Food and Agriculture Organization of the United Nations

SOUTH SUDAN EMERGENCY FOOD PRODUCTION PROGRAMME – PROJECT 1 (SSEFPP-1)

UTF/SSD/026/SSD

INTEGRATED PEST – VECTOR MANAGEMENT PLAN (IP-VMP)

July, 2024

ABBREVIATION AND ACRONYMS

ABC	Aggregation Business Centre
ADF	African Development Fund
AF	Additional Financing
AMVAT	Agricultural Markets, Value Addition and Trade Development Project
BPA	Business Producer Association
CAMP	Comprehensive Agricultural Development Master Plan
CSA	Climate Smart Agriculture
CSP	Country Strategy Paper
DP	Development Partners
ESMF	Environment and Social Management Framework
ESMP	Environment and Social Management Plan
FAO	Food and Agriculture Organization of the UN
FPA	Fiduciary Principles Agreement
GAP	Good Agricultural Practices
GoSS	Government of South Sudan
IDP	Internally Displaced Person
IFAD	International Fund for Agricultural Development
JICA	Japan International Cooperation Agency
MAFS	Ministry of Agriculture and Food Security
MTI	Ministry of Trade and Industry
MTR	Mid-term Review
NAC	National Advisory Committee
NARS	National Agricultural Research Systems
NDS	National Development Strategy
NTB	Non-Tariff Barriers
NTC	National Technical Committee
PCR	Project Completion Report
RBLF	Results Based Log frame
RMC	Regional Member Countries
SDGs	UN Sustainable Development Goals
SEG	Seed Enterprise Group
SSAPU	South Sudan Agricultural Producers Union
SSEFPP-1	South Sudan Emergency Food Production Programme – Project-1
SSNBS	South Sudan National Bureau of Standards
SSP	South Sudan Pound
TAAT	Technologies for African Agricultural Transformation
TPIA	Third Party Implementation Agency
TSF-I	Transitional State Facility Pillar 1
USAID	United States Agency for International Development
USD	United States Dollars
WFP	World Food Program

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1.1 Introduction

The African Development Bank is preparing to support the Government of South Sudan through FAO as a lead implementing agency in the implementation of Emergency Food Production Program – Project-1 (SSEFPP-1) in South Sudan with the objective to boost local food production and strengthen the resilience of food systems to mitigate short- and long-term risks due to the war in Ukraine and climate-induced stresses.

The proposed additional financing (AF) is in line with the following Articles of the Bank Group Policy on Additional Financing Policy (May 2021): **Article IV** for AF to an ongoing sovereign project for modified or increased scope of the project; **Article V** for AF to ongoing well-performing projects in response: - **(e)** as emergency relief assistance through an ongoing emergency project, **(c)** to implement additional or expanded activities that scale up the development impact of a well-performing project, **(g)** for a combination of two of the above reasons; **Article VI** qualifies the proposed intervention as an Emergency Relief Assistance and Emergency Operation eligible for AF. More specifically, the proposed intervention fulfils the AF eligibility criteria in VI (15).

The project will support technology generation and dissemination by supporting the strengthening and scaling up of Farmers seed producers and seed companies.
In South Sudan the project will increase production and productivity by increasing use of improved seeds, fertilizer and quality extension services, including development of guidelines and protocols for seed certification and fertilizer usage. The Project will also address the country's external shocks occasioned by the Russia-Ukraine war, the lingering effects of COVID-19, and climate-change induced crop failures, among other stresses. SSEFPP-1 will build on the ongoing AMVAT project,

- Where projects involve recourse to pest and vector management measures, FAO will give preference to integrated pest management (IPM) or integrated vector management (IVM) approaches using combined or multiple tactics.
- The project will procured pesticides / Fungicides product only for seed treatment, the IPVM will be promoted as the best option for pest -vector management.

OS3 applies to all Bank lending. Even if Bank lending for pesticides is not involved, an agricultural development project may lead to substantially increased pesticide use and subsequent environmental problems.

The OS3 also states that:

- The following additional criteria apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs will be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying

them; (d) their use will take into account the need to prevent the development of resistance in pests; and (e) where registration is required, all pesticides will be registered or otherwise authorized for use on the crops and livestock, or for the use patterns for which they are intended under the project.

Procedures for assessing pest management issues are described in the Bank's Environmental and Social Policy on Pests and Vector Management. Where projects involve recourse to pest management measures, the Borrower will give preference to integrated pest management (IPM) or integrated vector management (IVM). When significant pest management issues are associated with a project, ESMP developed during the EA process should include a pest management plan.

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques, such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. The IPM plan uses extensive technical knowledge of individual pests and their relationships to the environment and aims to maintain pests at acceptable levels through effective, economical, and environmentally sound methods.

A pest management plan is a comprehensive plan, developed when there are significant pest management issues such as (a) new land-use development or changed cultivation practices in an area, (b) significant expansion into new areas, (c) diversification into new crops in agriculture, (d) intensification of existing low-technology systems, (e) proposed procurement of relatively hazardous pest control products or methods, or (f) specific environmental or health concerns (e.g., proximity of protected areas or important aquatic resources; worker safety).

A pest management plan reflects the policies set out in OS3. The plan is designed to minimize potential adverse impacts on human health and the environment and to advance ecologically based IPM.

1.2 FAO General Requirements on Integrated Pest and Vector Management (IPVM)

FAO promotes Integrated Pest and Vector Management (IPVM) as a pillar of sustainable agriculture. IPVM means the careful consideration of all available pest/vector control techniques and subsequent integration of appropriate measures that discourage the development of pest/vector populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human and animal health and/or the environment. IPVM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest/vector control mechanisms.

1.3 Pest Management Plan

If provision or use of large volumes of pesticides is foreseen, a Pest Management Plan (PMP) needs to be prepared to demonstrate how IPM will be promoted to reduce reliance on pesticides, and what measures are taken to minimize risks of pesticide use. Such a PMP needs to be an integral part of the Environment and Social Commitment Plan. This PMP has been developed as the project locations are confirmed. This PMP will be used to guide the development project implementation.

1.3.1 Selection of pesticides

If after having considered available IPM approaches, pesticide use is deemed to be justified, then careful and informed consideration should be given to the selection of pesticide products. Factors to be taken into account include hazards and risks to users, selectiveness and risk to non-target species, persistence in the environment, efficacy and likelihood of development or presence of resistance by the target organism. Minimum environment and social analysis are needed.

FAO does not maintain a list of permitted or non-permitted pesticides because many locally specific conditions govern which pesticides may be used. However, in line with the provisions of the FAO/WHO International Code of Conduct on Pesticide Management and relevant multilateral environmental agreements that include pesticides, the following list of criteria will need to be met in order for a pesticide to be considered for use in an FAO project:

a. The product should be registered in the country of use, or specifically permitted by the relevant national authority if no registration exists. Use of any pesticide should comply with all the registration requirements including the crop and pest combination for which it is intended.
b. Users should be able to manage the product within margins of acceptable risk. FAO will not supply pesticides that meet the criteria that define Highly Hazardous Pesticides (HHPs) 3. Pesticides that fall in WHO Hazard Class 2 or GHS Acute Toxicity Category 3 can only be provided if less hazardous alternatives are not available and it can be demonstrated that users adhere to the necessary precautionary measures.
c. Preference should be given to products that are less hazardous, more selective and less persistent, and to application methods that are less hazardous, better targeted and requiring less pesticides.
d. Any international procurement of pesticides must abide with the provisions of the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure.

1.3.2 Functions of IPM

This IPM plan has numerous functions:

- to ensure public accountability for pesticide use
- to comply with all pertinent laws, regulations, bylaws, and policies regarding the use of pesticides on lands for which the State is responsible
- to consider community values in the development and implementation of pest management plans

- to promote ecologically sound pest management principles, concepts, and techniques in the design and implementation of development projects on public lands
- to develop and promote opportunities for public education and information regarding environmentally sound methods of pest management
- to train staff who develop and implement the State IPM plans
- to promote long-term, cost-effective management of pests

The IPM plan provides detailed information on how to prevent and manage pests on lands within the projects sites.

1.3.3 Principles of Pest Management

Eight principles of pest management are suggested to follow as common basis for the management of pest throughout project area. The consideration of all these principles is critical to the success of any pest management activity, regardless of scope and scale. These are:

1. Integration: Pest management in Agriculture production is an integral part of managing natural resources and agricultural systems.
2. Public awareness: Public awareness and knowledge of pest must be raised to increase the capacity and willingness of individuals to participate in control.
3. Commitment: Effective pest management requires shared responsibility, capability, capacity and a long-term commitment by farmers/ operators/ processors/ landowners/ managers, the community, industry groups and government. Those that create the risks associated with pest introduction or spread and those that benefit from the pest management should help to minimize the impacts of pest and contribute to the costs of management.
4. Consultation and partnership: Consultation and partnership arrangements among the users, local communities, industry groups, government agencies and local governments must be established to achieve a collaborative and coordinated approach to management.
5. Planning: Planning for pest management should be based on risk management to ensure that resources target the priorities identified at local, regional, and national levels.
6. Prevention and early intervention: Preventive pest management is generally more cost-effective than other strategies and is achieved by preventing the spread of pest species, and viable parts of these pests, especially by human activity early detection and intervention.
7. Best practice: Pest management must be based on ecologically and socially responsible practices that protect the environment and the productive capacity of natural resources while minimizing impacts on the community. It should balance feasibility, cost-effectiveness, sustainability, humaneness, community perceptions, emergency needs and public safety.
8. Improvement (research, monitoring and evaluation): Research about pest and regular monitoring and evaluation of control activities.
9. Needed to make evidence-based decisions and improve pest management practices.

Transition to a PMP program requires a diverse, action-oriented PMP Committee. This PMP Committee will be an environmentally conscious committee lead by the Project manager at PMU, A representative of the county agriculture Office and Farming Group will be the members of this committee. The leader of this team should be familiar with pests, pesticides and pesticide regulations. This arrangement is appropriate, because implementation of an IPM program can be tracked as a performance indicator.

PMP leadership is guided by pest management principles and environmental issues. Leadership with such academic background and experience qualifies to serve as an authority to supervise PMP implementation. Other team members will include Environmental, Agriculture Extension, agronomists, crop protection experts (entomologists, pathologists), aquaculture experts, health officer and livestock officer.

The use of pesticides must be guided by the principles of cost efficiency, safety to humans, the bio-physical environment and effectiveness in controlling the pests. Pesticides selection will be made in accordance with the AfDB guidelines for the selection of pesticides.

The Integrated Pest Management and Monitoring Plan (IPMP) is to be developed from the impacts and mitigation measures identified at the implementation stage based on the principles mentioned in this plan. The IPMP should include impacts from application of chemical as well as non-chemical pesticides. The reason why chemical pesticides are included is that in the initial stages of implementation of the IPM, chemical pesticides, will still be used but will be gradually phased out as the IPM gets established.

Training programs on various aspects of the pest and disease management and judicious use of chemical pesticides have to be organized by the pest management team.

Training modules for pest management in farms and nurseries should be developed. Following training programs will be provided, farmers' training, Pesticides dealers' training, Agriculture extension personnel including staff training, and Local service providers training.

To initiate the promotion of IPM and sound pesticide use will be effective by organizing awareness program involving Farmer's Groups and different stakeholders. Awareness will be raised through demonstrations, discussion meetings, dissemination of information about pest arrival, distribution of leaflet, booklet, etc.

1.3.4 Integrated Pest Management Plan (IPMP)

The IPMP should include impacts from application of chemical as well as non-chemical pesticides. The reason why pesticides are included is that in the initial stages of implementation of the IPM, pesticides will still be used the last resort, and will be gradually phased out as the IPM is established.

