiene* initially through initiation of a new field slaughter service on Upolu and Savaii, and later by construction of an abattoir on Upolu, all with associated cold chains.

Component 2: Fruit and Vegetable Production and Marketing. The objective of this component would be to enable interested fruit and vegetable growers to have access to new, higher yielding varieties, adopt improved technology and production techniques, make productivity enhancing on-farm investments, and organize themselves to strengthen their presence in the market and meet the demands of local retailers and foodservice operators for year-round supplies of fresh fruits and vegetables. The component would be comprised of a number of interrelated activities, including:

a. enhancing farmer access to *planting material* of a broad range of improved fruit and vegetable varieties, shown in local trials to be suitable for Samoan conditions;

b. financing eligible *farm enterprise investments* to facilitate land preparation, address problems with seasonal rainfall excesses and shortfalls, increase mechanization and provide start-up working capital through a combination of demand-driven matching grants and bank loans;

c. providing *technical advice* on variety selection, crop nutrition, improved husbandry practices, post harvest handling and organization of producer groups; and

d. promoting the growth of organic products and fruit and vegetable exports through assistance in *market development* and arrangements for *certification.*

Component 3: Institutional Strengthening. The objective of this component would be to improve the effectiveness of agricultural institutions (Government and non-government) providing extension and adaptive research services to Samoan farmers; and the ability of these same institutions working individually or in collaboration with each other to implement and monitor the project effectively. This would be done by:

a. enhancing institutional, technical and management capacity to improve extension effectiveness and address identified skill-gaps in staff and the operational procedures of implementing agencies;

b. providing incremental staff to manage the project effectively;

c. improving work facilities and providing adequate vehicles, equipment and operating expenditure to maximize operational effectiveness; and

d. designing and implementing a monitoring and evaluation system which is integrated into the existing Management Information System (MIS) of MAF.

1.2 IPMP Focus

The IPMP addresses the requirements of the World Bank OP 4.01 (D): and OP 4.09, Integrated Pest Management and, consistent with the SACEP objectives, focuses chiefly on the smallholder sector. However, other direct and indirect issues are also addressed, such as agrochemical runoff effects, etc.

2 Policy Regulation and Institutional Capacity

2.1 Conventions regarding Agrochemicals

GoS is a member of the Governing Council of the United Nations Environment Program, and it has membership to a number of international and regional treaties and conventions relating to environment, including a number that relate specifically to the control of hazardous substances:

- International Plant Protection Convention (IPPC)
- Basel Convention on the Trans-boundary Movement of Hazardous Wastes and Their Disposal;
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade[10];
- Stockholm Convention on Persistent Organic Pollutants;
- Vienna Convention on Protection of the Ozone Layer;
- Montreal Protocol on Ozone Depleting Substances;
- London Dumping of Wastes at Sea; and
- The regional agreement, South Pacific Regional Environmental Program.

2.2 GoS Policy, Legislation and Control

The Importation and Distribution of Agrochemicals into Samoa is under the jurisdiction of the department of quarantine at the MAF. The Quarantine department is empowered to monitor and regulate the import, use and management of chemicals in the country under the Environmental Act 2004.

The Quarantine Department is also responsible for the awarding of import permits, transfer of permits, issuing of pesticide guidelines (for sales, importation, manufacture, distribution, promotion, advertisement and use). In addition, it is responsible for maintaining an inventory of pesticide impacts, for providing packaging guidelines for agrochemicals, and for enforcing compliance with the regulations.

However, there is no proper institutional framework or network established for controlling the monitoring and controlling chemicals in Samoa. While a permitting system is in place, it does not have the manpower and capacity to fully implement it due to a lack of institutional capacity.

Lack of capacity at MAF to fully enforce agrochemical import and registration is an issue. For instance, pesticide users should provide management plans for hazardous chemicals (industrial chemicals). However, these are often not provided and there is a general lack of control over both the import and use of hazardous chemicals.

Although Quarantine Department and agrochemical registrar at MAF have plans to address at least some of these shortcomings, it appears that problems exist in formalizing and finalizing these plans for implementation and enforcement.

Other departments with responsibility relating to agrochemicals and pesticides include the Ministry of Health, customs, and the Ministry of Natural Resources, Environment, and forestry. Again, the effectiveness of these institutions is constrained due to a lack of capacity.

[10] Annex 1 lists the chemicals under the Stockholm and Rotterdam Conventions.

The Ministry of Agriculture and Fisheries (MAF), besides the Quarantine Department, has a crop protection department, stationed at Nu'u Agriculture Research Station. The department in short in staff, equipment and budget and has very few on-going research program, relevant to IPM that are mainly concentrated on cabbage diseases. While some awareness is undertaken by MAF and MNREM on the use and management of the organophosphate and other pesticides, including their potential risks to humans and the environment, not much else has been provided to the farmers and the public.

Moreover, the processes for regulation and control under the Environment Act (2004) are vague and are yet to be tested in the field. Nevertheless, there are other regulations which have specific provisions and mandates to meet GoS's obligations under various International Treaties and Conventions that GoS is a signatory to.

2.3 Policy and Organizational Issues

The main public sector institutions relevant to SACEP are the WIBDI, METI, and USP.

Whilst legal statutes of Quarantine Department and mandate of Crop Protection Department are considered adequate for the purposes of IPM, there is a need for a review of the legislation related to the F&V and livestock industry. This should include for the development of environmental sustainability criteria for the mentioned industries, with a medium term goal of ensuring internationally recognized certification of sustainability.

2.4 Infrastructure, Capacity, Institutional Arrangements and Collaboration

As the IPMP is focused on the F&V industry, it is essential to note the infrastructure and institutional arrangement and collaboration within institutions involved in the success of this industry. Much of the capacity strengthening arrangement is in Component 1 of the SACEP.

2.4.1 F&V production

There is currently no systematic IPMP in place for the F&V industry, or general agricultural production as a whole. The lack of a systematic IPM development in Samoa and lack of adequate manpower and budgetary issues emphasizes the need for establishing an effective IPMP as soon as possible. Some more progressive private farms such as Aggie's Farms have adopted certain IPM based practices, such as use of boiling water to reduce the population of nematodes before planting new crops, as an integral part of their production practices. However, not considering the organic food producers who are not using any pesticides, the number farmers who have adopted IPM related practices and/or the IPM related research activities by the MAF staff are less than desirable. On the other side of the spectrum lie the activities of NGOs such as WIBDI and METI to promote organic farming where use of no agrochemicals is mandatory.

A head cabbage (*Brassica*) IPM project was initiated by ACIAR, and SPS, in association with researchers from the University of Queensland, Australia in 2005 in Fiji and Samoa. The project proposal aimed to bridge existing technical gaps in Samoa by conducting further studies to introduce more effective and suitable natural enemies of cabbage pests. In addition, the project hopes to be able to evaluate and select more effective, and pest specific insecticides as well as considering ways to improve the cultural and agronomic practices of cabbage production in the two countries. The crop protection department at Nu'u is involved in conducting the research activities related to the above project and is involved in limited research activities on determining the economic threshold of pest and diseases for cabbage that is currently one of the main vegetable crops that is planted by most Samoan vegetable farmers. Very little IPM efforts are currently undertaken at Nu'u or any other institution in Samoa for other fruits and vegetable crops due to lack of funds and limited availability of trained staff.

The crop sciences department at the University of South Pacific (USP) in Apia has a highly knowledgeable staff including plant pathologist, and entomologist. They have been involved in training technical staff in IPM technologies as a part of the agricultural university's curriculum. Most

crop protection and extension staff at MAF and other institutions that are involved in agricultural production in Samoa have been trained by the USP staff in principles of IPM. However, in practice very limited efforts and budget is allocated to this very important applied agricultural research area. The USP researchers' technical knowledge and practical experience is a valuable resource and their input should be sought for development of training modules and FFS activities in the area of IPM. Their capabilities should be further reviewed in more detail and their input in planning of appropriate practical training and capacity building modules in the areas of IPM technologies and applied research should be requested. It is proposed to use their input in the above mentioned areas to increase capacity of crop protection and agricultural extension staff in MAF in the area of IPM and providing the necessary and appropriate assistance and training to both technical staff and project farmers in the area of IPM technologies in FFS format. The crop protection staff at USP are currently undertaking limited IPM related activities at the university, including trials on disease tolerant varieties of cabbage and fruit trees; and provision of training on integrated pest management at the graduate and undergraduate levels.

Finally, it should be highlighted that since the input of agrochemicals by small holders is small, any IPM or biological control methods proposed would need to be compatible with small holder farming systems.

2.4.2 Proposed major areas of intervention

The main areas of intervention that should be undertaken by Crop Protection and agricultural extension departments at MAF in relation to extension of IPM related activities include:

- Intensive farmer training;
- Provision of farmer support;
- Intensive public awareness;
- Strengthening and supporting stakeholder partnership;
- Farmer mobilization;
- Resource mobilization; and
- Development and enforcement of IPM related legislation.

3 Current IPM Practices and Proposed Changes

3.1 Current IPM Related Practices

Currently, there is no explicit IPM policy in Samoa and there is no legislation or regulation to publicize IPM principles. As was mentioned before, the crop protection department of MAF is currently working on determining the economic thresholds of pesticide application for head cabbages, but no other IPM related activities with regard to other crops are in the future plans. The IPM program should be vigorously pursued as part of SACEP through enhancing the capabilities of the crop protection department and full cooperation of crop protection and agricultural extension departments. IPM should be considered as an extension program, focusing more on demonstration of researched and proven technologies, new farming systems, and improvement in the current practices.

3.2 Proposed New IPM Related Activities

IPM packages should be developed through research and on-farm trials for major crops including the ones proposed by the SACEP project. The packages should identify the pests that are usually found in such type of crops in the region and identify the IPM economic threshold for application of pesticides, and identify the adaptable biological control and pest specific narrow spectrum pesticides to control economic impact on crop production. Techniques suggested for monitoring pests are:

- Rapid Roving Survey (RRS): Regular monitoring of insects and diseases along pre-selected routes at weekly interval to assess bio-control and alert the farmers about the potential of pest attack;

- Field Scouting: Field scouting shall be done once a weekly basis to keep close watch on appearance and infestation of insects, pests, diseases and bio-control of fauna to assess the Economic Threshold limit (the point where the potential loss due to crop damage by pests outweighs the cost of pesticide treatment). Pesticide treatment before surpassing the economic threshold is not justified and nature itself has a way of working against an increase in pest levels. In other words, the economic benefits of pest and disease control outweighs the economic benefits of increased crop productivity;
- Pest Monitoring through Pheromones/Sticky Traps: Traps coated with grease or sticky substances are placed at specified intervals to traps insects. In pheromone traps female sex hormone capsules are kept inside the trap to attract male population, which are eventually killed;
- Identification of activities of fruit flies, using IPM approach by identifying, introducing and expanding the suitable means of fruit fly control such as fruit fly traps, sanitation, protein bait spraying, and sticky tapes and monitoring their success rates in both Upolu and Savai'i; and
- Agro Ecosystem Analysis: This can be employed by a group of farmers for decision making on IPM. The basic components of agro-ecosystem analysis are:

- ✓ Health of plant at different stages of growth;
- ✓ Compensation ability of plant;
- ✓ Pest and defender population;
- ✓ Soil condition and irrigation status;
- ✓ Weather condition;
- ✓ Past experiences; and
- ✓ Other investment opportunities.

The pest management strategy proposed in SACEP is to define the Economic Threshold limits for major pests, identified for the major crops under consideration in Samoa. The presence of a pest in a field does not necessarily mean that the pest population would reach damaging levels. Crop protection department should be provided with adequate resources to enable them to determine the economic threshold limits for all promoted crops to allow for implementation of proposed IPM related activities. Economic returns from control of pests below the economic threshold limits are not justified. Thus the farmers need to be trained to recognize the economic threshold limits to ensure that crops would be treated based on IPM principals to work towards economic benefits.

Some of the methods suggested for control of pests in the Integrated Pest Management Package are:

- Cultural Practices;
- Mechanical Practices;
- Bio-Control Practices; and
- Chemical application.

These have been briefly described below.

Cultural Practices: These are agricultural practices that make the environment less favorable for proliferation of insect pests. Some typical cultural practices include cultivation of alternate hosts (e.g., weeds), crop rotation, selection of planting sites, trap crops, adjusting the timing of planting or harvest, tilling practices, and nutrient and irrigation application.

Mechanical Practices: The use of physical barriers such as row covers or trenches prevents insects from reaching the crop. Other methods include hand picking of pests, collection and destruction of larvae, sticky boards or tapes for control of flying insects, having sources which attract pests such as sugar or yeast solutions, and other trapping techniques.

Bio-Control Practices: Bio-control practices include managing of major insect pests through conservation of existing natural biological control agents including the African giant snails, say by introduction of flat worms, etc.

Chemical Application: Application of chemical pesticides should be recommended only when control of pests below the threshold limits are not possible by other techniques suggested above. Appropriate selective chemicals in recommended doses shall only be applied when economic threshold is reached. Gestation time for action of chemical pesticide should be provided for control of pests.

The main objective of the IPM component is to ensure capacity building of the farmers to be able to analyze (on their own) the agro-ecosystems and find out the threshold levels of the pest and defenders in order to decide about the appropriate intervention under the spirit of IPM. The efforts and cooperation of crop protection and extension departments of MAF are paramount in ensuring the success of the IPM activities.

For IPM to succeed, it requires that IPM demonstration cover a fairly large area. These demonstrations should cover all crops grown in an area. It should include cultivation of pest resistant/tolerant varieties, adoption of agronomic practices to minimize pest attack, promotion of use of bio-pesticides and need based application of bio-rational pesticides in the selected IPM villages.

There is a need to include IPM demonstration in Farmers' Field Schools (FFS) training for duration of some 10 days or more, as needed. Possible modules for IPM training have been detailed in Table 1. These modules must be refined through further discussions with the crop protection and agricultural extension departments at MAF. The USP crop protection experts could be involved in providing training to beneficiaries through structured PRAs.

Table 1: Proposed Tentative Training Modules for IPM

Training Module	Crop Stage	Activities
I	Pre-sowing	Farmer selection Farmers' meeting to explain FFS program Benchmark surveys
II	Germination	Group formation Leader farmer selection Pre-evaluation test Seed germination test Nursery bed preparation
III	Seedling/sowing	Seed treatment test Collection of field flora & fauna Sorting & identification Good message relay
IV	Seedling/vegetative	Sampling techniques Bio-ecology of major pests Demonstrating proper application of manure & fertilizer
V	Transplanting/vegetative	Agro-ecosystem analysis (AESA) Identification of diseases and their management Insect zoo
VI	Vegetative	Bio-ecology of major pests Predation experiments Installation pheromone traps IPM approach for major pests
VII	Vegetative/flowering	AESA Parasitic behavior study on eggs and larvae Installation of sticky traps Pesticide poisoning on natural enemies
VIII	Flowering	AESA of sprayed, unsprayed and field sprayed

Training Module	Crop Stage	Activities
		at economic threshold limit (ETL) Spraying of plants with and its comparative study with non sprayed field Pest population growth and its management Bio-ecology of major pests
IX	Fruiting	AESA of sprayed, unsprayed, and field sprayed at ETL IPM approaches for major crops Nematodes problem and its management Farmer presentation Yield comparison between IPM and non-IPM fields Post evaluation test Discussion on Post Harvest technologies

Currently the pesticide registration officer at the Quarantine Department of MAF is assigned to register every agricultural chemical that enters the country. However, he is not providing any crop based information or advice on chemicals to be applied for particular weed/pest, active ingredients, formulation, dilution, dosage, and/or gestation period. The staff at the agricultural chemical stores, operated by the government, do provide some recommendations, but number of visits made by the consultant reveal that the level of knowledge of the staff on appropriate levels of chemical application and the type of chemicals suitable for different plant diseases were less than satisfactory. There is also a need to empower the quarantine officers and the department to enforce the quarantine (Biosecurity) bill (2003) more effectively to reduce import of highly toxic or banned agrochemicals to Samoa by developing an effective agrochemical registration system to minimize the levels of persistent organic pollutants (POPs) in the natural environment.

IPM demonstrations should be conducted, not only at Nu'u research station, but also in farmers' fields in both islands of Upolu and Savai'i. A minimum of 20 demonstrations should be conducted during the five years period. The number of demonstrations is only indicative and the actual number can only be determined after identifying the needs of the farmers through PRA and gap analysis by the agricultural extension workers.

