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**Capacity Strengthening and Technical Assistance for the Implementation of
Stockholm Convention National Implementation Plan (NIPs) in Africa LDCs
of the COMESA and SADC sub-regions**

Technical Report*

**DRAFT REGIONAL STRATEGY ON PRODUCTION AND APPLICATION
OF BIOPESTICIDES IN THE COMESA and SADC SUB-REGIONS**

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1. BACKGROUND

1.1 Introduction

The African region has been waging a long-drawn and uphill battle to produce sufficient food for its growing population and to reduce the economic burden of food imports. Agricultural productivity in the region is severely hampered by limitations on the additional land that can be brought under cultivation, and by pests and diseases endemic in tropical and sub-tropical regions. Agriculture is one of the main activities responsible for bringing pesticides, a number of which are persistent organic pollutants (POPs), into the biosphere. POPs are organic compounds that to a varying degree, resist photolytic, chemical and biological degradation. POPs are often halogenated and are characterized by low water solubility and high lipid solubility, leading to their bio-accumulation in fatty tissues. They are semi-volatile, enabling them to move long distances in the atmosphere before deposition occurs. Humans can be exposed to POPs through diet, occupational accidents and through their environment (including indoor exposure). Exposure to POPs, either acute or chronic, has been associated with a wide range of adverse health effects, including illness and death. The widespread application of these chemical pesticides has led to more intensive agriculture, but has also been blamed as being the main source of bringing POPs pesticides into the atmosphere and subsequently into oceanic and freshwater ecosystems. The wide range of adverse health effects of POPs pesticides usage has made imperative the search for alternative pest control solutions. The use of biological pesticides could provide one such solution. Botanical pesticides are plant derived natural products and are inherently less harmful than conventional pesticides.

Traditionally used for various purposes in South Asia, *Azadirachta indica* (the “neem” tree) was classified in 1989 by the US National Research Council as a “tree for solving global problems”, (*Alternative Agriculture” Committee on the Role of Alternative Farming Methods in Modern Production Agriculture,*

National Research Council 1989) and the chemicals present in this tree can serve as models for environmentally sound pesticides.

Numerous scientific studies have shown that extracts of neem fruits, seeds, seed kernels, twigs, stem bark, root bark and leaves possess, among others, insect anti-feedant, insecticidal, insect growth disrupting, nematicidal, fungicidal, bactericidal, anti-inflammatory, antitumor and immune-stimulating properties.

Neem-derived products are easy to process in village-level industries and easy to use; thus, they offer potential for crop protection and off-farm income generation. The wide utility of neem makes it particularly suitable as a source of generating employment and income opportunities at the community level. Production and promotion of neem-based pesticides would support environmentally sustainable economic development globally and would offer an eco-friendly/biodegradable alternative to POPs pesticides.

1.2 Project linkage to national priorities, action plans and programmes:

In 2001, the Conference of the Plenipotentiaries (COP) on the Stockholm Convention on Persistent Organic Pollutants (POPs) (Stockholm, 22-23 May, 2001) adopted the text of the Stockholm Convention. Representatives of 92 countries signed the Convention, and many others signed the Final Act. The objective of the Stockholm Convention on POPs is to protect human health and the environment from POPs. The Convention is global in scope and multimedia in coverage, which means that it promotes reduction and elimination of “*total releases*” to all media: air, land, and water. It focuses initially on twelve chemicals that can be grouped into the following three categories:

- Pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene (also an industrial chemical and unintended byproduct), mirex and toxaphene;
- Industrial chemicals – PCBs (also unintended by-products); and
- Unintended by-products – dioxins and furans.

In Article 5 (c) of the Convention the following text was adopted, *“Promote the development and, where it deems appropriate, require the use of substitute [...] to prevent the formation and release of the chemicals listed in Annex C, [...]”*; and among these Hexachlorobenzene (HCB).

The POPs chemicals are persistent, non-degradable chemicals, which remain in the environment for a very long period, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment. Any exposure to the POPs can result into serious health effects including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease and damages to the central and peripheral nervous system.

At its fourth and fifth meeting held in 2009 and 2011, the COP, by decisions SC-4/10 to SC-4/18 and decision SC-5/3, adopted amendments to Annexes A (elimination), B (restriction) and C (unintentional production) of the Stockholm Convention to list ten (10) additional chemicals as new POPs. By decision SC-4/19, the COP decided to undertake a work programme to provide guidance to Parties on how best to restrict and eliminate these newly listed persistent organic pollutants and invited Parties to support work on the evaluation of alternatives and other work related to the restriction and elimination of these new POPs.

The new POPs include the following chemicals:

1. Alpha hexachlorocyclohexane (pesticide)

2. Beta hexachlorocyclohexane (pesticide)
3. Chlordane (pesticide)
4. Technical endosulfan and its related isomers (pesticide)
5. Hexabromobiphenyl
6. Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether)
7. Lindane (pesticide)
8. Pentachlorobenzene (pesticide)
9. Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride
10. Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromodiphenyl ether)

1.3 COMESA and SADC sub-regions

Most of the Common Market for Eastern and Southern Africa (COMESA) and Southern Africa Development Community (SADC) sub-regions Member States including the Least Develop Countries (LDCs) are already Parties to the Stockholm Convention on POPs. As such, these countries recognize the importance of proper management to reduce chemicals and wastes threats to their national sustainable development efforts. Although not all African LDCs have completed the development of their National Implementation Plans (NIPs) for the Stockholm Convention, a number of priority issues are emerging as common themes among them.

The member States are fully cognizant of the threats of POPs to the attainments of **food security** in particular and the recently adopted Sustainable Development Goals (SDG) in general. To this end, most COMESA and SADC sub-region member States have banned many of the POP pesticides as pesticide residues in food pose hazards to human health while residues in export products and commodities may give rise to trade restrictions.

The Global Environmental Facility (GEF) through the United Nations Industrial Development Organization (UNIDO) has been supporting the implementation of a project aimed at capacity strengthening and technical assistance for the implementation of Stockholm Convention's National Implementation Plans (NIPs) in Africa Least Developed Countries (LDCs) and Small Islands Developing States (SIDS) for COMESA, Economic Community of West African States (ECOWAS) and SADC sub-regions”.

The world is facing many problems such as Climate Change, Global Warming, Desertification & Depletion of natural resources, availability of potable water, high prices of food and managing the ecosystem wealth. Good quality pesticides and agrochemicals, which are environmentally friendly and biodegradable in nature are more needed now than ever for poor countries particularly in Africa. Africa is a less populated continent with abandon natural resources. However with all the above-mentioned global problems, Africa encounters compounded negative impact due to weakness in its infrastructure and human resources capacity. There is a need to develop partnerships to enable Africa overcome some of the acute and chronic problems it faces.

Most of the POPs, currently being used in the agricultural sector are health hazards. In order to reduce the use of these POPs in the agricultural sector, COMESA under the Climate Smart Agriculture intervention intends to upscale access and utilization of biodegradable and safer bio-botanical pesticides. This effort will build on the successes scored by COMESA Climate Smart Agriculture (CSA) National Task Forces and other existing programs and platforms through promotion of best practices, which has resulted in the increase of adoption of CSA in the pilot countries.

As part of the activities of the project entitled “*Capacity Strengthening and Technical Assistance for the Implementation of Stockholm Convention National Implementation Plan (NIPs) in Africa LDCs of the COMESA and*

SADC sub-region", UNIDO held a workshop on production and application of bio-botanical pesticides formulations for experts from COMESA and SADC sub-regions in Manzini, Swaziland during the period of 31 August to 02 September 2015. During the aforesaid workshop, it was recommended and concluded that there is a need to assess the requirement and availability of Neem based bio-pesticides in the participating countries; establish a policy framework and advocacy engaging public and private partnership in promoting the bio-pesticides concept; build national bio-pesticides forums that are inclusive of the relevant institutions to promote the concept and support the formulation of bio-pesticides programmes as well as create awareness and regional cooperation leading to capacity building and establishment of pilot facilities on bio-pesticides in the COMESA and SADC sub-region. Furthermore, a need to replicate the Regional Network on Pesticides for Asia and the Pacific (RENAP) as a source of evidence on harmful effects of conventional pesticides to support the need for alternatives was also identified.

Based on the recommendations of the regional training and in view of the potential of bio-pesticides as an important component of sustainable agriculture particularly on small farmer holdings, COMESA Secretariat, with its Climate Change Programme, Comprehensive Africa Agricultural Development Programme (CAADP), ACTESA in collaboration with UNIDO have agreed to develop a regional strategy to promote the use, production and application of bio-pesticides in the COMESA and SADC sub-regions implementing Climate Smart Agriculture.

In order to effectively implement the above identified collaboration, UNIDO recruited an international consultant to associate and advice COMESA Secretariat to undertake the pre-assessment on the use, production and application of bio-botanical pesticides in Mozambique, Rwanda, Swaziland, Uganda and Zambia. The consultant was accompanied by a COMESA staff during the pre-assessment missions. Building on the information collected, the consultant has come up with a draft regional strategy framework, which is to

be validated by the member states in the third week of March, 2016 in a workshop being organised by COMESA Secretariat.

1.4 The COMESA Treaty and Membership

COMESA is a regional organization of 19 sovereign African member states whose members include Burundi, Comoros, Democratic Republic of Congo (DRC), Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

COMESA was established in 1994 to replace the Preferential Trade Area for Eastern and Southern Africa (PTA), which had been in existence since 1981. The COMESA member States have agreed to promote regional integration through trade development and to cooperate in the development of their natural and human resources for the benefit of all their citizens.

1.5 The SADC Treaty and Membership

The SADC started as Frontline States whose objective was political liberation of Southern Africa. SADC was preceded by the Southern African Development Co-ordination Conference (SADCC), which was formed in Lusaka, Zambia on April 01, 1980 with the adoption of the Lusaka Declaration (Southern Africa: Towards Economic Liberation). The mission of SADC is to promote sustainable and equitable economic growth and socio-economic development through efficient productive systems, deeper co-operation and integration, good governance, and durable peace and security, so that the region emerges as a competitive and effective player in international relations and the world economy.

The SADC has a membership of 15 Member States, namely; Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe.

1.6 Current situation of POPs pesticides in the COMESA and SADC sub-regions

The COMESA region is estimated to have about 400 million people. The human population is increasing at an average rate of 3% per annum. The 19 COMESA member states have a total land area of some 12 million square km (40% of Africa's land mass), the largest geographic coverage of any Regional Economic Commission in Africa.