When coming up with the IPMP, the following steps should be considered and documented:

- Identify the main pests affecting crops in the areas of the project / Country, assess the risks to the operation, and determine whether a strategy and capacity are in place to control them.
- Where possible, apply early-warning system for pests and diseases (i.e., pest and disease forecasting techniques).

- Select resistant varieties and use the cultural , mechanical and biological control of pests, diseases and weeds to minimize dependence on pesticide (chemical) control options. An effective IPM regime should:

  - ✓ Identify and assess pests, threshold levels, and control options (including those listed below), as well as risks associated with these control options.
  - ✓ Rotate crops to reduce the presence of insects, disease, or weeds in the soil or crop ecosystems.
  - ✓ Support beneficial bio-control organisms—such as insects, birds, mites, and microbial agents—to perform biological control of pests (e.g., by providing a favorable habitat, such as bushes for nesting sites and other original vegetation that can house pest predators and parasites).
  - ✓ Favor manual, mechanical weed control and/or selective weeding.
  - ✓ Consider using mechanical controls—such as traps, barriers, light, and sound to kill, relocate, or repel pests.
  - ✓ Use pesticides to complement these approaches, not replace them.
  - ✓ Prior to procuring any pesticide, assess the nature and degree of associated risks and effectiveness, taking into account the proposed use and the intended users.

1.4 Environmental and Social Consequences of Pest Management Practices

The pest management practices programs are critical for the implementation and success of a Project. Especially in the planning, implementing the various pest management tactics, and assessing the results. Therefore, understanding why and how the project make decisions, how to best communicate with diverse stakeholders, and how the social sciences can inform best practices are most influential. The AfDB Integrated Safeguards System (ISS) aims to ensure the social and environmental sustainability of the projects, by supports through the protection of the environment and population from the potentially adverse impacts of projects.

The SSEFPP-1 Project, and farming manufacturing will be seriously threatened by pests if reckless type of the pesticide/ fertilizer is procured and usage. The pest management techniques assist to address and reduce these dangers. Though, the use of potentially hazardous chemical pesticides and fertilizers in pest management practices can have negative environmental and social impacts, which are related to the potential impacts on the environment and human health. Meanwhile it is the fastest and most efficient ways to reduce the number of pests is to use pesticidal, which provide farmers with amazing results quickly.

1.4.1 Environmental consequences of pesticide use

Pesticide-dependent pest control practices are often associated with pesticide misuse, which can result in several environmental consequences that threaten the sustainability of agriculture and life in the areas where they are used. Some of the key consequences include the destruction of biodiversity, which can

have a negative impact on the survival of many birds, aquatic organisms, and animals. Pesticides are a concern for the sustainability of the environment and global stability.

- Destruction of pollinators: Pesticides can harm pollinators, such as bees, butterflies, and birds, which can lead to poor crop yields
- Elimination of natural enemies of pests: Pesticides can also eliminate the natural enemies of pests, which can lead to an increase in the population of crop pests .
- Development of pest resistance: Overuse of pesticides can lead to the development of pest resistance, which can encourage further increases in the use of chemical pesticides .
- Contamination of soil and water bodies: Pesticides can contaminate soil and water bodies, which can have negative impacts on the environment and human health, .
- Pesticide poisoning: Farmers who use pesticides are at risk of pesticide poisoning, which can have deleterious effects on human health .
- Loss of biodiversity: Pesticides can also lead to a loss of biodiversity in the environment, particularly of aquatic species.

1.4.2 Social consequences use of pesticides

Some of the key social impacts of pesticide use include:

- The loss of livelihoods for farmers, who may suffer from pesticide poisoning and other health problems
- Displacement of communities and the loss of traditional knowledge about pest control practices. Exacerbate social inequalities, as small-scale farmers may not have access to the same resources as larger agribusinesses.

It is important to adopt Integrated Pest Management (IPM) strategies to minimize the use of pesticides and promote sustainable pest control practices. IPM strategies include the use of biological control agents, crop rotation, and the use of resistant crop varieties. By adopting these strategies, we can reduce both negative social and environmental impacts of pesticide use and promote sustainable agriculture. Hence other pest management issues that triggering the social welfare and environmental ecology are such as follows.

- Improper choice of pesticides.
- Damage, leakage/spillage and contamination during storage, handling, and disposal.
- Spillage and pollution of water resources and aquatic resources from pesticide use.
- Poisoning from improper use or administration of the pesticides.
- Impact from improper disposal of pesticide containers (drums).
- General health and safety of communities and environmental hazards.
  New land-use development or changed cultivation practices in an area.
- significant expansion into new areas.
- diversification into new crops in agriculture.
- intensification of existing low-technology systems.

- proposed procurement of relatively hazardous pest control products or methods.

1.5 Potential Impacts of Pest and Pesticide Management on Project Activities

The SSEFPP-1 are currently implementing in the five states of Northern Bahr el Ghazal, Upper Nile, Western Bahr el Ghazal, Eastern Equatoria and Western Equatoria project in South Sudan. The project woke on large scale delivery of agricultural inputs and extension services to male and female farmers and Development of seed and fertilizer frameworks, and institutional capacity strengthening in South Sudan. It is crucial to conduct a thorough assessment of the risks and benefits of Fertilizer, pest, and pesticide management before implementing any project activities. The potential impacts of pest and pesticide may impact the project activities both positive and negative.

The use of pesticides can have both positive and negative impacts on project activities in South Sudan. On the negative side, the use of pesticides can lead to the outbreak of specific pests, which can hinder the mitigation or control of pest activities in agricultural project areas. Pesticide use can also have negative environmental impacts, such as pollution, killing of fish and other wildlife, and reduction in water quality and availability of potable water. Pesticide use can also have negative human health effects from chronic or acute exposure. On the positive side, the use of pesticides can reduce crop losses, reduce the prevalence of human vector-borne diseases, increase the shelf life of agricultural commodities, increase livestock yields, reduce soil disturbance, and better protect wooden structures.

Pests /Vectors can cause significant economic losses in crop production. Although no systematic loss assessments have been undertaken in the SSEFPP-1 Project area, the annual losses are believed to be high as reported from the Desert and Fall army worm Report 2021. The key broad categories of pests and diseases include insects, weeds, storage pests, plant diseases, and vertebrate pests including rats and birds. Common insect pests in South Sudan include the elegant grasshopper (Zonocerus sp.) that attacks cassava, Fall Army worm, which commonly attacks cereal crops such as maize and sorghum, bollworm and cutworms that attack vegetables, stalk borers that attack maize and sorghum, and aphids that normally attack vegetables. Common plant diseases include cassava mosaic virus, especially in Yambio, Rust (fungus) that attacks maize and sorghum, and the Late blight which attacks tomatoes. All crops are affected by weeds. Some of the most serious damage is caused by parasitic weeds such as Striga. Striga can cause total crop loss in maize and sorghum. Numerous other weeds affect crops, springing up every year depending on crop type, farming system, rainfall, flood intensity, antecedent crops, and cultivations.

2.1. Project Description

The overall sector goal remains the AMVAT goal, to contribute to reduced food insecurity, poverty reduction, economic growth and building of community and household resilience and social cohesion. The specific SSEFPP-1 Development Objective (PDO) is to boost local food production and strengthen the resilience of food systems to mitigate short- and long-term risks due to the war in Ukraine and climate-induced stresses.

2.2 Theory of Change

The project impact is “Improved food and nutrition security”, with performance indicators of (i) Food security status, and (ii) National poverty rate. The project has two outcomes (i) Increased Agricultural Production and Productivity for Enhanced Food and Nutrition Security, and (ii) Strengthened Institutional Capacity and Policy Frameworks for Improved Agricultural Production and Productivity.

2.3 Project Components

The project will be implemented through 3 components: (i) Large-scale delivery of agricultural inputs (improved seeds and fertilizer) and extension services to male and female farmers; (ii) Development of seed and fertilizer frameworks, and institutional capacity strengthening; and (iii) Project management and coordination (table 2.1).

Table. 2.1 Project Components

No	Component Name	Cost (x 1000 UA)	Component Description
1	Large scale delivery of agricultural inputs (certified seeds of climate-adapted varieties, fertilizers) and extension services to farmers	4,849	***Sub-component 1.1: Deliver quality, nutrient rich and drought resistant seeds of sorghum, cowpeas and rice*** • Provision of Sorghum seeds (498 MT); Cowpeas seeds (498 MT); Rice seeds (10 MT); and tools ***Sub-component 1.2: Deliver quality fertilizer to farmers*** • Provision of 30 MT of fertilizers *[Calcium Ammonium Nitrate (CAN), Nitrogen-Phosphorous-Potassium (NPK), and Diammonium Phosphate (DAP)]* • Train 400 farmers (50% women) on fertilizer micro-dosing ***Sub-component 1.3: Strengthen smallholder farmers and cooperatives*** • Formation of strong viable farmer groups and Strengthen smallholder farmers - 10,000 farmers (30% women and 10% youth) (*including Mobilization of communities, development of bylaws, registration of cooperatives, inclusion of savings and loans, capacity building in financial literacy*) • Develop an e-registry database to facilitate farmer registration, e-extension services, credit vouchers and geolocation • Production of video training extension for low literacy areas through training of trainers for extension agents and provision of pico-projectors and screens ***Sub-component 1.4: Facilitate Farmers' access and linkages to output markets*** • Mobilize and train 10,000 farmers (30% women and 10% youth), and collaborate with the agri-based financial institutions such as Cooperative Bank and/or Alpha bank to access finance using their digitalized operations • Develop a digital platform with modules for extension services, input advisory, market intelligence, farm level intelligence, farmer risk profiling and financial access ***Sub-component 1.5: Promote good agricultural and nutrition practices*** • Conduct technical trainings of 100,000 beneficiaries (50% women, 20% youth) on production practices of Good Agricultural Practices (GAP), Integrated Pest Management (IPM), post-harvest handling, nutrition sensitive agriculture

No	Component Name	Cost (x 1000 UA)	Component Description
			• Production of 4 gender-responsive radio programmes per year in local languages and use of mobile Apps to provide production advisory to farmers including promotion of good agricultural and nutrition practices • Train women and youth on use of fuel-efficient stoves (FES) [Total 1,000 {500 women and 200 youth] – *targeted beneficiaries will be consulted on this option, and their priority considered for implementation*
2	Development of seed and fertilizer frameworks, and institutional capacity strengthening	576	***Sub-component 2.1: Develop seed and fertilizer frameworks (policies, regulations, and implementation guidelines)*** • Provide Technical support to MAFS on the development of seed certification and fertiliser framework, including protocols, guidelines and regulations • Develop MAFS capacities for seed and fertiliser use regulation ***Sub-component 2.2: Capacities of research, extension and farmer organizations enhanced*** • Develop capacity building and training programs suited for rural areas and support the training for extension workers to cascade these trainings to farmers • Provide 18 extension kits; conduct 2 trainings [for 1,000 farmers (30% women and 10% youth)] including the establishment of farmer-managed crop demos for enhanced adoption of improved crop varieties and GAPs to the MAFS and County Agriculture Department (CAD) (10% women among MAFS and CAD teams)
3	Project Management and Coordination	575	• Plan, manage and implement project activities, including monitoring and progress reporting, etc. • Implementation of FAO E&S safeguards plan for seed and fertilizer • Community mobilization and sensitization • Prepare and submit quarterly progress and supervision reports together with MAFS, ensuring quantitative and qualitative gender disaggregated data is collected and analysed • Conduct MTR and PCR missions • Undertake a gender responsive baseline study • Performance of the audit of the financial statements of FAO as a whole by its internal and external auditors including those of the SSEFPP-1 Project
			• Third Party Implementation Agency Fee
Total		**6,000.00**	

2.4 Project's Target Area and Population Beneficiaries and other Stakeholders

The SSEFPP-1 will support an additional 100,000 farming households (about 600,000 individuals) in the five states of Northern Bahr el Ghazal, Upper Nile, Western Bahr el Ghazal, Eastern Equatoria and Western Equatoria State. The SSEFPP-1 will prioritize households that have been receiving food aid over the past several years (many of them IDP returnees) but are now ready to graduate into or increase their agricultural development activities to produce crops for food and marketing for increased incomes. About 50% of these households are women headed households. 20% of beneficiaries will be youth integrated

either as producers, input suppliers, transporters, or cereal/pulse traders at various levels of the crops value chain.

