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GOVERNMENT OF ANGOLA
MINISTRY OF AGRICULTURE
AGRICULTURE DEVELOPMENT INSTITUTE

SMALLHOLDER AGRICULTURE DEVELOPMENT AND COMMERCIALIZATION PROJECT - MOSAP II

INTEGRATED PEST MANAGEMENT FRAMEWORK

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ABBREVIATIONS AND ACRONYMS

ADI	Agriculture Development Institute
CBO	Community Based Organisation
CBSD	Cassava Brown Streak Disease
CPS	Country Partnership Strategy
EIA	Environmental Impact Assessment
EDA	Agriculture Development Office of ADI at the Municipality level.
FAO	Food and Agriculture Organisation
FFS	Farmer Field Schools
GoA	Government of Angola
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
IVM	Integrated Vector Management
JICA	Japan International Cooperation Agency
MoA	Ministry of Agriculture
M&E	Monitoring and Evaluation
MOSAP II	Smallholder Agriculture Development and Commercialization Project
NDP	National Development Plan
NEMP	National Environmental Management Policy
PDO	Project Development Objective
PIU	A Project Implementation
PMP	Pest Management Plan
PPIU	Provincial Project Implementation Unit
UNDP	United Nations Development Programme
USAID	United States Agent for International Development

EXECUTIVE SUMMARY

1. The Smallholder Agriculture Development and Commercialization Project (SADCP, also known in Angola as MOSAP II) aims to increase smallholder agricultural productivity, production and marketing in the project areas. MOSAP II area consists of three Provinces Bié, Huambo and Malanje involving 25 municipalities and 80 communes. An estimated 175,000 rural households (estimated 875,000 people) are expected to be direct project beneficiaries. Approximately, 33% of these farmers are likely to be women farmers. In addition, the project would strengthen capacity of national and provincial staff dealing with agriculture as well as those dealing with agriculture in the private sector and NGOs. MOSAP will also benefit through training (i) stakeholders along FFS extension and the value chains methodologies (both NGOs and Private firms), (ii) institutions at the central, provincial and municipal level and (iii) staff, students and local service providers.

2. The activities funded under the MOSAP II may lead to the increased use of agricultural pesticides, inter alias, in the sector. This Integrated Pest Management Framework (IPMF) has been prepared in order to ensure the Project is managed in compliance with the World Bank's Operational Policy OP 4.09 on Pest Management, and with the related safeguard requirements of the Government of Angola (GoA). The IPMF includes proposals for effective and sustainable integrated pest management relating to specific project crops production (maize, beans, cassava, potato and horticulture) and marketing systems extending beyond the lifetime of the Project.

3. This IPMF briefly summarizes current knowledge of the incidence of specific project crops pests in the cropping and marketing systems of the area targeted by the Project. The Plan reviews relevant national policies and regulatory systems, which will be followed by an outline of the Work Plan and budget for integrated pest management to be applied under the MOSAP II.

4. The key pest problems encountered in the targeted specific project crops production systems include field insect-pests and biological agents, weeds, birds and rodents. Few farmers currently use pesticides, insecticides or herbicides.

5. Nonetheless, it is deemed important to provide all participating farmers with stronger advisory assistance relating to the safe use of pesticides, insecticides and herbicides. Pest scouting will be encouraged to allow control of migratory and an outbreak pest at an earlier stage, thus reducing the need for pesticide application and in another hand, preserves the natural biological control and mesures.

6. The project will be implemented over a five-year, to be initiated in 2016 and contain the flowing components:
    - Component 1. Capacity Building and Institutional Development
    - Component 2: Support for Increased Production and Commercialization
    - Component 3: Project Management, Monitoring and Evaluation

7. The Project for Management, Monitoring and Evaluation will finance management, coordination, monitoring and evaluation of the project and consists of two sub-components: (i) Project Management that ensure the correctly implementation of activities, on time and in accordance with the Loan Agreement. This would be the responsibility of a Project Coordinator and a small team of experts located at the national, and provincial or municipal levels; (ii) Project Monitoring and Evaluation that will be

responsible for collecting and processing appropriate information to monitor project performance and measure the output, effect and eventually the impact of project activities over time. Baseline information will also be collected at the beginning of project implementation.

8. Financing will be provided to support project coordination activities, including planning and budgeting, management and administration, monitoring and evaluation, safeguards compliance, and national and provincial engagement. If necessary, Government counterpart resources will be used to pay staff-related costs not eligible for IBRD funding.

9. The Project Target Area are the municipalities in the three Provinces of Bié, Huambo and Malanje. The project beneficiaries thus account for 40% of all the rural households in the three provinces and for nearly 10% of all rural households in Angola. Agriculture is the the major economic activity, being main crops maize, cassava, horticulture, beans and potatoes.

10. The World Bank Safeguard Policy OP 4.09 on Pest Management stipulates "in assisting borrowers to manage pests that affect either agriculture or public health and supports a strategy that promotes the use of biological or environmental control methods, and reduces reliance on synthetic chemical pesticides".

11. In Angola the pesticide management regulation used in agriculture and veterinary medicine, for private or official entities, are subject to prior participation of the local health authority, such as DSV, PNGA and ENA. All importants cautions related to the application of pesticides recommended for safe use of pesticide should be considered.

12. The use of pesticides, if not properly managed can lead to unwanted consequences to the Environmental, Occupational and Public Health. Uncontrolled use of pesticides, produce negative impacts on the human body from the moment they are absorbed, mainly on the skin, the digestive system and on the lugs. The risks of uncontrolled use of pesticides are related to the following steps: product storage, handling, transportation, dosage during treatments particularly contamination of applicators who could be exposed to pesticide effects, if instructions related to product utilization standards are not sufficiently applied.

13. The mitigation measures and monitoring of the pesticide use imply that farmers have to be trained to acquire the practical knowledge and skills in order to identify and control these factors, through preventive and curative control strategies including IPM approaches. For control of general pests the extension workers are recommended regularly to conduct training on safe use of pesticides to minimize the risks associated with pesticide use. All important cautions related to the application of pesticides recommended for safe use of pesticide should be considered. The monitoring and evaluation of pesticide use will collect and process appropriate information to monitor project performance and measure the output, effect and eventually the impact of project activities over time.

14. The mitigation measures and the monitoring proposals will be specific to the particular projects and locations taken forward. Therefore the budget for PMP implemention is related to the preparation of Specific Pest Management Plans, Pamphlets and Brochures Preparation, Awareness and Training. Total of US$ 210,000 will be required to effectively implement the PMP over a five-year period.

SUMÁRIO EXECUTIVO

15. O Projecto de Desenvolvimento da Agricultura Familiar e Comercialização (MOSAP II) tem como objectivo o aumento da produção e da produtividade da agricultura familiar e comercialização nas áreas do projecto, que consistem em 3 Províncias, Bié, Huambo e Malanje envolvendo 25 municípios e 80 comunas. Aproximadamente 175.000 famílias rurais (cerca de 875.000 pessoas) serão beneficiários directos do Projecto. Aproximadamente, 33% destes camponeses serão mulheres. Além disso, o projecto fortalecerá a capacidade dos quadros nacionais e provinciais que trabalham no sector agrícola tal como aqueles que lidam com a agricultura no sector privado e ONGs. O MOSAP II também beneficiará através de formação (i) os actores através da metodologia das Escolas na Machamba do campones (FFS) e de cadeias de valor (tanto ONGs como o sector privado), (ii) instituições ao nível central, provincial e municipal e (iii) técnicos, estudantes e prestadores de serviços locais.

16. As actividades realizadas pelo MOSAP II poderão levar a um aumento no uso de pesticidas agrícolas, *diga-se*, no sector. Este Plano de Maneio de Pragas (PMP) foi preparado de forma a assegurar que o Projecto seja gerido de acordo com Política Operacional OP 4.09 do Banco Mundial referente à Maneio de Pragas, e com as salvaguardas relacionadas do Governo de Angola (GoA). O PMP inclui propostas para uma eficaz e sustentável Gestão de Pragas relacionada com a produção das culturas específicas do Projecto (milho, feijão, mandioca, batata e horticolas) e sistemas de comercialização que se estendem para além do ciclo de vida do Projecto.

17. Este PMP resume brevemente o conhecimento actual da incidência de doenças e pragas das culturas no campo e nos sistemas de comercialização das áreas do Projecto. O Plano revê sistemas de regulação nacionais relevantes e políticas, que serão seguidos no desenho do Plano de Actividades e orçamento de gestão integrada de pragas e doenças para serem aplicados no MOSAP II.