On the other hand, the SADC is a region comprising 15 countries with estimated population of 277 million people. Economic growth in SADC thus differs greatly from country to country. On average, gross domestic product (GDP) per capita increased by 3% per year in SADC over the last decade. The member countries of SADC have a total land area of 554 919 square kilometer (SADC website). SADC region alone is estimated to have 2,000 chemical hazardous pesticides wastes which include POPs and whose management is inadequate.

Agriculture is the backbone of most economies in the COMESA and SADC sub-region and plays a key role in their industrial development and trade. Agriculture accounts for more than 32 per cent of the region's gross domestic product (GDP), employs about 80 per cent of its labour force, accounts for about 65 per cent of foreign exchange earnings and contributes more than 50 per cent of raw materials to the industrial sector. While the gains have been very impressive, the input intensive agriculture has resulted in some undesirable effects on the environment and the overall sustainability of the

farming systems resulting from the use POPs pesticides for crop protection against various pests.

However, despite the ban on the usage of the POPs pesticides, toxic chemical pesticides remain in use especially in the agricultural sector due to lack of better and cheaper options to chemical pesticides. Consequently, some COMESA and SADC sub-region Member States have made significant advances in the development and use of biopesticides, their potential remains largely underutilized with variable efforts and experiences in different countries. Several technological, capacity and policy gaps have been identified which need to be addressed.

1.6 COMESA and SADC sub-regions Objectives, Mission and Vision

COMESA

The COMESA Treaty, which sets the agenda for COMESA, covers a wide range of sectors and activities. However, the fulfillment of the complete COMESA mandate is regarded as a long-term objective and for COMESA to become more effective as an institution; it has defined its medium-term priority as the *Fostering Regional Trade and Investment for Accelerated Economic Growth and Development*

Article 3 of the Treaty specifies the following aims and objectives for COMESA:

- (a) to attain sustainable growth and development of the member States by promoting a more balanced and harmonious development of its production and marketing structures;
- (b) to promote joint development in all fields of economic activity and the joint adoption of macro-economic policies and programmes;
- (c) to raise the standard of living of its peoples and to foster closer relations among its member States;
- (d) to co-operate in the creation of an enabling environment for foreign, cross-border and domestic investment, including the joint promotion of research and adaptation of science and technology for development;

- (e) to co-operate in the promotion of peace, security and stability among Member States in order to enhance economic development in the region;
- (f) to co-operate in strengthening the relations between the Common Market and the rest of the world and the adoption of common positions in international fora; and
- (g) to contribute towards the establishment, progress and the realization of the objectives of the African Economic Community.

COMESA's vision is to create a fully integrated and internationally competitive and unified region in which people, goods, services and capital move freely. This is to be achieved progressively in stages through (a) the creation of a *free trade area* (FTA), followed by (b) a *customs union* with a common external tariff (CET), (c) a *common market* in which there is free movement between member states of labour and capital as well as goods and services, and, finally, (d) an *economic community* with a single currency, common monetary and fiscal policies, and free movement of people including the right of establishment and the right of residence. The target is to complete this process by 2025.

The ultimate mission of COMESA is to endeavour to achieve over the long-term sustainable economic and social progress in member states through increased cooperation and integration in all fields of development, particularly in trade, customs and monetary affairs, transport, communication and information, technology, industry and energy, gender, agriculture, environment and natural resources. This mission is consistent with and will contribute towards the long-term economic integration of African states set as a target in 1980 in the Lagos Plan of Action and Final Act of Lagos, and in the subsequent 1991 Treaty establishing the African Economic Community.

SADC

The Treaty establishing SADC was signed on August 17, 1992. The SADC Vision is to build a region in which there will be a high degree of harmonization and rationalization, to enable the pooling of resources to achieve collective

self-reliance in order to improve the living standards of the people of the region. The vision of SADC is one of a Common Future, a future within a regional community that will ensure economic well-being, improvement of the standards of living and quality of life, freedom and social justice and peace and security for the people of Southern Africa

The main objectives of Southern African Development Community (SADC) are to achieve economic development, peace and security, and growth, alleviate poverty, enhance the standard and quality of life of the peoples of Southern Africa, and support the socially disadvantaged through Regional Integration. These objectives are to be achieved through increased Regional Integration, built on democratic principles, and equitable and sustainable development.

1.7 COMESA AND SADC SUB-REGIONS Mandate on Cooperation in the Management of the Environment

COMESA

The role of the COMESA Secretariat is to take the lead in facilitating regional development and assist member States to make the adjustments necessary for them to become part of the global economy. Under Article 124 Para 2 (c) and (d) of the Treaty, COMESA member states have agreed to cooperate in the management of environment in the following ways:

- i. Encourage the manufacture and use of biodegradable pesticides, herbicides and packaging materials; and
- ii. Discourage the excessive use of agricultural chemicals and fertilizers.

SADC

The mandate of the SADC Secretariat is reflected by the SADC Treaty establishing the organization, and active participation in the negotiations and

ratification of major Multilateral Environmental Agreements. This commitment is also demonstrated through their active participation in the negotiations and ratification of major Multilateral Environmental Agreements (MEAs). To this end, the SADC Region has endeavored to put in place mechanisms for the implementation of MEAs such as the United Nations Framework Convention on Climate Change (UNFCCC); United Nations Convention to Combat Desertification (UNCCD); United Nations Convention on Biological Diversity (CBD); Basel/Bamako Convention; Persistent Organic Pollutants (POPs); and Ramsar Convention.

2. COMESA AGRICULTURAL, NATURAL RESOURCES AND ENVIRONMENT PROGRAM

In order to raise the competitiveness of the region's agricultural and environment sector, COMESA has in place a number of initiatives at different stages of implementation. These initiatives are in line with the aspirations of the COMESA treaty, which seeks to promote cooperation and coordination of regional agricultural, environment and natural resources policies, research and development, and resource exploitation.

2.1 The Comprehensive Africa Agricultural Development Programme (CAADP) and Environmental Action Plan

COMESA's Agriculture activities are being implemented under two continental frameworks, namely, the CAADP and the Environmental Action Plan (EAP) of the African Union's New Partnership for Africa's Development (AU/NEPAD). The overall goal of CAADP is to *"Help African countries reach a higher path of economic growth through agriculturally-led development, which eliminates hunger, reduces poverty and food insecurity, and enables expansion of exports."*

CAADP is a growth-oriented agricultural development agenda, aimed at increasing agricultural growth rates to six percent per year and to create the wealth needed for rural communities and households in Africa to prosper. To achieve this goal, CAADP focuses its interventions in four key pillars to achieve measurable outcomes:

- *Pillar 1:* Extending the area under sustainable land management and reliable water control systems;

- *Pillar 2*: Improving rural infrastructure and trade-related capacities for market access;
- *Pillar 3*: Increasing food supply, reducing hunger, and improving responses to food emergency crises; and
- *Pillar 4*: Improving agriculture research, technology dissemination and adoption.

The overall objective of the EAP is to contribute to the improvement of environmental conditions in Africa in order to contribute to the achievement of economic growth and poverty eradication in the region.

3. PEST CONTROL AND AGRICULTURE IN THE COMESA AND SADC SUB-REGION

3.1 Current situation of pest control in the Agriculture Sector

Pests have continued to limit crop productivity in the COMESA and SADC sub-region. Recent studies indicate that crop losses caused by pests amounts to 30% (Lenne 2000; Oerke and Dehne 2004); while as localized crop losses attributable to outbreaks of major migratory pests such as locusts and armyworms can be even greater, sometimes resulting in complete crop failure (Rose et al. 2000). Even though the crop pests is a problem faced by smallholder famers globally across in all cropping systems, much impact is faced in the region which is associated with poverty, limited knowledge and poor agricultural infrastructure imply that most smallholder farming is conducted without access to effective crop protection knowledge or resources (Lenne2000;N'juki et al.2004). The process of tracking and mobilising resources against sudden outbreak of migratory pests, such as armyworms and locusts present the small scale farmers with technical and logistical challenges. The major cause of high crop losses due to pests as well as their continuous impact on food availability and security is the poor resource farmers that don't have access to alternative indigenous pest control technology. A study carried out in armyworm-affected areas of Tanzania indicated that upto 70% of the poor resource farmers did not have access to pesticides during the armyworm outbreak season (N'juki et al. 2004). Furthermore, in some places, the lack of accessibility to chemical pesticides is not only caused by the inability of poor resource famers to afford pesticides, but because the sudden demand of pesticides

The search for alternatives to POP pesticides is also caused by several other factors, including the desire to avoid the problem of expired / obsolete

pesticide stocks. According to the 2013 World Bank Report, it was indicated that there are approximately 50,000 tonnes of obsolete / outdated POP pesticides in the sub-Saharan Africa. Only few member countries have safe disposal facilities and it has been estimated that to identify, collect, transport and dispose of these pesticides requires about USD \$1.25 billion; money that no COMESA and SADC sub-region member state can afford. In many cases, most POP pesticides are originally donated to member states by development donors/agencies to help them deal with major outbreak pests such as locusts or African armyworm (Crop Life International 2012).

3.2 Biological control agents as alternatives to synthetic chemicals

While the development of pesticides and its large scale application in the field has contributed greatly towards increased food production and improvement of health conditions on a global basis, the continued use of these chemical agents has resulted in environmental pollution, human safety and public health. The resurgence of new pests, resistance development, contamination of soil, water and air, destruction of predators and other non-target organisms including wildlife brought about the realization that these chemicals are not exclusively doing the job they are intended to do but also cause damage to the environment, Africa, being primarily dependent on agriculture, has taken to the increased usage of pesticides to meet the basic food requirements. The growing concern on environmental protection is now manifested in efforts to restrict or eliminate the use of pesticides that persist in the environment over a longer period of time involving risk to various forms of life. While the use of safe and environmentally friendly chemical pesticides continues, there is a pressing need for complementary use of biodegradable botanical pesticides in support of the Integrated Pest Management (IPM) programme. The botanicals and biopesticides are gaining prominence for the control of pests both in agriculture and public health programmes. Governmental agencies and Non-

Governmental organizations are promoting the development and application of such safer pesticides.

Biopesticides are classified as:

i. Microbial pesticides

- a. Bacteria e.g. *Bacillus* based biopesticides
- b. Fungi e.g. *Beauveria bassiana*, *Trichoderma*, *Fusarium*, *Metarrhizium*, etc.
- c. Viruses e.g. Nuclear Polyhydrosis viruses (NPVs), Granulosis viruses (GVs)
- d. Protozoa e.g. *Nosema*
- e. Nematodes e.g. *Romanomeris culicivovax*, etc.

ii. Botanical pesticides

- a. Neem based
- b. Pyrethrum based
- c. Other botanicals from *Madhuca* sp., *Hydrocarpus* sp., *Tinospora rumphii*, Chinaberry, *Pongamia glabra*, etc.