The SSEFPP-1 crops and locations are:

- Crop 1 (Sorghum), in Aweil East and Aweil West Counties (in Northern Bahr el Ghazal State); Renk County (Upper Nile State); Wau County (Western Bahr el Ghazal State); Magwi, Torit and Budi Counties (Eastern Equatoria State); and Yambio County (Western Equatoria State);
- Crop 2 (Cowpeas), in Aweil East and Aweil West Counties (in Northern Bahr el Ghazal State); Renk County (Upper Nile State); Wau County (Western Bahr el Ghazal State); Magwi, Torit and Budi Counties (Eastern Equatoria State); and Yambio County (Western Equatoria State); and
- Crop 3 (Rice), in Aweil Central County in Northern Bahr el Ghazal State.

2.5 The Objective of IPVMP

The purpose of the IPVMP is to ensure that the identified impacts related to application of pesticides are mitigated, controlled or eliminated through planned activities or components (see table 2.1 above) to be implemented throughout the project life. The IPVMP also provides opportunities for the enhancement of positive impacts. The IPVMP gives details of the mitigation measures to be implemented for the impacts; and the responsible institutions to implement them.

Implementation of the IPVMP may be slightly modified to suit changes or emergencies that may occur on site at the time of project implementation. The plan therefore should be considered as the main framework that must be followed to ensure that the key potential negative impacts are kept minimal or under control.

2.6 Current approaches to pest management, target crops and associated pest problems in the project sector

2.6.1 Pests and Diseases in the Project Areas

Farmers in the Project areas practice slash and burn agriculture on relatively small plots (average of two feddans per household). Cereals, especially sorghum, are grown as a staple, with additional crops being small amounts of vegetables, some of which are sold for cash and domestic consumption. Cattle are kept for draught power (cultivation) and other products and services such as milk, manure, cultural and cash in kind, donkeys are kept for transport. Other important livestock are sheep, goats and poultry, with beekeeping an important enterprise for some farmers. The major cereal crops are rice, sorghum, maize, and millet. Okra, Amaranthus and chickpeas are the most important vegetables. Vegetables are grown on relatively small pieces of land, not exceeding ¼ feddan per household. Crop pests and vectors cause economic losses. Although no systematic loss assessments have been undertaken in the SSEFPP-1 area, the annual losses are believed to be high. The key broad categories of pests and vectors include insects, weeds, storage pests, plant and vertebrate pests including rats and birds. Common insect pests in the

project areas include the elegant grasshopper (Zonocerus sp.) that attacks cassava, boll worm and cutworms that attack vegetables, stalk borers that attack maize and sorghum and aphids that normally attack vegetables. Common plant diseases include cassava mosaic virus especially in Yambio, Rust (fungus) that attacks maize and sorghum and the Late blight which attacks tomatoes. All crops are affected by weeds. Some of the most serious damage is caused by parasitic weeds such as Striga. Striga can cause total crop loss in maize and sorghum. Numerous other weeds affect crops, springing up every year depending on crop type, farming system, rainfall, flood intensity, antecedent crops and cultivations, etc. Farmers' perceptions are that weed infestation and diversity is rapidly increasing. In fact, some farmers abandon previously cultivated areas and open up new areas in a new planting season partially because of the high weed infestation in the previously cultivated areas. The common weeds include Striga, Bidens pilosa (Spanish needle), Datura stramonium (Thorn apple), Galisonga parviflora (Gallant soldier), Guizotia scarbra (Sunflecks), Tagetes minuta (Mexican marigold). Crops are also subject to attack and spoliation during storage. Storage facilities typically comprise above-ground brick granaries and woven bamboo baskets). Aboveground storage is especially susceptible to attack by rats and weevils.

The most prevalent vertebrate pests include the Red-billed Quelea (Quelea quelea) birds. These are more common in the project areas and are the most problematic pests while growing rice and other cereals. Rodents' pests including ground squirrels (Xerus erythropus) and cane rat (Thryonomys swinderianus) are more common in all the project sites and tend to feed on root tubers especially cassava but with minimal damage.

2.7 Practical and Current approaches to pest management

Pest/Vector Control practices in the Project areas Management of pests/vectors in the project areas is done by the Department of Plant Protection staff in the States. This is intended to ensure appropriate application of pesticides and prevent abuse. Farm and crop management techniques are also used to control pests/vectors but there are limitations and problems that the farmers face in using these methods. Below are the existing and potential pest/vector management efforts and their limitations.

2.7.1 Growing a Healthy Crop by Starting with Healthy Seed

A crop that germinates from seed that is healthy is likely to be less vulnerable to pest damage. Also, a crop grown from seed that has been bred from resistant strains is less likely to be damaged during plant growth and crop storage. Some farmers don't have access to good seed at the time of planting and as a result they use seed from the previous harvest. Farmer groups are given 'healthy' seed to plant but this is not always the case and this leads to crop loss.

2.7.2 Good farming practices to ensure vigorous crops

A plant growing in good garden conditions is generally less vulnerable to pest damage than a plant growing under stressed conditions. Good farming practices include timely and recommended land/soil preparation, planting and weeding. Limitations and constraints for the farmers include lack of appropriate

skills/knowledge, erratic and unpredictable rainy seasons, lack and/or limited farm inputs and resources to adequately and timely prepare their gardens.

2.7.3 Making the Crop Unattractive or Unavailable to Pests

This strategy includes adjusting planting times to ensure that crop development does not coincide with pest appearance. The success of using this strategy requires good knowledge of the seasons and the ability to forecast the right time for planting. The farmers need the appropriate training and information through the extension workers to ensure that they plant at the right times.

2.7.4 Crop Diversity or Rotation, Early Planting

Crop rotations or multiple cropping removes the chance for the re-appearance of persistent pests. This strategy depends on the availability of seed to the farmers who, sometimes, are in short supply of adequate and good quality seed. It was noted during the surveys that crop diversification and rotation was practiced to some extent. Some of the crops were difficult to sell due to lack of markets or very low prices. The farmers mentioned lack of markets as one of the reasons why they preferred to stick to the crops that had ready markets. This justifies the need to find mechanisms for linking the farmers to market outlets.

2.7.5 Biological control

This is achieved by conserving and enhancing natural biological/ecological controls already in the field and in selected situations, through natural enemies of pests. The use of botanical pesticides such as Chilli (Capsicum frutescens), Vernonia amygalina, Neem (Azadirachta indica) and Tobacco (Nicotiana tabacum) is practiced in some county. Ash made is also used as pests control method in some areas. These are used to control pests mainly on vegetables such as tomatoes and cabbage. The farmers need to be trained in available and appropriate biological controls that can be used to prevent and control pests.

2.7.6 Physical Control

Physical controls include hand picking of pests, uprooting infested crop, using fire to remove pests on crop residues and frequent weeding. These methods are commonly used by the farmers. However, there is need to enhance their application to ensure that they are used in a systematic and coordinated manner.

2.7.7 Use of pesticides

Pesticides may be used with care to ensure their toxicity to non-target organisms is as low as possible. The effectiveness of pesticides should be as selective as possible. Certain pesticides of natural origin are compatible with integrated pest management (IPM), causing minimum disturbance to natural biological and ecological pest control mechanisms. It was noted that farmers use pesticides although under the

guidance of staff from the Plant Protection Departments albeit in very small amounts particularly on vegetables. The farmers therefore need to be guided and trained to understand the limitations and environmental consequences of using pesticides. They should be knowledgeable of pesticides that are compatible with IPM and that do not degrade the natural biological pest control systems and integrate with their pest management practice. The farmers need to be equipped with information on pesticide application quantities and methods; prevention of chemical poisoning/accidents and effects of high pesticides residues in crops and safety precaution during application and storage.

2.8 Existing Pest Management Approaches consistent with IPM

Pest management approaches and practices that are consistent with IPM include the physical, biological and chemical pest control techniques. There is a draft Pesticides policy with MAFS that is yet to be presented to the Council of Ministers for consideration. It's expected to lead to the establishment of a Pesticides Council, which will be consistent with the requirements of IPM. The draft policy supports efforts to use recommended chemicals and to ban/control illegal importation of pesticides that are not approved by the Pesticides Board. Some of the pesticides management approaches and practices that are not consistent with IPM include overuse of and over-dependence on chemical control methods, and limited use of physical and biological methods due to lack of technical knowledge and supervision. The use of unlisted or unapproved pesticides and stockpiling of obsolete pesticides, as reported by some States MAEF are not consistent with IPM. These inconsistent approaches and practices emanate from the following:

i. Lack of training and limited knowledge of IPM practices and benefits by the farmers
ii. Inadequate technical supervision of the farmers by the extension workers due to shortage of trained personnel to support IPM
iii. Poor information availability and information management on pesticides and their uses
iv. Lack of systems and controls to enforce IPM approaches and practices in the various States and county level. This leads to isolated and independent use of pest control methods as is happening in some counties.

2.9 Proposed Pest Management

2.9.1 Integrated Pest Management

From the existing pest management approaches and regulatory framework given above, it is apparent that there are distinct shortfalls and inadequacies that need to be addressed to adopt and implement an IPM and to ensure compliance. The farmers, therefore, must be knowledgeable of IPM and must have a pesticide management plan that aims at protecting the environment. Integrated Pest Management (IPM) is a comprehensive approach to solving pest problems, IPM shifts the focus from controlling a pest now; to making the best management decisions for the long-term; and builds a comprehensive response to pest problems. The goal is to identify and implement coordinated strategies that work together in an integrated manner to provide optimum results; with the view to achieving long-term positive

environmental and social benefits. The concept of integration works on multiple levels in that remedial strategies for individual pests are integrated with each other to ensure compatibility with the need to manage other pests. The pest management strategies must be consistent with the objectives to protect the environment and to address social concerns. IPM approach arises as a response to negate over-reliance on pesticides and short-term solutions that do not account for all of the long-term costs and externalities. IPM acknowledges that pesticides are still valuable, but stresses that chemical control is but one of the many tactics considered in an IPM approach. Pesticide use in IPM is limited to situations where there is an identified need and lack of suitable alternatives. This contrasts with a preventive chemical approach where pesticides are used on a prescribed basis without determining the need or making full use of alternative measures.

2.9.2 Basic Requirements in IPM

The basic requirements for implementing IPM in the SSEFPP-1 project sites include understanding the biology and economics of the pest and the system in which the pest exists, monitor the pests and natural controls and establishing their economic or aesthetic injury thresholds. IPM can be achieved by selecting an appropriate strategy of cultural, mechanical, biological, and/or chemical prevention or control techniques that are briefly described below:

1. **Cultural practices**

These include habitat modification and adapting operating procedures so that pest damage is reduced, and natural control is enhanced. It involves sanitation or cleaning of sources of pest infestation, choosing plant varieties that are resistant to pest injury, adjusting planting time, fertilization, tillage, and harvesting operations to have the most beneficial effect for the pest management situation.

2. **Biological controls**

These are predators, parasites, and diseases that attack pests. Measures should be taken to conserve naturally occurring populations of these biological controls. In some situations where naturally occurring biological controls are not effective, they can be introduced from outside sources.