18. As pragas e doenças encontradas nas áreas das culturas específicas do Projecto incluem insectos-praga, infestantes, pássaros e roedores. Actualmente poucos agricultores usam pesticidas, insecticidas ou herbicidas, muito menos têm noção do papel do controle biologico natural na regulação das pragas das suas culturas agricolas.

19. De qualquer forma, é importante fornecer a todos os beneficiários, assistência efectiva relacionada com o uso seguro de pestecidas (fungicidas, insecticidas e herbicidas). Avaliação de pragas será encorajada de forma a assegurar um controlo preventivo de pragas, via medidas culturais (boa preparação do terreno, uso de datas de sementeira correctas, bom maneio da cultura, eliminação de resíduos das culturas via compostagem, por exemplo), numa fase inicial, assim reduzindo a necessidade de aplicação de pesticidas.

20. O projeto será implementado ao longo do período de cinco anos a partir de 2016 e contém as seguintes componentes:
    - Componente 1. Desenvolvimento da Capacidade Institucional
    - Componente 2: Apoio para Aumento da Produção, productividade e Comercialização
    - Componente 3: Gestão, Monitória e Avaliação de Projetos

21. O Projeto de Gestão, Monitoria e Avaliação irá financiar a gestão, coordenação, acompanhamento e avaliação do projecto e consiste em duas sub-componentes: (i) Gestão de Projetos que garantem a implementação correcta das actividades, a tempo e de acordo com o empréstimo concedido. Isto será da responsabilidade do Coordenador do Projeto e de pequena equipa de especialistas localizados aos níveis nacional e provincial ou

municipal; (ii) Projeto de Monitoramento e Avaliação será responsável pela recolha e processamento de informação adequada para monitorar o desempenho do projeto e medir resultados, efeitos e, eventualmente, o impacto das atividades do projeto ao longo do tempo. Informações de inqueritos (levantamentos) também serão coletadas no início da implementação do projecto.

22. Será fornecido financiamento para apoiar actividades de coordenação do projeto, incluindo planificação e orçamento, gestão e administração, monitoria e avaliação, cumprimento de garantias, e obrigações nacional e provincial. Se necessário, os recursos de contraparte do governo serão utilizados para pagar os custos relativos ao pessoal não elegíveis para financiamento do BIRD.

23. A area alvo do Projecto são os municípios de três províncias: Bié, Huambo e Malanje. Os beneficiários do projeto, portanto, representam 40% de todas as famílias rurais das três províncias e quase 10% de todos os agregados familares rurais em Angola. A agricultura é a principal actividade económica, sendo as principais culturas, milho, mandioca, horticultura, feijões e batata reno.

24. A Política Bancaria de Salvaguarda OP 4.09 estipula "em ajudar os mutuários a gerir as pragas que afectam tanto a agricultura como saúde pública, apoia uma estratégia que promove o uso de métodos de controle biológico ou ambiental, e reduz a dependência de pesticidas químicos sintéticos altamente toxicos ao homem e com consequencias desastrosas ao ambiente.

25. Em Angola, o regulamento de maneio de pesticidas utilizados na agricultura, saúde publica e na medicina veterinária, por entidades privadas ou oficiais, esta sujeito a participação prévia das autoridades de saúde local. Todos os cuidados importantes relacionados com a aplicação de pesticidas recomendados para o uso seguro de pesticidas devem ser consideradas, priorizadas e integradas aos sistemas de gestão.

26. O uso de pesticidas, se não for devidamente controlado, pode levar a conseqüências indesejáveis para o Meio Ambiente, Trabalho e Saúde Pública. O uso descontrolado de agrotóxicos produz impactos negativos no corpo a partir do momento que são absorvidos, principalmente na pele, no sistema digestivo e nos pulmões. Riscos previsíveis estão relacionados com etapas seguintes: armazenagem de produtos, manipulação, transporte, dosagem, durante tratamentos nomeadamente a contaminação de aplicadores que possam estar expostos aos efeitos de pesticidas, se as instruções relacionadas aos padrões de utilização de produto não forem suficientemente aplicadas.

27. Nas medidas de mitigação e monitoria da utilização de pesticidas, é necessário que os agricultores sejam treinados para adquirir o conhecimento prático e as habilidades para identificar e controlar fatores de perda de produção, por meio de estratégias de controle preventivo e curativo, incluindo abordagens IPM. Para o controle de pragas, recomenda-se que os agentes de extensão realizem treinamentos regulares sobre uso seguro de pesticidas para minimizar os riscos associados à sua utilização. A monitoria e a avaliação do uso de pesticidas responsabilizar-se-a pela recolha e tratamento de informação adequada para monitorar o desempenho do projeto e medir resultados, efeitos e, eventualmente, impacto das atividades do projeto ao longo do tempo.

28. O orçamento para implementação de PMP está relacionado com a preparação de planos específicos de maneio de pragas, preparação de panfletos e brochuras, sensibilização e formação. No total serão necessários US$ 210.000 dólares americanos para implementar eficazmente o PMP ao longo de um período de cinco anos.

1 APPROACH

29. This Integrated Pest Management Framework (IPMF) is designed to set out the overall approach for minimizing potential adverse impacts on human and environmental health through promotion of Good Agricultures Practices (GAP) and rational use of pesticides, insecticides and herbicides, as well as training and supervision for the safe use and disposal of pesticides.

30. The World Bank Safeguard Policy OP 4.09 on Pest Management stipulates that "in assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods, and reduces reliance on synthetic chemical pesticides". Further, "in appraising a project that will involve pest management, the Bank assesses the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. As necessary, the Bank and the borrower incorporate in the project components a Work Plan to strengthen this capacity".

31. In line with these objectives, IPMF (i) reviews the proposed aims and activities of the Project; (ii) highlights the anticipated pest and pest management problems in the areas targeted by the Project; (iii) reviews national policies and regulations for dealing with these pests; (iv) reviews the country's pest management practices including its experiences with IPM; (v) outlines a Work Plan for applying IPM to improve the effectiveness and safety of pest management under the proposed Project (ie to be specified in a specific Integrated Pest Management Plan IPMP); and (vi) sets out an overview monitoring and evaluation plan to be detailed withinthe IPMP.

32. The preparation of this IPMF involved literature reviews, consultations with relevant government departments, and consultations with farm communities.

33. The preparation of this document also involved consultations with regional and district officials in the targeted areas to review the project plans and pest management challenges. An inventory of common pest problems in the project sites, and the practices commonly used by farmers to control these pests was undertaken, discussed and compared with adoption data available in the literature.

2 DESCRIPTION OF THE PROJECT

34. The MOSAP II Project is designed to address two critical constraints to agricultural development in Angola. First, it is designed to increase agriculture institutional capacity through training programs, both nationally and in the project areas. Second, it is designed to address critical bottlenecks in the value chain, including extension, irrigation, production and post-harvest value addition, and market linkages of selected crops.

35. The project will be implemented over a period of five years, from April 2016 through June 2021. The total project cost is estimated at US$95 million, of which US$20 million equivalent will be in-kind and cash contributions from the Government of Angola and US$5 million equivalent will be in-kind and/or cash contributions from project beneficiaries. A US$70 million IBRD loan will constitute the remainder of the total project cost.

36. The MOSAP II builds on the experience gained under MOSAP, from which it differs in the following important aspects: (i) it is larger in scope in terms of absolute funding and number of beneficiaries; (ii) it includes a subcomponent to support development of small-scale irrigated agriculture; (iii) in addition to food crops (maize, cassava, beans, and Irish potatoes), it emphasizes the production of high-value crops, particularly vegetables; and (iv) it further strengthens commercialization of agriculture, including market linkages and contract farming. The proposed project has three components: Component 1- Capacity Building and Institutional Development; Component 2- Support for Increased Production and Commercialization; and Component 3- Project Management, Monitoring, and Evaluation. Details are provided in Annex 2 of the Project Appraisal Document (PAD).

2.1 Project Development Objective

37. The Project Development Objective (PDO) is to increase smallholder agricultural productivity, production and marketing in the project areas.

2.2 Project Components

38. The Project has three components: (i) Capacity Building and Institutional Development; (ii) Support for Increased Production and Commercialization; and (iii) Project Management, Monitoring and Evaluation.

Component 1. Capacity Building and Institutional Development

39. The objective of this component is to strengthen the technical, institutional, managerial and marketing skills of 150,000 of which 25,000 beneficiaries are expected to receive investment under Component 2 after graduation. All farmers seeking support under this project must first organize themselves into farmer organizations (groups, associations or cooperatives). As part of this process, the capacity will also be strengthened for government

agricultural extension specialists, agricultural research institutions, private agricultural service providers and NGOs related to different aspects of the project, including value chain. The expected results are: (i) smallholder farmer organizations established and strengthened; (ii) technical and managerial competence of smallholder farmers improved; and (iii) government capacity to support smallholder agricultural production and commercialization in the project area enhanced. Out of them, selected and qualified beneficiary smallholder farmer organizations will also be eligible for investment support under component 2. This component entails the following three sub-components.