In addition to the above the training strategy proposed for improving environment awareness proposes for two workshops for training of trainers in the first and second year respectively for the MAF agricultural extension employees. Further district level awareness training and workshops are proposed in each of the islands on a yearly basis by the trained MAF employees. IPM would be an integral part of the curriculum for all trainings conducted by MAF staff.

While organizing demonstrations, quality would be emphasized rather than number of demonstration conducted. Demonstration would be organized keeping in view the need of the farmers and field days would be an integral part of each of the field demonstration. Success or failure of demonstration would be judged on the basis of acceptance of technology by nearby farmers. To monitor the effect of demonstration, impact evaluation would be made at periodic intervals. The selection of the demonstration plots would be through detailed study of its suitability and those that facilitate adoption of the technologies for which demonstration are being held. The project support for these demonstrations would be in the form of cost of inputs, field day and training, etc. The achievement and impact of these demonstrations would be evaluated in terms of adoption of demonstrated technologies by the direct beneficiaries and non-beneficiaries in project farmers and in the adjoining villages during the following years rather than in terms of physical numbers of demonstrations. Proposed IPM related awareness and training needs during the life of project that are required for successful implementation of IPM principles by the project farmers are proposed and outlined in Table 2.

Table 2: Proposed IPM related awareness needs relevant to SACEP activities

Activity	Responsible agency	Schedule
Environmental awareness and training for trainers at Upolu	PCG at MAF, MNREM	Years 1 and 2
Environmental awareness training at district level for farmers, pesticide traders,	MAF extension officers trained on environmental principles	Yearly as needed
Farmer field school on IPM technologies	Crop protection and extension departments at MAF	Yearly at different project areas/villages

Apart from SACEP interventions following trainings/activities should be included as part of MAF'sresponsibilities as a part of the effective pest management program:

- Training of extension officers and resource persons as trainers would be developed through season long training programs in proposed fruit and vegetable crop production. One such training would be held in wet and one in dry season. The program aims at training 16 agricultural extension officers over a period of two years.
- Though a training workshop for field supervisors they would be exposed to IPM principals in a five days period. The extension officers would be trained on a yearly basis, as needed.
- One Day Awareness Campaign to ensure mass awareness of the IPM concept would be taken up by each of the trained agricultural extension officers. 20 farmers would be trained in each of the campaigns. The program should be able to cover all farmers involved in fruit and vegetable production component activities.
- Pesticide, fertilizer, and seed dealers and extension agents play a pivotal role in the application of pesticides and fertilizers and their promotion to the farmers. To educate them a one-day training program would be conducted in each district. The program targets to educate all agrochemical dealers.
- Strengthening of existing crop protection department to empower them to provide pest surveillance and to survey pest and disease situation through rapid roving surveys at regular intervals to guide field functionaries in a timely manner.
- Pest and disease forecasting unit should be established within the crop protection department and their capacity should be strengthened with necessary material building to run these centers.
- Demonstrative use of Bio-Pesticides in FFS to popularize use of Bio-pesticides such as neem extract.
- Evaluation and adoption of Indigenous Technical Know-how (ITK): Different IPM packages used by farmers would be evaluated for adoption through a participatory action research at the FFS for inclusion in the IPM program. One such method, use of boiling water to reduce the population of nematodes in tomato, cabbage, and other vegetable fields is already practices at Aggie's farm in Upolu. Possibility of expanding such activities to other farms and demonstration of their effectiveness to other farmer's fields should be an essential part of extension activities on IPM.

4 Pests and Diseases

Pests and diseases for F&V in Samoa are diverse and, depending on the weather pattern, can give rise to a variety of their populations.

Table 3 provides the information on currently known pests for fruits and vegetables in Samoa.

Table 3: Pests, Type of Damage and Diseases of F&V and fruit trees

Insect Pest	Type of Damage/Disease

Insect Pest	Type of Damage/Disease
Vegetables	
Diamondback moth	Feeds on outer pods of cabbage
Large cabbage moth	Feeds on outer/inner leaf of cabbage
Bacterial rot (tomatoes)	Cause the plant to wilt and die
Thrips and aphids	Stop tomatoes and capsicum from producing flowers
Giant African snails, scales, and mealy bugs	Soft rot, root rot
Fruit trees	
Fruit flies	Eggs laying in potential fruits, damaging the fruit
Fruit piercing moth	Sucking the juice from the fruit, causing damage to the fruit
Fruit flies, mealy bugs, thrips, aphids	Citrus canker, black spots
African giant snails	Black spots

4.1 General IPM principles

IPM consists of set of interventions that all together result in reduction of pest incidence to low and acceptable levels with minimal possible negative impact on natural ecosystems, non-targeted pests and the environment. Integrated Pest Management (IPM) is an effective tool to combat the negative effects of over application of pesticides that can potentially:

- destroy crop pollinators and lead to poor crop yields;
- eliminate the natural enemies of crop pests causing loss of natural pest control that keeps the populations of crop pests very low;
- cause development of pest resistance to pesticides;
- encouraging further increases in the use of chemical pesticides;
- contamination of the soil and water bodies;
- pesticide poisoning of farmers and deleterious effects on human health;
- unacceptable levels of pesticide residues in harvested produce and in the food chain; and
- loss of biodiversity in the environment.

Successful IPM is based on building sound farmer knowledge of the agro-ecological processes of the farming environment and empowering them to make informed decisions on the most appropriate management strategies to minimize crop loss due to pests, using economic threshold in pesticide application, and decide on best pest management practices to increase financial viability of their farming activity in an environmentally sustainable way.

Generally, The IPM components include:

- Cultural practices (good farm management);
  - ✓ Frequent, complete harvesting
  - ✓ Sanitation
  - ✓ Pruning of fruit trees, thinning of vegetable population
  - ✓ Weed management
- Planting materials resistant/tolerant to major pests and diseases;

- Biological control of pests and diseases if available; and
- Rational pesticide utilization (minimal, efficient and safe use of permitted pesticides).

Table 4 shows the typical results from the various IPM inputs where all these contribute to the health of the F&V.

Table 4: Results of various potential IPM Inputs

Results of inputs	Outputs or the results of the inputs
Sanitation	Reduce pests and diseases Improves general health of fruit trees and vegetable crops
Nitrogen Fertilizer Application	Increase vegetative growth Improves health and vigor
NPK	Induce flowering Promote growth
Weed control	Reserve plant nutrients Discourage pests and diseases Improve field and crop/tree sanitation
Shade control	Allow light penetration to dry moisture Discourage Pests and disease development
Tree pruning	Allow light penetration Provide uniform canopy Promote flowering Improves tree health, reduce pests and diseases Allows good plant husbandry and management as trees are small and accessible

SACEP would promote the use of IPM practices, in particular through the following measures where possible:

Major issues to be addressed through the use of IPM are

1. Increased use and reliance on chemical pesticides
   - ✓ Promote adoption of IPM on chemical pesticide practices through farmer education and training; and
   - ✓ Move farmers away from input-dependent crop/pest management practices and promote use of locally produced organic matter, botanical pesticides and biological control, use of economic threshold levels (ETL) for pesticide application.
2. Current pest management practices
   - ✓ Allocate adequate resources to implement the National Plant Protection Policy;
   - ✓ Increase IPM awareness amongst policy maker, agricultural produce retailers, and farming community; and
   - ✓ Promote safe handling and application of pesticides.
3. Enforcement of quarantine requirement
   - ✓ Strengthen institutional capacity at MAF to effectively supervise compliance with agrochemical registration and pesticide legislation.

4. IPM research and extension
    - ✓ Strengthen IPM research;
    - ✓ Strengthen IPM extension;
    - ✓ Strengthen group efforts for field implementation of IPM.
5. Environmental hazards of pesticide misuse
    - ✓ Create public awareness of pesticide misuse hazards through public awareness campaigns;
    - ✓ Undertake regular assessment of pesticide residues in irrigated agricultural production systems and in harvested produce; and
    - ✓ Carry out monitoring of pesticide poisoning in the farming and rural communities.
6. Increased dependence on chemical control
    - ✓ Support mixed cropping and crop rotation systems to keep pest species from reaching economic damage levels.
    - ✓ Promote proper disposal of unused agricultural chemicals and packaging materials.

SACEP activities through training and capacity building of the crop protection and agricultural extension departments would include support for training of farmers and other stakeholders on IPM strategies for the control of the pest and diseases, as well as resources for the implementation of the response plan. This is in line with the needs expressed by communities during consultations carried out for the preparation of the ESMF report. Specific training related to the safe, efficient and minimal utilization of pesticides, based on economic threshold levels for each major crop should also be provided. It is proposed to develop a direct working relationship with the crop protection department at the USP so that proper structured and applied training modules can be developed for not only MAF's crop protection and extension staff, but also project farmers through FFS on implementation of IPM approach in F&V production.

5 IPM Action Plan under SACEP

It is essential that SACEP supports the development of knowledge and builds upon lessons already learned on IPM in GoS. Little work has been conducted concerning biological control methods for F&V. This is something that could be supported by SACEP, being promoted by the MAF crop protection and agricultural extension departments.

The proposed IPM related activities include:

***Phase I*:** Preliminary reconnaissance study to identify the major pest problems in the selected production chains for the selected fruit and vegetable crops, their contexts (ecological, agricultural, public health, economic, and institutional), and defining main parameters for evaluation.

***Phase II*:** Within the context of the technical components of fruit and vegetable and animal feed production to develop operational plans to address the identified pest problems. The possible activities might include:

- ➢ Implementation and dissemination of the list of pest control products that are authorized by the project for procurement;
- ➢ Development of IPM approaches (biological control, cultural practices, use of resistant or tolerant varieties, reducing pesticide use to the minimum based on economic threshold limits and replacement of pesticides with other environmentally safe practices);
- ➢ Identification of actions that would be required and prioritize each of the selected production chains to:
    - ✓ improve the policy, economic, institutional, and legal framework for regulating, procuring, and managing the use of pesticides that are consistent with an IPM approach and are sustainable; and

- ✓ the proposed mechanisms for financing, implementing, monitoring, and supervising components relating to pest management or pesticide use, including any role envisaged for the private sector including local nongovernmental organizations such as WIBDI, SBEC, and METI.

- Finalizing of the proposed training plan to develop the capacity of all who are involved in initiating IPM related research and agricultural extension activities within production chain approach to provide alternatives to undesirable pesticide use. Training activities should also include the various aspects related to the safe use of pesticides such as the use of protective gear and safe disposal of containers used, timing of application, etc.;
- Agree on a time-bound program to phase out the use of an undesirable and broad spectrum pesticide and properly dispose of any existing stocks, if applicable;
- Depending on the nature and complexity of the pest management and pesticide-related issues confirmed before project implementation, and in relation to the Pest Management and the Environmental Action Plans, the supervision missions might include appropriate technical specialists; and
- At the end of the project, the implementation completion report (ICR) should be prepared to evaluate the environmental impact of pest management practices supported or promoted by the project and institutional oversight capacity of the Ministry.

5.1 Pesticide Use

The following criteria apply to the selection and use of pesticides in activities under SACEP:

- They should have negligible adverse human health effects (Categories II and III, as per WHO categories, 2004);
- They should have shown through field studies that they are effective against the target species;
- They should not be broad-spectrum pesticides and should have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application must be aimed to minimize damage to natural enemies; and,
- Their use should take into account the need to prevent the development of resistance in pests.

Pesticide financed by SACEP should be packaged, labelled in both English and Samoan languages, handled, stored, disposed of, and applied according to standards that comply with the FAO's Pesticide storage and stock control manual (FAO, 1996), Revised guidelines on good labelling practice for pesticides (FAO, 1995), Guidelines for the management of small quantities of unwanted and obsolete pesticides (FAO, 1999), Guidelines on Management Options for Empty Pesticide Containers (FAO, 2008), and Guidelines on personal protection when using pesticides in hot climates (FAO, 1990).

SACEP financing would not be used for formulated products that fall in WHO classes Ia and Ib, or when they are likely to be used by farmers without training, equipment, and facilities to handle, store, and apply these products properly.

SACEP financing would not be used for any pesticide products that contain active ingredients that are listed on Annex III of the Rotterdam Convention (on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade), unless the Samoan Government has taken explicit legal or administrative measures to consent to import and use of that active ingredient.

SACEP financing would not be used on any pesticide products which contain active ingredients that are listed on Annex A & B of the Stockholm Convention on Persistent Organic Pollutants, unless for an acceptable purpose as defined by the Convention, or if an exemption has been obtained by the Samoan Government under this Convention.

5.2 Occupational and Health Risks and Mitigation Measures

IPM methods based on cultural practices normally do not involve the use of chemicals and is of no risk to farmers. However, modern agricultural practices and intensive crop production normally

require adoption of agrochemicals use, such as would be the case for F&V production under SACEP. Therefore, it is essential to ensure that farmers involved in the project are made adequately aware and are taught proper procedures for the safe use, handling, application, storage and disposal of agrochemicals. The use of such gears as face and nose masks, eye and body protection and personal hygiene including thorough washing of hand and clothing after the application of the agrochemicals should be introduced and, as much as possible, enforced. Only permitted pesticides should be used in recommended quantity and frequency with appropriate application techniques and nozzles to make sure that the most efficient control of targeted insects, using narrow band and targeted pesticides with minimal quantity are used.

In addition, no pesticide, classified and listed as category I in the WHO Guidelines would be financed under SACEP and the project would assist MAF and other stakeholders in revisiting their recommendations in that area.

Training activities would be designed so as to maximize participation by women farmers since field observation indicated that most women are involved in day-to-day farming activities that include spraying of F&V crops with pesticides.

5.3 Implementation of IPM

5.3.1 Introduction

Integrated pest management is a decision-making process for the selection, implementation, and evaluation of pest management practices. It utilizes all available methods to achieve the most economically and environmentally sound management program. IPM is the integration of available techniques to reduce pest populations and maintain them below the levels causing economic injury in a way that avoids harmful side effects.

Specific pest management needs vary with the crop, cropping system, pest problems, pesticide use history, socio-economic conditions, and other factors. There are, however, well-defined principles that guide the implementation of integrated pest management (IPM). Based on these principles, some guidelines can be offered for the development of and execution of IPM activities for F&V and cassava production subprojects. The implementers of the subprojects should adopt these guidelines to the conditions found in their subprojects.

IPM can decrease pest losses, lower pesticide use, and reduce overall operation costs, while increasing crop yield and stability. Successful IPM programs would be developed for pests on various crops to be promoted by SACEP.

5.3.2 Proposed steps for implementation of IPM approach

Step 1. Assess IPM needs and establish priorities

- Consider the relative importance of target crops and their need for pesticide application;
- Review pesticide use history, trends, availability and needs for development of IPM technology;
- Identify training needs for farmers and extension agents; and
- Respect and use local knowledge.

Step 2. Identify key pests for each target crop

- Become familiar with key pests of target crops and the damage they cause; and
- Correctly identify the common pest.

Step 3. Monitor the fields regularly

- Inspect crops regularly to determine the level of pests and natural enemies;
- Seek assistance of agricultural extension staff if necessary; and
- Determine when crop protection measures, including pesticides are necessary.

Step 4. Select appropriate mix of IPM kits

- Maximize the effectiveness of traditional and introduced non-chemical control techniques;
- Use targeted (not broad spectrum) pesticides when no other practical, effective and economic non-chemical control methods are available;
- Examples of Non-chemical Pest Management Techniques include:
  - ✓ Maintaining good soil fertility and a diverse agro-ecosystem;
  - ✓ Plant resistant crop varieties;
  - ✓ Selecting pest resistant plant varieties for location and season;
  - ✓ Rotating crops;
  - ✓ Planting clean seed;
  - ✓ Select correct planting and harvest periods to minimize pest population increase;
  - ✓ Proper irrigation methods;
  - ✓ Correct fertilizer, rates, and timing;
  - ✓ Good crop sanitation;
  - ✓ Hand picking of larger pests; and
  - ✓ Use of natural control agents (biological control).

Step 5. Develop education, training, and demonstration programs for extension workers

- ✓ Conduct hands-on training of farmers in farmers' field format as opposed to a classroom;
- ✓ Use the participatory "Farmers' Field School" approach; and

Conduct special training for extension workers, government officials, retailers, and the public.

5.4 Overview of Training and Human Resource Development

Training of small farmers on IPM would be an integral part of SACEP activities. Small farmers need to know and understand how they can produce quality fruits and vegetables while minimizing any negative impact on the environment.

5.5 Training of Farmers

Under SACEP, farmers would be trained on IPM principles as early as possible to ensure full implementation of research findings of MAF and USP scientists and to ensure optimal use of agrochemicals within project areas. In addition, modules emphasizing IPM should become a part of the regular agricultural extension activities of MAF staff based on the findings of the crop production scientist at Nu'u and USP. Crop protection and agricultural extension staff capacity should be improved through structured and applied training programs to be conducted by USP staff under SACEP.