3.3 SWOT Analysis on Production, Promotion, and Adoption of Biopesticides (Neem based)

3.3.1 Production of Biopesticides

Strength:

- Abundance of botanical resources locally available
- Technology available
 - Commercial formulation
 - Indigenous knowledge
- Research and Development
- National and Regional Network
- Conducive government policy

- Alternative to chemicals

Weakness:

- Short shelf-life
- Bulky- storage and transport
- Sensitive to transport and storage
- Inadequate research as compare to chemicals
- Difficult to make commercial formulation
- Botanicals not available round the year

Opportunities:

- Best alternative to chemical pesticides
- Indigenous plants (opportunity to explore contents as well as plants)
- Establishing networks
- Government policy and consumer demands
- Eco-smart agriculture
- Farmers are shifting to IPM and organic agriculture

Threats:

- Compete with some chemical pesticides claimed to be eco-friendly and very less hazardous to human health
- Registration procedure is cumbersome
- Aggressive promotion by synthetic pesticide companies
- Less profit margin and product transaction

3.3.2 Promotion of Biopesticides

Strength:

- Conducive Government policy
- Demand of safe product by consumers
- Eco-friendly
- Multidisciplinary/ broad spectrum effect

- Many target crops
- Against many pests

Weakness:

- Aggressive promotion by synthetic pesticide companies
- Inadequate extension for promotion of botanical pesticides
- Farmer demand for knockdown effect
- Inadequate knowledge on botanical pesticides by users
- Stringent procedure for registration

Opportunities:

- Global demand of safe food and environment
- Supportive national and international policy
- High public demand in future

Threats:

- Less technology in hand
- Competition with chemical multinational companies

3.3.3 Adoption of Biopesticides

Strength:

- Extension program already initiated (Farmer Field School (FFS), etc.)
- Give protection to the crop throughout the crop period
- Used by organic and IPM farmers
- Steps towards organic movement
- Do not cause toxicity to the plants
- Highly biodegradable
- Most of the farmers are willing to adopt
- Safe to human health and environment

Weakness:

- Farmers demand towards quick acting pesticides

- Not attractive, bulky and difficult to use
- Cannot store for long period
- Not available in all seasons
- Mainly used against insect pests and not for weeds

Opportunities:

- Less mammalian toxicity, ecofriendly
- Low waiting period (PHI)
- High consumer demand.
- Utilization of local resources/ low cost technology

Threats:

- High preference of chemical pesticides by commercial farmers
- Low confidence of the Farmer with respect to the efficacy of the product
- Number of botanical commercial products available and their efficacy unknown

3.4 Why neem pesticides?

Farmers all over the world primarily rely on the use of chemical pesticides for controlling pests of economically important crops. Even though their use may show quick results, most chemical pesticides leave toxic residues in the crop, soil and water bodies, harm beneficial species of insects, and cause development of resistance in certain species of pests. Moreover, they pose a health hazard not only to farmers involved in spraying, but also to human beings and livestock who consume crops treated with such pesticides. The World Health Organization (WHO) and the United Nations Environment Programme (UNEP) have estimated that a large number of human deaths occur annually across the globe due to pesticide poisoning. These are grave concerns which require immediate redressal. The widespread application of these chemical pesticides has led to more intensive agriculture, but has also been blamed as being the main source of bringing POPs pesticides into the atmosphere and subsequently into oceanic and freshwater ecosystems. The wide range of adverse health effects of POPs pesticides usage has made

imperative the search for alternative pest control solutions. The use of biological pesticides could provide one such solution. Botanical pesticides are plant derived natural products and are inherently less harmful than conventional pesticides. Neem has much to offer in solving global agricultural, environmental and public health problems. It has been recognised as a valuable instrument for sustainable development.

Neem-based pesticides promise an effective and safe alternative to chemical pesticides, especially for the resource-poor farmers. They offer the following advantages:

- ***Easy availability of raw material***
- ***Low cost***
- ***Safety to farmers and consumers***
- ***Harmlessness to beneficial species of insects***
- ***Less prone to pest resistance***
- ***Environment-friendly attributes***

Major breakthrough in neem research was made by Pradhan et.al (1962) who reported neem seed activity as anti-feedant against Locust. Since then the literature is flooded with information on the activities of various neem products against a variety of pests. Neem constituents are group of isoprenoids and non-isoprenoids. Various limonoids present in the seed have been reported for its bioactivity against various pests. Complexity of active principles of neem does not allow their chemical synthesis as a cost effective proposition. The alternative approach of obtaining bioactive fractions from neem seed is, therefore, feasible and economically viable. All parts of neem tree are useful for various purposes. For example, the results of the project “*Technical Support for Development and Production of Neem Products as Environment Friendly Pesticides*” in India have proven that use of neem based pesticides could offer a harmonious and ecofriendly approach to pest management.

3.5 Global Environmental Benefits of the Neem based pesticides

3.5.1 *Environmentally sustainable economic development*

Agriculture is one of the main sources through which pesticides are introduced into the biosphere. The widespread application of chemical pesticides has led to more intensive agriculture, but has also been blamed for greater dissemination of toxic pesticides. Furthermore, chemical pesticides result in toxic residues in food products and, as such, are a major health hazard. Because of these problems, agriculture is in constant quest of new and more environment-friendly pesticides. There are a number of biologically-derived pesticides (bio-pesticides) that have been found effective, eco-friendly and acceptable. The neem tree (*Azadirachta indica*), for example, is a source of chemicals that have been used successfully in pest management. It is available in Africa and has been used traditionally by small farmers and the landless poor for multiple purposes like preparation of organic manure and organic pesticides. Neem-derived products are easy to process in village-level industries and easy to use; thus, they offer great potential for crop protection and off-farm income generation. Its wide utility makes neem particularly suited to generating employment and income opportunities at the community level. Production and promotion of neem-based pesticides would support environmentally sustainable economic development in COMESA and SADC sub-regions.

3.5.2 *Improved water quality*

Most pesticides applied on crops eventually end up accumulating in ground and surface water, and have been detected in rain, snow and fog. Contamination from land-based sources is responsible for at least 80% of marine pollution worldwide. Agriculture is known to be a major source of pollution of marine ecosystems, but the magnitude of the problem and its full consequences are difficult to estimate.

A large number of studies demonstrate that the current high rate of release of pesticides in developing nations especially in Africa and the Asia region is a problem of global dimensions, since it affects other parts of the world too.

High temperatures and rainfall in this region appear to lead to rapid dissipation of pesticides into the atmosphere and from there to oceanic and freshwater ecosystems. Organic contaminants are transferred from the atmosphere to water by wet (rain, snow, fog) or dry particle deposition, and through gas exchange at the air-water interface. This overall process is known as the *global distillation effect*. Oceans are especially sensitive to atmospheric deposition because of their large surface area. This leads to a major fraction of hydrologic inputs enriched with pesticides entering the marine environment. Therefore, pesticides released in the region add to the global problem of POPs contamination in the hydrological environment. By providing alternative to chemical pesticides in the form of ecologically sound, neem-based pesticides, it will therefore prevent future contamination and threats to the quality of the global hydrological cycle.

3.5.3 Conservation of Biological Diversity

The use of a wide range of chemicals to eliminate pests and weeds is an important aspect of agricultural practices globally, and has undoubtedly resulted in significantly increased crop yields and reduced postharvest losses. The downside of pesticide usage is severe health hazards, environmental degradation and loss of biodiversity.

The unwanted side effects of pesticide use are the alteration of endemic biodiversity by unselective destruction of the natural enemies of pests and other non-target organisms. This has often resulted in major pest outbreaks, as well as in the emergence of secondary pests arising from the elimination of their natural predators by the application of toxic pesticides.

Pesticide residues in soil, in addition to eliminating or reducing parasitic microbes, are also toxic to non-parasitic and ecologically useful soil microbial and vertebrate population. Although, they may reduce certain microorganism populations, they stimulate the growth of others, especially the saprophytic and spore forming types, thus leading to altered biotic integrity, and altered and/or reduced soil fauna diversity.

3.5.4 Reclamation of Wasteland through Neem Plantations

Large scale plantations of neem trees are an effective way of reclaiming waste or degraded land such as abandoned mining sites, hill slopes, etc. In Nagpur, India for instance, an abandoned mining site belonging to Manganese Ore India Ltd. has been successfully reforested using improved varieties of neem, with the help of technical expertise from local research institutions. Similarly, in Kunming, P. R. China a massive neem plantation has been undertaken on degraded land areas. Apart from increasing the forest cover, such plantations can provide raw materials to local farmers for manufacturing neem based pesticides and medicinal products, and generate rural income opportunities in the process. Neem leaves can further be used as fodder for farm animals. Together with plantations on wasteland, neem trees can also be planted along roadsides in rural areas to enhance their availability to the farming community.

3.5.5 Neem trees to combat desertification

The ability of this tree to thrive in arid and semi-arid conditions, neem tree plantations have been effectively used in African countries as windbreakers for checking soil erosion, and for combating the spread of desert areas.

3.6 Applicable models:

Despite severe restrictions on the use of POPs, these remain a source of severe environmental contamination in developed and industrialized countries

alike. The pilot facility for the production of neem based pesticides would provide a model for the development, promotion and use of highly efficacious, ecologically-friendly bio-pesticides in agricultural areas in developing nations especially in COMESA and SADC sub-regions of Africa.