40. **Subcomponent 1.1: Strengthening Capacity of Smallholder Farmers and Farmers' Organizations through Farmer Field Schools.** The capacity of smallholder farmers and farmers' organizations will be strengthened in all critical aspects related to agriculture by using and scaling up the Farmer Field School (FFS) initiative that is currently being implemented by FAO, jointly with local ADI/EDA extension service, in the three Provinces to be covered by the proposed project. The FFS training is expected to benefit 150,000 smallholder farmers. The FFS methodology empowers smallholder farmers to set their own agenda and take steps to improve their agricultural knowledge and economic situation. It also includes training of master trainers (mainly EDAs agricultural extension staff), who will in turn train other government extension staff and farmer facilitators by using the enhanced and improved FFS curriculum.

41. **Subcomponent 1.2: Institutional Strengthening of Local, Provincial and National Units of the Ministry of Agriculture.** The second sub-component aims to strengthen the institutional capacity of MINAGRI at the national and decentralized levels to provide the complementary services needed for MOSAP II farm level investments in the critical areas of agricultural extension, irrigation services, market information, agricultural statistics and policy analysis. Investments would take place at national level and in the provinces and municipalities where MOSAP II will operate. Investments under the sub-component are designed to: (i) expand the regular collection and dissemination of data on crop forecasts, crop production, prices and other market information – particularly in the MOSAP project area; (ii) strengthen platforms for discussing relevant policy issues that may arise as part of MOSAP II implementation; and (iii) strengthen extension service delivery and technical backstopping to farmers by building capacity at ADI (provincial level) and EDA (municipal level), both of which are constrained by a lack of technical knowledge among front-line staff, limited mobility, and poor infrastructure.

42. **Subcomponent 1.3: Strengthening Capacity and Global Knowledge to address Emerging Research Problems.** The third sub-component aims to strengthen the capacity of Angola's national and provincial level agricultural research system to expand access to technologies that increase farm production and productivity. This would include focusing on scaling up the availability of improved technologies within Angola for MOSAP II supported farmer organizations, filling technical knowledge gaps around priority cropping systems within the MOSAP II project area, and bringing in new knowledge and technologies available within the region or globally, where appropriate. Special attention is paid to crops and technologies preferred by women.

Component 2: Support for Increased Production and Commercialization

43. This component would provide demand-based investment support to farmer organizations currently engaged in production and wanting to rehabilitate/develop irrigation schemes or engage in agricultural value chain activities. This support would be provided by experienced and competent service provider to be hired by the project. Eligibility criteria for investment support may vary according to the type of support required, as described below, but eligibility for each subsequent investment would be contingent on satisfactory performance in the previous phase.

44. **Subcomponent 2.1: Provision of Technical Support:** The implementation modalities for providing technical support includes the contracting of an experienced and competent service provider to undertake initial feasibility work for investment support, to undertake pre-identification and community mobilization (including the establishment of water user associations) work, to complete designs for the small scale irrigation schemes, to help prepare all the sub-project proposals for investment support as part of the project's matching grants initiative, to ensure the environmental and social sustainability for the proposed sub-project proposals (in accordance with the World Bank's safeguard policies), and to monitor the performance and supervise implementation of all the sub-projects under investment support. The service provider will also ensure that improved technologies and skills are available to smallholder farmer organizations and their members such that the sub-project proposals are economically, financially, socially and environmentally viable and sustainable.

45. **Sub-component 2.2: Provision of Investment Support.** The menu of investment support options will be flexible but the eligibility criteria will be strictly followed. The farmer organizations and enterprises may be eligible for the following 4 different investment support options: Investment support for production only, Investment support for value chains/marketing only, Investment support for production and value chain/marketing and Investment support for irrigation, production and value chain/marketing.

Component 3: Project Management, Monitoring and Evaluation

46. The third component will finance management, coordination and monitoring and evaluation of the project and consists of two sub-components:

47. **Sub-Component 3.1: Project Management.** The purpose of this sub-component is to ensure that the project is implemented correctly, on time and in accordance with the Loan Agreement. This would be the responsibility of a Project Coordinator and a small team of experts located at the national, and provincial or municipal levels. Financing will be provided to support project coordination activities, including planning and budgeting, management and administration, monitoring and evaluation, safeguards compliance, and national and provincial engagement. If necessary, Government counterpart resources will be used to pay

staff-related costs not eligible for IBRD funding. The final arrangements for project management will incorporate the lessons learned under MOSAP.

48. **Sub-Component 3.2: Project Monitoring and Evaluation.** The monitoring and evaluation (M&E) system will be established that will be responsible for collecting and processing appropriate information to monitor project performance and measure the output, effect and eventually the impact of project activities over time. Baseline information will also be collected at the beginning of project implementation.

2.3 Organization and Implementation Arrangements

49. At the national level, the project will be implemented by the Ministry of Agriculture (MoA), with appropriate support from national and international consultants (such as FAO) as well as NGOs. Although it has limited capacity, the MoA is currently implementing the MOSAP Project with Satisfactory rating. MOSAP had serious implementation issues at the beginning due to weak implementation and fiduciary capacity.

50. The lessons learned from MOSAP experience will be used to strengthen the implementation arrangements for MOSAP II. Capacity building and institutional development at the local and national levels will be among the major contributions of MOSAP II for agricultural development in Angola in the medium to long-term. MoA will be responsible for the overall implementation of the project, in consultation with the other Ministries at the national level that are involved, in order to ensure that the project activities are consistent with national policies. A Project Coordination Committee (PCC), chaired by the Minister (or, by delegation, the Secretary of State of Agriculture) will have the overall decision making responsibility regarding the management of the project, including approval of work plans and budgets. The Director General of ADI (within MoA) will be the executive level manager of the project. A Project Implementation Unit (PIU), headed by a Project Coordinator will be established within ADI and charged with (national level) day-to-day management of the project. A small executive Project Implementation Sub-Committee (PISC) of the PCC will be established to speed-up decisions and procedures. At the local level, project implementation will be guided by Local Government Authorities working through the District Agricultural Offices. Each district will be responsible for procurement, contract administration, supervision of project activities, and reporting on progress for sites under its jurisdiction.

51. At the provincial level, the Agriculture Development Institute (ADI) will be responsible for project implementation, in coordination with the Provincial Directorate of Agriculture and in consultation with other provincial government agencies as well as provincial level representatives of the other Ministries that are involved. A Provincial Project Coordination Committee (PPCC), chaired by the Vice-Governor responsible for the economic development, will oversee project implementation, including monitoring local project progress and making decisions in line with the objectives and institutional arrangements consistent with the project document and legal agreements. The Provincial

Director of ADI will be responsible for project implementation. A Provincial Project Implementation Unit (PPIU), headed by a Provincial Project Coordinator will be established within the provincial ADI and charged with (provincial level) day-to-day management of the project. A small executive Provincial Project Implementation Sub-Committee (PPISC) of the PPCC will be established to speed-up decisions and procedures.

52. At the local level, the Agricultural Development Office of ADI (EDA) will be responsible for project implementation, in coordination and consultation with the Municipal administration. The EDA will obtain the consent of the Municipal administration before forwarding sub-project proposals to the provincial level. Given the nature of the project, implementation at the field level is extremely important. However, the administrative and technical capacities at these levels are generally very weak. It is for this reason that the project will assist in capacity building of the EDAs, put technical assistance at the disposal of the EDAs, and engage services providers to assist the EDAs in their work related to project implementation.

3.0 MOSAP II TARGETED REGIONS

53. The project area is expected to cover 80 communes, which are part of 25 municipalities in the three Provinces of Bié, Huambo and Malanje. The population census of 2014 estimates that the three provinces have a total population of 4.2 million representing about 17.2 percent of the total population in Angola[1]. The total number of rural households in Angola is estimated to be 1.8 million. Almost one quarter of these, about 440,000, live in the project area. An estimated 175,000 rural households (with a total of about 0.875 million people) are expected to be direct project beneficiaries. The project beneficiaries thus account for 40% of all the rural households in the three provinces and for nearly 10% of all rural households in Angola (Table 3.1).

Table 3.1. Project areas

Provinces		**Municipalities**	**Communes**
Bie	1	Andulo	Headquarter Commune
	2		Cassumbe
	3		Caluncinga
	4		Chivaulo
	5	Catabola	Headquarter Commune
	6		Sande
	7		Caiuera
	8		Chiuca

[1] Anon. 2014. Censo 2014: Resultados preliminaries do recenseamento geral da populacao e da habitacao de Angola 2014.