All these would be delivered through the various productive partnerships within Components 1 and 2 of the SACEP. During consultation with USP, NGOs, and relevant MAF staff as well as some of the farmers, a number of responses were expressed about different ways or modalities for the delivery of the required training. Training on IPM would be conducted through a number of protocols, including structured and applied training, on farm training or "training by association", and farmer to farmer approaches as promoted by the WIBDI, and other proven approaches.

In addition, farmers could be trained on principles of IPM in a community setting at community halls. This would have the advantage of greater community involvement. Training in classrooms (structured training) is a more formal avenue of training which is often not popular with smallholder farmers who have various family and community obligations. It might be more appropriate for training of trainers.

A large number of NGO based activities such as activities by WIBDI and METI have been formed in the project islands and they could be also sources to draw farmers from to attend the training.

5.6 Public Awareness Raising

To inform the retailers and the public of the importance of IPM and make them aware of the benefits of using the IPM approach to food production in reduction of potential concentration of pesticides in the food and vegetable produce, it is proposed to develop an information campaign through public media such as newspapers, radio and television. Such awareness program should concentrate its efforts on informing the public that use of IPM approach reduces the need for application of pesticides, minimizing potential concentration of pesticides on fruits and vegetables and the possible presence of few blemishes on the vegetable does not only indicate poor quality, but that such blemishes might also be an indication that the produce has not been sprayed during its last stages of development, reducing the possibility of having pesticide residue in the produce.

6 Monitoring and Evaluation under SACEP

As is recommended in the ESMF, MAF should recruit an Environmental and Social Management Officer (ESMO) to coordinate the ESMF and EMP related activities and be engaged as a member of PCG for the SACEP. It would be the responsibility of this person and international TA to train the relevant agricultural extension officers involved in PMP and other environment related activities of PCG and any other staff involved in monitoring activities and to routinely visit all the establishments of SACEP in the two target islands, and to report to the PCG on a semi- annual basis.

6.1 Activities Requiring Monitoring

The application of IPM measures are often done by the farmer as he/she is in control of his F&V garden, based on the training that has been given by the trained MAF staff. The uptake of IPM by farmers would be confirmed through the project M&E activities, by observing a sample of farmers, who have attended the training and monitoring results from their F&V garden blocks.

During quarterly visits the ESMO would need to visit selected blocks to observe the application of IPM measures. These sites and areas would need to be discussed with the relevant agricultural extension and other MAF staff involved in project coordination.

Appendix 1: Currently used pesticides in the GoS Agriculture sector

No	Chemical Trade Name	Active Ingredients	WHO Category
1	Banvine	200 g/l of 2,4-D + 100 g/l Dicamba, both as arvine salt	III
2	Blitzen pellets	15 g/kg Metaldehyde in pellet form	II
3	Claw PCO	30 g/l (10%) Bifenthrin	II
4	Conqueror	970 ml/l mineral oil in form of emulsified concentrate (Glyphosate)	U
5	Cusol	Copper ammonium complex equivalent to 400 g copper sulphate as water soluble concentrate	II
6	Dipel DF	*Bacilus thuringiensis* subsp. kustaki	U
7	Match	50 g/l Lufenuron 596 g/l hydrocarbon liquid	U
8	Orthene	970 g/kg Acephate	III
9	Prevathon	5% Chloranruniliprole	NL*
10	Shield	45 g/l Acephate or inhale	III
11	Stewart	150 g/l Indoracarb form of concentrate	NL

* Not listed

Appendix 2: List of chemicals under Stockholm & Rotterdam Conventions

Stockholm Convention	Rotterdam Convention
Annex A:	**Pesticides:**
Aldrin	2,4,5-T
Chlordane	Aldrin
Dieldrin	Benomyl (certain formulations)
Endrin	Binapacryl
Heptachlor	Captafol
Hexachlorobenzene	Carbofuran (certain formulation)
Mirex	Chlordane
Toxaphene	Chlordime
Polychlorinated biphenyls (PCB)	Chlorobenzilate
	DDT
	Dieldrin
	Dinoseb and Dinoseb salts
	DNOC and its salts
	1,2-dibromoethane (EDB)
	Ethylene dichloride
	Ethylene oxide
	Fluroacetamide
	HCH (mixed isomers)
	Heptachlor
	Hexachlorobenzene
	Lindane
	Mercury compounds (certain formulations)
	Monocrotophos and parathion (all formulations)
	Pentachlorophenol
	Thiram (certain formulations)
	Toxaphene
	Certain hazardous pesticide formulations of:
	Methamidophos
	Methyl-parathion
	Monocrotophos
	Phosphamidon
	Parathion
	Industrial chemicals:

Stockholm Convention	Rotterdam Convention
	Asbestos (actinolite, amosite, anthophyllite, crocidolite, tremolite) Polybrominated biphenyls (PBBs) Polychlorinated byphenyls (PCBs) Polychlorinated terphenyls (PCTs) Tetraethyl and tetramethyl lead Tris (2,3-dibromopropyl) phosphate

Appendix 3: WHO Pesticide Categorization Tables (2004)

Table 2. Highly hazardous (Class IB) technical grade active ingredients in pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Acrolein [C]	107-02-8	1092		L	H	29	EHC 127; HSG 67; IARC 63; ICSC 90
Allyl alcohol [C]	107-18-6	1098		L	H	64	Highly irritant to skin and eyes; ICSC 95
Azinphos-ethyl [ISO]	2642-71-9	2783	OP	S	I	12	DS 72; JMPR 1974
Azinphos-methyl [ISO]	86-50-0	2783	OP	S	I	16	DS 59; ICSC 826; JMPR 1992
Blasticidin-S	2079-00-7	2588		S	F	16	
Butocarboxim [ISO]	34681-10-2	2992	C	L	I	158	JMPR 1985a
Butoxycarboxim [ISO]	34681-23-7	2992	C	L	I	D288	
Cadusafos [ISO]	95465-99-9	3018	OP	L	N,I	37	JMPR 1992
Calcium arsenate [C]	7778-44-1	1573	AS	S	I	20	EHC 224; IARC 84; ICSC 765; JMPR 1969
Carbofuran [ISO]	1563-66-2	2757	C	S	I	8	DS 56; ICSC 122; JMPR 1997b, 2003b. See note 2
Chlorfenvinphos [ISO]	470-90-6	3018	OP	L	I	31	ICSC 1305; JMPR 1995b
3-Chloro-1,2-propanediol [C]	96-24-2	2689		L	R	112	See note 1
Coumaphos [ISO]	56-72-4	2783	OP	S	AC,MT	7.1	ICSC 422; JMPR 1991
Coumatetralyl [ISO]	5836-29-3	3027	CO	S	R	16	
Zeta-cypermethrin [ISO]	52315-07-8	3352	PY	L	I	c86	See note 9, p. 7; HSG 22; ICSC 246
Demeton-S-methyl [ISO]	919-86-8	3018	OP	L	I	40	DS 61, EHC 197; ICSC 705; JMPR 1990
Dichlorvos [ISO]	62-73-7	3018	OP	L	I	56	Volatile, DS 2; EHC 79; HSG 18; IARC 20, 53; ICSC 690; JMPR 1994
Dicrotophos [ISO]	141-66-2	3018	OP	L	I	22	ICSC 872
Dinoterb [ISO]	1420-07-1	2779	NP	S	H	25	
DNOC [ISO]	534-52-1	2779	NP	S	I-S,H	25	JMPR 1965a, EHC 220. See note 2
Edifenphos [ISO]	17109-49-8	3018	OP	L	F	150	JMPR 1982
Ethiofencarb [ISO]	29973-13-5	2992	C	L	I	200	JMPR 1983
Famphur	52-85-7	2783	OP	S	I	48	
Fenamiphos [ISO]	22224-92-6	2783	OP	S	N	15	DS 92; ICSC 483; JMPR 1998b, 2003b
Flucythrinate [ISO]	70124-77-5	3352	PY	L	I	c67	Irritant to skin and eyes, see note 9, p.7; JMPR 1986b
Fluoroacetamide [C]	640-19-7	2588		S	R	13	See note 2
Formetanate [ISO]	22259-30-9	2757	C	S	AC	21	
Furathiocarb	65907-30-4	2992	C	L	I-S	42	
Heptenophos [ISO]	23560-59-0	3018	OP	L	I	96	
Isoxathion [ISO]	18854-04-8	3018	OP	L	I	112	

Table 2. Highly hazardous (Class IB) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Lead arsenate [C]	7784-40-9	1617	AS	S	L	c10	EHC 224; IARC 84; ICSC 911; JMPR 1969
Mecarbam [ISO]	2595-54-2	3018	OP	Oil	I	36	JMPR 1987a
Mercuric oxide [ISO]	21908-53-2	1641	HG	S	O	18	ICSC 981, CICAD 50. See note 2
Methamidophos [ISO]	10265-92-6	2783	OP	S	I	30	See note 2; HSG 79; ICSC 176; JMPR 1991, 2003b
Methidathion [ISO]	950-37-8	3018	OP	L	I	25	JMPR 1998b
Methiocarb [ISO]	2032-65-7	2757	C	S	I	20	JMPR 1999
Methomyl [ISO]	16752-77-5	2757	C	S	I	17	DS 55, EHC 178; HSG 97; ICSC 177, JMPR 1989, 2002
Monocrotophos [ISO]	6923-22-4	2783	OP	S	I	14	See note 2; HSG 80; ICSC 181; JMPR 1996b
Nicotine [ISO]	54-11-5	1654		L		D50	ICSC 519
Omethoate [ISO]	1113-02-6	3018	OP	L	I	50	JMPR 1997a
Oxamyl [ISO]	23135-22-0	2757	C	S	I	6	DS 54; JMPR 1986b, 2003b
Oxydemeton-methyl [ISO]	301-12-2	3018	OP	L	I	65	JMPR 1990, 2003b
Paris green [C]	12002-03-8	1585	AS	S	L	22	Copper-arsenic complex
Pentachlorophenol [ISO]	87-86-5	3155		S	I,F,H	D80	See note 2; Irritant to skin; EHC 71; HSG 19; IARC 53; ICSC 69
Propetamphos [ISO]	31218-83-4	3018	OP	L	I	106	
Sodium arsenite [C]	7784-46-5	1557	AS	S	R	10	EHC 224; IARC 84
Sodium cyanide [C]	143-33-9	1689		S	R	6	ICSC 1118; CICAD 61
Strychnine [C]	57-24-9	1692		S	R	16	ICSC 197
Tefluthrin	79538-32-2	3349	PY	S	I-S	c22	See note 9, p. 7
Thallium sulfate [C]	7446-18-6	1707		S	R	11	DS 10, EHC 182; ICSC 336
Thiofanox [ISO]	39196-18-4	2757	C	S	I-S	8	
Thiometon [ISO]	640-15-3	3018	OP	Oil	I	120	DS 67; ICSC 580; JMPR 1980
Triazophos [ISO]	24017-47-8	3018	OP	L	I	82	JMPR 1994, 2003b
Vamidothion [ISO]	2275-23-2	3018	OP	L	I	103	JMPR 1989
Warfarin [ISO]	81-81-2	3027	CO	S	R	10	DS 35, EHC 175; HSG 96; ICSC 821
Zinc phosphide [C]	1314-84-7	1714		S	R	45	DS 24, EHC 73; ICSC 602

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

Notes to Class II

1. 3-Chloro-2,3-propanediol in nonlethal dosage is a sterilant for male rats. This compound is also known as alpha chlorhydrin.
2. The international trade of carbofuran, DNOC, fluoroacetamide, methamidophos, monocrotophos, and pentachlorophenol is regulated by the Rotterdam convention on Prior Informed Consent (see http://www.pic.int/), which entered into force on 24 February 2004. See Table 7, p. 39.

THE FINAL CLASSIFICATION OF ANY PRODUCT
DEPENDS ON ITS FORMULATION
See Pages 6 & 7, and the Annex

Table 3. Moderately hazardous (Class II) technical grade active ingredients in pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Alanycarb [ISO]	83130-01-2		C	S	I	330	
Anilofos [ISO]	64249-01-0		OP	S	H	472	
Azaconazole	60207-31-0			S	F	308	
Azocyclotin [ISO]	41083-11-8	2786	OT	S	AC	80	JMPR 1990, 1995b
Bendiocarb [ISO]	22781-23-3	2757	C	S	I	55	DS 52
Benfuracarb [ISO]	82560-54-1	2992	C	L	I	205	
Bensulide [ISO]	741-58-2	2902		L	H	270	ICSC 383
Bifenthrin	82657-04-3	3349	PY	S	I	c55	JMPR 1993
Bilanafos [ISO]	71048-99-2			S	H	268	
Bioallethrin [C]	584-79-2		PY	L	I	c700	See note 1; note 9, p. 7; ICSC 227
Bromoxynil [ISO]	1689-84-5	2588		S	H	190	
Bromuconazole	116255-48-2			S	F	365	ICSC 1264
Bronopol	52-51-7			S	B	254	ICSC 415
Butamifos [ISO]	36335-67-8		OP	L	H	630	
Butylamine [ISO]	13952-84-6	1992		L	F	380	Irritant to skin; ICSC 401; JMPR 1982, 1985b
Carbaryl [ISO]	63-25-2	2757	C	S	I	c300	DS 3; EHC 153; HSG 78; IARC 12, Supppl. 7; ICSC 121; JMPR 1997b, 2002
Carbosulfan [ISO]	55285-14-8	2992	C	L	I	250	JMPR 1987a, 2004
Cartap [ISO]	15263-53-3			S	I	325	EHC 76; JMPR 1996a
Chloralose [C]	15879-93-3			S	R	400	
Chlordane [ISO]	57-74-9	2996	OC	L	I	460	See notes 2 and 3; DS 36; EHC 34; HSG 13; IARC 79; ICSC 740; JMPR 1986b
Chlorfenapyr [ISO]	122453-73-0			S	I,MT	441	
Chlorphonium chloride [ISO]	115-78-6	2588		S	PGR	178	Irritant to skin and eyes
Chlorpyrifos [ISO]	2921-88-2	2783	OP	S	I	135	DS 18; ICSC 851; JMPR 2000
Clomazone [ISO]	81777-89-1			L	H	1369	
Copper sulfate [C]	7758-98-7		CU	S	F	300	
Cuprous oxide [C]	1317-39-1		CU	S	F	470	ICSC 421, EHC 200
Cyanazine [ISO]	21725-46-2		T	S	H	288	ICSC 391
Cyanophos [ISO]	2636-26-2		OP	L	I	610	
Cyfluthrin [ISO]	68359-37-5		PY	S	I	c250	See note 9, p. 7; JECFA 1997
Beta-cyfluthrin [ISO]	68359-37-5		PY	S	I	450	See note 9, p. 7
Cyhalothrin [ISO]	68085-85-8	3352	PY	Oil	Ix	c144	See note 9, p. 7; EHC 99; HSG 38; ICSC 858; JMPR 1985c, JECFA 2000b
Cypermethrin [ISO]	52315-07-8	3352	PY	L	I	c250	See note 9, p. 7; DS 58; EHC 82; HSG 22;ICSC 246; JECFA 1996