4.0 PROCESS OF STRATEGY DEVELOPMENT

4.1 Methodology for Strategy Development

In order to come up with a well-informed draft regional strategy on production and application of Neem based biopesticides, a pre-assessment mission was undertaken by UNIDO and COMESA Secretariat to Mozambique, Rwanda, Swaziland, Uganda and Zambia. The purpose of the pre-assessment was to collect, collate and analyze information and baseline data, to identify technical needs, and other relevant aspects in member states for setting up of a pilot facility in the region to promote, production and application of neem based Biopesticides. Furthermore, to understand the local situation and country-specific needs of the participating countries, and to identify suitable local partners/ institutions in which to anchor the project activities in the country, i.e. the ‘owners/managers’ of the Demonstration Production Centre in the Neemshed area, and other relevant aspects in member states for finalization of the components of the Project and strategy for their implementation. Carrying out such an assessment required attention in attempt to identify information gaps and implement the inappropriate intervention measures in order to address the POPs problem that is adversely affecting millions of people in Africa and the world at large. The pre-assessment employed several methods to obtain the desired results as outlined below:

4.2 Desk Study

Desk study involved extensive review of available data and literature on a number of on-going programmes in the COMESA and SADC sub-regions particularly on agriculture, environment, forestry, livestock, and status of Neem biopesticides among others. Other issues of interest include the existing National Agriculture Investment Frameworks, National Climate Smart Agriculture Taskforces and Programmes that support the promotion on production and application of neem based bio-pesticides. In addition, relevant

Government Ministries, Departments and other stakeholders, their current status and possible roles in the promotion of the neem based bio-pesticides were identified. Such Ministries and institutions include:

- Ministry of Agriculture (Plant Protection Department)
- Universities (School of Agriculture -faculty of Agronomy/Plant)
- Forestry Department
- National Agriculture Research Institutions
- Environmental Management Authority
- Farmers Union / Association
- NGOs that promote organic agriculture
- National Climate Smart Agriculture Taskforce
- Many other relevant institutions

4.3 Stakeholder Interview

The pre-assessment was structured to collect and collate most of the key information through consultations, interviews and observation based on pre-determined parameters. A checklist and specially designed structured and semi-structured questionnaires were developed for each component of the study and administered to the most appropriate prime resource persons/respondents as was found necessary. Where physical meeting was not possible in certain cases, telephone and email contacts were established where applicable. The data collected was analysed and processed appropriately to meet the study objectives.

4.4 Focused group discussions

In addition to the desk studies and interviews, the team organized group meetings for the players and experts in various components of the Pre-assessment. For a given topic, a group of experts were brought together to deliberate exhaustively on major issues of interest in a structured and guided

manner. The format, structure and number of such meetings were dictated by the need and were convened by the pre-assessment team. Checklists of questions were used to ensure that all the relevant information was collected and collated. Focused group discussions covered such areas as technical, institutional parameters among others.

Initially, two workshops were planned to be conducted, one at the beginning of the pre-assessment (inception workshop) and the other at the end of the visits (validation workshop). However, owing to budgetary constraints, focused group discussions were used in place of the Inception Workshop as the only alternative.

4.5 Site verification surveys

Besides the personal interactions, focused group discussions and other methods of soliciting data from various sources, the team also made surveys on all the potential Neemshed sites and interrogated all the information solicited from various sources in order to make their own independent assessments and arrive at final conclusions.

4.6 Country visits

Visits to the selected countries of Mozambique, Rwanda, Swaziland, Uganda and Zambia were made. The existing national platforms, institutions and programmes in Agriculture and Environment were documented, including their activities, national policies, administrative structures, partnerships among others.

5. FINDINGS OF THE PRE-ASSESSMENT MISSIONS

The following were the findings of the pre-assessment missions:

5.1 Mozambique

Mozambique is a Party to the Stockholm Conventions on POPs since 30 April 2004. The Government is determined to eliminate the intentionally produced POPs as soon as practicable by implementing the NIP. The Environmental Management Act of 2004 provides for management of POPs in line with the requirement of the Stockholm Convention. The inventory of POPs undertaken in 2004 revealed that there are about 750 metric tonnes of obsolete stocks of POP pesticides (including Aldrin, Dieldrin and Toxaphene) and 350 metric tonnes of obsolete stocks of DDT stored in various areas in the country. Mozambique has set targets for increased use of substitutes and other alternatives approaches to POP and PIC pesticides,. strengthened management and control of DDT and increased use of effective substitutes and other alternative approaches to DDT use in disease vector control.

The National POPs Focal Point in the National Directorate for the Environment (NDE), Ministry of Land, Environment and Rural Development (MITADER), coordinated the meetings in Mozambique.

In Mozambique, the mission findings included the following:

- The team was shown ten fully grown Neem trees, which were planted under the DANIDA project during the mid-90s within the Ministry's premises, no other Neem trees planted under the same project were found;
- No record of the DANIDA project or reports could be accessed at the time of the mission;

- The people that the team interacted with were aware of the effects of the POP pesticides;
- The extension department of the Ministry of Agriculture has direct linkage with the small scale farmers in Mozambique;
- The stakeholders consulted extended all support for the successful implementation of the biopesticide project in Mozambique.

5.2 Rwanda

Rwanda is Party to the Stockholm Convention on POPs and ratified as approved by the Presidential Order n° 78/01 of 8 July 2002. The National Implementation Plan (NIP) was developed in December 2006. As per the NIP, an inventory of 2,948 kg of outdated Endosulfan and Lindane was made. It has also been reported in the NIP that the country does not currently have sufficient human, material nor financial resources or corresponding legislation to face the rational management of the POPs pesticides. Moreover, the absence of an organization responsible for controlling the importation, the production, marketing, and use of the dangerous chemicals deserve a particular attention for the implementation of the Convention on POPs as regards international cooperation.

The institutions that were consulted in Rwanda included: University of Rwanda, Rwanda Agricultural Board, Karama Agriculture Research Center, The Participatory Ecological Land Use Management (PELUM – Rwanda), Rwanda Agriculture and Livestock Inspection and Certification Services, Ministry of Agriculture and Animal Resource, Ministry of Natural Resources, The Rwanda Environment Management Authority and Rwanda Organic Agriculture Movement .

The following are the findings in Rwanda:

- Neem has officially been taken up for plantation under agroforestry;
- Neem tree and aloe vera plant are used by farmers to make a natural pesticide that prevents plants from diseases. These natural remedies prevent crop diseases caused by bacteria and it fights the disease that makes diseased crops dried up;
- There were more Neem trees in the eastern province a few years back but many of them were cut down as a source of fuel as most of the villagers did not know the potential of the tree apart from being used as malaria control medicine;
- The potential for Biopesticides especially Neem is very much known in academic circles and as such, it would be easy to promote neem based pesticides among the farming community as Neem is already taught in most medical schools in the Universities as a traditional medicine for blood pressure and diabetes;
- The imported Neem pesticides available in the market are too expensive for the resource poor rural farmers;
- There is no specific programme or research in Universities aimed at promoting the production and application of Biopesticides in agriculture. The University of Rwanda is very keen to take the lead in carrying out Bio-efficacy studies of the Neem and also undertake neem plantation;
- Rwanda Organic Agriculture Movement and PELUM are implementing programmes promoting organic agriculture for a sustainable development.
- All the organisations/Institutions that were consulted whole heartedly supported the initiative of UNIDO and COMESA Secretariat and offered their respective infrastructure and facilities to promote and set up pilot facilities for neem based pesticides as

alternative to POP pesticides, which was in line with their respective mandates

5.3 Swaziland

Swaziland became a signatory to the Stockholm Convention on POPs in May 2001 and acceded to the Convention on 13 January 2006. None of the POPs pesticides are produced in Swaziland. DDT is exclusively used for malaria vector control and used for indoor residue spraying. DDT used in Swaziland is imported from South Africa and is used for vector control in the malaria endemic areas in the Lubombo Range, Lowveld and some parts of the Middleveld. Annually ten (10) tons of DDT is imported, of which some six (6) tons are effectively used each year, thus a stock of 4 tons/y goes into stores for future use. The NIP has prioritised phasing out the use of DDT for disease vector control by 2015.

The mission consulted experts from different institutions viz. Swaziland Environment Authority, Africa Co-operative Action Trust (ACAT), Ministry of Agriculture, Go Green Initiative, Junior Achievement, Swaziland National Agriculture Union, Cotton Board, University of Swaziland (Luyengo Campus), Malkerns Research Station and Department of Forestry.

After the in-country consultation with experts, the following are the findings:

- There is no organised programme on Neem trees;
- Smallholder farmers are aware of the risks associated with the use of POP pesticides;
- There is no information available regarding any studies carried out on the production and application/usage of Neem as a bio-pesticide and the suitability of growing neem in the country;

- Although Neem is not widely available, all the consulted institutions were quite enthused with the initiative to promote the use, production and application of Neem based biopesticides;
- Most smallholder farmers could not afford to buy the chemical pesticides due to financial constraints and therefore, depend on homemade recipes thus providing a good entry point for neem based bio pesticides;
- Swaziland Environment Authority and the Forestry Department are willing to undertake neem plantation in the degraded land areas;
- IPM practices were highly promoted meaning chemical pesticides were only used as the last resort in a judicious manner;
- There is a huge market for products that were organically produced, a good example was that of organic cotton;
- There was an already existing platform (National CSA Taskforce) where all the relevant stakeholders from both public and private sectors meet twice a year;
- Around 1.2 million people depend on subsistence farming for their livelihoods, which has been drastically handicapped by the high cost of agriculture inputs ranging from seeds to chemical pesticides;
- The initiative of empowering the small scale farmers with a zero cost biopesticide such as neem has been embraced by all the consulted stakeholders; as it would be of great help to the farming community both monetary-wise and to protect their health;
- Activities involving smallholder farmers are driven directly by his Majesty the King himself, as such there is a political will at the highest level already;

- Swaziland has the required expertise and infrastructure to undertake various field trials.

5.4 Uganda

Uganda acceded to the Stockholm Convention on Persistent Organic Pollutants (POPs) on 20 July 2004, and as a Party to the Convention, the country has developed its NIP. According to the NIP, over 2,224 tonnes of pesticides are imported annually. POPs pesticides have never been produced or manufactured in the country, however, some of their formulations were used in agriculture viz. dieldrin against Tsetse fly; lindane and dieldrin for seed dressing; aldrin against termite; and chlordane against soil borne pests. Only small quantity of POPs pesticides were reported in the Forestry Resources Research Institute (FORRI) where it is suspected to have been used in research. One of the top priorities of the country is to have regulation and proper management of DDT.

Different ministries and institutions viz. Ministry of Agriculture, Animal Industry and Fisheries, Uganda Environment Management Authority, Uganda National Farmers Federation (UNFFE), CARITAS-Uganda and Makerere University were consulted during the mission.