	9		Chipeta
	10	Chinguar	Headquarter Commune
	11		Cangote
	12		Cutato
	13	Camacupa	Headquarter Commune
	14		Ringoma
	15		Umpulo
	16		Muinha
	17		Kuanza
	18	Kuito	Kunje
	19		Chicala
	20		Cambandula
	21		Trumba
	22	Nhareia	Headquarter Commune
	23		Gamba
	24		Cayeye
	25	Chitembo	Headquarter Commune
	26		Cachingues
	27		Mumbue
	28		Mutumbo
Target area of Bie		**7**	**28**
Huambo	29	Bailundo	Bimbe
	30		Hengue
	31		Luvemba
	32		Comuna Sede Bailundo
	33		Lunge
	34	Londuimbali	Headquarter Commune
	35		Cumbila
	36		Galanga
	37		Alto Hama
	38		Ussoque
	39	Mungo	Headquarter Commune
	40		Cambuengo
	41	Cachiungo	Headquarter Commune
	42		Chiumbo
	43		Chinhama
	44	Chicala Cholohanga	Headquarter Commune
	45		Sambo
	46		Samboto
	47	Huambo	Chipipa
	48		Calima

	49	Caála	Headquarter Commune
	50		Calenga
	51		Cuima
	52		Catata
	53	Ekunha	Comuna Sede Ecunha
	54		Tchipeio
Target area of Huambo		**8**	**26**
Malanje	55	Cacuso	Headquarter Commune
	56		Lombe
	57		Quizenga
	58		Soqueco
	59	Kalandula	Kuale
	60		Kota
	61		Kalandula
	62		Cateco Kangola
	63		Quale
	64		kinge
	65	Caculana	Caculama
	66		Caxinga
	67		Muquixe
	68	kiwaba-Nzoji	Mufuma
	69		Kiwaba-Nzoji
	70	Malanje	Cambaxe
	71		N'gola-Luije
	72	Cahombo	Headquarter Commune
	73		Cambo Sunginge
	74	K. Katembo	Headquarter Commune
	75		Talamungongo
	76	Kangandala	Headquarter Commune
	77	Kunda dia base	Headquarter Commune
	78	Massango	Headquarter Commune
	79	Queda	Headquarter Commune
	80		Xandel
Target area of Malanje		11	26
Total of three Target Areas		**26**	**80**

3.1 Bié

54. Bié has an area of 70 314 km² and an aproximated population of 1.794 000 inhabitants. Provincial capital is Kuito, with the following municipalities: Andulo, Camacupa, Catabola, Chinguar, Chitembo, Cuemba, Cunhinga, Kuito and Nharea.

55. Climate is tropical, hot and humid, with two seasons: from October to April (7 months) hot with rains, and from May to September (5 months) dry. During the rainy season, it's common and short dry period that usually takes around two weeks. Temperatures varies between 2ºC and 10ºC in colder months to 18ºC - 25ºC in hotter ones. Annual rainfall in the region is around 1.200 mm to 1.500 mm.

56. Regarding soils it presents a plateau relief, with an average altitude above 1,000 meters (superior, to 1.500m in the SW quadrant), framed in two scenic drives - the Old Plateau and Upper Kwanza. The dominant soils are ferralitic and psamítico.

57. Agriculture is the major economic activity in the Region. Major crops are maize and beans.

3.2 Huambo

58. Huambo has an area of 35.771 Km^2, and a population of 1.890.147. Provincial capital is Huambo, with the following municipalities: Huambo, Bailundo, Caála, Londuimbali, Catchihungo, Ecunha, Longonjo, Ucuma, Chinjenje, Mungo e Chicala Cholonhanga.

59. Average temperature varies between 19ºC and 20ºC, and Annual rainfall in the region ranged from 1.100 to 1.400 mm. The climate is tropical, humid with two seasons like Bié.

60. Regarding soils, most common are ferralitics, with a sandy to argilo-arenosa texture, deep and well drained, with low organic matter and mineral nutrients.

61. Hydric resources are rich in Huambo with Queve, Cunene and Cubango rivers. They offer significate agricultural irrigation potential, beside fishery.

62. Agriculture is the major economic activity, with maize, potato, beans and horticulture as main crops.

3.3 Malange

63. Malanje Province covers an area of 97,602 km^2 and has a population of 968.135 inhabitants. It is administratively divided into 14 municipalities and 37 communes, with the city of Malange as its capital.

64. The weather is humid tropical mesothermic and varies between 20° C and 25° C. The coldest month is June with the hottest months of March and April. There are two seasons: the rainy season that includes the months of August to May and the other, the dry season (cacimbo), the remaining period. Rainfall varies between 900 and 1400 mm/year.

65. The predominant soils in the Province are fersialiticos and pesamiticos, varying in altitude from 500 to 1,500m relative to sea level. It's bathed by several rivers most notably the Kwanza and its tributaries, including: Lucala, Kuije, Malanje, Lutete, Cassamba, and Cuhambaetc.

66. The population consists mostly in smallholder farmers, being cassava and beans the most frequent crops in the region.

4. LEGAL FRAMEWORK AND INSTITUTIONAL CAPACITIES

4.1. Legislative and Regulatory Framework for Pesticide Management

65. Angola has legislation on plant protection and pesticides, which is currently under revision to assure compliance with the International Plant Protection Convention. As a member of the World Trade Organisation (WTO), Angola is required to comply with the international standards within the WTO framework. Phytosanitary measures include all relevant laws, decrees, regulations, requirements and procedures taken by a state in order to protect plant health and prevent the spread of pests. However, the agreement is required to harmonize such measures at international level. Pesticides control is also a considerable concern nationally, with unacceptable maximum residue levels on some agricultural crops for the domestic and international markets. Greater regulation through strengthened legislation will contribute to the judicious application and safe use of pesticides. In accordance with the World Bank Safeguard Policies (OP 4.09 pest management), this pest management framework has been prepared to outline how future sub projects will ensure that they do not engage in unsafe pest management. In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. The Bank may finance the purchase of pesticides when their use is justified under an IPM approach. The procurement of any pesticide in a Bank financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users.

66. Angola's legislation regarding plant heath dates back to 1965, with "Regulamento de Sanidade Vegetal (DSV)", Diploma 3:001. Under this DSV, the pesticide management regulation used in agriculture and veterinary medicine, for private or official entities, must be subject to prior participation of the local health authority (Article. 25th); The Entities that use conditional sale of pesticides are responsible for the implementation thereof, in accordance with the instructions in order to prevent all accidents, both on the staff carrying out the treatments as the consuming public of foodstuffs treated with them (Article 26th).

67. The defense of crops of forest stands and even simple natural vegetation against pests are based on appropriate phytosanitary surveillance at borders or ports of entry, and key measures of internal phytosanitary police. In Angola, the Plant Health Regulation and

Instructions should also be subjected to stored or outstanding products, animals of small agricultural industries, such as bees, of the silkworm and its products, and even the plants classified as harmful. The border surveillance intend to prevent entry into the territory, through import or international traffic, new parasites and pathogens of plants or of such animals. The import and transit in the province of the following products is subjected to the provisions of this Regulation and the Instructions for its perfect execution that is issued by the National Directorate of Agriculture and Forestry, the Plant Health Division of Distribution (Article 1st):

- Plants or its parts, including seedlings, fruits and seeds intended for crop;
- Agricultural and forest products, and others that are potential vectors of parasites or pathogens.
- Insects and other invertebrates at any stage, for industrial purposes or for use in the biological control of pests of plants.
- Plant packaging material of any of the preceding points.

68. The importation of any product such as soil, manure or compounds that serve as vehicles or packaging plants requires that the following procedures must be observed (Article 2nd:

- Advance Licence of plant health, passed by the Plant Protection Division, including plant health certificates, port of entry and authority;
- Whenever the circumstances so justify, the plant product treatments to import at the expense of the importer or consignee and if there is no health risk to the Province or, otherwise, their destruction without the compensation to the importer;
- The presentation by the importer of the plant health certificates issued by the origin does not dispense the formalities plant health inspection at the entrance of the product;

69. The entry of products by any other border point will be refused and should those whose import is attempted against the provisions of the Article 4th /nr3, will be seized and destroyed without compensation for their owners.

70. The entry of plant products, which are part of the passenger baggage, is subject to the provisions of this Regulation, which must be provided of customs import bulletin, that indicate the destination of the products in the case of not being allowed to import (Article 6th).

71. Goods, which, by their sanitary state, the Plant Health Services considere to quarantine, can be imported through the port that works confined testing station. And the importer must present a guarantee for payment of the established fees (Article 8th).