3. **Chemical control**

This involves selecting a pesticide with the lowest toxicity to humans and non-target organisms (including biological controls) and using it in such a way to prevent or minimize undesirable environmental effects. The lowest effective amount of pesticide is applied, using appropriate and carefully calibrated equipment. In many cases, use of pesticides cannot be entirely eliminated. However, use of pesticides must be controlled so as to reduce or eliminate social and environmental impacts. A comprehensive IPM should support a pesticide management plan that is designed to ensure that pesticides are procured, handled, stored, applied and disposed in such a manner that protects life and the environment. The plan should

consider the entire life cycle of the pesticides. Hence the SSEFPP-1 activities and operations must observe the following:

i. All pesticides must be purchased from registered pesticides dealers.
ii. Pesticides must be purchased strictly according to the requirements to avoid overstocking. A follow up system for the procurement, transportation, receipt and custody of pesticides must be established.
iii. Movement or transportation of pesticides from suppliers must conform to FAO guidelines. Pesticides must not be mixed up with other items, particularly food items. They should be in well confined containers.
iv. Pesticides shall be stored in a dedicated and centralized warehouse or storage facility, separately from agricultural produce and other items. All pesticides must always be under lock and key and under the custody of a very responsible person. Storage of pesticides in farmers' houses must be prohibited. Warehouses must be protected from sources of fire. Access to the warehouses must be restricted to responsible and authorized persons.
v. All pesticide mixing containers and spraying equipment must be washed and cleaned in a safeguarded central point. All containers must be disposed of in an environmentally acceptable manner.

IPM initiatives have the potential for improvement to better manage pests on the farmers' fields and in food handling facilities to improve yields and to prevent damage to crops. Section 2.7 above highlights some of the IPM practices that are being used to a limited extent, in the project areas. These practices have great potential and therefore need to be supported and strengthened through extension services and targeted training activities to ensure maximum benefits.

2.10 Recommended best practice of Integrated Pest management Practices

1. Trainings and sensitizations in Pest management

Farmers and implementing agencies must undergo comprehensive training in pest management, in liaison with the MAFS. The farmers and implementing agencies must have first-hand knowledge of the pests, pesticides to be used on their farms and IPM. Sensitization campaigns must be carried out at least annually to ensure that the farmers are reminded of IPM practices. These campaigns could benefit from the normal agricultural sensitization programmes conducted by the ministry and other stakeholders through use of brochures, and demonstrations as well as electronic media and broadcasting. Implementation of an IPM approach in line with Bank policy - and as required on occupational health and environmental grounds - will require a major increase in capacity at several levels:

- Research: to develop measures which are economically effective under command area physical, ecological and social conditions.
- Delivery: training of trainers in IPM.
- Farmers: to understand and apply IPM.

- Monitoring: to provide the advance warning of pest build-ups required for management, and to verify control measures, as well as to measure the performance of the IPM capacity building activities themselves.

Key players in this system will be MAFS, implementing agencies, the State MAEF, county and Payam agricultural officers. There should also be a link to markets, especially if a line of organic products is developed. Implementing NGOs have a role, but whilst useful for temporary support they tend not to provide institutional sustainability. IPM is for the long-term, given the fragility of some of the ecosystems where the project is being implemented and the emphasis on increase in household acreage under cultivation to ensure food security as a government policy.

2. Availability of Farm Inputs and Information

The farmers must be assisted to acquire the necessary farm inputs in time for planting at the appropriate time. They must have access to the necessary information for facilitating implementation of IPM. Such information includes the correct planting times, crop management practices, water management; and pesticides use and management. Information dissemination may be conducted through the print media (brochures, etc) and through demonstrations and radio.

3. Research into IPM Methods

Research activities must be targeted at initiatives for promoting IPM. Such initiatives are to include identification and testing of botanical, biological, physical as well as chemical methods for the control of pests. The results of these research initiatives must be communicated to the farmers as appropriate.

4. Monitoring and Evaluation of IPM

All the activities of integrated pest management and pesticide management must be monitored by the appropriate authorities and Agricultural Officers at county level in collaboration with other departments. The effectiveness of the plan must be evaluated annually. Comprehensive details for pesticide management and monitoring are given in table 4.1.

2.11 Assessment of risks to the environment, population health and the economy from Pesticides

The effects of pesticides on the environment, health and agricultural sustainability were highlighted here. In this section available data about the ultimate impacts of pesticides on the environment and health are evaluated from three different perspectives: the burden of disease; monetary costs; and effects on ecosystem services.

The impact of pesticides is defined as a durable change in the condition of the environment or people brought about by their (adverse) effects. Pesticides are sold and used because of the benefits they are

expected to provide. The potential benefits of pest control (of which pesticides are an instrument) include reduced crop losses, reduced prevalence of human vector-borne diseases, longer shelf life of agricultural commodities, greater livestock yields, reduced soil disturbance, and better protection of wooden structures. The overall adverse human health impact of pesticides can be quantified as burden of disease. So far, no international estimates are available of the burden of disease caused by pesticides, with the exception of self-poisoning (Prüss-Ustün et al. 2016a; Prüss-Ustün et al. 2016b; WHO 2016; Landrigan et al. 2018; WHO 2019). No recent independent global or regional reviews of the economic benefits of pesticide use are available (Wiese and Steinman 2020). While the pesticide industry certainly collects information about the costs and benefits of their products internally, such data do not seem to be publicly available for systematic review and independent analysis. Pesticide use has different types of costs: direct costs, which are all the monetary and non-monetary expenses borne by farmers and other pesticide users; indirect or hidden costs (e.g., occupational health effects, development of pest resistance, or reduction in crop pollination); and external costs or externalities, which are the costs of pesticide use borne by society as a whole (e.g., pesticide regulation, treatment of polluted water, or clean-up of stocks of obsolete pesticides) (Ajayi et al. 2002; Bourguet and Guillemaud 2016). Despite great uncertainties associated with estimates of the indirect environmental and health costs of pesticide use, these costs are likely to be high. The most recent review of annual indirect environmental and health costs, published in 2016, found that they ranged from USD 5.5 million in Niger in 1996 to almost USD 12 billion in the United States in 2005. However, these were considered to be underestimates and to be based on outdated information (Bourguet and Guillemaud 2016).

Pesticide use may affect ecosystem services, in particular pollination, soil function, pest regulation, food production and maintenance of future options. There is clear evidence that pesticides adversely affect the natural regulation of pests and other detrimental organisms (MA 2005). High levels of pesticide use also impact pollination (Dainese et al. 2019), although it is less clear whether sublethal exposure of pollinators leads to a reduction in pollination services (Kovács-Hostyánszki et al. 2016). The circumstances under which pesticide use affects soil functions are currently unclear and require further research (Dornbush and von Haden 2017). Food and feed production can be positively or negatively influenced by pesticides, depending on the circumstances of their use. Relatively few studies have been conducted on pesticides' impact on biodiversity and the associated capacity of (agro-)ecosystems to adapt to change. Where such studies have been carried out, biodiversity was generally shown to be adversely affected by pesticide use (Potts, Imperatriz-Fonseca and Ngo 2016; Stavi, Bel and Zaady 2016; Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] 2019).

2.12 Control of the Distribution and use of Pesticides

When considering the distribution and use of pesticides, it is important to carefully select the appropriate pesticide products. Factors that should be considered include the hazards and risks to users, selectiveness and risk to non-target species, persistence in the environment, efficacy, and likelihood of development or presence of resistance by the target organism. It is also important to conduct a minimum environment and social analysis.

The Food and Agriculture Organization (FAO) does not maintain a list of permitted or non-permitted pesticides because many locally specific conditions govern which pesticides may be used. However, in line with the provisions of the FAO/WHO International Code of Conduct on Pesticide Management and relevant multilateral environmental agreements that include pesticides, the following list of criteria will need to be met for a pesticide to be considered for distribution in any FAO project:

i. Pesticides requiring special precautions will not be used if the requirements are not likely to be met.
ii. Pesticides distributed will be selected from an approved list, taking into consideration toxicity, persistence, user experience, local regulatory capabilities, type of formulation, proposed use, and available alternatives.
iii. The type and degree of hazard and availability of alternatives will be used to restrict or disallow types of pesticides under Bank loans. These criteria include toxicity, acute mammalian toxicity, chronic health effects, environmental persistence, and toxicity to non-target organisms.
iv. The registration status in the country and capability to evaluate long-term health and environmental impacts of pesticides will also be considered. Users should be able to manage the product within margins of acceptable risk.
v. FAO will not supply pesticides that meet the criteria that define Highly Hazardous Pesticides (HHPs) .

Pesticides that fall in WHO Hazard Class 2 or GHS Acute Toxicity Category 3 can only be provided if less hazardous alternatives are not available and it can be demonstrated that users adhere to the necessary precautionary measures. Preference should be given to products that are less hazardous, more selective and less persistent, and to application methods that are less hazardous, better targeted and requiring less pesticides .

2.13 Ability to Manage/Dispose of Obsolete Pesticides and Polluted Packaging

Pesticides pose risk to man and his environment from the stage of manufacture until they are used, disposed off or completely degraded. It is important to have the ability to manage and dispose of obsolete pesticides and polluted packaging. FAO South Sudan works closely with governments, industry, and civil society organizations around South Sudan on developing solutions to prevent and dispose of obsolete pesticides and associated waste, and to manage empty containers in agriculture. They have developed an extensive training program, published guidelines and other resources to effectively and safely dispose of stockpiles; implement specific measures to avoid their re-accumulation; and ensure proper treatment of empty containers . This IPM will actively address waste management, stockpile disposal and container safety to protect both the environment and public health.

2.13.1 Waste Management Strategies

The IPM outlines specific strategies for dealing with pesticide-related waste which includes addressing obsolete, unwanted, and banned pesticides that can no longer be used. Effective waste management will

therefore prevent the accumulation of old pesticides and associated waste in rural areas where farming and pest control activities immensely occur.

2.13.2 Proper Disposal of Stockpiles

The IPM provides guidelines for safely disposing of stockpiles of obsolete pesticides since stockpiles often contain toxic chemicals that leak into the environment and contaminate water and soil. Therefore, this being an essential part, FAO will collaborate with South Sudan government, industries, and civil society organizations to prevent re-accumulation of such stockpiles.

2.13.3 Empty Container Management

The IPM ensures proper treatment of empty pesticide containers. In South Sudan so many people unknowingly reuse pesticide containers for domestic purposes, which can lead to poisoning accidents thus FAO will emphasize on educating the users about the dangers and health risks of reusing such containers.

2.13.4 Guidelines and Training

FAO will incorporate guidelines and training programs. The plan has incorporated guidelines and training programs through its developed extensive resources to help countries dispose of obsolete pesticides safely, prevent re-accumulation, and manage empty containers in agriculture.

3.0 Policy, Legal and Institutional Framework for Integrated Pest Management (IPM)

3.1 Institutional Framework

The Ministry of Agriculture and Food Security (MAFS) plays a major role in the import and distribution of pesticides in the country, and provides training to staff working in plant protection departments around the country. In turn, the staff members of the plant protection departments are involved in training of field extension workers and farmers. However, due to lack of facilities, trained personnel and funds, inspection tasks such as checking on package, labelling, test for quality and residue in plant parts, animals and soils are not taking place as expected. Local distribution of pesticides is carried out by the State MAEF to the counties. There is no official private sector distribution of pesticides, but minimal informal activity. Pest management advice is mainly delivered through the extension system run by MAF.

Given the emergency nature of this project, FAO will activate their internal Emergency Activation and Response Protocol, to expedite implementation of all project activities. FAO therefore has the requisite systems and mechanisms to expedite the implementation of the SSEFPP-1.