After the in-country consultative meeting with stakeholders, the findings included the following:

- Neem trees are available in the country in a scattered manner and are primarily used for medicinal purposes to repel mosquitoes.
- Large number of fully grown Neem trees were witnessed in the courtyards of the houses in the areas visited;

- The focus of smallholder farmers was to grow crops for export purposes. Unfortunately, most consignments were being rejected due to presence of high level of pesticide residues in the produce;
- Promoting the use of biodegradable, user and eco-friendly pesticides such as neem would help in increasing the livelihoods of the resource poor farmers;
- There was a project back in the 90s that was promoting Neem trees in the country, thus, a large number of neem trees were planted in the country;
- Neem was being promoted and applied using extract from boiled leaves to combat pest problems with limited success;
- There is limited knowledge amongst the Agriculture Officers, Extension Officers/workers and farmers about the actual potential of neem (extracted from the Neem leaves instead of the Neem seeds, which are said to contain maximum amount of the total available limonoids in the Neem tree);
- Smallholder farmers and other stakeholders are keen to take up neem at pilot level to produce pesticide to control a variety of pests on different crops;
- There has been a program linking the smallholder farmers to financial institution to access soft loans for their inputs;
- Open markets for smallholder farmers are organised to display their agricultural produce as well as access technical advice from district agricultural officers;
- Some extension workers have been using Neem to regulate blood pressure and diabetes;

- The required infrastructure and network for promotion of Neem based Biopesticides is available and spread out in 79 out of the 112 districts in the country, which could be used to organize the training programmes, demonstrations and to host pilot facility on behalf of the Ministry of Agriculture for the promotion and production of Neem based pesticides;
- All stakeholders welcomed the idea of promoting Neem in the country as an alternative to chemical pesticides and extended all possible support and commitment for the implementation of the project; and
- No programme or research on Neem is currently being conducted at Makerere University under the Faculty of Agricultural Sciences, however, the University is willing to collaborate and undertake the field trial work and generate bio-efficacy and phyto-toxicity data of the neem based pesticides developed under the project.

5.5 Zambia

Zambia is a Party to the Stockholm Convention and ratified it on 5th October 2006. The POPs of major concern are Chlordane, DDT, PCBs, and PCDD/PCDF. Chlordane is used for termite control in the construction industry and in plantations. The lack of cost-effective alternatives for termite control implies that the use of Chlordane will continue for some time to come. DDT is exclusively used for malaria vector control and there has been a steady increase in the quantities used, particularly for Indoor Residue Spray (IRS). The top priority is to have a system in place for management and control of POP pesticides especially Chlordane.

In Zambia, the mission consulted experts from the following institutions/organisations: University of Zambia, Participatory Ecological Land

Use Management (PELUM - Zambia), Green Living Movement, Zambia Agriculture Research Institute (ZARI), Makulu Central Research Station, Kasisi Agricultural Training Centre (KATC) and National Institute for Scientific Research (NISR).

The findings of the pre-assessment in Zambia included:

- Well established Neem nurseries in KATC and ZARI;
- The leaves of Neem are being used as pesticides by most of the smallholder farmers;
- Apart from the Neem leaves; moringa, *Tephrosia vogelli*, chilli and garlic are also being used by smallholder farmers as alternatives to chemical pesticides especially in the Northern part of the country;
- Bio-pesticides made out of the Neem and Moringa tree leaves are being promoted by ZARI in the country to prevent small scale and resource poor farmers from continuous use of chemical pesticides, which has proven to be very costly to control agricultural pests in the field and in storage;
- Like other stakeholders, ZARI has expressed keen interest in the project and was ready to be associated in the implementation of the project through generation of bio-efficacy data of neem based pesticides under different agro-climatic conditions in the country;
- There are about ten (10) existing district agriculture research stations that could be used as training centres for the smallholder farmers;
- A series of short courses (3 days to 2 weeks) in organic agriculture (e.g., biological pest management) coupled with field days are being organised by KATC;
- The facility at KATC could accommodate up to 60 participants for training purposes.

6. SUGGESTIONS BY THE MEMBER STATES COVERED DURING PRE-ASSESSMENT

The following suggestions have been made by the member states:

- All the countries requested for capacity building for the smallholder farmers and extension workers;
- They also requested for the efficacy of neem to be validated under local conditions;
- In Swaziland, it was requested that a study be undertaken before the introduction of the Neem to identify possible challenges that might come with the tree, amount of water required to grow the tree and its tendency to multiply to the unintended lands;
- School children/students should be engaged in the promotion of Biopesticides at country;
- Neem should be researched whether it could be used against storage pests as well as in the control of animal ticks;
- Demo plots using neem based pesticides should be set up in all the participating countries;
- UNIDO, in collaboration with COMESA Secretariat, should explore and identify other trees that could also be exploited for production of Bio-Pesticides;
- UNIDO, through COMESA Secretariat, should organize exhibitions of neem during National Agricultural Shows in the countries for wider acceptance of neem in agriculture.

7. CONCLUSION OF THE FINDINGS

Having observed, discussed and assessed the neem in field situation in the five countries viz. Mozambique, Rwanda, Swaziland, Uganda and Zambia, the following transpired:

- Neem has officially been taken up for plantation under agro-forestry, social forestry in Uganda. A large number of Neem trees has been planted especially in the northern part of the country;
- Fully grown neem trees are available both in Rwanda and Uganda but more in Uganda;
- Smallholder farmers are aware of the benefits of neem and the ill effects of chemical pesticides in the countries visited;
- All the countries are keen to promote the Biopesticides as an alternative to chemical pesticides in the agriculture sector;
- Farming community in the countries visited already know the potential of neem, however they lack in knowledge of quality preparation of neem based pesticides using neem seeds;
- All the countries visited have the infrastructure required to set up pilot facilities for production of neem based Biopesticides;
- Bio-efficacy of the neem biopesticides need to be generated in the respective countries under local agro-climatic conditions, however, results from Asia could be the basis to start with.
- Government willingness to extend its infrastructure for the establishment of Neemshed, a Centre of Excellence, in their respective country.

8. RECOMMENDATIONS FOR THE PILOT FACILITIES IN THE REGION

Having assessed the neem in the field situation the mission recommends that pilot facilities be established in Rwanda and Uganda. The facilities, once established and become sustainable in these countries, would be replicated in COMESA/SADC sub-regions.

Other countries namely Mozambique and Swaziland where neem population is not enough, the activities such as awareness raising programmes and training to the farming communities on the preparation and application of neem based pesticides, generation of bio-efficacy data and field demonstrations in the farmers' fields across the countries on different crops could be undertaken so that non-POPs and toxic chemical pesticide alternatives could be promoted in right earnest to enable countries to fulfil their commitments stipulated in the NIPs to meet their obligations under the Stockholm Convention. Neem plantation activities could be undertaken in Swaziland and Mozambique so that demand of neem seeds could be met locally in the future.

Furthermore, the mission recommends, subject to detailed due diligence, the following in-country partners:

Rwanda

- The Karama Agriculture Research Center - to provide land for hosting the Neemshed, undertake field trials as well as provide the Neem fruits from the already existing Neem trees at the centre.
- The University of Rwanda - to carry out bio-efficacy studies of the Neem, which is available and known in Rwanda;
- The Rwanda Agricultural Board - to take up the role of mobilising smallholder farmers and provide training using the already existing facilities at district level under their network;

- PELUM Rwanda - to sensitize the farmers and policy makers as well as tree planting;
- The Rwanda Environment Management Authority and the Rwanda Natural Resources Management (RNRM) – to carry out an inventory to confirm the actual quantity of the Neem available in the country;
- The Rwanda Organic Agriculture Movement could play the role of coordinator and host the pilot facility in their existing set up and organize large scale farmer’s field demonstration across the country on different crops against variety pests.

Uganda

- The Ministry of Agriculture, Animal Industry and Fisheries - to oversee the project implementation at national level and to host the pilot facility for the production and promotion of neem based pesticides;
- Uganda Environment Management Authority would use the degraded land areas to set up Neem plantations;
- UNFFE to mobilise and train small scale farmers to reach grassroots farming communities in major districts of the country showcase the best practices at the National Agricultural Show and provide extension services using their facilities at district level; and
- Makerere University through the Department of Plant Production – to undertake the efficacy studies on major crops on behalf of the Ministry of Agriculture, Animal Industry and Fisheries.

Zambia

- The University of Zambia - to assist in undertaking Bio-efficacy studies of the Neem based pesticides;
- PELUM (Zambia) - to focus on the mobilisation and training of small scale farmer communities;

- Green Living Movement - to use their already established district training centres to provide training and sensitise the farmers and extension services in production and application of Biopesticides;
- ZARI - to assist to generate data on different crop against variety of pests and make recommendations for the farmers to adopt neem in their agricultural practices; and
- Kasisi Agriculture Training Centre - to extend their infrastructure for setting the Neem Centre for the pilot facility and the facilities to accommodate 70 participants for training programmes, mobilise farmers, supply Neem seedlings, prepare weekly radio programs for Yatsani community radio, exhibitions, etc. NISIR - to use their existing platform at district levels to disseminate information on the dosage of the Neem extract on various crops against different pests.

Swaziland

- Swaziland Environment Authority to undertake neem census;
- African Cooperative Action Trust (ACAT) to organize neem plantation and training programmes for farmers;
- Junior Achievement to explore business venture for the neem technology;
- Swaziland National Agricultural Farmer Union and the Cotton Board to conduct training programmes at district levels for farming communities; and
- University of Swaziland and Malkerns Research Station to undertake field trials.

Mozambique

- Ministry of Agriculture- Department of Plant Protection to organize field trials for data generation and disseminate the knowledge of neem through training programmes;

Validation workshop

A two (2) day Regional Stakeholders Workshop will be organized during March, 2016 to review and validate the Draft Regional Strategy on Production and Application of Neem based Biopesticides. The first day of the workshop will also be used to:

- i. Solicit additional inputs from a wider range of stakeholders (Ministries of Agriculture, Ministry of Environment, Agricultural Research Institutions, Environment Management Authorities, Forestry Department, Farmer's Union / Associations, Universities; NGOs and civil society);
- ii. Extract from the recommendations areas in which COMESA Secretariat could add the most value as a regional economic community;
- iii. Prioritize the recommendations that needs urgent attention for implementation in a larger number of COMESA and SADC member states; and
- iv. Prepare the final Regional Strategy on biopesticides for adoption by the member countries on the second day of the workshop

9. IMPLEMENTATION OF THE REGIONAL STRATEGY ON BIO-PESTICIDES

Developing countries in COMESA and SADC sub-regions fighting a never ending battle to produce sufficient food for their growing populations and at the same time, to gain economic independence. Increase in agricultural production must come from increased crop yields per hectare under the umbrella of increased use of fertilizers and crop protection agents. The bulk of such agricultural inputs are chemicals, which often result in soil, water and food contamination, posing severe dangers to human health and the environment. Assistance is required to help countries promote the use and develop production capacity of cost-effective eco-friendly alternatives to POPs pesticides, through emphasis on non-chemical alternatives such as neem derived bio-pesticides.

The overall aim of the regional strategy is to provide low cost, safe, economical, and environmentally-sound approaches to alternative pesticides through putting up Pilot Facilities in selected countries in the region.