72. Under no circumstances will be allowed in any way the importation of seeds for commercial purposes of retail sale, packed in small quantities packaging. The seeds will be seized shipments whose entry is attempted against the provisions of this article, and relegated to the Judicial Authority of Angola, in case of bad faith, or making false statements (Article 12th).

73. The Plant Protection Division will rawn up lists of plant species designated by their common and scientific names, and products whose imports suits condition according to the phytosanitary provisions. The lists are to be drawn up in two lists. In the lists will be safeguarded whatever is necessary as the fruits and seeds (Article 14th):

- List A will include plant species and products whose importation is prohibited, whatever the origin.
- List B cover species and products whose import is allowed only from certain sources.

74. The transport between regions or through a given area, plant or its parts may be prohibited or subject to restrictions for reasons of plant health. Plants or parts will be seized in transit in the province, carrying insect pests and diseases. Plants or plant parts carrying insect pests and diseases will be completely destroyed (Article 20th).

75. WHO Toxicity Class: The WHO bases its ratings, outlined in the table below, on the lowest published rat oral LD50, the lethal dose (in milligrams of substance per kilogram of body weight) that kills 50% of the test animals in a standard assay (see Table 4.1.1). WHO gives a hazard ranking of 1a (Extremely Hazardous) to the most hazardous pesticide active ingredients. While the WHO ratings generally reflect acute toxicity, they also take into account other toxic effects such as reproductive and developmental toxicity. WHO 1 (1a and 1b) are considered extremely toxic, and they are general rejected for use.

Table 4.1.1 WHO Toxicological Classification

WHO Toxicological Classification		**Rat LD50** (mg of chemical per kg of body weight)			
Class	Description	Solids (oral)	Liquids (oral)	Solids (dermal)	Liquids (dermal)
Ia	Extremely hazardous	≤ 5	≤ 20	≤ 10	≤ 40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	200-2,000	100-1,000	400-4,000
III	Slightly hazardous	> 500	> 2,000	> 1000	> 4,000
IV	Unlikely to present acute hazard in normal use	> 2,000	> 3,000	---	---

Source: The WHO Recommended Classification of Pesticides by Hazard, 2009.

76. In practice, the majority of classifications will be made on the acute oral LD_{50} value. However, dermal toxicity must always be considered since it has been found that, under most conditions of handling pesticides, a high proportion of the total exposure is dermal. Classification based on dermal data in a class indicating a great risk is necessary when the dermal LD_{50} values indicate greater hazard than oral LD_{50} values. It is highly desirable that, whenever practicable, toxicological data for each formulation to be classified should be available from the manufacturer.The detailed precautions necessary for the use of a pesticide depend on the nature of the formulation and the pattern of use and are best decided by a pesticide registration authority when accepting a commercial label (WHO 2009).

Table 4.1.2 Pesticide can be used in Angola and its classification

Chemical Comercial name	Active Ingredients	WHO Toxicological class	Registration Number	Campany
Sevin 5pp	Carbaril	II	IN 001	Agran
Mortein Target Actellic	Pirimifos Metil+ Permetrina	II	IN 002	Syngenta
Soleol M	Óleo de verão		IN 003	Agran
Sevin 85 wp	Carbaril	II	IN 004	Agran
Agror 40 cpe	Dimetoato	II	IN 005	Agran
Demand 2,5 cs	Lambda Cyhalotrina	II	IN 006	Syngenta
Malaton 50 s	Malatião	III	IN 007	Agran
Icon 2,5 cs	Lambda- cyhalotrin	II	IN 008	Syngenta
Selecron 500 ec	Profenofos 500	II	IN 009	Syngenta
Duduthrin 5 % Ec	Lambda cyalotrina	II	IN 013	Goldenagric
Delta	Deltametrina 25 g/l	II	IN 014	Sapec
Malation 5 p	Malation	III	IN 015	Agran
Twigathoate 40% Ec	Dimetoato	II	IN 016	Goldenagric
Twigaphos 48% Ec	Clorpirifos	II	IN 017	Goldenagric
Super Guard Dust	Permetrin + pirimifos-metil	II	IN 018	Agran - Avima
Deltagran 2,5 ec	Deltametrina	II	IN 019	Agran
Larvin 37.5 % sc	Thiodicarbe 375 g/l	II	IN 021	Bayer
Sumigran 50	Fenitrotião	II	IN 022	Agran
Twigacyper 55 Ec	Cypermetrina 50 g/lt	II	IN 025	Goldenagric
Dynamec 018 ec	Abamectina 18 g/l	II	IN 027	Syngenta
Alpha-Zipper	Alfa-cipermetrina 10%	II	IN 028	Sapec
Confidor 35 sc	Imidaclopride 350 g/l	II	IN 030	Bayer
Confidor 20% sl	Imidaclopride 200 g/l	II	IN 031	Bayer
Actellic 50 ec	500 g/l Pirimifos Metilo	II	IN 032	Syngenta
Pacha	15g/l Lambda- Cialotrina + 20g/l Acetamiprida	II	IN 033	Syrius

Zipper	Cypermetrina 100g/l	II	IN 034	Sapec
Furanpri	Clorpirifos 50 g/kg	II	IN 035	DVA-Agro
Confidor 70 wg	Imidaclopride 700 g/kg	II	IN 037	Bayer
Corsário	Imidaclopride 18g/l ou 17,8%(p/p)	II	IN 039	Sapec
Ciclone 48 ec	Clorpirinfos 48g/l ou 48,4%(p/p)	II	IN 040	Sapec
Leni 50 ec	Deltametrina 50 g/l	II	IN 041	Cegonha
Cigogne c	Cipermetrina 50g/l + Chlorpyrinfos 500 g/l	II	IN 043	Cegonha
Kart	Kartap 500 g/l	II	IN 044	Cegonha
Acamat	Abamectina 18 g/l	II	IN 045	Cegonha
Montaz	250g/kg Imidacloprid + 200g/kg Thiram	II	IN 048	Sirius
Cipclorius	Cipermetrina 50g/l+Chlorpyrinfos 500 g/l	II	IN 049	Syrius
Malation ulv	Malation	III	IN 050	Agran
Desirius	Deltametrina 25 g/l	II	IN 051	Sirius
Antuka	3g/kg Permetrin + 16g /kg Pirimiphos methyl	II	IN 052	Cegonha
Insector	Imidaclopride + Thirame	II	IN 053	Cegonha
Fiprorius 0.3 G	Fipronil 0.3%	II	IN 054	Sirius
Fiprorius 50 sc	Fipronil 50 g/l	II	IN 055	Sirius
Indorius	Indoxacarbe 155%	II	IN 057	Sirius
Biorius	*Bacillus turgiensis* var. kurstakit	III	IN 058	Sirius
Fixe 80	Fipronil 800 g/kg	II	IN 059	Cegonha
Dimetec	Dimetoato 400 g/l	II	IN 061	Sapec
Fitanol	Óleo de verão	III	IN 062	Sapec
Judo Forte	Lambda-Cialotrina 15 g/l + Profenofos 15 g/l	II	IN 063	Sapec

Malaton 5p	Malatião	II	IN 066	Sapec
Poney	Acefato 75%	II	IN 068	Sapec
Fastac 100 ec	Alfa cipermetrina 100 g/l	II	IN 069	Basf Agromundo
Zipper 200	Cipermetrina 200 g/l	II	IN 070	Sapec
Decis Forte 10% ec	Deltametrina 100 g/l	II	IN 072	Bayer
Acamat Super	Piridabena 150 g/l	II	IN 073	Cegonha
Boreal	Abamectina 18 g/l	II	IN 075	Sapec
Regentway 20% sc	Fipronil	II	IN 076	Agroway
Acarius	Abamectina 18 g/l	II	IN 078	Syrius
Actellic 50 ec	Pirimifos Metilico	II	IN 080	Agran
Insectido 5 Ec	Lambda cialotrina 50 g/l	II	IN 082	DVA Agro GmbH
Actellic 1 p	Pirimifos Metilico	II	IN 084	Agran
Binferius	Binfetrina 100 g/l	II	IN 085	Sirius
Karate 5 ec	Lambda- Cyalotrina	II	IN 086	Syngenta
K-othrine wg 250	Deltamentrina 250 g/kg	II	IN 087	Sheba (Bayer)
Matacarius	Hexitiazox 50 g/l	U	IN 088	Sirius
Cyperin	Cipermetrina 200g/l	II	IN 089	Agrom) Plaskem
Bastião 3 G	Imidaclopride 30 g/kg	II	IN 092	Cegonha
Sevin 25 ulv	Carbaril	II	IN 094	Agran
Sumigran ulv	Fenitrotião	II	IN 096	Agran
Fixe 50 Ec	Fipronil 50 g/L Ec	II	IN 097	Cegonha
Moran 150 Ec	Indoxacarbe 150 g/l Ec	II	IN 098	Cegonha
Ferticlopride	Imidaclopride 200g/l	II	IN 101	Fertiangola
Fertiphos	Clorpiriphos 480g/l	II	IN 102	Fertiangola
Fertimectina	Abamectina	II	IN 103	Fertiangola
Ferticiper	Cipermetrina 100g/l	II	IN 104	Fertiangola
Abamate	Abamectina 18g/l	II	IN 105	Taurus