The South Sudanese government and the Food and Agriculture Organization of the United Nations (FAO) have been collaborating to create a national plant protection organization (NPPO) and prepare a framework for phytosanitary laws. The objective of this project is to enhance the nation's regulatory framework through the creation and enforcement of legislation. This will not only expand the nation's

market access but also protect the environment, livestock, and public health. In September 2021, the IGAD Center for Pastoral Areas and Livestock Development (ICPALD) approved the National Sanitary and Phytosanitary (SPS) Strategy for South Sudan. The strategy seeks to enhance the nation's sanitary and phytosanitary (SPS) measures' current state, obstacles, and future directions. SPS technical specialists from around the nation reviewed the plan, which is in line with the IGAD regional SPS policy. It is anticipated that the Line ministries will incorporate the plan into federally and donor-funded initiatives.

3.2 Regulatory Framework

The Republic of South Sudan is committed to achieving food security and reducing poverty. South Sudan's chances of success in this endeavour are largely dependent on its agricultural development. Currently there is not regulatory framework for the importation and use of pesticides in South Sudan. A draft pesticides policy has been prepared and is yet to be enacted. There is no separate policy on IPM in South Sudan or any developed IPM implementation strategy. Similarly, there is no formal policy on organic agriculture or the development, quality control and marketing of organic produce. South Sudan is not yet a signatory to the Stockholm Convention on Persistent Organic Pollutants (POPs), and therefore, has not established this in domestic law.

3.2.1 National Regulatory and Policy Framework

Since attaining Independence in July 2011, the GRSS has adopted a new constitution, as well as policies and legislation related to E&S standards. Some legislation from the previous 'Southern Sudan' remains in place. At the same time, other laws and regulations are still being drafted, with the ultimate aim of enhancing sustainable socio-economic development. The policies and laws provide procedures to be followed in the planning and implementation of activities in order to utilize resources and execute programs to maximum benefit.

3.2.2 The Transitional Constitution of 2011

The transitional Constitution of the Republic of South Sudan of 2011 emphasizes the bill of rights (article 9) as a commitment to respect and promote human rights and fundamental freedoms enshrined in this Constitution. It integrates main considerations on the rights of women (article 16), the rights of children (article 17) and the protection of the unit of society, the family (article 39). The Transitional Constitution incorporates numerous provisions that have a bearing on the environment. Article 41 (1) provides that the people of South Sudan have a right to a clean and health environment, (2) every person have the obligation to protect the environment for the benefit of present and future generations, and (3) Every person have the right to have the environment protected for the benefit of present and future generations, through reasonable legislative action and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and

- Secure ecologically sustainable development and use of natural resources while promoting rational economic and social development to protect the biodiversity of South Sudan.

Furthermore, Article 166 (6) expects local governments involve communities in decision making in the promotion of a safe and healthy environment.

3.2.3 The National Environment Policy, 2015-2025

The National Environment Policy (NEP) 2015-2025 calls for a comprehensive EIA to be conducted before ELRP execution, and it should focus on negative impacts, their mitigation, management, and remediation. The policy's goal is to ensure protection and conservation of the environment and sustainable management of renewable natural resources to meet the needs of its present population and future generations. The objectives of the environmental policy seek to:

- Improve livelihoods through sustainable management of the environment and use of natural resources;
- Build the capacity of the government and other stakeholders to better manage the environment;
- Integrate environmental considerations into development policies, plans, and programs among communities, government, and private sector; and
- Promote effective, widespread, and public participation in the conservation and management of the environment;

The policy gives guidance on:

- Natural resource management: oil, energy, mining resources; forest and tree resources; wetlands, rivers, lakes and other water resources; land resources; animal resources; fisheries; wildlife and biological diversity; Hills, Mountains and Plateaus; Natural Heritage;
- Climate change including waste management, pollution prevention, natural disasters, desertification, conflict and environment, ozone layer depletion, and renewable energy
- Environmental rule of law: national environmental legislation; environmental crimes, including compliance, enforcement, punitive measures, and sanctions; registration of environmental consultants, consultancies, and firms; environmental assessments, environmental standards;
- Capacity building supporting institutional, human, school-based and non-governmental capacity building.

The NEP is important to this ESMP because it provides legal guidelines and principles to be followed in environmental management during the implementation of SSEFPP-1. It specifies that: (a) development activities require an Environmental and Social Impact Assessment (ESIA) and must obtain an Environmental Certificate before implementation; (b) approved development activities should conduct regular environmental audits; and (c) the Ministry of Environment and Forestry must review the issuance of all permits, licenses and compliance certificates.

3.2.4 The Agriculture Sector Policy Framework, 2012-2017

The Food and Agriculture Policy Framework (FAPF) of the Ministry of Agriculture and Food Security (MAFS) emphasizes the need to transform agriculture from a traditional/subsistence system and achieve food security through science-based, market-oriented, competitive, and profitable agriculture without compromising the sustainability of the natural resources for generations to come. Its strategic objectives include:

- Priority policies that quickly boost agricultural production
- Make agricultural inputs, including credit facility, affordable to farmers
- Rehabilitate and expand rural infrastructure, including feeder roads and markets
- Develop and provide research and extension services and market linkages
- Develop and strengthen institutional and human resource capacity
- Protect, regenerate, and conserve natural resources; formulate policy incentives for rational and sustainable management, and use.

3.2.5 The Health Policy 2016-2025

The National Health Policy 2016-2025 aims to ensure improved health services by defining new paradigms for health service delivery, health financing, strategic information, leadership and governance, human resources for health, and access to essential medicines. Policy objectives are to strengthen: (i) organisation and infrastructure for effective and equitable delivery of the basic package of health and nutrition services; (ii) leadership and management of the health system and increase health system resources; (iii) partnerships for healthcare delivery and system development.

Guiding principles are: (i) health and health services as a human right; (ii) primary health care approach; (iii) decentralisation; (iv) partnerships; (v) international conventions and guidance; (vi) gender mainstreaming; (vii) community participation; (viii) efficiency and effectiveness; (ix) respect for values and cultures.

SSEFPP is aligned with the need and health priorities by improving service delivery needs for food and nutrition security as well as preventing any adverse impact due to phytosanitary products, defined in the IPMP.

3.2.6 The Draft Land policy (DLP), 2014

The Land Policy has not been validated yet and will be object to a second reading at the Parliament. DLP is as a crucial piece of legislation for South Sudan with the potential to lay the foundations to strengthen communities' and women's land rights, promote transparent land governance, peacefully resolve land-related disputes, and support the displaced population to protect and re-assert their land rights. Key aspects to note include: (i) the DLP recognises IDPs and returnees will likely migrate to urban areas and therefore support securing tenure for new residents; (ii) women and men enjoy equality of rights to land and other property; (iii) the DLP further recognises the importance of community tenure arrangements in providing land to South Sudanese citizens, especially in rural areas.

3.2.7 The Draft National Disaster Risk Management Policy, 2020

The policy is under validation and define the pillars of disaster risk management in South Sudan: (i) institutional framework; (ii) preparedness and timely intervention; (iii) early warning system; (iv) traditional mitigation and coping capacities; (v) post-integration recovery and stabilization; (vi) institutional linkages; (vii) capacity building; (viii) cross-sectoral coordination and cross cutting issues integration; (ix) resource mobilization. It defines the following regulatory framework to be developed: (i) National Disaster Management Act; (ii) 5 years national Disaster Risk Management Strategy Plan of Action; and (iii) an alignment of existing plan considering disaster risk management.

3.2.8 The Draft Forest Policy, 2015

The Forest Policy of 2012 was revised, and a draft Forest Policy (2015) was formulated to broadly protect the role forests play in the ecological stability of rivers, lakes, swamps, and agricultural production systems. It also seeks to optimize the benefits from forestry and agro-forestry activities for food security and poverty alleviation.

The policy integrates forest sector management with rural development efforts to ensure that the rural population of South Sudan can meet their basic needs—such as, household food security; shelter; wood fuel; safe water, sanitation, and health facilities; primary education; good local governance; empowerment and self-reliance. This policy is founded on the following guiding principles:

- All forest and tree resources of South Sudan will be managed sustainably to ensure streams of benefits to present and future generations;
- Permanent forest estates (PFE) will be established and managed to ensure conservation of biodiversity and a steady flow of benefits;
- Forests and tree resources will be managed in accordance with set criteria and indicators for sustainable management;
- Appropriate specific policies, legislation, institutional reforms will be implemented to support rapid growth of the forest sector;
- Industrial and other plantations will be sustainably managed to meet growing wood demands;
- There will be increased participation and benefits for communities in forest management through collaborative management schemes;
- Tree based industrial development (forest products processing) will be promoted and supported to increase the economic benefits from forest resources;
- Forestry institutions and services will be strengthened to increase productivity, achieve household food security, alleviate poverty, and contribute to the macro-economy of South Sudan;
- There will be sustained commitment to forest-related regional and international agreements and conventions; and
- Management of forests and tree resources will be guided by best knowledge and information.

3.3 National Bills and Acts

- The Environment Protection and Management Bill, 2013
- The Land Act, 2009
- The Local Government Act (2009)
- The Wildlife and National Parks Protection Act, 2003
- The Draft Wildlife Bill, 2013
- The Forest Bill, 2009
- The Water Bill, 2013
- The Public Health (Water and Sanitation) Acts, 2008
- The Pesticide Control Bill for South Sudan (Proposed as of 2021)
- The Child Act (Act No. 10 of 2008)
- The Labour Act (Act No. 64 of 2017)
- The NGO Act, 2016

3.4 Customary Laws

The 2009 Local Government Act recognizes customary law as one of the sources of law in South Sudan. The Act further establishes customary law courts at the boma, payam, and county levels. The Transitional Constitution of South Sudan passed on 9 July 2011 when South Sudan became an independent country, affirms customary law as one of the sources of law for the new nation. Preservation of indigenous cultural values and customs against the encroachment of centrally imposed sharia jurisprudence from Khartoum was a key element of the independence struggle for South Sudan. The SSEFPP will ensure sensitization of customary authorities in using AfDB standards while managing project activities related grievance, through stakeholder engagement and the project grievance redress mechanism.

3.5 International Policies

3.5.1 The International Plant Protection Convention (IPPC), 1951

The IPPC is an intergovernmental treaty overseen by FAO that aims to protect the world's plant resources from the spread and introduction of pests and promoting safe trade. The Convention introduced International Standards for Phytosanitary Measures (ISPMs) as its main tool to achieve its goals, making it the sole global standard setting organization for plant health. The first ISPM was adopted in 1993 and there were 44 adopted ISPMs, 29 Diagnostic Protocols and 39 Phytosanitary Treatments as of March 2021. These international standards:

- Protect sustainable agriculture and enhance global food security
- Protect the environment, forests and biodiversity
- Facilitate economic and trade development

3.5.2 Convention on Biological Diversity (1992)

The Convention on Biological Diversity adopts a broad approach to conservation. It requires Parties to the Convention to adopt national strategies, plans and programs for the conservation of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies. The proposed programme is expected to conserve biodiversity, especially the rare and endangered species in the project area and its environs.

3.5.3 African Development Bank Group - Updated Integrated Safeguards System (2023)

E&S Operational Safeguard 3. Resources Efficiency and Pollution Prevention and Management

OS3 recognizes that economic activities often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. The objectives of OS3 are as follows: To promote the sustainable use of resources, including energy, water and raw materials, To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities, To avoid or minimize project-related emissions of short and long-lived climate pollutants, To avoid or minimize generation of hazardous and non-hazardous waste, To minimize and manage the risks and impacts associated with pesticide use. The applicability of this OS is established during the environmental and social assessment described in OS1.