Neem (*azadirachta indica*) is an evergreen tree native to the Indian sub-continent, and can grow in almost all types of soils and agro-climatic conditions. It is now widespread in many African countries as well, having been imported there from India during colonial times. The chemicals present in this tree can serve as models for environmentally sound pesticides. It has been regarded as a 'Wonder Tree', with a vast range of medicinal properties, and products derived from this tree can be used by farmers as eco-friendly pesticides. If the potential of the neem tree is adequately tapped, there is great scope for generating additional income and employment opportunities in rural areas besides reclamation of vast barren wastelands. In general, farming communities in COMESA and SADC sub-regions use the leaves and bark of the neem tree to protect themselves from diseases and crops from pests. The technology suggested to be propagated in this regional strategy report makes

use of the neem kernel, which is far more potent than the leaves insofar as active ingredients relevant to pesticidal properties is concerned.

Based on the survey/assessment in the field and drawing upon the results of the successfully completed UNIDO Project IND/97/958, *“Technical Support for Development and Production of Neem Products as Environment Friendly Pesticides”*, and its Phase-II through the RENPAP titled *“Production and Promotion of Neem-based pesticides as Environment Friendly Biodegradable Alternatives to Chemical Pesticides”*, it is proposed to transfer the low cost farmer-friendly technology developed and best practices implemented in India to selected countries in COMESA and SADC sub- regions of Africa.

The pre-assessment report suggested the following two-pronged approach to deal with the establishment of pilot facility in selected countries in the COMESA and SADC sub-regions:

- a. Partnering with one identified technical institution in each country (an Agricultural University/Research Institution) to carry out bio-efficacy and phyto-toxicity studies and field trials to determine the country-specific and crop-specific dosages for the particular prevailing agro-climatic conditions in the identified neem-shed areas; and
- b. Partnering with a suitable civil society organizations to establish the pilot production and distribution centres in the neem-shed areas and conduct extension and promotion work.

This two-pronged approach will be strengthened through training-of-trainers/key personnel from each participating country.

The pilot facility will build on the Indian experience where public policy has been instrumental in promoting along with strong civil society participation, the acceptance at rural community level the piloting of such technologies at sites within the identified neem-shed areas. A neem-shed area is a defined area

consisting of a large group of villages, which will be considered as the 'catchments area' for spreading public awareness about the importance of neem, and training villagers to engage in the correct method of collection of neem fruits, washing, de-pulping and drying them to obtain the seeds, then either supplying them to a collection centre for mechanized decorticating, storage and processing of the kernel into pesticide through Neem Kernel Aqueous Extract (NKAE) or to decorticate the seeds themselves and process the kernel to extract the pesticide themselves. The farmers will also be trained in the proper application of pesticide to various crops in the correct dosages.

Based on extensive consultation with NGOs with experience in this field, it is expected that bio-pesticides technologies will most easily win broad acceptance within the civil society if, at a minimum, they can demonstrate two important characteristics:

- They operate in systems that are essentially very robust and appropriate technologies easily adjustable in rural settings.
- They can achieve comparable protective efficiency to chemical pesticides in controlling a wide range of pest-plant situations.

Full civil society involvement in all project elements will characterize the work of the project at both regional and country levels. This is considered to be a unique project characteristic that is crucial to project success.

Through a well coordinated network and by harnessing all available resources of the participating countries, the regional strategy on bio-pesticides would be to set up Theme Parks for establishment of a repository of neem germplasm of high yielding active principles, and setting up of static and mobile plants at the village level. The long-term strategy would be to develop and adopt eco-friendly, sustainable agro-based products for complementing the role of chemical products, in particular POPs pesticides, in pest management.

The programme development process would have a bottom-up approach with the basic work being done at the level of the National Coordinator of the member country who would coordinate the activities with the respective Ministries and Departments, namely, Environment, Agriculture, Forest, Chemicals and others.

In view of the complexity and the magnitude of the proposed project the work will have to be undertaken to cover the following major areas of operation.

i. Establishment of Theme Parks (Neem Centres)

Theme Parks would be established on target sites measuring approximately 100 hectares, in-line with agro-climatic conditions, in the vicinity of villages or urban towns, which have groundwater availability. Theme Parks would be established for promoting large-scale plantations in places which are otherwise wasteland. These parks would establish appropriate germplasm, assess them for increased productivity, develop techniques for improved seed viability and high bioactive principles, and disseminate knowledge and techniques for propagating latest varieties of neem trees to the farmers. Besides, the neem parks would have demonstration plants producing various products for generating income through the development of sustainable agriculture in wasteland and at the same time preserving the environment and enriching the ecosystem. Such parks would become models for promoting sustainable agriculture in wasteland for generating rural employment and income in the long run on a community basis with the initial incentive given by the local authorities/ government.

In addition, it is also proposed to utilize the wasteland in the vicinity of abandoned mining areas for the establishment of Theme Parks as a step towards regeneration of degraded land through plantation of neem trees. This strategy has been successfully tried in China on a pilot scale, where millions of trees have been planted for harnessing the beneficial properties of neem. This

would not only improve utilization of waste uncultivable barren land but also supplement increased coverage of land with neem forest for preservation of environment and for production and processing of neem seeds. Such large scale neem plantations provide a huge opportunity to work towards achievement of the twin objectives of poverty alleviation and environmental conservation.

Through screening of agro-climatically suitable locations, Theme Parks could be established in course of the project implementation. These parks would become Centres of Learning for the farmers and provide technical backup and material for promoting agro-based products for sustainable eco-friendly agriculture.

ii. Process Development for neem-based products

The pilot production based on the technologies perfected in India would be established in a cost effective manner and subsequently based on successful establishment and implementation, small production units would be set up at the grassroots-level.

iii. Standardization and Bio-screening

The following activities would be undertaken along with formulation development to screen various formulations biologically for their suitability:

- i. Bioassaying of different formulations for various bioactivities like anti-feedant, repellency, behavioural, insecticidal, etc.;
- ii. Quality assurance test through bioassay technique;
- iii. Field testing at experimental farm-level;
- iv. Large scale field testing;

- v. Bioassaying and field testing against non-target pests of important crops;
- vi. Toxicological studies for registration purposes;
- vii. Market recommendations;
- viii. Adoption of neem based formulation as seed protectant for seed storage (in warehouses) in Gene bank for long-term storage of seeds free from pesticides, etc.;
- ix. Integration with other control methods for possible adoption in IPM system.

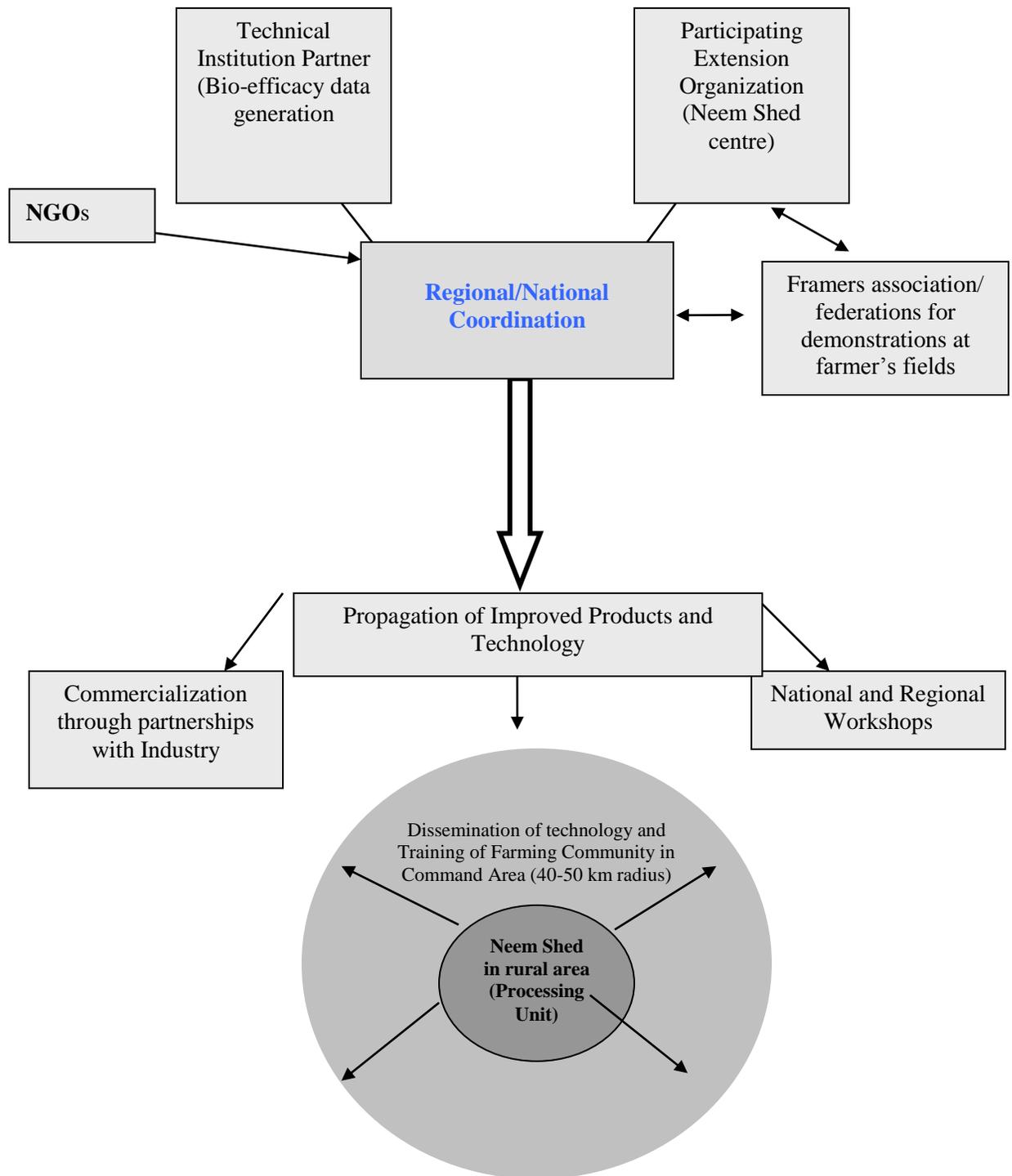
iv. Extension work for disseminating new products and improved technology, and organization of scientific neem seed collection and processing

Improved products and technology for processing neem seeds would be disseminated to the farming I community in rural areas around the Theme Park by setting up an extension network of trainers for reaching out to farmers' households, and through organization of village level workshops and training programmes. Field demonstrations of neem pesticides would be laid out at the Theme Parks and in farmers' fields in villages to directly demonstrate the efficacy of the improved technology. Lead farmers would be selected to pilot such dissemination of knowledge and to create a sense of involvement. Emphasis would be laid on scientific collection of neem seeds so as to obtain raw material of high quality. Mobile plants would be established in the different parts of the region for production of simple neem products, such as one-step extracts. These mobile plants would serve as small village based factories for resource poor farmers, who would be able to utilize these factories. The mobile plants may be transported to villages for producing neem based agro-products and thus become a tool for income generation.