Judo	Lambda cialotrina 100g/l	II	IN 106	Sapec
Falathion 570 Ec	Malatião 600g/l	III	IN 107	Fertisem
Lalotrina 5% Ec	Lambda cyhalotrin	II	IN 111	Globalway
Primeiro 35%Sc	Imidaclopride	II	IN 112	Globalway
Regentway 80% WDG	Fipronil	II	IN 113	Globalway
Karapri EC	Lambda cyhalotrin 50 g/l	II	IN 114	DVA - AGRO
Termidor 25	Fipronil 25 g/lt	II	IN 115	Agromundo-Basf
Deltapri	Deltametrina 25 g/lt	II	IN 116	DVA Agro
Fertialfa	Alfa-cipermetrina 100g/l Ec	II	IN 117	Fertiangola
Fertidelta	Deltametrina 50g/l Sc	II	IN 119	Fertiangola
Fertifenil	Dimetoato 400g/l Ec	II	IN 120	Fertiangola
Fertikare	Lambda-cyhalotrin 100g/l Ec	II	IN 121	Fertiangola
Fertithio	Endosulfão 350 g/l Ec	II	IN 122	Fertiangola
Cesarina	Ciromazina 100 g/lt	III	IN 123	Louis Dreyfus
Epicure 0,4%	Abamectina 4g/l 97%	II	IN 125	Agromundo-Nulandis
Regent	Fipronil 80g/kg	II	IN 126	Agromundo
Lambada	Lambda-cyhalotrin 50g/l	II	IN 128	Taurus
Abamec	Abamectina	II	IN 129	Globalway
DiPel Df	*Bacillus thurgiensis* subs israelensis	III	IN 131	Agromundo(sumitomo)
Delta	Deltametrina	II	IN 133	Globalway
Mectina 1,8% EC	Abamectina 18 g/l	II	IN 134	Agromundo Nulandis
Fertipronil	Fipronil 200g/l	II	IN 135	Fertiangola
Dafipri	Dimetoato 40%	II	IN 136	DVA Agro
Lagapri	Indoxacarb 15%	II	IN 137	DVA Agro

Kohinor 350 SC	Imidaclopride	II	IN 138	Dispec
Lamdex 5 Ec	Lambda-cyhalotrin 50g/l	II	IN 139	Dispec
Aceta Star 46 Ec	Acetamipride 16 g/l + Bifentrina 30 g/l	II	IN 141	Dispec
Servus 25 Ec	Deltametrina 25 g/l	III	IN 142	Dispec
Karapri	Lambda cyhalotrin 50g/l	II	IN 143	DVA Agro
Deltapri	Deltametrina 25 g/l	IV	IN 144	DVA Agro

Source: The WHO Recommended Classification of Pesticides by Hazard, 2009.

76. Recently a new national regulation document is being discussed. The Angolan government's environmental strategies, policy framework, and management approaches and priorities are still being developed and will be spelled out in two major documents - the National Environmental Management Program (PNGA) and the National Environmental Strategy (ENA) - both currently under formulation. Responsibility for formulating and implementing environmental policies and programs and for environmental management in Angola lies with the Ministry of Urbanism and the Environment. This includes the promotion of a policy to support environmental and educational processes within the formal, informal and non- formal sectors of education (Safeguard policy /EA OP/BP/GP 4.01).

77. Environmental legislation in Angola was outdated until the early 1990's, when a new State Secretariat for the Environment was established. This new Secretariat developed new strategies and policy approaches leading to the formulation of a 'Lei de Bases do Ambiente' (Environmental Framework Law) which was approved in 1998 by the Angolan National Assembly. The Environmental Law inspired and triggered complementary legislation in a number of sectors - often new versions of outdated laws from the colonial period - which were in accordance with the principles and provisions of the Angolan Constitution and Environment Law. The Environmental Law is applicable to all public or private activities, which may influence the environment either directly or indirectly. The salient features of the Law include the following:

- All projects, the activities of which have implications for communities, interfere with the ecological equilibrium or exploit natural resources that may affect third parties, must be subject to an Environmental and Social Impact Assessment for which Public Consultation is mandatory.
- Projects and operations that are likely to have a negative impact on the environment are required to be subject to an Environmental Impact Assessment by independent assessors
- The environmental impact study
- Licensing of activities that are liable to cause significant environmental impacts shall be required. The issuance of an environmental license shall be based upon an environmental impact assessment.

- 5. The Government will pass legislation to control the production, emission, disposal, transport, importation and management of gaseous, liquid and solid pollutants.
- 6. The law also forbids, explicitly, the importation of dangerous residues or dangerous wastes, except for that laid down in specific legislation passed by the National Assembly.

78. Some potentially applicable sectoral legislation in Angola are presented in the table below:

Table 4.1.3 Some potentially applicable sectoral legislation in Angola

Legislation	**Responsible authority**
Land Use Planning and Urban Development Act, No. 3/04 of 25 June 2004.	Ministry of Environment & Ministry of Agriculture
Local Municipalities Act (Law of Local Authorities), No. 17/99 of 1999	Provincial and local authorities
Local Municipalities Act (Law of Local Authorities), No. 17/99 of 1999	Provincial and local authorities
Foreign Investment Act (Law of Foreign Investment), No. 15/94 of September 23, 1994	Ministry of Planning

Source: SADC Environmental Legislation Handbook 2012.

4.2 Procedures stablished for the use of pesticides.

79. As a member of the World Trade Organisation (WTO), Angola is required to comply with the international standards within the WTO framework. Phytosanitary measures include all relevant laws, decrees, regulations, requirements and procedures taken by a state in order to protect plant health and prevent the spread of diseases and pests. However, in order to prevent such measures becoming disguised restrictions on trade, the WTO SPS Agreement requires harmonizing such measures at international level. Pesticides control is also a considerable concern nationally, with unacceptable MRLs on some agricultural crops for the domestic market. Greater regulation through strengthened legislation will contribute to the judicious application and safe use of pesticides.

80. According to the World Bank financed agriculture operations, pest populations are normally controlled through IPM approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. However, pesticides can be used when their application is justified under an IPM approach. For that reason, the procurement of any pesticide is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. With respect to the classification of pesticides and their specific formulations, the World

Bank refers to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification. It is important to apply criteria to the selection and use of pesticides in IPM projects, including:

- Taking into account the need to prevent the development of resistance in pests.
- To be effective against the target species.
- They negligible adverse human health effects.
- They must have minimal effect on non-target species and the natural environment.
- The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them (World Bank, 2006).

4.3 Other Regulation that establish Environmental Quality Standards and of Emissions and Effluents

81. *The Land Use Planning and Urban Development Act, No. 3/04 of 25 June 2004*: The Act adopts a concept of integrated planning, which not only includes socio-economic aspects but also attempts to create synergies in the relationship between the city and the countryside. It calls for the establishment of a decentralised system to coordinate land use planning. The Act describes a number of principles of water management that the government should put into practice. These include: the right of individuals and entities to access water; integrated management of water resources; institutional coordination and community participation; the harmonisation of the water management policy with land use planning and environmental policies; water as a renewable resource for people; and the relationship between pollution and social and financial issues. It encourages the development of a new administrative policy for the water sector, which includes a decentralised system of control over the use of water, as well as for the protection of water resources and the environment. In the implementation of such a policy, the government aims to achieve a number of objectives, namely to ensure access to water resources; ensure a continuous balance between the availability of water resources and demand; promote research activities and the sustainable use of existent water resources; ensure proper sewage systems; and regulate the discharge of domestic effluents (Walmsley & Patel, 2011).

82. In Angola, the most relevant environmental management and related legal elements are the following:

- The Environmental Framework Law Nr. 5/98 of June 19.
- The Environmental Impact Assessment Decree Nr. 51/04 of July 23.
- The Emission of Environmental Licences Decree Nr. 59/07 of July 13.
- The Land Law Nr. 9/04 de, of November 9.
- The Executive Decree on EIA conformity Nr. 92/12 of March 1.
- The Executive Decree on EIA Public Consultation Nr. 87/12 of February 24.