3.5.4 International Code of Conduct on the Distribution and Use of Pesticides – (Revised Version – 2003)

The International Code of Conduct on the Distribution and Use of Pesticides was one of the first voluntary Codes of Conduct in support of increased food security, while at the same time protecting human health and the environment. It's the worldwide guidance document on pesticide management for all public and private entities engaged in, or associated with, the distribution and use of pesticides. The code is designed to provide standards of conduct and to serve as a point of reference in relation to sound pesticide management practices, in particular for government authorities and the pesticide industry. The revised version of the International Code of Conduct on the Distribution and Use of Pesticides by Council Resolution 1/123 includes the life-cycle concept of pesticide management and an expanded definition of IPM as well as strengthens the monitoring of the Code and explicitly invites governments, the pesticide industry, NGOs and other interested parties to provide regular feedback on its implementation. The Code demonstrates that pesticide management should be considered a part of chemical management, as well as of sustainable agricultural development. This means that collaboration, cooperation and information exchange between various government and nongovernment entities, in particular those involved in agriculture, public health, environment, commerce and trade, have become increasingly important.

3.5.5 International plant Protection Convention of FAO (1952)

The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It is governed by the Commission on Phytosanitary Measures (CPM) which adopts International Standards for Phytosanitary Measures (ISPMs).

3.5.6 United Nations Framework convention on Climate Change (1992)

The convention seeks to regulate levels of greenhouse gases (GHGs) concentration in the atmosphere, to avoid the occurrence of climate change at levels that would harm economic development, or that would impede food production activities.

3.5.7 The United Nations Convention to Combat Desertification (UNCCD), 1996

The UNCDD was adopted in 1994 and came into force in December 1996. The objective UNCCD is to combat desertification and mitigate the effects of drought in seriously affected countries, especially those in Africa, Latin America, the Caribbean, Asia, and Northern Mediterranean. It seeks to achieve this through integrated approaches to development supported by international cooperation and partnership arrangements in the affected areas. It emphasizes long-term strategies that focus on improved land productivity and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, particularly at the community level.

3.5.8 Vienna Convention on the Protection of the Ozone Layer

The Vienna Convention was an intergovernmental negotiation for an international agreement to phase out ozone depleting substance in March 1985. It ended in the adoption of the Vienna Convention for the Protection of the Ozone Layer. The Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, the monitoring of CFC production and the exchange of information. The GOSS acceded to the convention on 12 January 2012.

3.5.9 World Food Security and the Plan of Action of November 1996

This declaration seeks to secure effective prevention and progressive control of plant and animal pests and diseases, including especially those which are of trans-boundary nature, such as rinderpest, cattle tick, foot-and-mouth disease and desert locust, where outbreaks can cause major food shortages, destabilize markets and trigger trade measures; and promote concurrently, regional collaboration in plant pests and animal disease control and the widespread development and use of integrated pest management practices.

4.1 Project Integrated Pest Management Measures

The SSEFPP-1 project aims to support the farming system in five states of South Sudan, namely Northern Bahr el Ghazal, Upper Nile, Western Bahr el Ghazal, Eastern Equatoria, and Western Equatoria. Integrated Pest Management (IPM) is a crop protection method that aims to prevent pest infestations on agricultural lands. It combines biological, chemical, manipulation, modification of cultural practices, and use of resistant varieties physical and crop specific (cultural) management strategies and practices to grow healthy crops and minimize the use of pesticides, reducing or minimizing risks posed by pesticides to human health and the environment for sustainable pest management. IPM is a dynamic process that makes use of an ecological systems approach and encourages the user or producer to consider and use the full range of best pest control options available given economic, environment, and social considerations. It is based on ecology, the concept of ecosystems, and the goal of sustaining ecosystem functions. By switching to integrated pest management, farmers can contribute to sustainable farming practices.

4.1.1 The measures objectives for the PMP

The Project Could set measurable objectives and improve the IPM indicators relevant to the Counties / State; and determining factors such as:

- When the IPM program will start.
- How much it will cost.
- What will be accomplished by choosing IPM.
- How success shall be monitored.

The determination of above must be done prior to IPM implementation. Additionally, measurable goals will be set, to track:

- Pest management costs.
- Monitoring /Surveillance of pest activity before and after implementation of the IPM program.
- Number of calls related to pest problems and toxic chemical use reduction.

4.2 Proposed relevant activities for integrated pest/vector management

To establishes IP/VM activities implementation timeline that includes time to execute all the steps in the implementation plan of the project. it is imperative to include time to organize the administration of the Integrated Pest Management (IPM) and conduct any farmer training, as well as manage the fertilizer and IPM process. Information on IPM programs will be gathered, including the time it will take for development and how successful they have been. Budgetary and technical information for previously implemented IPM programs will be obtained and analysed to establish lessons learned. The FAO/ will conduct the National Training of trainers (TOT) that will support Build the capacities and Raise awareness among the communities and the National Team Surveillance and Monitoring, for pest preparedness in response to the invasion of any transboundary pest/vectors. The capacity building will include.

- Goal, Principles & Benefits of IPM Program.
- Access quality Fertilizer.
- Usage of Agricultural tools.

- Rapid monitoring Surveillance g response of the transboundary pest outbreak/entering the country.

4.3 Monitoring, evaluation, and reporting of the implementation of the Action Plan

To guarantee that the Action Plan on Integrated Pest Management measures is successfully implemented, it is essential to monitor, assess, and report on the project's progress. This include creating an implementation schedule that accounts for the time needed to complete each task in the project's implementation plan, setting up the Integrated Pest Management (IPM) administration, holding any necessary training sessions both for the farmer and the implementing partner, and overseeing the fertilizer and IPM procedures. Data on IPM initiatives, such as the length of time required for development and the degree of success achieved, will be collected. To determine lessons learned, financial and technical data from previously executed IPM programs will be gathered and examined. The project will be tracked utilizing the FAO monitoring system's input, output, and result. The following are the steps involved in an IPM program that can be critically observed in the project Implementation.

- Problem assessment: This is the first step in an IPM program, which involves deciding if the pest presence is dangerous to crops.
- A correct understanding of the infestation scope determines if the problem should be addressed.
- Field visits: Field visits are conducted to get a practical insight into the pest problem.
- Monitoring: Crops are monitored regularly to identify pests timely and assess the risks. Prevention measures are taken to minimize the risk of pest infestations.
- Decision-making: Decisions are made on the necessity of actions and how IPM will work. All appropriate integrated management options are considered and applied.
- Action: The results of the IPM program are analyzed to determine the effectiveness of the program.

4.4 Pest Monitoring Plan

Successful implementation of the Integrated Pest Management Plan in the project locations will require regular monitoring and evaluation of activities under taken by the farmers to be involved in the project. The focus of monitoring and evaluation will be to assess the build-up of IPM capacity among the farmers and the extent to which IPM techniques are being adopted in Agriculture production, and the economic benefits that farmers derive by adopting IPM. It is also crucial to evaluate the prevailing trends in the benefits of reducing pesticide distribution, application and misuse.

Indicators that require regular monitoring and evaluation during the programme implementation include the following:

1. Number of farmers engaged in IPM capacity building in the project locations
2. Number of farmers who have successfully received IPM training in IPM methods
3. Number of trainees practicing IPM according to the training instructions
4. Number of women as a percentage of total participating in IPM and successfully trained
5. Number of youth as a percentage of total participating in IPM and successfully trained
6. Number of farmers as a percentage of total applying IPM

4.5 Steps in Setting up IPM

4.5.1 Identify the implementation team

Transition to a PMP program requires a diverse, action-oriented PMP Committee. This PMP Committee will be an environmentally conscious committee lead by the Project Director at PMU, DPP, Representative of the County Agriculture Department(CAD) and Farming Group will be members of this Committee. The leader of this team should be familiar with pests, pesticides and pesticide regulations. This arrangement is appropriate, because implementation of an IPM program can be tracked as a performance indicator.

PMP leadership is guided by pest management principles and environmental issues. Leadership with such academic background and experience qualifies to serve as an authority to supervise PMP implementation. Other team members include Environmental, Agriculture Extension , agronomists, crop protection experts(entomologists, pathologists), aquaculture expert, health officer and Livestock officer.

4.5.2 Decide on the scale of implementation

To determine the scale of implementation, a strategic approach will be taken. IPM will be clearly defined and discussed by the PD as is done for all other development projects. A representative of the CAD offices must attend these meetings to help explain the IPM approach and give examples of similar documented success studies. Through these discussions comprehension will be achieved, and potential objections will be addressed with successful practical examples.

4.5.3 Review and set measures objectives for the PMP

The PMP Committee will set measurable objectives and refine the IPM indicators relevant to their Counties / State; and determining factors such as:

- When the IPM program will start
- How much it will cost
- What will be accomplished by choosing IPM
- How success shall be monitored

The determination of above must be done prior to IPM implementation. Additionally, measurable goals will be set, to track:

- Pest management costs;
- Monitoring of pest activity before and after implementation of the IPM program;
- Number of calls related to pest problems and toxic chemical use reduction.

Furthermore, the time when the shift to IPM will occur must be discussed and agreed upon prior to implementation. The initial step will be to establish an implementation timeline that includes time to execute all of the steps outlined in the implementation plan. It is imperative to include time to organize the administration of the IPM and conduct any farmer training as well as manage the IPM process.

The IPM Committee will gather information on previously implemented or currently being implemented IPM programs; the time it took to develop them and how successful they have been. They will obtain the budgetary and any technical information for the previously implemented IPM programs and analyze the elements to establish lessons to learn. Field visits to currently running programmes will be conducted to get a practical insight.

Reduced pesticide use is the substantive yardstick in measuring an IPM's ability to create a safer environment. Baseline study will be conducted and therefore an information database that includes annual quantities of pesticides used will be designed to enable comparative analysis to the previous years. The goal will be a downward trend over time or ideally, a specific reduction amount, ultimately leading to a scant usage of highly toxic pest control chemicals.

4.5.4 Analysis current housekeeping, maintenance and pest control practices

While preparing to make a transition to IPM, the PMP Committee will familiarize itself with the organization's current policies and practices with respect to structural maintenance, sanitation and pest control. Occasionally, current practice may be consistent with IPM principles. Familiarization will provide the flexibility necessary to adapt to, and prepare for the necessary changes.

Structural maintenance is arguably the most efficient way to keep pests out of a facility because it physically stops pests from entering wherever possible. Structural maintenance will therefore be a regular part of the IPM. Cracks, crevices or other unnecessary openings in the building exterior that can be used by pests as harborage areas or entry points regardless of size, will be sealed appropriately. Sanitation deprives pests of food and water. A sanitation plan must therefore be accounted for in the development of an IPM. Staff must be provided with special sanitation training.

4.5.5 Establish a system of regular IMP inspection

PMP's central focus is regular facility inspections. Such inspections are the "life blood" for a continuous cycle of IPM activities that may or may not include chemical treatments. Activities will include:

a) Routine Inspections
b) Pest Identification
c) Selection of Control Methods
d) Monitoring and Evaluation

IPM inspections must emphasize on the four "zones" of pest activity:

a) Entry points

b) Water sources

c) Food sources

d) Harborage areas.

During inspections, all existing pest issues and potential problem areas, inside and outside, must be noted for follow-up.

For in-house IPM programs, the greatest inspection challenge will be establishing routine, proactive surveillance by trained specialists. To ensure this is done, the EMC or an independent consultant will conduct inspections and audits twice a year.

4.5.6 Define the treatment policy selection

A clear written policy on how the facility will respond to pests, when they appear,must be developed. Included in the policy will be definitions of both non-chemical and chemical treatment options and the sequence or prioritization in which they will be considered. It should be unequivocal on when and where chemical treatments are appropriate. Finally, it should include an “approved materials” list to ensure informed choices when chemical treatments are applied.