10. ORGANIZATIONAL CHART OF NEEM CENTRE FOR IMPLEMENTATION OF THE PILOT FACILITY FOR NEEM BASED BIOPESTICIDES

The Neem Centre will be established in neem-shed command area. It will

- be equipped with prototype/ pilot machinery for the processing/production of neem based pesticide,
- undertake seed collection, de-pulping, drying, storage, production and application of neem based pesticides (NKAE),
- training of trainers, seed collectors, farmers, village women, extension officers and workers;
- field demonstrations in selected crops in the neem-shed command area



11. TARGET BENEFICIARIES

- The main beneficiaries would be **resource poor farmers**, and **small-scale village level agri-business enterprises and micro-industries**. Farmers would get access to less expensive and abundantly available pesticides improving their self-reliance, and small-scale village entrepreneurs could avail of the opportunity to use the simple technology to set up micro industries manufacturing the pesticides. They would also be able to access **niche markets** for organically grown fruits and vegetables.
- **Women** and **unemployed rural youth** would be particularly benefited as they would be involved in the **agri-business** of seed collection and processing of neem kernel for the manufacture of the neem based pesticides, and this would **generate employment** for them.
- **Technical institutions** such as Agricultural Universities/ Research Institutes would benefit from the technology transfer and institutional linkages, as well as capacity enhancement through participating in the bio-efficacy studies.
- Through reduction in use of polluting chemical crop protection agents, health hazards from handling of chemicals, and **soil, water and food contamination** would reduce. Thus the community as a whole would be benefited.
- Finally, there would be benefit to the **environment**, through **reduction in POPs**.

12. STRATEGY ON PRODUCTION AND APPLICATION OF BIOPESTICIDES

CONCLUSIONS AND RECOMMENDATIONS

Conclusions	Recommendations	Place of Action
1. Neem has officially been taken up for plantation under agro-forestry, social forestry in Uganda. A large number of Neem trees have been planted especially in the northern part of the country.	Transfer of technology for neem based pesticides in the selected countries	
2. Fully grown neem trees are available both in Rwanda and Uganda but more in Uganda.	Capacity building through establishment of Pilot facilities	Rwanda and Uganda Zambia (separately through COMESA assistance)
3. Smallholder farmers are aware of the benefits of neem and the ill effects of chemical pesticides in the countries visited.	Establishment of Theme Parks (Neem Centres)	Rwanda and Uganda Zambia
4. All the countries are keen to promote the Bio-pesticides as alternative to chemical pesticides in the agriculture sector.	Propagation of Neem trees in degraded and agro-forestry zones	Rwanda, Uganda Zambia, Swaziland, Mozambique and other interested member countries
5. Farming community in the countries visited already know the potential of neem, however they lack in knowledge of quality preparation of	Skill development programme on production, promotion and application of neem based pesticides for member countries	Rwanda; Uganda Zambia, Swaziland, Mozambique and other interested

neem based pesticides using neem seeds.	experts.	member countries
6. All the countries visited have the infrastructure required to set up pilot facilities for production of neem based Biopesticides.	Organise awareness raising programmes for policy makers, scientists/ extension officers, NGOs, farming communities.	Rwanda, Uganda Zambia, Swaziland, Mozambique and other interested member countries
7. Government willingness to extend its infrastructure for the establishment of Neemshed, a Centre of Excellence, in their respective country.	Replication of technology including mobile plants where feasible, in the rural setting.	Rwanda, Uganda Zambia (separately through COMESA assistance)
8. Bio-efficacy of the neem biopesticides need to be generated in the respective countries under local agro-climatic conditions, however, results from Asia could be the basis to start with.	Organization of seed collection, depulping, drying, storage, production and application of neem based pesticides (NKAE)	Rwanda, Uganda Zambia (separately through COMESA assistance)
	Generation of bioefficacy and phytotoxicity data on economically important crops against different pests	Rwanda; Uganda Zambia, Swaziland and Mozambique
	Organise large scale demonstration trials using NKAE at farmer's fields	Rwanda; Uganda Zambia, Swaziland and Mozambique

13. FOCUS OF THE STRATEGY

Based on the recommendations given by Member Countries during the Pre-assessment mission, the strategy will address the following key issues:

- Create awareness among the decision makers, including high level and technical consultation meetings, on the crucial importance of Bio-pesticides in the strategies and policies for sustainable development, and poverty reduction;
- Enhancing of regional cooperation on harmonization of approaches to the production and application of biopesticides;
- To strengthen capacity in national research and training institutions and implementation of bio pesticide research programs.
- Facilitate capacity building of policy makers, extension workers and small scale farmers on use of bio pesticide taking the Neem tree as one of the alternatives;
- Provide support on the strengthening of the CA/CSA Task forces in selected member countries. This will widen adoption of bio-pesticide by small scale farmers.

14. OPERATIONALISATION OF REGIONAL STRATEGY ON BIOPESTICIDES IN COMESA AND SADC SUB-REGIONS

Planned Action:

Strategic Focus Area A: Inclusion of Biopesticides in Poverty reduction strategy papers and CAADP compacts

Considering that:

1. Production and application of Biopesticides is often conceptualized with conservation rather than with economic development;
2. The definition of Climate Smart Agriculture does not always include the use of Biopesticides as an alternative to synthetic pesticides, causing the importance of Biopesticides in the Agriculture sector to be overshadowed by synthetic pesticides as well as its contribution to poverty reduction strategies;
3. Recognizing the economic value of Biopesticides in the Agriculture Sector can, under the right circumstances, contribute to their sustainable environment management; and
4. There is a strong need for a multi-sector approach to policy, planning and practice in promoting Biopesticides to avoid duplication and create synergies.

Planned Action

COMESA Secretariat will undertake the following activities:

1. Support the mainstreaming of the production and application of Biopesticides into CAADP Compacts and poverty alleviation strategies, so that their contribution to the economy, livelihood and other sectors (Forestry, Environment, Chemical management, Trade) features more prominently in these plans. Attention should be given to :
 - The definition of CSA should be Biopesticide sensitive;
 - The economic contribution of Biopesticides to development rather than just environmental protection; and
 - How national programs on Biopesticides may benefit from their linkage to CAADP
2. Lobby and support member states to mainstream the data derived from members States' application of the aforementioned instrument for full accounting of the agriculture sub-sector (Biopesticides) into macro-level economic development processes and documents [e.g. Poverty Reduction Strategy Papers (PRSPs), national Sustainable Development Goals (SDGs), National Development Plans.
3. Lobby for donor and member country support for the implementation of the AU-CAADP Companion Document on forestry, and clearly articulate how the COMESA/SADC Regional Strategy on Bio-pesticides will support realization of the objectives outlined in this document.
4. Support research and inter-governmental / inter-ministerial dialogue to raise awareness on the linkages between Bio-pesticides and other sectors, and to encourage high-level commitment to cross-sectoral planning.

Strategic Focus Area B: Participation in international processes

Considering that:

1. African perspectives are under-represented in international negotiations due to the high cost of staying engaged, the imbalanced playing field (negotiation skills rarely receiving explicit attention, and the framing of positions being inadequately supported by research and advisory infrastructures), thereby undermining effective negotiation in support of national interests; and
2. The “African voice” in international negotiations is often undermined through insufficient articulation of shared positions.

Planned Action

In response to that, COMESA/SADC sub-regions will undertake the following:

1. Support analysis and improved understanding of the types of challenges that require stronger negotiating power within the sector, and to provide a platform for member states to have a greater voice in shaping international processes and patterns of trade and investment affecting forests. This should include support to the development of a common position on forestry issues; leveraging increased finance to the region and sector nationally and internationally; and support to more effective engagement in international processes through capacity building in negotiation skills, and leveraging financial support for member states’ participation in international processes and implementation of agreements.

2. Assist member states in leveraging the potential of international agreements through support to member states in mainstreaming these within national development documents and processes.
3. Support member states' readiness in harnessing the potential of Biopesticides in sustainable agricultural to reduce poverty levels, increase crop productivity and improved livelihoods.
4. Assume regional coordination function for those working on Bio-pesticides, including information sharing and capacity building functions.
5. Support the mainstreaming of production and application of Bio-pesticides into national level CAADP Compacts, National Climate Smart Agricultural Investment Frameworks (NCSAIFs) and poverty alleviation strategies, so that the sector's contribution to the economy, poverty reduction, local livelihoods and other sectors (agriculture, environment, water) feature more prominently in these plans. However, attention should be given to the contribution of Bio-pesticides to sustainable economic development (not just environmental protection); the contribution of Bio-pesticides to other sectors (e.g. through provision of medicine in the health sector and other environmental services); and finally how the country programs on Bio-pesticides may benefit from their linkage to CAADP, National Climate Smart Agricultural Taskforces (NCSAT) and NCSAIFs.
6. Accelerate adoption of productivity-enhancing technologies. COMESA/SADC member states have placed a high priority on accelerating food production and productivity through adoption of existing and newly generated appropriate technologies in order to reverse the declining trends in food production and productivity in

the region. One important factor that needs to be addressed as part of this focus includes limited access to inputs (cost effective and ecologically friendly pesticides), poor extension systems and capacity building at both regional and national levels. The overall aim of this strategic area of focus is increasing the agricultural productivity within the region. In particular, COMESA/SADC will focus on achieving increased usage of Bio-pesticides for crop protection in Member States; and improved accessibility of appropriate technologies related to Bio-pesticides.

7. Lobby for donor and member country support for the implementation of the AU-CAADP Companion Document on forestry (focus should be placed on trees used in the production of Biopesticides), and clearly articulate how the COMESA/SADC Regional Strategy on Bio-pesticides will support the realization of the objectives outlined in this document. Under this strategic area, COMESA/SADC will focus on the establishment of Neemshed and plantations of other trees that could be used as Bio-pesticides. This will be done through strict collaboration with the forestry department in member countries to make sure that Neem and other alternatives to synthetic pesticides are included in the tree planting initiatives and programs at country level.
8. Support research and inter-governmental / inter-ministerial dialogue to raise awareness on the linkages between production and application of Biopesticides and other sectors, and to encourage high-level commitment to cross-sectoral planning.