Table 3. Moderately hazardous (Class II) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Alpha-cypermethrin [ISO]	67375-30-8	3349	PY	S	I	c79	See note 9, p 7; EHC 142; JECFA 1996
Cyphenothrin [(1R)-isomers] [ISO]	39515-40-7	3352	PY	L	I	318	
2,4-D [ISO]	94-75-7	3345	PAA	S	H	375	DS 37; EHC 29, 84; HSG 5; IARC 41, Suppl. 7; ICSC 33; JMPR 1998b
DDT [ISO]	50-29-3	2761	OC	S	I	113	See notes 2 and 3; DS 21; EHC 9, 83; IARC 53; ICSC 34; JMPR 1985c, 2001
Deltamethrin [ISO]	52918-63-5	3349	PY	S	I	c135	See note 9, p. 7; DS 50; EHC 97; HSG 30; IARC 53; ICSC 247; JMPR 2001
Diazinon [ISO]	333-41-5	3018	OP	L	I	1000	DS 45, EHC 198; ICSC 137; JMPR 1994, 2002
Difenzoquat [ISO]	43222-48-6	2588		S	H	470	
Dimethoate [ISO]	60-51-5	2783	OP	S	I	c150	DS 42; EHC 90; HSG 20; ICSC 741; JMPR 1997b, 2004
Dinobuton [ISO]	973-21-7	2779	NP	S	AC,F	140	
Diquat [ISO]	2764-72-9	2781	BP	S	H	231	Irritant to skin and eyes and damages nails; DS 40; EHC 39; HSG 52; JMPR 1994
Endosulfan [ISO]	115-29-7	2761	OC	S	I	80	DS 15; EHC 40; HSG 17; ICSC 742; JMPR 1999
Endothal-sodium [(ISO)]	125-67-9	2588		S	H	51	
EPTC [ISO]	759-94-4		TC	L	H	1652	ICSC 469
Esfenvalerate [ISO]	66230-04-4	3349	PY	S	I	87	JMPR 2003b
Ethion [ISO]	563-12-2	3018	OP	L	I	208	ICSC 888; JMPR 1991
Fenazaquin [ISO]	120928-09-8	2588		S	AC	134	
Fenitrothion [ISO]	122-14-5		OP	L	I	503	DS 30; EHC 133; HSG 65; ICSC 622; JMPR 2001
Fenobucarb	3766-81-2		C	S	I	620	
Fenpropidin [ISO]	67306-00-7			L	F	1440	
Fenpropathrin [ISO]	64257-84-7	3349	PY	S	I	c66	See note 9, p. 7; JMPR 1994
Fenthion [ISO]	55-38-9	3018	OP	L	I,L	D586	DS 23; ICSC 655; JMPR 1998b
Fentin acetate[(ISO)]	900-95-8	2786	OT	S	F	125	DS 22; EHC 15; JMPR 1992; CICAD 13
Fentin hydroxide[(ISO)]	76-87-9	2786	OT	S	F	108	DS 22; EHC 15; ICSC 1283; JMPR 1992; CICAD 13
Fenvalerate [ISO]	51630-58-1	3352	PY	L	I	c450	See note 9, p. 7; DS90; EHC 95, HSG 34; IARC 53; ICSC 273; JMPR 1985c
Fipronil	120068-37-3	2588		S	I	92	JMPR 1998b, 2001
Fluxofenim [ISO]	88485-37-4			oil	H	670	
Fuberidazole [ISO]	3878-19-1			S	F	336	

Table 3. Moderately hazardous (Class II) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Gamma-HCH [ISO], Lindane	58-89-9	2761	OC	S	I	88	JMPR 2003b; See note 3
Guazatine	108173-90-6			S	FST	230	LD50 value refers to triacetate; JMPR 1998b
Haloxyfop	69806-34-4			S	H	393	JMPR 1996b
HCH [ISO]	608-73-1	2761	OC	S	I	100	See notes 2, 3 and 4; EHC 123; IARC 20, Suppl 7; ICSC 487; JMPR 1974
Imazalil [ISO]	35554-44-0	2588		S	F	320	ICSC 1303; JMPR 2001, 2002
Imidacloprid [ISO]	138261-41-3			S	I	450	JMPR 2002
Iminoctadine [ISO]	13516-27-3			S	F	300	Eye irritant
Ioxynil [ISO]	1689-83-4	2588		S	H	110	ICSC 900
Ioxynil octanoate [(ISO)]	3861-47-0			S	H	390	
Isoprocarb [ISO]	2631-40-5	2757	C	S	I	403	
Lambda-cyhalothrin	2164-08-1	3349	PY	S	I	c56	See note 9, p. 7; HSG 38
Mercurous chloride [C]	10112-91-1	2025	HG	S	F	210	See note 3; ICSC 984, CICAD 50
Metaldehyde [ISO]	108-62-3			S	M	227	DS 93
Metam-sodium [(ISO)]	137-42-8	2771		S	F-S	285	
Methacrifos [ISO]	62610-77-9		OP	L	I	678	JMPR 1991
Methasulfocarb [ISO]	66952-49-6	2757		S	F	112	
Methyl isothiocyanate [ISO]	556-61-6	2588		S	F-S	72	Skin and eye irritant; see note 5
Metolcarb [ISO]	1129-41-5		C	S	I	268	
Metribuzin [ISO]	21087-64-9			S	H	322	
Molinate [ISO]	2212-67-1		TC	L	H	720	
Nabam [ISO]	142-59-6	2771		S	F	395	Goitrogenic in rats
Naled [ISO]	300-76-5	3018	OP	L	I	430	DS 39; ICSC 925
Paraquat [ISO]	1910-42-5	2781	BP	S	H	150	See note 6; DS 4; EHC 39; HSG 51; ICSC 5; JMPR 1987a, 2004
Pebulate [ISO]	1114-71-2		TC	L	H	1120	
Permethrin [ISO]	52645-53-1	3352	PY	L	I	c500	See note 9, p. 7; DS 51; EHC 94; HSG 33; IARC 53; ICSC 312; JMPR 2000
Phenthoate [ISO]	2597-03-7	3018	OP	L	I	c400	DS 48; JMPR 1985c
Phosalone [ISO]	2310-17-0	2783	OP	S	I	120	ICSC 797; JMPR 1998b, 2002
Phosmet [ISO]	732-11-6	2783	OP	S	I,AC	113	ICSC 543; JMPR 1995b, 1999, 2004
Phoxim [ISO]	14816-18-3		OP	L	I	D1975	DS 31; JECFA 2000a

Table 3. Moderately hazardous (Class II) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Piperophos [ISO]	24151-93-7	3018	OP	oil	H	324	
Pirimicarb [ISO]	23103-98-2	2757	C	S	AP	147	JMPR 1983, 2005
Prallethrin [ISO]	23031-36-9	3352	PY	oil	I	460	
Profenofos [ISO]	41198-08-7	3018	OP	L	I	358	JMPR 1991
Propiconazole [ISO]	60207-90-1			L	F	1520	JMPR 1988, 2005
Propoxur [ISO]	114-26-1	2757	C	S	I	95	DS 25; ICSC 191; JMPR 1990
Prosulfocarb [ISO]	52888-80-9		TC	L	H	1820	
Prothiofos [ISO]	34643-46-4		OP	L	I	925	
Pyraclofos [ISO(*)]	77458-01-6	3018	OP	L	I	237	
Pyrazophos [ISO]	13457-18-6	2784		S	F	435	JMPR 1993
Pyrethrins [C]	8003-34-7			L	I	500-1000	See note 7; DS 11; JMPR 1971, 2000, 2004
Pyroquilon [ISO]	57369-32-1			S	F	320	
Quinalphos [ISO]	13593-03-8	2783	OP	S	I	62	
Quizalofop-p-tefuryl [ISO]	119738-06-6			L	H	1012	
Rotenone [C]	83-79-4	2588		S	I	132-1500	See note 8; HSG 73; ICSC 944
Spiroxamine [ISO(*)]	118134-30-8			L	F	500	Dermal LD_{50} 1068 mg/kg; may cause skin sensitisation
TCA [ISO] (acid)	76-03-9	1839		S		400	See note 2 to table 5, p. 34; ICSC 586
Terbumeton [ISO]	33693-04-8		T	S	H	483	
Tetraconazole [ISO]	112281-77-3			Oil	F	1031	
Thiacloprid				S	I	444	
Thiobencarb [ISO]	28249-77-6		TC	L	H	1300	
Thiocyclam [ISO]	31895-22-4			S	I	310	
Thiodicarb [ISO]	59669-26-0	2757	C	S	I	66	JMPR 2001
Tralomethrin	66841-25-6	3349	PY	S	I	c85	
Triazamate [ISO(*)]	112143-82-5	2588		S	AP	50-100	
Trichlorfon [ISO]	52-68-6		OP	S	I	250	DS 27; EHC 132; HSG 66; IARC 30, Suppl 7; ICSC 585; JMPR 1979; JECFA 2000b,2003
Tricyclazole [ISO]	41814-78-2			S	F	305	
Tridemorph [ISO]	81412-43-3			Oil	F	650	
Xylylcarb	2425-10-7		C	S	I	380	

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JECFA : Evaluation by the Joint FAO/WHO Expert Committee on Food Additives; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

Notes to Class II

1. Bioallethrin, esbiothrin, esbiol, and esdepalléthrine are members of the series; their toxicity varies considerably within this series, according to concentrations of isomers.
2. The production and use of chlordane and DDT are strictly limited by the Stockholm convention on persistent organic pollutants, which entered into force on 17 May, 2004. See http://www.pops.int/ .
3. The international trade of chlordane, DDT, Gamma-HCH, HCH, and mercury compounds is regulated by the Rotterdam convention on Prior Informed Consent (see http://www.pic.int/), which entered into force on 24 February 2004. See Table 7, p. 39.
4. HCH: The LD_{50} varies according to the mixture of isomers. The value shown has been chosen, and the technical product placed in Class II, as a result of the cumulative properties of the beta isomer.
5. The melting point of methyl isothiocyanate (S) is 35°C.
6. Paraquat has serious delayed effects if absorbed. It is of relatively low hazard in normal use but may be fatal if the concentrated product is taken by mouth or spread on the skin.
7. Mixture of compounds present in *Pyrethrum cineraefolium* and other flowers;
8. Compounds from roots of *Derris* and *Lonchocarpus* spp

THE FINAL CLASSIFICATION OF ANY PRODUCT
DEPENDS ON ITS FORMULATION
See Pages 6 & 7, and the Annex

Table 4. Slightly hazardous (Class III) technical grade active ingredients in pesticides

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Acephate [ISO]	30560-19-1		OP	S	I	945	JMPR 2003b
Acetochlor [ISO]	34256-82-1			L	H	2950	
Acifluorfen [ISO]	50594-66-6			S	H	1370	Strong irritant to eyes
Alachlor [ISO]	15972-60-8	2588		S	H	930	See note 1, p. 30; DS 86; ICSC 371
Allethrin [ISO]	584-79-2		PY	Oil	I	c685	See note 9, page 7; EHC 87; HSG 24; ICSC 212; JMPR 1965a
Ametryn [ISO]	834-12-8		T	S	H	1110	
Amitraz [ISO]	33089-61-1			S	AC	800	ICSC 98; JMPR 1999
Azamethiphos [ISO]	35575-96-3		OP	S	I	1010	
Bensultap [ISO]	17606-31-4			S	I	1100	
Bentazone [ISO]	25057-89-0			S	H	1100	HSG 48; ICSC 828; JMPR 1992, 1999, 2005
Butralin [ISO]	*33629-47-9*			*S*	*H*	*1049*	*Classification changed*
Butroxydim [ISO]	138164-12-2			S	H	1635	
Chinomethionat [ISO]	2439-01-2			S	AC,F	2500	JMPR 1988
Chlormequat (chloride) [ISO]	999-81-5			S	PGR	670	ICSC 781; JMPR 2000
Chloroacetic acid [C]	79-11-8	1751		S	H	650	Irritant to skin and eyes; data refer to sodium salt; ICSC 235
Copper hydroxide [C]	20427-59-2		CU	S	F	1000	
Copper oxychloride [C]	1332-40-7		CU	S	F	1440	
4-CPA [ISO]	122-88-3		PAA	S	PGR	850	
Cycloate [ISO]	1134-23-2		TC	L	H	>2000	
Cyhexatin [ISO]	13121-70-5		OT	S	AC	540	EHC 15; JMPR 1992, 1995b
Cymoxanil [ISO]	57966-95-7			S	F	1196	
Cyproconazole	94361-06-5			S	F	1020	
Dazomet [ISO]	533-74-4			S	F-S	640	Irritant to skin and eyes; ICSC 786
2,4-DB	94-82-6			S	H	700	
Dicamba [ISO]	1918-00-9			S	H	1707	ICSC 139
Dichlormid	37764-25-3			L	H	2080	
Dichlorobenzene [C]	106-46-7			S	FM	500-5000	Mixture of isomers: ortho (3) 95-50-1, meta (3) 541-73-1, para (2B) 106-46-7
Dichlorophen [ISO]	97-23-4		OC	S	F	1250	
Dichlorprop [ISO]	7547-66-2			S	H	800	ICSC 38
Diclofop [ISO]	40483-25-2			S	H	565	

Table 4. Slightly hazardous (Class III) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Dicofol [ISO]	115-32-2		OC	S	AC	c690	DS 81; IARC 30; ICSC 752; JMPR 1993
Diethyltoluamide [ISO]	134-62-3			L	RP (insect)	c2000	DS 80
Difenoconazole [ISO]	119446-68-3			S	F	1453	
Dimepiperate [ISO]	61432-55-1		TC	S	H	946	
Dimethachlor [ISO]	50563-36-5			S	H	1600	
Dimethametryn [ISO]	22936-75-0		T	L	H	3000	
Dimethipin [ISO]	55290-64-7			S	H	1180	JMPR 2000, 2005
Dimethylarsinic acid [C]	75-60-5	1572	AS	S	H	1350	EHC 224
Diniconazole [ISO]	83657-24-3			S	F	639	
Dinocap [ISO]	39300-45-3		NP	S	AC,F	980	ICSC 881; JMPR 1999
Diphenamid [ISO]	957-51-7			S	H	970	ICSC 763
Dithianon [ISO]	3347-22-6			S	F	640	JMPR 1993
Dodine [ISO]	2439-10-3			S	F	1000	JMPR 2001
Empenthrin [(1R) isomers] [ISO]	54406-48-3		PY	Oil	I	>2280	
Esprocarb [ISO]	85785-20-2		TC	L	H	>2000	Skin and eye irritant
Etridiazole [ISO]	2593-15-9			L	F	2000	
Fenothiocarb [ISO]	62850-32-2		C	S	L	1150	
Ferimzone [ISO]	89269-64-7			S	F	725	
Fluazifop-p-butyl [ISO]	83066-88-0			L	H	2451	
Fluchloralin [ISO]	33245-39-5			S	H	1550	
Flufenacet [ISO(*)]	142459-58-3			S	H	600	May cause skin sensitization
Fluoroglycofen	77501-60-1			S	H	1500	
Flurprimidol [ISO]	56425-91-3			S	PGR	709	
Flusilazole	85509-19-9			S	F	1110	JMPR 1996b
Flutriafol [ISO]	76674-21-0			S	F,FST	1140	
Fomesafen [ISO]	72178-02-0		OC	S	H	1250	
Furalaxyl [ISO]	57646-30-7			S	F	940	
Glufosinate [ISO]	53369-07-6			S	H	1625	JMPR 2000
Hexazinone [ISO]	51235-04-2			S	H	1690	

Table 4. Slightly hazardous (Class III) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Hydramethylnon	67485-29-4			S	I	1200	
Iprobenfos	26087-47-8			S	F	600	
Isoprothiolane [ISO]	50512-35-1			S	F	1190	
Isoproturon [ISO]	34123-59-6			S	H	1800	
Isouron [ISO]	55861-78-4			S	H	630	
Malathion [ISO]	121-75-5	3082	OP	L	I	c2100	See note 2, p. 30; DS 29; IARC 30; ICSC 172; JMPR 1998b, 2004
MCPA [ISO]	94-74-6		PAA	S	H	700	IARC 41, Suppl 7; ICSC 54
MCPA-thioethyl [ISO]	25319-90-8		PAA	S	H	790	
MCPB [ISO]	94-81-5			S	H	680	
Mecoprop [ISO]	7085-19-0			S	H	930	ICSC 55
Mecoprop-P [ISO]	16484-77-8			S	H	1050	
Mefluidide [ISO]	53780-34-0			S	H	1920	
Mepiquat [ISO]	15302-91-7			S	PGR	1490	
Metalaxyl [ISO]	57837-19-1			S	F	670	JMPR 2003b
Metamitron [ISO]	41394-05-2			S	H	1183	
Metconazole [ISO]	125116-23-6			S	F	660	
Methylarsonic acid [ISO]	124-58-3		AS	S	H	1800	ICSC 755, EHC 224
Metolachlor [ISO]	51218-45-2			L	H	2780	
Myclobutanil	88671-89-0			S	F	1600	JMPR 1993
2-Napthyloxyacetic acid [ISO]	120-23-0			S	PGR	600	
Nitrapyrin [ISO]	1929-82-4			S	B-S	1072	
Nuarimol [ISO]	63284-71-9			S	F	1250	
Octhilinone [ISO]	26530-20-1			S	F	1470	
N-octylbicycloheptene dicarboximide [C]	113-48-4			L	SY	2800	
Oxadixyl	77732-09-3			A	F	1860	
Paclobutrazol [ISO]	76738-62-0			S	PGR	1300	JMPR 1989
Pendimethalin [ISO]	40487-42-1			S	H	1050	
Pimaricin	7681-93-8			S	F	2730	See note 3, p. 30
Pirimiphos-methyl [ISO]	29232-93-7		OP	L	I	2018	DS 49; JMPR 1993
Prochloraz [ISO]	67747-09-5			S	F	1600	JMPR 2003b
Propachlor [ISO]	1918-16-7			S	H	1500	DS 78; EHC 147; HSG 77
Propanil [ISO]	709-98-8			S	H	c1400	ICSC 552