The key to an effective IPM is to correctly identify pests that have invaded the area before. Due to pest behavior variations from one species to the other, the appropriate response will vary accordingly.

Once the pest is identified and the source of activity is pin-pointed, the treatment policy will call for habitat modifications such as exclusion, repair or better sanitation. These counter measures can drastically minimize pest presence before chemical responses are considered. Additional treatment options—chemical and non-chemical can then be tailored to the biology and behavior of the target pest.

The final step in the pest response cycle is Monitoring. The information gained through on-going monitoring of the problem will facilitate determination of supplemental treatment options if required.

4.5.7 Establish communication protocols

Communication protocols must be developed to assist environmental services, facility maintenance, facility management and service providers. IPM is a cooperative effort and therefore effective communication between various parties is essential for success. PMP Committee and fish farmers must document pest sightings.

The PMP Committee will make recommendations and notify CAD for pesticide treatments. They will also communicate with the maintenance team to make the necessary repairs.

4.5.8 Develop Agriculture farmer training plans and policies

The Agriculture Farmer Groups will serve as a pool of “inspectors” charged with reporting pest sightings to expedite response times and help limit the scope of new infestations. Training sessions will be

conducted to acquaint farmers with IPM principles and their responsibilities for the success of the IPM program.

4.5.9 Track progress and reward success

Measurable objectives set at the beginning, must be measured against the IPM program's performance at least once a year. Documentation to facilitate the evaluation process is as follows:

- ✓ Detailed description of the parameters and service protocols of the IPM program, stating the ground rules;
- ✓ Specific locations where pest management work was performed;
- ✓ Dates of service;
- ✓ Activity descriptions, e.g., baiting, crack-and crevice treatment, trapping, structural repair; hygiene and
- ✓ Log of any pesticide applications, including:
    - Target pest(s);
    - The brand names and active ingredients of any pesticides applied;
    - PCB registration numbers of pesticides applied;
    - Percentages of mix used in dilution;
    - Volume of pesticides used expressed in kilograms of active ingredient;
    - Applicator's name(s) and certification identity (copy of original certification and re-certification should be maintained);
    - Facility floor plan on which all pest control devices mapped and numbered;
    - Pest tracking logs (sightings and trap counts);
    - Action plans, including structural and sanitation plans, to correct any pest problems;
    - Pest sighting memos for IPM Committee to use in reporting pest presence to County Agriculture department Executive Committee (CAEC); and
    - Using these records, and the goals of the IPM program (increased efficacy, lower costs and reduced pesticide use), the IPM Committee must see:
        - ✓ Fewer pest sightings and farmer complaints;
        - ✓ Lower monitoring-station counts over time;
        - ✓ Lower costs after the first 12-18 months, once IPM's efficacy advantage has had time to take effect; and
        - ✓ Downward trend in volume or frequency of chemical pesticide usage

- ✓ Reduced pest infestations on the fishes

IPM is a team effort. Therefore, the PMP Committee will track and report the program's successes following each evaluation; and encourage good practices by recognizing farmers who played a role. Communicating the success of the program in reducing toxic chemical use and exposure, reducing pest complaints and lowering costs will help farmers to understand the purpose of the program and appreciate its success. The more they understand, the more likely they will participate willingly in helping expand and institutionalize the IPMP.

After the program has been in place for long enough to show significant results, it is recommended for the PMP Committee to work with PPD to publicize successes more broadly and to demonstrate the environmentally responsible approach to effective pest management and control. PMP Committee and Plant protection Department (PPD)will lead theexample by sharing success with other stakeholders.

Table 4.1: Integrated Pest Management and Monitoring Plan

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
	1.			**2. Positive Impact of Chemicals Pesticides**				
1.	**Increase in Crop Yield**	Minimising Loss in quantities and qualitative of harvest due to pest attack and contaminations.		Implement a long term IPM programme to sustain productivity and combat negative effects of chemical pesticides	PPD-PMU farmers participation	IPMP	MAFS PMU	Annually
1.2	**Increase in economic growth**	Minimizing damages and crop losses (quantitative and qualitative)			PPD – PMU Farmers	IPMP	MAFS	Annually
	3.			**4. Negative impact of Pesticides**				
2.	**Depletion of organic soil nutrients**	• Persistent use of chemical pesticides	•	• Apply soil conditioning measures which include IPM	Farmers	IPMP	PPD – PMU PIU	Quarterly
2.1	**Poisoning of non-target species including natural enemies and bio-pesticides**	• Lack of knowledge of chemical pesticides potency • Lack of knowledge and understanding	•	• Regulate registration and use of pesticides, application	Regulatory authority Agro-input dealers	IPMP	MAFS PMU PPD	Quarterly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
		of bio-pesticides. • Equipment malfunction • Use of wrong type of equipment • Wrong time and method of application (Spraying)		equipment and protective gears. • Train end users of pesticides on standard operation procedures for pesticides use and application as well as appropriate IPM practices. • Supervise and control use of chemical pesticides so that only approved and recommended	Farmers and Farmer Organizations Public and private extension service providers PPD - PMU			

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				ones are used • Provide PM equipment • Regularly maintain and clean equipment as recommended by supplier • Dispose old equipment as recommended by manufacturer. • Provide recommended protective gear • Use recommended and appropriate				

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				• protective gear • Conduct trainings in IPM				
2.2	**Adulteration**	Lack of controls and enforcement of regulation		Strengthening regulatory capacities for inspection, sampling and testing	Pesticide regulatory authority, Manufactures, Suppliers and/or Distributors (agro-input dealers). Pesticides transporters, suppliers and research station	• Packaging, labelling and storage standards • Product specification • EMA 2008 • Pesticides regulation	MAFS PPD PMU	Quarterly
2.3	**Health and safety risks**	• Exposure to Pesticides • Chemical pesticides misuse (over/under use) due to lack of appropriate knowledge • Accidental or intentional poisoning due	•	• Provide protective clothing and ensure it is used • Train farmers in proper pesticides handling.	• Agro-dealers • Transporters • Farmers • PMU • PIU	• Pesticides regulation • Labour regulation • PPD • SMAF • CAD	Ministry of Labour MoH MAFS SMAEF CADPPD PMU	Annually

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
		to Improper labelling or storage, frustration, social pressures		• Routine medical examination				
2.4	**Water, soil and environmental pollution**	• Lack of understanding of target location/field where pesticides is to be applied. • Inappropriate building for storage of pesticide • Cleaning of equipment • Disposal of remains of pesticides • Disposal of Containers and equipment • Lack of understanding of target location/field where pesticides is to be applied.	•	• Environmental Impact Assessment on storage and use. • Construction suitable warehouse and bio-beds draining channels and draining dams • Use chemical remains to re-spray. • Clean equipment in one designated place	• Pesticides transporters and suppliers • Agro-input dealers • PMU • PIU • Farmers	Water pollution standard Pesticides equipment recommendation	PPD – CAD Department of Environment Ministry of Water	Quarterly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				• Use plants such as water lilies to absorb waste pesticides. • Take regular stock of pesticides • Use IPM Training of farmers, on storage, use and disposal of chemicals				
	Improper storage of pesticides by suppliers/distributers	Wrong shelving or Stacking		Routine inspection and inventory checks	Agro-dealers Farmer Organizations	PPD regulations Manufacturers guidelines	PPD ,CAD	Half Yearly
		• Inadequate storage Space		Provide adequate and separate storage space for Pesticides	Agro-dealers Farmer Organizations	• PPD regulation	PPD,CAD	Half yearly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
		• Bad housekeeping • Multipurpose use of warehouse						
	Improper use of pesticide application equipment	Multi-purpose use of equipment or pesticides		Control use of equipment and pesticides • Training on equipment use and management. • Integrated pest management(IPM)	Farmers and producer organizations	Pesticides Regulation	PPD - CAD	Quarterly
2.8	**Pesticides resistance in pest**	Lack of appropriate knowledge in pesticides application rates -under dose or overdose		Train farmer on safe use and application method of pesticides	PMU PIU Farmers	Pesticides regulation	PPD CAD	Yearly
	5.	**6. Positive impact of biological control**						
3.	**Reduce environmental and health risk**			Promote environmental and health benefits of biological controls to the farmers to	PMU - PIU	EMA 2019(draft)	MOEF MAFS	Quarterly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				appreciate the advantage				
3.1	**Reduction in time spent on application of chemical pesticides**			Inventory of indigenous biological control method and create awareness to the farmers to enhance knowledge	PMU PIU	IPMP	MAFS	Annually
3.2	**Adoption of improved varieties resistant or tolerant to pests and diseases**	Sometime rural farmers may resist introduction of new varieties and stick to traditional varieties		Create awareness on the new improved seed varieties, which are resistant to pest and will reduce the use of pesticides	PUM PIU	IPMP	MAFS	Quarterly
3.4	**Increase in soil fertility and reduction of soil erosion**	Tree cover as biological control of pest will result in increase in soil stability and reduction of erosion			PMU PIU	IPMP	MAFS	
	7.		**8. Negative Impact of Biological Control**					
4.1	**Damage on other unintended crops**	Wrong application of method by farmers	•	• Apply biological control carefully with good knowledge	PMU – PIU Famers and farmer organizations	IPMP	MAFS	

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				• Train farmers on the appropriate application of biological control agent. • Training on integrated pest management				
4.2	**Risk of damage to crops**	The slowness of biological agents to act may frustrate IPM programmes as farmers are used to the rapid result of chemical pesticides	•	• Train farmers on the benefits of biological control as well as IPM	PMU - PIU	IPMP	MAFS	
	9.		**10. Positive Impacts of Mechanical Methods**					
5.1	**Reduction in time spent on fields managing and controlling pests**			Regularly services equipment and machinery maintain their efficiency				

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
	11.	**12. Negative Impact of Mechanical Methods**						
6.	**Damage to Crops**	Use of heavy and spacious automated machinery						
4.5	**Health and safety Risk**	Personnel operating farm machinery may be exposed to accidents and sharp blades during farm operations and maintenance of the machinery.	•	• Promote IPM approach • Provide protective gears • Train farmers on machinery operation		• IPMP	MAFS Ministry of Labour	Annually
4.6	**Air pollution**	Generation of dust and release of carbon dioxide by farm machinery	•	• Servicing of farm machinery • Controlling of machinery speeds during operation to reduce generation of dust	PMU- Farmers	SSEMA (2019) Draft	DE MAFS	Quarterly
4.7	**Soil contamination**	Fuel and oil leaks from farm machinery and	•	• Discarding waste	PMU	SSEMA2019(Draft)	DE	Quarterly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
		spills from discarded waste oil containers		oil container in Approved disposal sites • Vehicle Servicing and fuel /oil storage areas				
4.8	**Health and Safety risk**	Snake bites, or crocodile attacks , sesi flies,scopoyong	•	• Provide protective clothing to workers • Train farmers on proper handling and operation of equipment • Promote IPM method	PMU MAFS Farmers	N/A	PPD - MAFS	Annually
4.9	**High costs for labour**	Employment of a lot of labour requires		Conduct sensitisation and awareness	PMU – Farmers	N/A	MAFS	Annually

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
		considerable amount of money to pay as wages		campaigns in the project implementation area for farmers to adopt IPM as a sustainable method of managing a pest				
4.10	**Increase in time spent managing pests**	Use of hoes and slasher requires long times to be spent by farmers to control pest in the fields		Community sensitisation and awareness campaigns for farmer to adopt IPM as a sustainable method of managing pest	Farmers	N/A	PMU	Annually
	13.	**14. Positive Impacts of IPM**						
5.	**Increase in Agriculture yields**	Non chemical methods are generally slow		Train farmers in timely and appropriate use of pest management techniques to protect (crops, vegetable and vegetables) from other pest and crop damage.	PPD - PMU	IPMP	MAFS	Annually
5.1	**Contribution to food security**	Non chemical methods are generally slow	•	• Train pesticides marketer	PMU - MAFS	IPMP	MAFS	Annually

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				s in selection and handling of approved pesticides • Train farmers in the appropriate application of the various IPM practices • Educate Farmers on Preservation techniques and timeframes of different integrated pest management options				

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
5.2	**Saving in foreign exchange**	Banned chemicals	•	• Train pesticides suppliers in selection of appropriate pesticides to be eligible for supplying to project(MAFS – PMU) • Train farmers in the appropriate application of the various IPM practices	PMU MAFS	Pesticides Regulation	PPD , CAD MAFS	Quarterly
5.3	**Contribution to offsetting rural/urban migration**	Banned chemicals	•	• Enforce regulation prohibiting importati	PMU Farmers	Pesticide regulation	MAFS PPD CAD	Quarterly

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				on of banned pesticides • Educe farmers on harmful consequences banned chemical pesticides • Assist local communities to establish cooperatives and market produce to potential markets for additional income				
5.4	**Improved environmental protection**		•	• Enforce regulation prohibiting importati	PMU	IPMP	PMU	Annually

S/N	Potential Issues/ Concerns	Cause of Concern		Control/Mitigation Measures	Responsible person/institution and cost per year per county	Standards/regulation	Monitoring institution	Monitoring frequency
				on of banned chemical pesticides • Educate farmers on harmful consequences of banned chemical Pesticides.				