Regional Cooperation on Biopesticides Development

This section focuses on attracting investment for adding value to Bio-pesticides in the region. Further, COMESA/SADC will also enhance cooperation among member states in Joint management of trans-boundary resources and sharing of information on Research and Development.

Strategic Focus Area C: Investments in Value Addition

Considering that:

1. Disproportionate value is often captured by foreign relative to national actors, and by national companies and traders relative to local actors;
2. For recognized markets in Bio-pesticides, value is largely captured elsewhere;
3. A host of tree products used in production of Bio-pesticides and forest ecosystem services have not yet captured their true value;
4. Regulatory frameworks and services enabling actors in the region to penetrate preferential markets (e.g. certified and organic products, fair trade) and retain benefits from innovations (e.g. intellectual property rights) are poorly developed; and
5. Technical capacity, support services and regulatory frameworks for promoting the production and application of Bio-pesticides are weak in the region, undermining capacity to derive benefit from emerging markets for Bio-pesticides.

Planned Action:

COMESA/SADC will undertake the following activities:

1. Support member states in developing an investment climate that encourages investment in the production and application of Bio-pesticides
2. Source investments for the greater participation of local communities at all levels of the marketing chain.
3. Support the development of a mechanism for sourcing timely information regarding the demand for Bio-pesticides, recent research and the latest developments in the sector (e.g. medicinal products) to enable member states to respond in a timely manner to emerging opportunities. Support, organize and provide access to regional and international trade fairs (to promote new products and allow for the exchange of ideas).
4. Provide clear standards, guidelines and minimum requirements for regional trade of Biopesticides, to enable member states to retain value and manage resources sustainably without hindering trade and investment in the agriculture sector.
5. Support research into product and market development for alternative products to synthetic pesticides that have promise to capture “win-win” opportunities for enhanced value, local livelihoods and sustainability.
6. Provide guidelines for investors, as well as information on the Bio-pesticides, producers, consumers and markets.

7. Encourage member states to support capacity building and investment in support of local-level processing and support to research, development and promotion of new technologies.
8. Support strategic linkages to regional institutions involved in the production, processing and trade of Bio-pesticides.
9. Explore with other regional organizations the most appropriate means to provide timely capacity building to support of member states to effectively respond to the emerging Bio-pesticide opportunities and market. Assistance is needed in understanding markets and regulatory requirements, identifying opportunities, supporting the establishment of baselines, etc. before appropriate policies and investments could be identified.

Strategic Focus Area D: Research and Knowledge Sharing

Considering that:

1. The current value of research is undermined by failure to link research to real policy concerns, the tendency to shed light on only one angle of a complex problem, limited efforts to translate research findings into policy-relevant language, limited attention to “downstream research” (research on how to implement policies and recommendations) and limited efforts to use and synthesize what is already known;
2. The deficiencies in research contribute to the perception that research is expensive, undermine public funding for research and contribute to the inability to capture emergent opportunities conditional on strong research inputs (e.g. adoption of Biopesticide depend highly on bio-efficacy information);

3. Policy makers also have some responsibility, given that their unwillingness to pay for research may carry a political cost (e.g. use of consultants funded and selected by others) and they must be proactive in communicating their information needs;
4. Regional cooperation represents an opportunity for enhancing the benefits from any given research investment (by creating economies of scale), providing a broader perspective on an issue (through regional comparison) and can facilitate identification of “best practice” and policies that work;
5. Research has a role to play in policy and strategy implementation, in the form of monitoring and evaluation and feedback into policy design and implementation, a function that is rarely put to use;
6. There is a need to shift away from conventional research topics to more strategic questions – for example those that go beyond biophysical research to take a systems perspective, or those enabling policy-makers to move away from reactionary toward more anticipatory decision-making (e.g. scenario analysis, early warning systems); and
7. There is a need to harness the existing financial and human capacity of universities, regional institutions and networks to meet more strategic information needs for diverse end users (policy-makers, practitioners, extension workers and smallholder farmers);

Planned Action

COMESA/SADC will undertake the following activities:

1. Use available capacity and institutions (subgrantees such as Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) in the region that are leading in some areas of research and who can translate research findings into policy-relevant language.
2. Avoid the common pitfall of implementing only those research agendas associated with external funding agencies and their consultants.
3. Support demand-driven, forward-looking and adequately funded research (such as on trends analysis and early warning systems) to enable proactive planning and avoid the tendency of perpetually reacting to latest crisis.
4. Facilitate fora where research results are presented to a wider audience, including policy makers in a regular manner (within - especially during among National Taskforces Meeting and between countries). Regular sharing of research on regional trade in the sector, value chains, etc. is of critical importance to COMESA/SADC member states.
5. Facilitate access to and flow of information on emerging issues or opportunities in the region, which may also be needed by other end users, e.g., for supporting poor resource farmer industries, extension workers and policy makers / practitioners.

6. Facilitate prioritization of research in order to answer more strategic questions and harness the existing financial and human capacity to meet more strategic information needs (e.g. through Memorandum of Understandings (MOUs) with universities, advanced research institutes and centers of excellence such as with the RENPAP
7. Assist in capacity assessment, to identify deficiencies in current research, and for putting in place regional or sub-regional mechanisms to address research gaps.
8. Develop innovative means to fund research (for now focused on biophysical research rather than larger “systems”-type questions), to support the transition from research being under-valued and under-funded to research as an integral part of national innovative systems funded by government and other stakeholders. Use networks to fund research of regional character.
9. As part of its strategy on research and knowledge sharing, must undertake stocktaking as a starting point on all the key focus areas discussed.

15. IMPLEMENTATION MODALITIES OF THE REGIONAL STRATEGY ON BIO-PESTICIDES

UNIDO in collaboration with the COMESA and SADC sub-region, Member States, and other developmental partners will work together to implement the regional strategy and attain its objective. The initial activity will be to build capacity in the region to address the issues of Bio-pesticides. In this regard, COMESA will mobilize resources to set up a dedicated unit within the COMESA Secretariat to coordinate activities on Bio-pesticides as well as raising its profile in the region. For its sustainability, this model will be replicated in the SADC sub-region and other regions in Africa.

16. **INPUTS**

16.1 **Counterpart inputs**

The Government of Uganda and Rwanda along with the participating organizations/NGOs would provide counterpart contributions in kind/cash in the form of land, laboratories, fixtures, maintenance of Neem Sheds, staff, etc. to this project and directly by providing to the cooperatives equipment as well as building / infrastructure for establishing Neem Sheds. The participating institutions would provide staff to carry out the project activities like generation of bio-efficacy data, training programmes, running of Neem Centres in neem-shed areas, etc.

16.2 **UNIDO inputs**

UNIDO will be responsible for the following inputs for setting up the Pilot facility:

(a) International staff

Recruitment of the international expert required for the project.

(b) National staff

A National Coordinator, who would be recruited on a part-time basis, with demonstrable skills and experience would coordinate the work in the respective participating country.

(c) Sub-contracts

UNIDO would enter into agreements with the participating institutions, which would establish and manage the Neem Centres and implement the specified activities. UNIDO will also enter into agreements / MoUs with the participating Agricultural Universities to act as National Technical Partners, and implement the specified activities.

(d) Training

Training for trainers would also be organized locally by UNIDO expert. Neem Centre institutions along with trainers would organize a number of training programmes for the benefit of NGOs, Self Help Group (SHG), farming community, village women, extension officers, industry, etc.

(e) Equipment and supplies

Procurement / fabrication of machinery required for the production of neem based pesticides based on the designs from India would be done locally and commissioned in Neem Centres.

16.3 BUDGET

For Three years duration of the project implementation

BL	Description	US\$	US\$
		(UNIDO)	(COMESA)
11-00	International consultants	27,000	15,000
15-00	Project Travel	25,000	5,000
17-00	National consultants	12,000	6,000
21-00	Sub-contracts (for establishment of 2 Neem-pesticide production centres, and field studies and trials by 2 Technical Institutions - one each in Rwanda and Uganda,)	40,000	20,000 (for Zambia)
30-00	Training	12,000	8,000
35-00	Workshops/meetings	12,000	6,000
51-00	Miscellaneous	3,000	2,000
99-99	Total	131,000	62,000

ABBREVIATIONS

ACAT	Africa Cooperative Action Trust
ACTESA	Alliance for Commodity Trade in East and Southern Africa
AU/NEPAD	African Union's New Partnership for Africa's Development
CAADP	Comprehensive Africa Agricultural Development Programme
CBD	United Nations Convention on Biological Diversity
CET	Common External Tariff
COMESA	Common Market for Eastern and Southern Africa
COP	Conference of the Plenipotentiaries
CSA	Climate Smart Agriculture
DANIDA	Danish International Development Agency
DDT	Dichlorodiphenyl trichloroethane
EAP	Environmental Action Plan
ECOWAS	Economic Community of West African States
FANRPAN	Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agriculture Organization
FFS	Farmer Field School
FORRI	Forestry Resources Research Institute
FTA	Free Trade Area
GDP	Gross Domestic Product
GEF	Global Environment Facility
GVs	Granulosis viruses
HCB	Hexachlorobenzene
IPM	Integrated Pest Management
IRS	Indoor Residue Spray
KATC	Kasisi Agriculture Training College
LDCs	Least Developed Countries
MEA	Multilateral Environmental Agreements
MITADER	Ministry of Land, Environment and Rural Development,
NCSAIFs	National Climate Smart Agricultural Investment Frameworks
NCSAT	National Climate Smart Agricultural Taskforces
NDE	National Directorate for the Environment

NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NISIR	National Institute for Scientific and Industrial Research
NIPs	National Implementation Plans
NPVs	Nuclear Polyhydrosis viruses
PCDD/PCDF	Polychlorinated dibenzo-p-dioxins and dibenzofurans
PELUM	Participatory Ecological Land Use Management
POPs	Persistent Organic Pollutants
PRSPs	Poverty Reduction Strategy Papers
PTA	Preferential Trade Area for Eastern and Southern Africa
REMA	Rwanda Environmental Management Authority
RENAP	Regional Network on Pesticides for Asia and the Pacific
RNRA	Rwanda Natural Resource Authority
RNRM	Rwanda Natural Resources Management
ROAM	Rwanda Organic Agriculture Movement
SADC	Southern African Development Community
SDG	Sustainable Development Goals
SEA	Swaziland Environment Authority
SHG	Self Help Group
SIDS	Small Islands Developing States
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework - Convention on Climate Change
UNFFE	Uganda National Farmers Federation
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization
ZARI	Zambia Agriculture Research Institute