Table 4. Slightly hazardous (Class III) technical grade active ingredients in pesticides, continued

Common name	CAS no	UN no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Propargite [ISO]	2312-35-8			L	AC	2200	JMPR 2000
Pyrazoxyfen [ISO]	71561-11-0			S	H	1644	
Pyridaben [ISO]	96489-71-3			S	AC	820	
Pyridaphenthion	119-12-0		OP	S	I	769	
Pyridate [ISO]	55512-33-9			S	H	c2000	
Pyrifenox [ISO]	88283-41-4			L	F	2900	
Quinoclamine [ISO]	2797-51-5			S	H	1360	
Quizalofop	76578-12-6			S	H	1670	
Resmethrin [ISO]	10453-86-8		PY	S	I	2000	See note 4, p. 30; EHC 92,DS 83,HSG 25;ICSC 324
Sethoxydim [ISO]	74051-80-2			L	H	3200	
Simetryn [ISO]	1014-70-6		T	S	H	1830	
Sodium chlorate [ISO]	7775-09-9	1495		S	H	1200	ICSC 1117
Sulfluramid [ISO]	4151-50-2			S	I	543	
2,3,6-TBA [ISO]	50-31-7			S	H	1500	
Tebuconazole [ISO]	107534-96-3			S	F	1700	JMPR 1995b
Tebufenpyrad [ISO(*)]	119168-77-3			S	MT	595	
Tebuthiuron [ISO]	34014-18-1			S	H	644	
Thiram [ISO]	137-26-8			S	F	560	DS 71; EHC 78; IARC 53; ICSC 757; JMPR 1993, See note 5
Tralkoxydim [ISO]	87820-88-0			S	H	934	
Triadimefon [ISO]	43121-43-3			S	F	602	JMPR 1986b, 2005
Triadimenol [ISO]	55219-65-3			S	FST	900	JMPR 1990, 2005
Tri-allate [ISO]	2303-17-5		TC	L	H	2165	HSG 89; ICSC 201
Triclopyr [ISO]	55335-06-3			S	H	710	
Triflumizole	99387-89-0			S	F	695	ICSC 1252
Undecan-2-one [C]	112-12-9			Oil	RP, dogs,cats	2500	
Uniconazole [ISO]	83657-22-1			S	PGR	1790	
XMC	2655-14-3		C	S	I	542	
Ziram [ISO]	137-30-4			S	F	1400	Irritant to skin; DS 73; EHC 78; IARC 53; ICSC 348; JMPR 1997b

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

Notes to Class III:

1. Alachlor was previously classified as Class Ia pesticide due to its carcinogenicity in rats. But mechanistic studies have indicated that tumors are induced by a mechanism not relevant to humans.
2. Malathion: LD_{50} value can vary according to impurities. This value has been adopted for classification purposes and is that of a technical product conforming to WHO specifications.
3. Pimaricin: antibiotic, identical with tennecetin and natamycin.
4. Resmethrin is a mixture of isomers, the trans isomer (70-80%) also being known as bioresmethrin and the *cis* isomer (20-30%) as cismethrin. Bioresmethrin alone is of much lower toxicity (oral LD_{50} 9 000 mg/kg) and is the subject of DS 34. It appears in table 5.
5. The international trade of thiram is regulated by the Rotterdam convention on Prior Informed Consent (see http://www.pic.int/), which entered into force on 24 February 2004. See Table 7, p. 39.

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Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Aclonifen	74070-46-5		S	H	>5000	
Acrinathrin [ISO]	101007-06-1	PY	S	MT	>5000	
Alloxydim	55634-91-8		S	H	2260	
Amitrole [ISO]	61-82-5		S	H	5000	EHC 158, DS 79; HSG 85; IARC 79; ICSC 631; JMPR 1998b
Ammonium sulfamate	7773-06-0		S	H	3900	
Ancymidol [ISO]	12771-68-5		S	PGR	4500	
Anthraquinone	84-65-1		S	RP (birds)	>5000	
Asulam [ISO]	3337-71-1		S	H	>4000	
Atrazine [ISO]	1912-24-9	T	S	H	c2000	DS 82; HSG 47; IARC 53; ICSC 99
Azimsulfuron [ISO]	120162-55-2		S	H	>5000	
Azoxystrobine [ISO]	131860-33-8		S	F	>5000	
Bacillus thuringiensis (Bt)	68038-71-1		S	I	>4000	EHC 217
Benalaxyl [ISO]	71626-11-4		S	F	c4200	JMPR 1988
Benazolin [ISO]	3813-05-6		S	H	3200	Irritant to skin and eyes
Benfluralin [ISO]	1861-40-1		S	H	>10000	
Benfuresate	68505-69-1		S	H	2031	
Benomyl [ISO]	17804-35-2		S	F	>10000	EHC 148, DS 87; HSG 81; ICSC 382; JMPR 1996b. See note 3
Benoxacor [ISO]	98730-04-2		S	H	>5000	This molecule is not an active substance as such but is a "safener"
Bensulfuron-methyl	83055-99-6		S	H	>5000	
Bifenox [ISO]	42576-02-3		S	H	>6400	
Bioresmethrin [ISO]	28434-01-7	PY	L	I	>7000	DS 34; EHC 92; HSG 25; ICSC 229; JMPR 1992
Biphenyl	92-52-4		S	F	3280	ICSC 106
Bispyribac	125401-75-4		S	H	2635	
Bitertanol	*55179-31-2*		*S*	*F*	*>5000*	*JMPR 1999; See note 1*
Borax [ISO]	1303-96-4		S	F	4500	ICSC 567
Bromacil [ISO]	314-40-9		S	H	5200	
Bromobutide	74712-19-9		S	H	>5000	
Bromopropylate [ISO]	18181-80-1		S	AC	>5000	JMPR 1994
Bupirimate [ISO]	41483-43-6		S	F	c4000	
Buprofezin [ISO]	69327-76-0		S	I	2200	JMPR 1992
Butachlor	23184-66-9		L	H	3300	
Butylate [ISO]	2008-41-5	TC	L	F	>4000	
Captan [ISO]	133-06-2		S	F	9000	Irritant to skin; DS 9; HSG 50; IARC 30, Suppl 7; ICSC 120; JMPR 1996b, 2005
Carbendazim [ISO]	10605-21-7		S	F	>10000	DS 89; EHC 149; HSG 82; ICSC 1277; JMPR 1996b
Carbetamide [ISO]	16118-49-3	C	S	H	>10000	
Carboxin [ISO]	5234-68-4		S	FST	3820	
Carpropamid [ISO(*)]	104030-54-8		L	F	>5000	
Chloransulam methyl	14750-35-4			H	>5000	

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use, continued

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Chlorfluazuron	71422-67-8		S	IGR	8500	
Chloridazon [ISO]	1698-60-8		S	H	2420	
Chlorimuron	99283-00-8		S	H	4102	
Chlorothalonil [ISO]	1897-45-6		S	F	>10000	EHC 183; HSG 98; IARC 73; ICSC 134; JMPR 1993
Chlorotoluron [ISO]	15545-48-9		S	H	>10000	
Chlorpropham [ISO]	101-21-3	C	S	PGR	>5000	IARC 12, Suppl 7; JMPR 2001
Chlorpyrifos methyl [ISO]	5598-13-0	OP	S	I	>3000	DS 33; JMPR 1993
Chlorsulfuron	64902-72-3		S	H	5545	
Chlorthal-dimethyl [ISO]	1861-32-1		S	H	>3000	
Chlozolinate	84332-86-5		S	F	>4000	
Cinmethylin	87818-31-3		L	H	3960	
Cinosulfuron [ISO]	94593-91-6		S	H	>5000	
Clofentezine [ISO(*)]	74115-24-5		S	AC	>5200	JMPR 1987a
Clomeprop	84496-56-0		S	H	>5000	
Clopyralid	57754-85-5		S	H	4300	Severe irritant to eyes
Cloxyfonac	32791-87-0	PAA	S	PGR	>5000	
Cryolite [C]	15096-52-3		S	I	>10000	
Cycloprothrin	63935-38-6	PY	L	I	>5000	
Cyclosulfamuron [ISO(*)]	136849-15-5		S	H	>5000	
Cycloxydim	101205-02-1		S	H	3900	JMPR 1993
Cyhalofop [ISO]	122008-85-9		S	H	>5000	
Cyromazine	66215-27-8		S	L	3300	JMPR 1991
Daimuron	42609-52-9		S	H	>5000	
Dalapon	75-99-0		S	H	9330	
Daminozide [ISO]	1596-84-5		S	H	8400	JMPR 1992
Desmedipham [ISO]	13684-56-5		S	H	>9600	
Diafenthiuron [ISO]	80060-09-9		S	AC	2068	
Dichlobenil [ISO]	1194-65-6		S	H	3160	ICSC 867
Dichlofluanid [ISO]	1085-98-9		S	F	>5000	JMPR 1985a
Diclomezine	62865-36-5		S	F	>10000	
Dicloran	99-30-9		S	F	4000	ICSC 871; JMPR 1999
Diclosulam [ISO]	145701-21-9			H	>5000	
Diethofencarb	87130-20-9		S	F	>5000	
Diflubenzuron	35367-38-5		S	L	>4640	DS 77, EHC 184; HSG 99; JMPR 2002
Diflufenican [ISO(*)]	83164-33-4		S	H	>2000	
Dikegulac [ISO]	18467-77-1		S	PGR	>10000	
Dimefuron [ISO]	34205-21-5		S	H	>2000	
Dimethirimol [ISO]	5221-53-4		S	F	2350	
Dimethomorph [ISO]	110488-70-5		S	F	>5000	
Dimethyl phthalate [C]	131-11-3		L	RP (insect)	8200	ICSC 261
Dinitramine [ISO]	29091-05-2		S	H	3000	
Dipropyl isocinchomerate [C]	3737-22-2		L	RP (fly)	5230	
Dithiopyr [ISO]	97886-45-8		S	H	>5000	
Diuron [ISO]	330-54-1		S	H	3400	
Dodemorph [ISO]	1593-77-7		L	H	4500	
Ethalfluralin [ISO]	55283-68-6		S	H	>10000	
Ethephon	16672-87-0		S	PGR	>4000	JMPR 1994; 2003b
Ethirimol [ISO]	23947-60-6		S	FST	6340	

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use, continued

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Ethofumesate [ISO]	26225-79-6		S	H	>6400	
Ethyl butylacetylaminopropionate	*52304-36-6*		*L*	*RP (insect)*	*>5000*	*See note 1*
Etofenprox	80844-07-1		S	I	>10000	JMPR 1994
Famoxadone [ISO(*)]	131807-57-3		S	F	>5000	JMPR 2004
Fenarimol [ISO]	60168-88-9		S	F	2500	JMPR 1996b
Fenbuconazole	*114369-43-6*		*S*	*F*	*>2000*	*Dermal LD_{50} > 5000 mg/kg; JMPR 1998*
Fenbutatin oxide [ISO]	13356-08-6	OT	S	MT	2630	EHC 15; JMPR 1993
Fenchlorazole [ISO]	103112-35-2		S	H	>5000	
Fenclorim	3740-92-9		S	H	>5000	
Fenfuram [ISO]	24691-80-3		S	FST	>10000	
Fenhexamid [ISO(*)]	126833-17-8		S	F	>5000	
Fenoxycarb	79127-80-3	C	S	I	>10000	
Fenpiclonil	74738-17-3		S	FST	>5000	
Fenpropimorph	67564-91-4		oil	F	3515	JMPR 1995b, 2002, 2005
Ferbam [ISO]	14484-64-1		S	F	>10000	DS 94; EHC 78; IARC 42, Suppl 7; ICSC 792; JMPR 1997b
Flamprop-M	90134-59-1		S	H	>3000	
Florasulam	*145701-23-1*		*S*	*H*	*>5000*	*Dermal LD50 > 2000*
Flucarbazone-sodium	181274-17-9		S	H	> 5000	
Flucycloxuron [ISO]	94050-52-9		S	AC	>5000	
Flufenoxuron	101463-69-8		S	I	>3000	
Flumetralin	62924-70-3		S	PGR	>5000	
Flumetsulam [ISO]	98967-40-9		S	H	>5000	
Fluometuron [ISO]	2164-17-2		S	H	>8000	
Flupropanate	756-09-2		S	H	>10000	
Flupyrsulfuron [ISO]	144740-54-5		S	H	>5000	
Flurenol [ISO]	467-69-6		S	PGR	>5000	
Fluridone [ISO]	59756-60-4		S	H	>10000	
Flurochloridone	61213-25-0		S	H	4000	
Fluroxypyr	69377-81-7		S	H	>5000	
Fluthiacet	149253-65-6		S	H	>5000	
Flutolanil	66332-96-5		S	F	>10000	ICSC 1265; JMPR 2003b
tau-Fluvalinate	102851-06-9	PY	oil	I	>3000	Skin and eye irritant
Folpet	133-07-3		S	F	>10000	HSG 72; ICSC 156; JMPR 1996b
Fosamine [ISO]	25954-13-6	OP	S	H	2400	
Fosetyl	15845-66-2		S	F	5800	
Gibberellic acid	77-06-5		S	PGR	>10000	
Glyphosate [ISO]	1071-83-6		S	H	4230	EHC 159, DS 91; ICSC 160; JMPR 1987a
Halofenozide	*112226-61-6*		*S*	*I*	*2850*	*Dermal LD50 > 2000*
Hexaconazole	79983-71-4		S	F	2180	JMPR 1991
Hexaflumuron [ISO]	86479-06-3		S	I	>5000	ICSC 1266
Hexythiazox	78587-05-0		S	AC	>5000	JMPR 1992
Hydroprene [ISO]	41205-09-8		L	IGR	>10000	
2-Hydroxyethyl octyl sulphide [C]	3547-33-9		L	RP (insect)	8530	
Hymexazol	10004-44-1		S	FST	3900	
Imazamethabenzmethyl [(ISO)]	81405-85-8		S	H	>5000	
Imazapyr	81334-34-1		S	H	>5000	Irritant to eyes
Imazaquin	81335-37-7		S	H	>5000	

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use, continued

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Imazethapyr	81335-77-5		S	H	>5000	
Imibenconazole [ISO]	86598-92-7		S	F	>5000	
Inabenfide	82211-24-3		S	PGR	>10000	
Iprodione [ISO]	36734-19-7		S	F	3500	JMPR 1996b
Iprovalicarb	140923-17-7		S	F	>5000	
Isoxaben	82558-50-7		S	H	>10000	
Kasugamycin	19408-46-9		S	F	>10000	
Lenacil [ISO]	2164-08-1		S	H	>10000	
Linuron [ISO]	330-55-2		S	H	4000	ICSC 1300
Maleic hydrazide [C]	10071-13-3		S	PGR	6950	IARC 4, Suppl 7; JMPR 1997b CAS no 123-33-1 for dione tautomer
Mancozeb	8018-01-7		S	F	>8000	Irritant to skin on multiple exposure; DS 94; EHC 78; ICSC 754; JMPR 1994
Maneb [ISO]	12427-38-2		S	F	6750	Irritant to skin on multiple exposure; DS 94; EHC 78; ICSC 173; JMPR 1994
Mefenacet	73250-68-7		S	H	>5000	
Mepanipyrim [ISO]	110235-47-7		S	F	>5000	
Mepronil [ISO]	55814-41-0		S	F	>10000	
Metazachlor	67129-08-2		S	H	2150	
Methabenzthiazuron [ISO]	18691-97-9		S	H	>2500	
Methoprene [ISO]	40596-69-8		L	IGR	>10000	DS 47; JMPR 2002
Methoxychlor [ISO]	72-43-5	OC	S	I	6000	DS 28; IARC 20, Suppl 7; ICSC 1306; JMPR 1978
Methozyfenozide	*161050-58-4*		*S*	*I*	*>5000*	*Dermal LD50 > 5000;JMPR 2004*
Methyldymron	42609-73-4		S	H	3948	
Metiram	9006-42-2		S	F	>10000	JMPR 1994
Metobromuron [ISO]	3060-89-7		S	H	2500	
Metosulam	139528-85-1		S	H	>5000	
Metoxuron	19937-59-8		S	H	>3200	
Metsulfuron methyl	74223-64-6		S	H	>5000	
Monolinuron	1746-81-2		S	H	2250	ICSC 1273
2-(1-Naphthyl) acetamide	86-86-2		S	PGR	6400	
1-Naphthylacetic acid	86-87-3		S	PGR	c3000	
Napropamide	15299-99-7		S	H	5000	
Naptalam	132-66-1		S	PGR	8200	
Neburon [ISO]	555-37-3		S	H	>10000	
Niclosamide [ISO]	50-65-7		S	M	5000	DS 63
Nicosulfuron [ISO]	111991-09-4		S	H	>5000	Irritant to eyes
Nitrothal-isopropyl [ISO]	10552-74-6		S	F	6400	
Norflurazon [ISO]	27314-13-2		S	H	>8000	
Noviflumuron	*121451-02-3*		*S*	*I*	*>5000*	*Dermal LD50 > 5000; See note 1*
Ofurace	58810-48-3		S	F	2600	
Oryzalin [ISO]	19044-88-3		S	H	>10000	
Oxabetrinil	74782-23-3		S	H	>5000	
Oxadiazon [ISO]	19666-30-9		S	H	>8000	
Oxine-copper [ISO]	10380-28-6	CU	S	F	7792	
Oxycarboxin [ISO]	5259-88-1		S	F	2000	
Oxyfluorfen [ISO]	42874-03-3		S	H	>5000	
Penconazole	66246-88-6		S	F	2120	JMPR 1993
Pencycuron	66063-05-6		S	F	>5000	