5.1 Cost estimates for implementation

5.1.1 Financial and Economic Analysis

FIRR (base case) 21%

EIRR (base case) 25% NPV, USD 13.60 million at 12%

The project is financially and economically viable, as evidenced by the Project's Financial Internal Rate of Return (FIRR) of 21% and Economic Internal Rate of Return (EIRR) of 25%. At the enterprise level, a typical 1.5 Ha farm model shows that as a result of the project, annual net margin is expected to increase by 60%, from USD 422 per farm to USD 673 per farm at full development. This demonstrates that at the enterprise level, the project is financially feasible.

The benefits considered in the analysis are those derived from increased productivity of crops due to improved seeds and fertiliser, farmer trainings, use of modern technologies and the ability to aggregate, store and market crops. This increase in productivity and marketing of crops translates directly into increased incomes at the household level.

Sensitivity analysis was conducted on the EIRR for various scenarios and as presented in the table below, it demonstrates that the project is quite robust and would remain viable under a range of alternatives.

Results of the Sensitivity Analysis on the EIRR

Scenario	**EIRR**	**NPV (USD million, 12%)**
20% decrease in income from crops	21%	8.44 million
20% increase in investment costs	22%	11.21 million

5.1.1 Additional Positive Effects

The project will generate other benefits/ positive effects which have not been factored in the EIRR analysis above, such as increase in off-farm activities due to better training (increased farmer capacity) and enhanced nutrition. In addition, the project will include benefits such as innovation, safeguards, policy advice, increased body of knowledge and skills, capacity building for Government and other key players at national, state and local levels, etc.

Increasing incomes from the project's increased agricultural productivity will allow for more household disposable income for improved access to better health, education and other social services, and savings.

The project's promotion of climate smart agriculture and good agricultural and nutrition practices will further reinforce the resilience of the beneficiary communities, supply chain actors and the Government against climate-related and other external shocks.

5.2 Project Beneficiaries

The project is expected to benefit all the famers in South Sudan. However, this plan will be implemented in specific areas expected project location / counties, the primary beneficiaries will be affected farmers, pastoralists and households that targeted for this project.

5.3 Stakeholder Engagement

MAFS /FAO will present this IPVMP as draft to identified stakeholders as part of public consultation and more specifically to seek input from the stakeholders on potential impacts and mitigation measures of the Project.

5.4 IPMP Disclosure

This IPVMP will be disclosed in accordance with E&S Operational Safeguard 10 of AfDB on Stakeholder Engagement and Information Disclosure on the Website of MAFS, FAO and News Paper and forwarded to the Banks for disclosure at its public information center (PIC) of the country at the Banks external website. This IPVMP will also be disclosed in the project areas and made accessible to the beneficiaries.

5.5 Grievance Mechanism (Refer to the overall Project GM)

The Food and Agriculture Organization (FAO) has incorporated the Grievance Redress Mechanism (GRM) into the Integrated Pest – Vector Management Plan (PVMP). The primary objective is to establish a responsive, clear, and respectful mechanism for addressing grievances among stakeholders. This mechanism will allow parties to seek and receive redress.

Within the framework of this plan, AAP assistants deployed in various locations where pests/vector are distributed will receive and address grievances. These grievances will be categorized based on factors such as unintended crop damage, nutrient depletion, non-target species poisoning (including natural enemies and biopesticides), health and safety risks (including water, soil, and environmental pollution), improper storage by suppliers, misuse of pesticide application equipment, and pesticide resistance.

Additionally, FAO will operate a toll-free hotline (515) to promptly address grievances. In cases where gender-based violence (GBV) related to pesticide distribution occurs, the 882 hotlines will also handle and resolve such incidents.

All grievances received through the AAPs and the call center will be resolved using control and mitigation procedures outlined in the Integrated Pest – Vector Management Plan (PVMP), if these measures do not adversely impact humans and the surrounding environment.

5.6 Capacity Building of Stakeholders

To enhance capacity during the transition toward a Pest- Vector Management Program (PVMP), it is essential to establish a robust and action oriented PVMP Committee. This committee will play a pivotal role in driving environmentally conscious practices. The key aspects include:

1. Committee Composition:

- The PVMP Committee will comprise of individuals from diverse backgrounds. These include the Project Manager from the Project Management Unit (PMU), a representative from the County Agriculture Office, and a member representing local Farming Groups.
- The appointed leader of this team should possess expertise in pests, pesticides, and pesticide regulations. Their familiarity with these critical areas will ensure effective implementation of an Integrated Pest Management (IPVMP) program.

2. Leadership and Expertise:

- The leadership of the PVMP will be guided by pest management principles and a strong commitment to environmental stewardship.
- Individuals with relevant academic backgrounds and practical experience will serve as authorities overseeing PVMP implementation. This will ensure a well-informed approach.

3. Team Composition:

In addition to the core members, the PVMP team will include experts from various domains:

- Environmental Specialists
- Agriculture Extension Personnel
- Agronomists
- Crop Protection Experts (Entomologists and Pathologists)
- Aquaculture Specialists
- Health Officers
- Livestock Officers

4. Training Initiatives:

The PVMP team will organize comprehensive training programs covering pest and disease management and the judicious use of chemical pesticides.

Specific training modules will be developed for pest/vector management in farms and nurseries. These modules will cater to:

- Farmers
- Pesticide Dealers
- Agriculture Extension Personnel and Staff

5. Promoting IPVM and Responsible Pesticide Use:

- To raise awareness and foster adoption, the PVMP will initiate an awareness program involving Farmer's Groups and other stakeholders.
- Strategies include demonstrations, discussion meetings, and the distribution of informative materials such as leaflets and booklets.

By aligning efforts at the national level, FAO will be able to effectively enhance pest management practices and promote sustainable agricultural practices.

REFERENCES

Ajayi, O.C., Camera, M., Fleischer, G., Haidara, F., Sow, M., Traore, A. and Van Der Valk, H. (2002). Socioeconomic Assessment of Pesticide Use in Mali. Pesticide Policy Project, Special Issue Publication Series No 6. University of Hannover, Germany. https://www.ifgb.uni-hannover.de/fileadmin/ifgb/4_Materials_Research/PPP_Special_Paper_Series/ppp_s06.pdf.

Bourguet, D. and Guillemaud, T. (2016). The hidden and external costs of pesticide use. In Sustainable Agriculture Reviews. Volume 19. Springer International Publishing Switzerland. Chapter 12, 35-120. https://doi.org/10.1007/978-3-319-26777-7_2.

Dainese, M., Martin, E.A., Aizen, M.A., Albrecht, M., Bartomeus, I., Bommarco, R. et al. (2019). A global synthesis reveals biodiversity-mediated benefits for crop production. Science Advances 5(10), eaax0121. https://doi.org/10.1126/sciadv.aax012.

Dornbush, M.E. and von Haden, A.C. (2017). Intensified agroecosystems and their effects on soil biodiversity and soil functions. In Soil Health and Intensification of Agroecosystems. Al-Kaisi, M.M. and Lowery, B. (eds.). Academic Press. Chapter 8, 173-193. https://doi.org/10.1016/B978-0-12-805317-1.00008-7.

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019). The Global Assessment Report on Biodiversity and Ecosystem Services: Summary for Policymakers. Díaz, S., Settele, S., Brondízio, E.S., Ngo, H.T., Guèze, M., Agard, J. et al. (eds.). Bonn: Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. https://ipbes.net/sites/default/files/202002/ipbes_global_assessment_report_summary_for_policymakers_en.pdf.

Kovács-Hostyánszki, A., Li, J., Pettis, J., Settele, J., Aneni, T., Espíndola, A. et al. (2016). Drivers of change of pollinators, pollination networks and pollination. In The Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on Pollinators, Pollination and Food production. Potts, S.G., Imperatriz-Fonseca, V.L. and Ngo, H.T. (eds.). Bonn: Secretariat of the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services. Chapter 2, 27-149. https://www.ipbes.net/assessment-reports/pollinators.

Landrigan, P.J., Fuller, R., Acosta, N.J.R., Adeyi, O., Arnold, R., Basu, N.N. et al. (2018). The Lancet Commission on Pollution and Health. The Lancet 391(10119), P462-P512. https://www.thelancet.com/commissions/pollution-and-health.

Potts, S.G., Imperatriz-Fonseca, V.L. and Ngo, H.T. (eds.) (2016). Assessment Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on Pollinators, Pollination and Food Production. Bonn: Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. https://ipbes.net/assessment-reports/pollinators.

Prüss-Ustün, A., Wolf, J., Corvalán, C., Bos, R. and Neira, M. (2016a). Preventing Disease through Healthy Environments: A Global Assessment of the Burden of Disease from Environmental Risks. Geneva: World Health Organization. https://www.who.int/publications/i/item/9789241565196.

Prüss-Ustün, A., Wolf, J., Corvalán, C., Neville, T., Bos, R. and Neira, M. (2016b). Diseases due to unhealthy environments: An updated estimate of the global burden of disease attributable to environmental determinants of health. Journal of Public Health 39(3), 464-475. https://doi.org/10.1093/pubmed/fdw085.

Stavi, I., Bel, G. and Zaady, E. (2016). Soil functions and ecosystem services in conventional, conservation, and integrated agricultural systems. A review. Agronomy for Sustainable Development 36, 32. https://doi.org/10.1007/s13593-016-0368-8.

United Nations Environment Programme [UNEP] 2022). The environmental, human health and economic impacts of pesticides. https://www.unep.org/resources/report/ environmental-and-health-impacts-pesticides-and-fertilizers-and-waysminimizing.

Wiese, A. and Steinmann, H.-H. (2020). Yield effects associated with glyphosate use in non-GMO arable farming: A review. Crop Protection 134, 105148. https://doi.org/10.1016/j.cropro.2020.105148.

World Health Organization (2016). The Public Health Impact of Chemicals: Knowns and Unknowns. Geneva. https://apps.who.int/iris/ handle/10665/206553.

World Health Organization (2019). The Public Health Impact of Chemicals: Knowns and Unknowns: Data Addendum for 2016. Geneva. https://apps.who.int/iris/handle/10665/279001.