- Law of Associatios on Environment Protection Nr. 3/06 of January 18.
- Decree on Environmental Auditing Nr. 1/10 of January 13.
- Law on Land Planning and Urbanism Nr. 3/04 of June 25.
- Decree on Rural, Urban and Territorial Planning Nr. 2/06 of January 23.
- Land Law Nr. 9/04 of November 9.
- Regulation of National Parks Nr.10.375 of October 15, 1958.
- Decree on the Protection of Flora and Forestry Resources Nr. 40.040 of January 20, 1955.
- Presidential Decree on Waste Management Nr. 190/12 of August 24.
- Law on the Aquatic Biological Resources Nr. 6A/04 of October.
- Presidential Decree on Water quality for public health, integrated water management and environment protection Nr. 261/2011 of October 6.
- Waters Law Nr. 6/02 of June 21.
- Presidential Decree on General Use of Water Resources Nr. 82/14 of April 21.
- Cultural Heritage Law Nr. 14/05 of October 7.
- General Work Law Nr. 2/00 of February 11.

4.4. Institutional framework for pesticide management

83. There are several agencies, at National and Province levels that will play a key role in ensuring that mechanisms and recommendations provided in the IPMF are effectively implemented. These include the implementing agency, MINAGRI, IDA and the Environment Ministry Provincial Departments, among others.

84. The National Environmental Management Policy (NEMP) (1997) has identified six key major environmental issues in the country. These are land degradation, water pollution, air pollution, loss of wildlife habitats, deterioration of aquatic systems and deforestation.

85. The NEMP requires establishment of sector environmental management Units at each Ministry, with the responsibility of ensuring compliance on environmental matters.

86. All pesticides are poisonous and thus the rules have to be observed to avoid human health impairment and environmental pollution. In addition to material safety data sheet (MSDS) accompanied with any given pesticide, the following general rules will have to be observed:

- Keep only closed original containers with labels.
- Keep pesticides under lock and key in a cool, dry and ventilated place away from fire, food, feed, water and out of reach of children. In the same room also the spraying equipment can be stored.
- Pesticides should be shelved and the floor be of cement to be able to detect leakage and clean it early enough where applicable.
- Equipment for weighing and mixing pesticides should only be used for this purpose and be locked in the store.
- Protective clothing should be used only for spraying purposes.

- Absorb spillage immediately with sawdust or earth; sweep up, burn or bury. Have cement floor for better cleaning.
- Do not re-use empty containers. Empty containers should be burnt if possible or crushed and bury in a sanitary landfill.
- Use a well aerated store and sales room.
- Instruct your personnel on safety precautions before it is too late.
- Make contacts to a qualified physician for emergencies.
- Use of protective equipment and capacity building on pesticide management aspects.

87. The pesticide management regulation used in agriculture and veterinary medicine, for private or official entities, must be subject to prior participation of the local health authority. Entities that use conditional sale of pesticides are responsible for the implementation thereof, in accordance with the instructions in order to prevent all accidents, both on the staff carrying out the treatments as the consuming public of foodstuffs treated with them (Art. 25th and 26th/ RSV/Diploma 3:001, 1965).

4.4. Word Bank Operational Policy on Pest Management OP.09

88. There are ten safeguard policies in the World Bank, created to inform decision-making, ensuring that projects financed by the Bank are environmentally and socially sustainable. These Operational Policies include Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Forestry (OP/BP 4.36), Pest Management (OP 4.09), Cultural Heritage (OP/BP 11.03), Indigenous People (OP/BP 4.10), Involuntary Resettlement (OP/BP 4.12), Safety of Dams (OP/BP 4.37), Projects on International Waterways (OP/BP 7.50) and Projects in Disputed areas (OP/BP 7.60).

89. The World Bank Safeguard Policy on Pest Management, OP 4.09 applies to all Bank lending, whether or not the loan finances pesticides. Even if Bank lending for pesticides is not involved, an agricultural development project may lead to substantially increased pesticide use and subsequent environmental problems. The questions regarding agricultural pest management may be addressed to the Director, Rural Development, and the questions regarding pesticide use in public health projects may be directed to the Director, Health Services. This Safeguard Policy include de list below:

- In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower addresses pest management issues in the context of the project's environmental assessment.
- In appraising a project that will involve pest management, the Bank assesses the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. As necessary,

the Bank and the borrower incorporate in the project components to strengthen such capacity.

- For Agricultural Pest Management the Bank uses various means to assess pest management in the country and support integrated pest management (IPM), and the safe use of agricultural pesticides: economic and sector work, sectoral or project-specific environmental assessments, participatory IPM assessments, and investment projects and components aimed specifically at supporting the adoption and use of IPM.
- In Bank-financed agriculture operations, pest populations are normally controlled through IPM approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. The Bank may finance the purchase of pesticides when their use is justified under an IPM approach.
- For Pest Management in Public Health in Bank-financed public health projects, the Bank supports controlling pests primarily through environmental methods. Where environmental methods alone are not effective, the Bank may finance the use of pesticides for control of disease vectors.
- For Criteria for Pesticide Selection and Use, the procurement of any pesticide in a Bank-financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users.5 With respect to the classification of pesticides and their specific formulations, the Bank refers to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification (Geneva: WHO 1994-95).6 The following criteria apply to the selection and use of pesticides in Bank-financed projects:
  - **a.** They must have negligible adverse human health effects.
  - **b.** They must be shown to be effective against the target species.
  - **c.** They must have minimal effect on nontarget species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them.
  - **d.** Their use must take into account the need to prevent the development of resistance in pests.
- The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank.7 The Bank does not finance formulated products that fall in WHO classes Ia and Ib, or formulations of products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

5. INTEGRATED PEST AND PESTICIDE MANAGEMENT APPROACHES IN AGRICULTURE AND PUBLIC HEALTH

90. Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management. It uses natural predators, pest-resistant plants and other methods to preserve a healthy environment in an effort to decrease reliance on harmful pesticides (Radcliffe et al 2009).

91. As insect pests, pathogens and weeds pose a continuous threat to the yield and quality of production of agricultural commodities, the development of effective management strategies is essential for sustaining productivity and maintaining long-term profitability. An ever-increasing problem in containing pests in recent years is probably the result of dependence on single control tactics employing chemical controls (Radcliffe et al 2009).

92. This clearly highlighted the fact that chemical controls alone will not provide long-term control of pests. Reliance on single control tactics have resulted in environmental degradation, contamination of food products, problems of residues and resistance in target species, thereby seriously impairing the sustainability. It is therefore essential to devise a sound management system that is based on ecological principles resulting in sustainable agricultural production without disturbing the balance of nature. The aim of this new approach is to shift management strategies so that they have less reliance on chemicals and more on the biology of pests and their interactions with crops (Kogan 1998).

93. Thus, ecologically based IPM combining all approaches – physical, cultural, chemical and biological – is the only option for sustaining productivity and maintaining the health of ecosystems. IPM programmes need to be designed in a way to manage pests on the one hand and ensure the build-up of beneficial organisms on the other (Altieri et al 2005). Some of the key issues that need attention are as follows:

- Emphasis should be on understanding the ecological relationships between the host plant and the management practices, such as cultural, biological and host-plant resistance.
- All the components – biological, chemical, cultural and physical – need to be integrated.
- Such programmes should minimize economic, environmental and healths risks and provide sustainability over time.

94. From time to time, researchers have found many ecofriendly alternative methods such as botanical pesticides, attractants and repellents, insect growth inhibitors and biological control. IPM strategies have gained increased attention in recent years as a potential means of reducing commodity losses to pests (Kogan 1998). The development of ecologically based IPM systems that take a broader view of all pests within an agroecosystem context is currently emphasized. This emphasis is being laid more on the ecological principles and their applications in pest-management strategies in the context of whole farming systems

representing a sustainable approach to managing pests combining biological, physical, chemical and cultural tools to ensure favour able economic, ecological and sociological consequences. Thus, new pestmanagement systems must be developed that are effective in the long term, costeffective and not detrimental to human and environmental health (Fox et al 1991).