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use, continued

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Penoxsulam	*219714-96-2*		*S*	*H*	*>5000*	*Dermal LD_{50} > 5000*
Pentanochlor	2307-68-8		S	H	>10000	
Phenmedipham [ISO]	13684-63-4		S	H	>8000	
Phenothrin [ISO]	26002-80-2	PY	L	I	>5000	DS 85; EHC 96; HSG 32; ICSC 313; JMPR 1989
2-Phenylphenol [C]	90-43-7		S	F	2480	ICSC 669; IARC 73; JMPR 2000
Phosphorus acid [C]	13598-36-2		L	F	>5000	
Phthalide	27355-22-2		S	F	>10000	
Picloram [ISO]	1918-02-1		S	H	8200	ICSC 1246
Piperonyl butoxide	51-03-6		Oil	SY	>7500	IARC 30, Suppl 7; JMPR 1996b
Pretilachlor [ISO]	51218-49-6		L	H	6100	
Primisulfuron [ISO]	113036-87-6		S	H	>5050	
Probenazole	27605-76-1		S	F	2030	
Procymidone [ISO]	32809-16-8		S	F	6800	JMPR 1990
Prodiamine [ISO]	29091-21-2		S	H	>5000	
Prometon [ISO]	1610-18-0	T	S	H	2980	
Prometryn [ISO]	7287-19-6	T	S	H	3150	
Propamocarb	24579-73-5		S	F	8600	JMPR 1987a
Propaquizafop	111479-05-1		S	H	>5000	ICSC 1271
Propazine [ISO]	139-40-2	T	S	H	>5000	ICSC 697
Propham [ISO]	122-42-9		S	H	5000	IARC 12, Suppl 7; JMPR 1993
Propineb [ISO]	12071-83-9		S	H	8500	DS 94; EHC 78; JMPR 1994
Propyzamide [ISO]	23950-58-5		S	H	5620	
Pyrazolynate [ISO]	58011-68-0		S	H	9550	
Pyrazosulfuron [ISO]	98389-04-9		S	H	>5000	
Pyrimethanil [ISO]	53112-28-0		S	F	4150	
Pyriminobac	136191-56-5		S	H	>5000	
Pyriproxyfen [ISO]	95737-68-1		S	I	>5000	ICSC 1269; JMPR 2000
Pyrithiobac sodium [ISO]	123343-16-8		S	H	3200	
Quinclorac	84087-01-4		S	H	2680	
Quinmerac [ISO]	90717-03-6		S	H	>5000	
Quinoxyfen [ISO]	124495-18-7			F	>5000	
Quintozene [ISO]	82-68-8		S	F	>10000	EHC 41; HSG 23; IARC 5, Suppl 7; JMPR 1996b
Rimsulfuron [C]	122931-48-0		S	H	>5000	
Siduron [ISO]	1982-49-6		S	H	>7500	
Simazine	122-34-9	T	S	H	>5000	ICSC 699
Spinosad [ISO(*)]	168316-95-8			I	3738	For Spinosyn A and D, CAS nos are 131929-60-7 and 131929-63-0; JMPR 2002
Sulfometuron	74223-56-6		S	H	>5000	
Sulphur (UN number 1350)	7704-34-9		S	F,I	>3000	Skin and mucous membrane irritant. See note 2; ICSC 1166
TCA (sodium salt) [ISO]	650-51-1		S	H	3200	Irritant to skin and eyes: see note 3
Tebufenozide	*112410-23-8*		*S*	*I*	*>5000*	*Dermal LD50 > 5000;JMPR 1997b, 2004*
Tebutam	35256-85-0		Oil	H	6210	
Tecnazene [ISO]	117-18-0		S	F	>10000	EHC 42; HSG 12; JMPR 1995b
Teflubenzuron	83121-18-0		S	I	>5000	JMPR 1995b
Temephos [ISO]	3383-96-8	OP	L	I	8600	DS 8; ICSC 199
Terbacil [ISO]	5902-51-2		S	H	>5000	
Terbuthylazine [ISO]	5915-41-3	T	S	H	2160	
Terbutryn [ISO]	886-50-0	T	S	H	2400	

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use, continued

Common name	CAS no	Chem type	Phys state	Main use	LD_{50} mg/kg	Remarks
Tetrachlorvinphos [ISO]	22248-79-9	OP	S	I	4000	
Tetradifon [ISO]	116-29-0		S	AC	>10000	EHC 67; HSG 11; ICSC 747
Tetramethrin [ISO]	7696-12-0	PY	S	O	>5000	EHC 98; HSG 31; ICSC 334
Thiabendazole [ISO]	148-79-8		S	F	3330	JECFA 1997, 2002
Thidiazuron	51707-55-2		S		>4000	
Thifensulfuron-methyl	79277-27-3		S	H	>5000	
Thifluzamide	*130000-40-7*		*S*	*F*	*>5000*	*Dermal LD_{50} > 5000*
Thiophanate-methyl [ISO]	23564-05-8		S	F	>6000	JMPR 1996b, 1999
Tiocarbazil	36756-79-3	TC	L	H	10000	
Tolclofos-methyl [ISO]	57018-04-9		S	F-S	c5000	JMPR 1995b
Tolylfluanid [ISO]	731-27-1		S	F	>5000	JMPR 1989, 2003b
Transfluthrin [ISO]	118712-89-3	PY	S	I	>5000	
Triasulfuron	82097-50-5		S	H	>5000	
Tribenuron [ISO]	106040-48-6		S	H	>5000	
Trietazine [ISO]	1912-26-1	T	S	H	2830	ICSC 202
Triflumuron	64628-44-0		S	PGR	>5000	
Trifluralin [ISO]	1582-09-8		S	H	>10000	IARC 53; ICSC 205
Triflusulfuron-methyl [ISO]	126535-15-7		S	H	>5000	
Triforine [ISO]	26644-46-2		S	F	>6000	JMPR 1998b
Triticonazole [ISO]	131983-72-7		S	F	>2000	
Validamycin	37248-47-8		S	F	>10000	
Vinclozolin [ISO]	50471-44-8		S	F	10000	JMPR 1996b
Zineb [ISO]	12122-67-7		S	F	>5000	DS 94; EHC 78; IARC 12; ICSC 350; JMPR 1994

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JECFA : Evaluation by the Joint FAO/WHO Expert Committee on Food Additives; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

Notes to table 5:

1. Sulphur dust can spontaneously ignite unless diluted about 50% with inert material.
2. TCA: The data shown refer to sodium trichloroacetic acid. In many countries, the same term (TCA) refers to the free acid (now accepted by ISO): this is a solid with an oral LD_{50} of 400 mg/kg and if used as a pesticide would be placed in Class II. It is highly corrosive to skin.
3. The international trade of benomyl is regulated by the Rotterdam convention on Prior Informed Consent (see http://www.pic.int/), which entered into force on 24 February 2004. See Table 7, p. 39.

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TABLE 6. ACTIVE INGREDIENTS BELIEVED TO BE OBSOLETE OR DISCONTINUED FOR USE AS PESTICIDES

Ingredients discontinued have been identified from the previous edition of this classification, from the Pesticide Manual (Pesticide Manual, 1991, 1994; 1997, 2003), and in some cases from the manufacturer. It is difficult, in some cases, to be sure whether or not all commercial activity in a substance has ceased; some of these materials are known to be still in use for non-agricultural purposes. IPCS will be grateful for details of any materials in this Section, which are still in commercial use. The common name and CAS number are indicated.

Active ingredient	CAS no
Acrylonitrile	107-13-1
Aldoxycarb	1646-88-4
Aldrin[1,2]	309-00-2
Allidochlor	93-71-0
Allyxycarb	6392-46-7
Amidithion	919-76-6
Aminocarb	2032-59-9
Anilazine	101-05-3
ANTU	86-88-4
Aramite	140-57-8
Arsenous oxide	1327-53-3
Athidathion	19691-80-6
Atraton	1610-17-9
Aziprotryne	4658-28-0
Azothoate	5834-96-8
Barban	101-27-9
Barium carbonate	513-77-9
Benodanil	15310-01-7
Benquinox	495-73-8
Benzoximate	29104-30-1
Benzoylprop-ethyl	33878-50-1
Benzthiazuron	1929-88-0
Binapacryl[1]	485-31-4
Bis(tributyltin) oxide	56-35-9
Bisthiosemi	39603-48-0
Bromocyclen	1715-40-8
Bromofenoxim	*13181-17-4*
Bromophos	2104-96-3
Bromophos-ethyl	4824-78-6
Bufencarb	8065-36-9
Butacarb	2655-19-8
Butam	35256-85-0
Butenachlor	87310-56-3
Buthidazole	55511-98-3
Buthiobate	51308-54-4
Butonate	126-22-7
Butopyronoxyl	532-34-3
Buturon	3766-60-7
Calcium cyanamide	156-62-7
Camphechlor[1,2]	8001-35-2
Carbamorph	31848-11-0
Carbanolate	671-04-5
Carbon disulfide	75-15-0
Carbophenothion	786-19-6
Chlomethoxyfen	*32861-85-1*
Chloramben	*133-90-4*
Chloraniformethan	20856-57-9
Chloranil	118-75-2
Chloranocryl	2164-09-2
Chlorbenside	103-17-3
Chlorbufam	1967-16-4
Chlorbicyclen	2550-75-6
Chlorbromuron	*13360-45-7*
Chlordecone	143-50-0
Chlordimeform[1]	6164-98-3
Chlorfenac	85-34-7
Chlorfenethol	80-06-8
Chlorfenprop-methyl	14437-17-3
Chlorfenson	80-33-1
Chlorfensulfide	22274-74-0
Chlorflurenol	2536-31-4
Chlormebuform	37407-77-5
Chlormethiuron	28217-97-2
Chlornitrofen	1836-77-7
Chlorobenzilate[1]	510-15-6
Chloroneb	2675-77-6
Chloropropylate	5836-10-2
Chloroxuron	1982-47-4
Chlorquinox	3495-42-9
Chlorphoxim	14816-20-7
Chlorthiamid	*1918-13-4*
Chlorthiophos	21923-23-9
Cloethocarb	51487-69-5
Clofop	26129-32-8
Coumachlor	81-82-3
Crimidine	535-89-7
Credazine	14491-59-9
Crotoxyphos	7700-17-6
Crufomate	299-86-5
Cyanofenphos	13067-93-1
Cyanthoate	3734-95-0
Cycloheximide	66-81-9
Cycluron	2163-69-1
Cyometrinil	63278-33-1
Cypendazole	28559-00-4
Cyprofuram	69581-33-5
Cypromid	2759-71-9
Delachlor	24353-58-0
Demephion-O	682-80-4
Demephion-S	2587-90-8
Demeton-O	298-03-3
Demeton-S	126-75-0
Demeton-S-methylsulphon	17040-19-6
Desmetryn	*1014-69-3*
Dialifos	10311-84-9
Di-allate	2303-16-4
Diamidafos	1754-58-1
Dibromochloropropane	96-12-8
Dibutyl phthalate	84-74-2
Dibutyl succinate	141-03-7
Dichlofenthion	97-17-6
1,2-Dichloropropane	78-87-5
Dichlozoline	24201-58-9
Diclobutrazol	75736-33-3
Dieldrin[1,2]	60-57-1
Dienochlor	*2227-47-0*
Diethatyl	38727-55-8
Difenoxuron	14214-32-5
Dimefox	115-26-4
Dimetilan	644-64-4
Dimexano	1468-37-7
Dinex	131-89-5
Dinocton	32534-96-6
Dinoseb[1]	88-85-7
Dinoseb acetate[1]	2813-95-8
Dioxabenzophos	3811-49-2
Dioxacarb	6988-21-2
Dioxathion	78-34-2
Dipropetryn	4147-51-7
Disul	149-26-8
Ditalimfos	5131-24-8
Drazoxolon	5707-69-7
Eglinazine	6616-80-4
Endothion	2778-04-3
Endrin[2]	72-20-8
EPBP	3792-59-4
Erbon	136-25-4
ESP (Oxydeprofos)	2674-91-1
Etacelasil	37894-46-5
Etaconazole	60207-93-4
Ethidimuron	30043-49-3
Ethiolate	2941-55-1
Ethoate-methyl	116-01-8
Ethohexadiol	94-96-2
Ethyleneglycolbis (trichloroacetate)	2514-53-6
Etrimfos	*38260-54-7*

TABLE 6. ACTIVE INGREDIENTS BELIEVED TO BE OBSOLETE OR DISCONTINUED FOR USE AS PESTICIDES, continued

Active ingredient	CAS no
EXD	502-55-6
Fenaminosulf	140-56-7
Fenazaflor	14255-88-0
Fenchlorphos	299-84-3
Fenitropan	65934-95-4
Fenoprop (Silvex)	93-72-1
Fenoxaprop-ethyl	82110-72-3
Fenson	80-38-6
Fensulfothion	115-90-2
Fenthiaprop	95721-12-3
Fenuron	*101-42-8*
Fenuron-TCA	*4482-55-7*
Flamprop	58667-63-3
Fluazifop	69335-91-7
Flubenzimine	37893-02-0
Fluenetil	4301-50-2
Fluorodifen	15457-05-3
Fluoromide	13577-71-4
Fluotrimazole	31251-03-3
Fluvalinate	69409-94-5
Fonofos	*944-22-9*
Formothion	2540-82-1
Fosmethilan	83733-82-8
Fosthietan	21548-32-3
Furconazole-cis	112839-32-4
Furmecyclox	60568-05-0
Glyodin	556-22-9
Glyphosine	2439-99-8
Griseofulvin	126-07-8
Halacrinate	34462-96-9
Haloxydine	2693-61-0
Heptachlor[1,2]	*76-44-8*
Heptopargil	73886-28-9
Hexachloroacetone	116-16-5
Hexaflurate	17029-22-0
Hydroxyquinoline sulfate	134-31-6
Ipazine	1912-25-0
IPSP	5827-05-4
Isazofos	*42509-80-8*
Isobenzan	297-78-9
Isobornyl thiocyano acetate	115-31-1
Isocarbamid	30979-48-7
Isocil	314-42-1
Isodrin	465-73-6
Isofenphos	*25311-71-1*
Isomethiozin	57052-04-7
Isonoruron	28805-78-9
Isopropalin	33820-53-0
Isothioate	36614-38-7
Isoxapyrifop	87757-18-4
Jodfenphos	18181-70-9
Karbutilate	4849-32-5
Kelevan	4234-79-1
Kinoprene	42588-37-4
Leptophos	21609-90-5
Lythidathion	2669-32-1
Malonoben	10537-47-0
Mebenil	7055-03-0
Mecarbinzid	27386-64-7
Mecarphon	29173-31-7
Medinoterb acetate	2487-01-6
Menazon	78-57-9
Mephospholan	950-10-7
Methazole	20354-26-1
Methiuron	21540-35-2
Methoprotryne	841-06-5
Methoxyethylmercury silicate[1]	64491-92-5
Methoxyphenone	41295-28-7
Methoxymethyl mercury chloride[1]	123-88-6
Methylmercury dicyandiamide[1]	502-39-6
Metsulfovax	21542-18-6
Mexacarbate	315-18-4
Mipafox	371-86-8
Mirex[2]	2385-85-5
Monalide	7187-36-7
Monuron	150-68-5
Monuron-TCA	140-41-0
Morfamquat	4636-83-3
Myclozolin	54864-61-8
Naphthalene	91-20-3
Naphthalic anhydride	81-84-5
Nitralin	4726-14-1
Nitrilacarb	29672-19-3
Nitrofen	1836-75-5
Norbormide	991-42-4
Noruron	2163-79-3
Oxapyrazon	4489-31-0
Oxydisulfoton	2497-07-6
Parafluron	7159-99-1
Perfluidone	37924-13-3
Phenisopham	57375-63-0
Phenkapton	2275-14-1
Phenobenzuron	3134-12-1
Phenylmercurydimethyldithiocarbamate[1]	32407-99-1
Phenylmercury nitrate[1]	8003-05-2
Phosacetim	4104-14-7
Phosdiphen	36519-00-3
Phosfolan	947-02-4
Pindone	*83-26-1*
Piproctanyl	69309-47-3
Pirimiphos-ethyl	*23505-41-1*
Potassium cyanate	590-28-3
Profluralin	26399-36-0
Proglinazine	68228-20-6
Promacyl	34264-24-9
Promecarb	2631-37-0
Propaphos	*7292-16-2*
Propyl isome	83-59-0
Prothiocarb	19622-08-3
Prothoate	2275-18-5
Proxan	108-25-8
Pydanon	22571-07-9
Pyracarbolid	24691-76-7
Pyridinitril	1086-02-8
Quinacetol sulfate	57130-91-3
Quinonamid	27541-88-4
Ryania	8047-13-0
Sabadilla	8051-02-3
Salicylanilide	87-17-2
Schradan	152-16-9
Scilliroside	507-60-8
Secbumeton	26259-45-0
Sesamex	51-14-9
Sodium fluoride	*7681-49-4*
Sodium hexafluorosilicate	*16893-85-9*
Sulfallate	95-06-7
Sulfoxide	120-62-7
Sulprofos	*35400-43-2*
SWEP	1918-18-9
2,4,5-T[1]	93-76-5
TDE	72-54-8
TEPP	107-49-3
Terbucarb	1918-11-2
Tetrasul	2227-13-6
Thiazafluron	25366-23-8
Thicyofen	116170-30-0
Thionazin	297-97-2
Thiophanate	23564-06-9
Thioquinox	93-75-4
Triamiphos	1031-47-6
Triapenthenol	76608-88-3
Triarimol	26766-27-8
Tricamba	2307-49-5
Trichlamide	70193-21-4
Trichloronat	327-98-0
Tridiphane	58138-08-2
Trifenmorph	1420-06-3
Trimethacarb	12407-86-2
Vernolate	*1929-77-7*

[1] The international trade of aldrin, binapacryl, camphechlor (toxaphene), chlordimeform, chlorobenzilate, dieldrin, dinoseb and dinoseb salts, heptachlor, mercury compounds, and 2,4,5-T is regulated by the Rotterdam convention on Prior Informed Consent (see http://www.pic.int/), which entered into force on 24 February 2004. See Table 7, p. 39.

[2] The use and production of aldrin, camphechlor (toxaphene), dieldrin, endrin, heptachlor and mirex is prohibited or severely restricted by the Stockholm convention on persistent organic pollutants, which entered into force on 17 May, 2004. See http://www.pops.int/

TABLE 7. PESTICIDES SUBJECT TO THE PRIOR INFORMED CONSENT (PIC) PROCEDURE (UNEP 2004) [1]

Class	Pesticide	CAS number
O	Aldrin [2]	309-00-2
O	Binapacryl	485-31-4
Ia	Captafol	2425-06-1
II	Chlordane [2]	57-74-9
O	Chlordimeform	6164-98-3
O	Chlorobenzilate	510-15-6
II	DDT [2]	50-29-3
	1,2-Dibromoethane (EDB)	106-93-4
O	Dieldrin [2]	60-57-1
O	Dinoseb and dinoseb salts	88-85-7
Ib	DNOC and its salts (such as ammonium salt, potassium salt and sodium salt)	534-52-1; 2980-64-5; 5787-96-2; 2312-76-7
	Ethylene dichloride	107-06-2
	Ethylene oxide	75-21-8
Ib	Fluoroacetamide	640-19-7
II	HCH (mixed isomers)	608-73-1
O	Heptachlor [2]	76-44-8
Ia	Hexachlorobenzene [2]	118-74-1
II	Lindane	58-89-9
	Mercury compounds, including inorganic mercury compounds, alkyl mercury compounds and alkyloxyalkyl and aryl mercury compounds	
Ib	Pentachlorophenol	87-86-5
O	2,4,5-T	93-76-5
O	Toxaphene	8001-35-2
	Dustable powder formulations containing a combination of benomyl at or above 7%, carbofuran at above 10%, thiram at or above 15%	17804-35-2; 1563-66-2; 137-26-8
Ib	Methamidophos (soluble liquid formulations of the substance that exceed 600 g active ingredient/L)	10265-92-6
Ia	Methyl-parathion (emulsifiable concentrates (EC) with 19.5%, 40%, 50%, 60% active ingredient and dusts containing 1.5%, 2% and 3% active ingredient	298-00-0
Ib	Monocrotophos (all formulations)	6923-22-4
Ia	Parathion (all formulations – aerosols, dustable powder (DP), emulsifiable concentrate (EC), granules (GR) and wettable powders (WP) of this substance are included, except capsule suspensions (CS)	56-38-2
Ia	Phosphamidon (soluble liquid formulations of the substance that exceed 1000 g active ingredient/L)	13171-21-6 [mixture, (E) & (Z) isomers] 23783-98-4 [(Z)-isomer] 297-99-4 [(E)-isomer]

[1] According to the PIC Convention, export of a chemical can only take place with the prior informed consent of the importing Party. The PIC procedure is a means for formally obtaining and disseminating the decisions of importing countries as to whether they wish to receive future shipments of a certain chemical and for ensuring compliance to these decisions by exporting countries. The aim is to promote a shared responsibility between exporting and importing countries in protecting human health and the environment from the harmful effects of such chemicals (further information can be found at: http://www.pic.int/

[2] The use and production of aldrin, chlordane, DDT, dieldrin, heptachlor and hexachlorobenzene is prohibited or severely restricted by the Stockholm convention on persistent organic pollutants, which entered into force on 17 May, 2004. See http://www.pops.int/

TABLE 8. GASEOUS OR VOLATILE FUMIGANTS NOT CLASSIFIED UNDER THE WHO RECOMMENDED CLASSIFICATION OF PESTICIDES BY HAZARD

The Classification does not set out any criteria for air concentrations on which classification could be based. Most of these compounds are of high hazard and recommended exposure limits for occupational exposure have been adopted by national authorities in many countries.

Pesticide	CAS number	Remarks
Aluminium phosphide	20859-73-8	DS 46; EHC 73; HSG 28; JMPR 1972
Chloropicrin	76-06-2	JMPR 1965b
1,2-Dibromoethane	106-93-4	EHC 177; IARC 71
1,3-Dichloropropene	542-75-6	EHC 146; HSG 76; IARC 71
Ethylene dichloride	107-06-2	EHC 176; HSG 55; IARC 71
Ethylene oxide	75-21-8	HSG 16; JMPR 1972; IARC 60; CICAD 54
Formaldehyde	50-00-0	HSG 57; IARC 62; CICAD 40
Hydrogen cyanide	74-90-8	JMPR 1965b; CICAD 61
Magnesium phosphide	12057-74-8	DS 46; EHC 73; HSG 28; JMPR 1972
Methyl bromide	74-83-9	DS 5; EHC 166; HSG 86; JMPR 1972; IARC 71
Phosphine	7803-51-2	DS 46; EHC 73; HSG 28; JMPR 1972
Sulfuryl fluoride	2699-79-8	

EHC = Environmental Health Criteria Monograph; DS= Pesticide Data Sheet; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues.

ANNEX

HOW TO FIND THE HAZARD CLASS OF A FORMULATION

The following tables A-D can be used to find the hazard class of a formulation. These should be used only if toxicity data is not available on the formulation itself; see the note at the top of page 6.

The tables should be used as follows:

Step 1: What is the approved name of the active ingredient in the pesticide? Use the index to find the entry in tables 1-5 of the Guidelines.

Step 2: From the entry in the Guidelines, what is the route of application used for the classification? What is the physical state of the formulation?

If the route is O (oral) and the formulation is a solid, use table A of this Annex.

If the route is O (oral) and the formulation is a liquid, use table C of this Annex.

If the route is D (dermal) and the formulation is a solid, use table B of this Annex.

If the route is D (dermal) and the formulation is a liquid, use table D of this Annex.

Step 3: From the entry in the Guidelines, what is the LD_{50} of the active ingredient.

Using the table A, B, C, or D, selected in Step 2, find the column along the top line which most nearly includes the LD_{50} figure.

Step 4: What is the concentration % of the active ingredient in the formulation?

Using the same table A, B, C, or D, find the figure in the left hand column which most nearly includes this percentage figure.

Step 5: Find the square where the column selected in Step 3 crosses the line selected in Step 4. The number in this square is the approximate LD_{50} of the formulation.

Step 6: The hazard classes are shown by blocks of squares. The hazard class of the formulation is that of the block in which lies the square selected in Step 5.

These tables can also be used to find the hazard class of mixtures. First see pages 6 and 7, para. 4 of the Guidelines and select the method to be used to arrive at the LD_{50} of the mixture. For method (b), use the above method from Step 1, using the name of the more or most toxic ingredient. For method (c), pass to Step 4 using the total percentages of all active ingredients in the mixture.

Table A. LD_{50} values and classification of formulations when the route is **oral** and the formulation **solid**

First row = Oral LD_{50} of the active ingredient

First column = Percent concentration of the active ingredient in the formulation

	Class Ia			Class Ib									Class II																				Class III									
	1	3	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000
100	1	3	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000
95	1	3	5	11	16	21	26	32	37	42	47	53	63	74	84	95	105	126	147	168	189	211	263	316	368	421	474	526	632	737	842	947	1053	1263	1474	1684	1895	
90	1	3	6	11	17	22	28	33	39	44	50	56	67	78	89	100	111	133	156	178	200	222	278	333	389	444	500	556	667	778	889	1000	1111	1333	1556	1778		
85	1	4	6	12	18	24	29	35	41	47	53	59	71	82	94	106	118	141	165	188	212	235	294	353	412	471	529	588	706	824	941	1059	1176	1412	1647	1882		
80	1	4	6	13	19	25	31	38	44	50	56	63	75	88	100	113	125	150	175	200	225	250	313	375	438	500	563	625	750	875	1000	1125	1250	1500	1750	2000		
75	1	4	7	13	20	27	33	40	47	53	60	67	80	93	107	120	133	160	187	213	240	267	333	400	467	533	600	667	800	933	1067	1200	1333	1600	1867			
70	1	4	7	14	21	29	36	43	50	57	64	71	86	100	114	129	143	171	200	229	257	286	357	429	500	571	643	714	857	1000	1143	1286	1429	1714	2000			
65	2	5	8	15	23	31	38	46	54	62	69	77	92	108	123	138	154	185	215	246	277	308	385	462	538	615	692	769	923	1077	1231	1385	1538	1846				
60	2	5	8	17	25	33	42	50	58	67	75	83	100	117	133	150	167	200	233	267	300	333	417	500	583	667	750	833	1000	1167	1333	1500	1667	2000				
55	2	5	9	18	27	36	45	55	64	73	82	91	109	127	145	164	182	218	255	291	327	364	455	545	636	727	818	909	1091	1273	1455	1636	1818					
50	2	6	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	240	280	320	360	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000					
45	2	7	11	22	33	44	56	67	78	89	100	111	133	156	178	200	222	267	311	356	400	444	556	667	778	889	1000	1111	1333	1556	1778	2000						
40	3	8	13	25	38	50	63	75	88	100	113	125	150	175	200	225	250	300	350	400	450	500	625	750	875	1000	1125	1250	1500	1750	2000							
35	3	9	14	29	43	57	71	86	100	114	129	143	171	200	229	257	286	343	400	457	514	571	714	857	1000	1143	1286	1429	1714	2000								
30	3	10	17	33	50	67	83	100	117	133	150	167	200	233	267	300	333	400	467	533	600	667	833	1000	1167	1333	1500	1667	2000									
25	4	12	20	40	60	80	100	120	140	160	180	200	240	280	320	360	400	480	560	640	720	800	1000	1200	1400	1600	1800	2000										
20	5	15	25	50	75	100	125	150	175	200	225	250	300	350	400	450	500	600	700	800	900	1000	1250	1500	1750	2000												
15	7	20	33	67	100	133	167	200	233	267	300	333	400	467	533	600	667	800	933	1067	1200	1333	1667	2000														
10	10	30	50	100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000																
5	20	60	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000																					
3	33	100	167	333	500	667	833	1000	1167	1333	1500	1667	2000																									
1	100	300	500	1000	1500	2000																																
0.5	200	600	1000	2000																																		
0.3	333	1000	1667																																			
0.1	1000																																					
0.05	2000																																					

UNLIKELY TO PRESENT ACUTE HAZARD IN NORMAL USE

Table B. LD_{50} values and classification of formulations when the route is **DERMAL** and the formulation **SOLID**

First row = Dermal LD_{50} of the active ingredient

First column = Percent concentration of the active ingredient in the formulation

	Class Ia			Class Ib									Class II																				Class III								
	1	5	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000
100	1	5	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000
95	1	5	11	21	32	42	53	63	74	84	95	105	126	147	168	189	211	263	316	368	421	474	526	632	737	842	947	1053	1263	1474	1684	1895	2105	2632	3158	3684	
90	1	6	11	22	33	44	56	67	78	89	100	111	133	156	178	200	222	278	333	389	444	500	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2778	3333		
85	1	6	12	24	35	47	59	71	82	94	106	118	141	165	188	212	235	294	353	412	471	529	588	706	824	941	1059	1176	1412	1647	1882	2118	2353	2941	3529		
80	1	6	13	25	38	50	63	75	88	100	113	125	150	175	200	225	250	313	375	438	500	563	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500	3125	3750		
75	1	7	13	27	40	53	67	80	93	107	120	133	160	187	213	240	267	333	400	467	533	600	667	800	933	1067	1200	1333	1600	1867	2133	2400	2667	3333			
70	1	7	14	29	43	57	71	86	100	114	129	143	171	200	229	257	286	357	429	500	571	643	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857	3571			
65	2	8	15	31	46	62	77	92	108	123	138	154	185	215	246	277	308	385	462	538	615	692	769	923	1077	1231	1385	1538	1846	2154	2462	2769	3077				
60	2	8	17	33	50	67	83	100	117	133	150	167	200	233	267	300	333	417	500	583	667	750	833	1000	1167	1333	1500	1667	2000	2333	2667	3000	3333				
55	2	9	18	36	55	73	91	109	127	145	164	182	218	255	291	327	364	455	545	636	727	818	909	1091	1273	1455	1636	1818	2182	2545	2909	3273					
50	2	10	20	40	60	80	100	120	140	160	180	200	240	280	320	360	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600					
45	2	11	22	44	67	89	111	133	156	178	200	222	267	311	356	400	444	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2667	3111	3556						
40	3	13	25	50	75	100	125	150	175	200	225	250	300	350	400	450	500	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500	3000	3500							
35	3	14	29	57	86	114	143	171	200	229	257	286	343	400	457	514	571	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857	3429								
30	3	17	33	67	100	133	167	200	233	267	300	333	400	467	533	600	667	833	1000	1167	1333	1500	1667	2000	2333	2667	3000	3333									
25	4	20	40	80	120	160	200	240	280	320	360	400	480	560	640	720	800	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600										
20	5	25	50	100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	3000	3500												
15	7	33	67	133	200	267	333	400	467	533	600	667	800	933	1067	1200	1333	1667	2000	2333	2667	3000	3333														
10	10	50	100	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000																
5	20	100	200	400	600	800	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600	4000																				
3	33	167	333	667	1000	1333	1667	2000	2333	2667	3000	3333	4000																								
1	100	500	1000	2000	3000	4000																															
0.5	200	1000	2000	4000																																	
0.3	333	1667	3333																																		
0.1	1000																																				

UNLIKELY

TO PRESENT

ACUTE HAZARD

IN NORMAL USE

Table C. LD_{50} values and classification of formulations when the route is **ORAL** and the formulation **LIQUID**

First row = Oral LD_{50} of the active ingredient

First column = Percent concentration of the active ingredient in the formulation

	Class Ia					Class Ib													Class II																				Class III	
	1	5	10	15	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000
100	1	5	10	15	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000
95	1	5	11	16	21	32	42	53	63	74	84	95	105	126	147	168	189	211	263	316	368	421	474	526	632	737	842	947	1053	1263	1474	1684	1895	2105	2632	
90	1	6	11	17	22	33	44	56	67	78	89	100	111	133	156	178	200	222	278	333	389	444	500	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2778	
85	1	6	12	18	24	35	47	59	71	82	94	106	118	141	165	188	212	235	294	353	412	471	529	588	706	824	941	1059	1176	1412	1647	1882	2118	2353	2941	
80	1	6	13	19	25	38	50	63	75	88	100	113	125	150	175	200	225	250	313	375	438	500	563	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500		
75	1	7	13	20	27	40	53	67	80	93	107	120	133	160	187	213	240	267	333	400	467	533	600	667	800	933	1067	1200	1333	1600	1867	2133	2400	2667		
70	1	7	14	21	29	43	57	71	86	100	114	129	143	171	200	229	257	286	357	429	500	571	643	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857		
65	2	8	15	23	31	46	62	77	92	108	123	138	154	185	215	246	277	308	385	462	538	615	692	769	923	1077	1231	1385	1538	1846	2154	2462	2769			
60	2	8	17	25	33	50	67	83	100	117	133	150	167	200	233	267	300	333	417	500	583	667	750	833	1000	1167	1333	1500	1667	2000	2333	2667	3000			
55	2	9	18	27	36	55	73	91	109	127	145	164	182	218	255	291	327	364	455	545	636	727	818	909	1091	1273	1455	1636	1818	2182	2545	2909				
50	2	10	20	30	40	60	80	100	120	140	160	180	200	240	280	320	360	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2400	2800					
45	2	11	22	33	44	67	89	111	133	156	178	200	222	267	311	356	400	444	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2667						
40	3	13	25	38	50	75	100	125	150	175	200	225	250	300	350	400	450	500	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500	3000						
35	3	14	29	43	57	86	114	143	171	200	229	257	286	343	400	457	514	571	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857							
30	3	17	33	50	67	100	133	167	200	233	267	300	333	400	467	533	600	667	833	1000	1167	1333	1500	1667	2000	2333	2667	3000								
25	4	20	40	60	80	120	160	200	240	280	320	360	400	480	560	640	720	800	1000	1200	1400	1600	1800	2000	2400	2800											
20	5	25	50	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	3000												
15	7	33	67	100	133	200	267	333	400	467	533	600	667	800	933	1067	1200	1333	1667	2000	2333	2667	3000														
12	8	42	83	125	167	250	333	417	500	583	667	750	833	1000	1167	1333	1500	1667	2083	2500	2917																
10	10	50	100	150	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000																	
8	13	63	125	188	250	375	500	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500																			
6	17	83	167	250	333	500	667	833	1000	1167	1333	1500	1667	2000	2333	2667	3000																				
5	20	100	200	300	400	600	800	1000	1200	1400	1600	1800	2000	2400	2800	3200																					
4	25	125	250	375	500	750	1000	1250	1500	1750	2000	2250	2500	3000																							
2	50	250	500	750	1000	1500	2000	2500	3000																												
1.5	67	333	667	1000	1333	2000	2667																														
1	100	500	1000	1500	2000	3000																															
0.5	200	1000	2000	3000																																	
0.3	333	1667	3333																																		
0.1	1000																																				
0.05	2000																																				

UNLIKELY

TO PRESENT

ACUTE HAZARD

IN NORMAL USE

Table D. LD_{50} values and classification of formulations when the route is **DERMAL** and the formulation **LIQUID**

First row = Dermal LD_{50} of the active ingredient
First column = Percent concentration of the active ingredient in the formulation

	Class Ia							Class Ib														Class II																		Class III
	1	5	10	15	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000	5000	6000
100	1	5	10	15	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000	5000	6000
95	1	5	11	16	21	32	42	53	63	74	84	95	105	126	147	168	189	211	263	316	368	421	474	526	632	737	842	947	1053	1263	1474	1684	1895	2105	2632	3158	3684	4211	5263	
90	1	6	11	17	22	33	44	56	67	78	89	100	111	133	156	178	200	222	278	333	389	444	500	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2778	3333	3889	4444	5556	
85	1	6	12	18	24	35	47	59	71	82	94	106	118	141	165	188	212	235	294	353	412	471	529	588	706	824	941	1059	1176	1412	1647	1882	2118	2353	2941	3529	4118	4706	5882	
80	1	6	13	19	25	38	50	63	75	88	100	113	125	150	175	200	225	250	313	375	438	500	563	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500	3125	3750	4375	5000		
75	1	7	13	20	27	40	53	67	80	93	107	120	133	160	187	213	240	267	333	400	467	533	600	667	800	933	1067	1200	1333	1600	1867	2133	2400	2667	3333	4000	4667	5333		
70	1	7	14	21	29	43	57	71	86	100	114	129	143	171	200	229	257	286	357	429	500	571	643	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857	3571	4286	5000	5714		
65	2	8	15	23	31	46	62	77	92	108	123	138	154	185	215	246	277	308	385	462	538	615	692	769	923	1077	1231	1385	1538	1846	2154	2462	2769	3077	3846	4615	5385			
60	2	8	17	25	33	50	67	83	100	117	133	150	167	200	233	267	300	333	417	500	583	667	750	833	1000	1167	1333	1500	1667	2000	2333	2667	3000	3333	4167	5000	5833			
55	2	9	18	27	36	55	73	91	109	127	145	164	182	218	255	291	327	364	455	545	636	727	818	909	1091	1273	1455	1636	1818	2182	2545	2909	3273	3636	4545	5455				
50	2	10	20	30	40	60	80	100	120	140	160	180	200	240	280	320	360	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600	4000	5000	6000				
45	2	11	22	33	44	67	89	111	133	156	178	200	222	267	311	356	400	444	556	667	778	889	1000	1111	1333	1556	1778	2000	2222	2667	3111	3556	4000	4444	5556					
40	3	13	25	38	50	75	100	125	150	175	200	225	250	300	350	400	450	500	625	750	875	1000	1125	1250	1500	1750	2000	2250	2500	3000	3500	4000	4500	5000						
35	3	14	29	43	57	86	114	143	171	200	229	257	286	343	400	457	514	571	714	857	1000	1143	1286	1429	1714	2000	2286	2571	2857	3429	4000	4571	5143	5714						
30	3	17	33	50	67	100	133	167	200	233	267	300	333	400	467	533	600	667	833	1000	1167	1333	1500	1667	2000	2333	2667	3000	3333	4000	4667	5333	6000							
25	4	20	40	60	80	120	160	200	240	280	320	360	400	480	560	640	720	800	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600	4000	4800	5600									
20	5	25	50	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1250	1500	1750	2000	2250	2500	3000	3500	4000	4500	5000	6000										
15	7	33	67	100	133	200	267	333	400	467	533	600	667	800	933	1067	1200	1333	1667	2000	2333	2667	3000	3333	4000	4667	5333	6000												
10	10	50	100	150	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2500	3000	3500	4000	4500	5000	6000															
5	20	100	200	300	400	600	800	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600	4000	5000	6000																				
3	33	167	333	500	667	1000	1333	1667	2000	2333	2667	3000	3333	4000	4667	5333	6000																							
2	50	250	500	750	1000	1500	2000	2500	3000	3500	4000	4500	5000	6000																										
1	100	500	1000	1500	2000	3000	4000	5000	6000																															
0.5	200	1000	2000	3000	4000	6000																																		
0.4	250	1250	2500	3750	5000																																			
0.3	333	1667	3333	5000																																				
0.25	400	2000	4000																																					
0.15	667	3333																																						
0.1	1000	5000																																						
0.05	2000																																							
0.03	3333																																							
0.02	5000																																							

UNLIKELY

TO PRESENT

ACUTE HAZARD

IN NORMAL USE

Pesticide active ingredients, which occur in Tables 1-8, in CAS no order

For each active ingredient, the classification (Ia, Ib, II, III, or U (unlikely to pose an acute hazard in normal use, O (obsolete), FM (fumigant), and page number(s) are given.

CAS no	Class	Page
50-00-0	FM	40
50-29-3	II	22, 39
50-31-7	III	29
50-65-7	U	34
51-03-6	U	35
51-14-9	O	38
52-51-7	II	21
52-68-6	II	24
52-85-7	Ib	18
54-11-5	Ib	19
55-38-9	II	22
56-35-9	O	37
56-38-2	Ia	16, 39
56-72-4	Ib	18
57-24-9	Ib	19
57-74-9	II	21, 39
58-89-9	II	23, 39
60-51-5	II	22
60-57-1	O	37, 39
61-82-5	U	31
62-38-4	Ia	16, 39
62-73-7	Ib	18
62-74-8	Ia	16
63-25-2	II	21
66-81-9	O	37
72-20-8	O	37
72-43-5	U	34
72-54-8	O	38
74-83-9	FM	40
74-90-8	FM	40
75-15-0	O	37
75-21-8	FM	39, 40
75-60-5	III	27
75-99-0	U	32
76-03-9	II	24
76-06-2	FM	40
76-44-8	O	*38, 39*
76-87-9	II	22
77-06-5	U	33
78-34-2	O	37
78-57-9	O	38
78-87-5	O	37
79-11-8	III	26
80-06-8	O	37
80-33-1	O	37
80-38-6	O	38
81-81-2	Ib	19
81-82-3	O	37
81-84-5	O	38
82-66-6	Ia	16
82-68-8	U	35
83-26-1	O	*38*
83-59-0	O	38
83-79-4	II	24
84-65-1	U	31
84-74-2	O	37
85-34-7	O	37
86-50-0	Ib	18
86-86-2	U	34
86-87-3	U	34
86-88-4	O	37
87-17-2	O	38
87-86-5	Ib	19, 39
88-85-7	O	37, 39
90-43-7	U	35
91-20-3	O	38
92-52-4	U	31
93-71-0	O	37
93-72-1	O	38
93-75-4	O	38
93-76-5	O	38, 39
94-74-6	III	28
94-75-7	II	22
94-81-5	III	28
94-82-6	III	26
94-96-2	O	37
95-06-7	O	38
96-12-8	O	37
96-24-2	Ib	18
97-17-6	O	37
97-23-4	III	26
99-30-9	U	32
101-05-3	O	37
101-21-3	U	32
101-27-9	O	37
101-42-8	O	*38*
103-17-3	O	37
106-46-7	III	26
106-93-4	FM	39, 40
107-02-8	Ib	18
107-06-2	FM	39, 40
107-13-1	O	37
107-18-6	Ib	18
107-49-3	O	38
108-25-8	O	38
108-62-3	II	23
112-12-9	III	29
113-48-4	III	28
114-26-1	II	24
115-26-4	O	37
115-29-7	II	22
115-31-1	O	38
115-32-2	III	27
115-78-6	II	21
115-90-2	O	38
116-01-8	O	37
116-06-3	Ia	16
116-16-5	O	38
116-29-0	U	36
117-18-0	U	35
118-74-1	Ia	16, 39
118-75-2	O	37
119-12-0	III	29
120-23-0	III	28
120-62-7	O	38
121-75-5	III	28
122-14-5	II	22
122-34-9	U	35
122-42-9	U	35
122-88-3	III	26
123-33-1	U	34
123-88-6	O	38, 39
124-58-3	III	28
125-67-9	II	22
126-07-8	O	38
126-22-7	O	37
126-75-0	O	37
131-11-3	U	32
131-89-5	O	37
132-66-1	U	34
133-06-2	U	31
133-07-3	U	33
133-90-4	O	*37*
134-31-6	O	38
134-62-3	III	27
136-25-4	O	37
137-26-8	III	29, 39
137-30-4	III	29
137-42-8	II	23
139-40-2	U	35
140-41-0	O	38
140-56-7	O	38
140-57-8	O	37
141-03-7	O	37
141-66-2	Ib	18
142-59-6	II	23
143-33-9	Ib	19
143-50-0	O	37
148-79-8	U	36
149-26-8	O	37
150-68-5	O	38
152-16-9	O	38
156-62-7	O	37
297-78-9	O	38
297-97-2	O	38
297-99-4	Ia	16, 39
298-00-0	Ia	16, 39
298-02-2	Ia	16
298-03-3	O	37
298-04-4	Ia	16
299-84-3	O	38
299-86-5	O	37
300-76-5	II	23
301-12-2	Ib	19
309-00-2	O	37, 39
314-40-9	U	31
314-42-1	O	38
315-18-4	O	38
327-98-0	O	38
330-54-1	U	32
330-55-2	U	34
333-41-5	II	22
371-86-8	O	38
465-73-6	O	38
467-69-6	U	33
470-90-6	Ib	18
485-31-4	O	37, 39

Pesticide active ingredients, which occur in Tables 1-8, in CAS no order, continued

For each active ingredient, the classification (Ia, Ib, II, III, or U (unlikely to pose an acute hazard in normal use, O (obsolete), FM (fumigant), and page number(s) are given.

CAS no	Class	Page
495-73-8	O	37
502-39-6	O	38, 39
502-55-6	O	38
507-60-8	O	38
510-15-6	O	37, 39
513-77-9	O	37
532-34-3	O	37
533-74-4	III	26
534-52-1	Ib	18, 39
535-89-7	O	37
542-75-6	FM	40
555-37-3	U	34
556-22-9	O	38
556-61-6	II	23
563-12-2	II	22
584-79-2	III	26
584-79-2	II	21
590-28-3	O	38
592-01-8	Ia	16
608-73-1	II	23, 39
640-15-3	Ib	19
640-19-7	Ib	18, 39
644-64-4	O	37
650-51-1	U	35
671-04-5	O	37
682-80-4	O	37
709-98-8	III	28
731-27-1	U	36
732-11-6	II	23
741-58-2	II	21
756-09-2	U	33
759-94-4	II	22
786-19-6	O	37
834-12-8	III	26
841-06-5	O	38
886-50-0	U	35
900-95-8	II	22
919-76-6	O	37
919-86-8	Ib	18
944-22-9	O	*38*
947-02-4	O	38
950-10-7	O	38
950-37-8	Ib	19
957-51-7	III	27
973-21-7	II	22
991-42-4	O	38
999-81-5	III	26
1014-69-3	O	*37*
1014-70-6	III	29
1031-47-6	O	38
1071-83-6	U	33
1085-98-9	U	32
1086-02-8	O	38
1113-02-6	Ib	19
1114-71-2	II	23
1129-41-5	II	23
1134-23-2	III	26
1194-65-6	U	32
1303-96-4	U	31
1314-84-7	Ib	19
1317-39-1	II	21
1327-53-3	O	37
1332-40-7	III	26
1420-06-3	O	38
1420-07-1	Ib	18
1468-37-7	O	37
1563-66-2	Ib	18, 39
1582-09-8	U	36
1593-77-7	U	32
1596-84-5	U	32
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Pesticide active ingredients, which occur in Tables 1-8, in CAS no order, continued

For each active ingredient, the classification (Ia, Ib, II, III, or U (unlikely to pose an acute hazard in normal use, O (obsolete), FM (fumigant), and page number(s) are given.

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29173-31-7	O	38
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64257-84-7	II	22
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66246-88-6	U	34
66332-96-5	U	33
66841-25-6	II	24
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Pesticide active ingredients, which occur in Tables 1-8, in CAS no order, continued

For each active ingredient, the classification (Ia, Ib, II, III, or U (unlikely to pose an acute hazard in normal use, O (obsolete), FM (fumigant), and page number(s) are given.

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70193-21-4	O	38	86479-06-3	U	33	119446-68-3	III	27
71048-99-2	II	21	86598-92-7	U	34	119738-06-6	II	24
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71561-11-0	III	29	87310-56-3	O	37	120162-55-2	U	31
71626-11-4	U	31	87757-18-4	O	38	120928-09-8	II	22
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73886-28-9	O	38	88283-41-4	III	29	122453-73-0	II	21
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77501-60-1	III	27	97886-45-8	U	32	136849-15-5	U	32
77732-09-3	III	28	98389-04-9	U	35	138164-12-2	III	26
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INDEX. CLASSIFICATION OF ACTIVE PESTICIDE INGREDIENTS

Ia = Extremely hazardous; IB = Highly hazardous; II =Moderately hazardous; III = slightly hazardous; U = Unlikely to present acute hazard in normal use; FM =Fumigant, not classified; O = Obsolete as pesticide, not classified.

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