95. Generally small producers use various methods and techniques in combination, including integrated pest management (IPM) to control the pest and diseases of field crops. These control methods include:

- Traditional or cultural control methods: burning of old crop debris to control stem borer pupae and soil insects, early planting and timely weeding to control Striga weeds and other pest, hand picking and burning blister beetles adults, uprooting Striga weeds before flowering, using repellants and noise devices to scare away village weaver birds.
- Crop rotation, fallowing, good seed and stock selection, seed treatment, recommended spacing and optimum plant population densities, application of recommended fertilizer dosage rates and manures, use of resistant varieties, early harvesting, crop sanitation, burning of old and affected plants, tethering and timely harvesting.
- Physical and mechanical control methods: regular monitoring of pest populations, hand picking, digging of trenches and burying to control hairy caterpillars and armyworms, and use of baits for millipedes. Ploughing to expose grasshopper's egg-pods and pupae of other insect pests.
- The use of chemical should be the last option of control measure. If necessary, should be used selective insecticides to avoid the elimination of natural enemies and negative impacts on the environment and public health.
- Natural compounds from plant sources may have the advantage over conventional fumigants in terms of low mammalian toxicity (not true in all cases), rapid degradation and local availability. Compounds of plant origin can be used only for small-scale applications or for space treatments. Validation studies will be necessary to fully determine the potential for biological controls as replacements for insecticidal protectants, good hygiene in the grain store or storage depot is important in maintaining grain and seed quality (Shadia 2011).
- Use of Neem Powder and Plastic Containers to protect seeds from infestation.
- Use IPM methods combining and integrating more than one methods to control the pest and disease.

96. Research and development of alternative control methods are being disseminated using FFS approach to disseminate appropriate pest and pesticide management practices.

5.1 Pest Problems in Project Crop Production

97. Angola farmers in the project areas face major infestations of pests, including plants-parasites. The main pests, plant diseases, parasitic weeds listed in Tables 1, 2, 3, 4 and 5 below by crop: maize, cassava, bean, potato and vegetables. From the table above the most common diseases and pests in Angola include the following:

Table 5.1.1 Major Pest of Cassava, Sweet potato, Aris potato and Tomato in Angola.

Common Name	**Name of Pest or Vector**	**Crop**
Cercospora leaf spot	*Cercospora visae*	Cassava
Anthracnose fungus	*Collectotrichum gloesporioides*	Cassava
Bacterial blight	*Xanthomonas campestris*	Cassava
Black rot	*Xanthomonas axonopodis* pv *manihotis*	Cassava
Bacterial blight	*Uromyces manihotis*	Cassava
Phytophtora root rot	*Phytophthora* spp, *Risopus nigricans*	Sweet potato
Phytophtora blight	*Phytophthora infestans*	Cassava and Sweet
Fusarium vascular wilt	*Fusarium* spp	Aris potato ant Tomato
Alternaria solani	*Alternaria allii*	Aris potato and Tomato
Phytophthora infestans	*Alternaria* sp	Aris potato and Tomato
Rhyzotonia root rot	*Rhyzotonia solani*	Aris potato and Tomato
Tuber rotting	*Xanthomonas and Erwinia caratovora*	Sweet, Aris potato and To
Powdery scab	*Spongospora* sp	Aris potato and Tomato
Sweet potato vein mosaic virus	*Potyviruses* sp	Sweet potato
Sweet potato yellow dwarf virus	*Begomovirus* sp	Sweet potato
African cassava mosaic virus (ACMV)	*Begomovirus* sp	Cassava
Cassava Brown Streak Virus (CBSV)	Potyviridae	Cassava
Koot-knot nematode	*Meloidogyne* spp	Cassava and Sweet potato
Root-lesion nematode	*Pratylenchus brachyurus*	Cassava
Reniform nematode	*Rotylenchus reniformis*	Cassava

Table 5.1.2 Major Diaseses of Common bean, Cowpea and Maize crops

Common Name	**Name of Pest or Vector**	**Crop**
A anthracnose of common bean	*Colleotrichum lindemuthianum*	Common bean & Cowpea
Alternaria alterante	*Colleotrichum dematium va. truncata*	Common bean & Cowpea

	Phoma exigua var.exigua	Common bean & Cowpea
Dry bean rust	*Uromyces appendiculatus*	Common bean & Cowpea
Leaf spot	*Alternaria tenussina*	Common bean & Cowpea
Cercospora Leaf Spot	*Cercospora cruenta*	Common bean & Cowpea
Septoria leaf spot	*Septoria vignae*	Common bean & Cowpea
Mancha foliar	*Cercospora vignicola*	Common bean & Cowpea
Powdery mildew	*Erysiphe polygoni*	Common bean & Cowpea
Sclerotinia rot, Sclerotinia leaf spot	*Sclerotinia sclerotiorum*	Common bean & Cowpea
Athelia stem rot, Southern stem blight	*Sclerotium rolfssi*	Common bean & Cowpea
Rhizoctonia root rot	*Fusarium solani*	Common bean & Cowpea
Fusarium yellows	*Fusarium oxysporum* sp. *phaseoli*	Common bean & Cowpea
Pythium root rot	*Pythium myriotyylum*	Common bean & Cowpea
Cowpea Mosaic Virus	*Rhizoctonia solani = Thanatephorus Cuccmeris)*	Common bean & Cowpea
Pod and stem blight	*Diaporte phaseolorum*	Common bean & Cowpea
Neotropical soybean bug	*Nematospora* sp & *Nezara viridula (Insect)*	Common bean & Cowpea
Stigmatomicose	*Elsinoe phaseoli*	Common bean & Cowpea
Verrugose (Scab)	*Xanthomonas campestres* pv. *Phaseoli*	Common bean & Cowpea
Murcha bacteriana comum	*Pseudomonas savastanoi* pv. *phaseolicola*	Common bean & Cowpea
Murcha bacteriana aureolada	(= Ps. Syringae pv. Phaseolicola	Common bean & Cowpea
Bean Yellow Mosaic Virus (BYMV)	Potyvirus sp	Common bean & Cowpea
Wheat leaf rust	*Puccinia polysora, Puccinia sorghi*	Maize
Leaf blight	*Helminthosporium turcicum*	Maize

Phyllosticta leaf spot	*Phyllosticta mayis*	Maize
Maize anthracnose fungus	*Colleototrichum graminicola*	Maize
Podridão negra	*Bipolaris zeicola = Helminthosporium carbonum*	Maize
Podridão seca	*Stenocarpella macrospora = Diplodia macrospora*	Maize
Queda do colmo	*Stenocarpella maydis = Diplodia zeae*	Maize
Virus das estrias de milho	Maize streak gemini virus (MSV)	Maize

Table 5.1.3 Major Crop Pest in Angola

Common Name	**Name of Pest or Vector**	**Crop**
Insects		
Whitefly	*Bemisia tabaci* (Vector)	Cassava
Lagarta desfoliante	*Erinnys ello*	Cassava
Broca do haste	*Ata* sp., *Acromymex* sp.	Cassava
Mosca da mandioca	*Siblua pendula*	Cassava
Termites	Termites	Cassava
Piolho	*Cochonilha sp*	Cassava
Gafanhoto elegante	*Zonocerus elegans*	Cassava
Lagarta branca	*Yucca smalliana*	Cassava
Rodents	*Mus musculus* & *Rattus norvegicus*	Cassava
Ácaros da mandioca	*Mononychellus tanajo*	Cassava
Brocas do colmo	*Busseola fusca, Sesamia calamistis* (Lepidoptera: Noctuidae)	Maize
	Chilo partellus (Lepidoptera: Crambidae)	Maize
Brocas da espiga	*Mussidia nigrivenella* (Lepidoptera: Pyralidae)	Maize

Lagarta das searras ou militar	Spodoptera exempta = *Laphygna exempta* (Lepidoptera: Noctuidae)	Maize
Pragas de armazenamento	*Sitotroga cerealella* (Lepidoptera: Gelechiidae)	Maize
	Sitopphilus orizae (Coleoptera: curculionidae)	Maize
Roscas (lagartas)	*Agrotis segetum, A. ypsilon* (Lepidoptera: Noctuidae)	Maize
Pássaros (pedizes, etc.)	*Rhynchotus rufenses*	Maize & Beans
Ratos, Toupeiras	*Talpidae*	Maize & Beabs
Ácaros	*Tetranychus urticae*	Common bean & Cowpea
Besouro da flor	*Mylabris* spp, *Coryna* spp. (Coleoptera: Meloidae)	Common bean & Cowpea
Besouro da folhagem	*Ootheca mutabilis, O. bennigseni* (Coleoptera: Chrysomelidae)	Common bean & Cowpea
Besouro listrado	*Alcidodoles leucogrammus* (Coleoptera: Curculionidae)	Common bean & Cowpea
Cigarrinha verde	*Empoasca dolichi, E. lybica* (Hemiptera: Cicadellidae)	Common bean & Cowpea
Gorgulhos	*Acanthoscelides obtecus & Zabrotes subfasciatus* (Coleoptera: Bricidae)	Common bean & Cowpea
Lagarta caterpilar	*Spodoptera* spp. (Lepidoptera: Noctuidae)	Common bean & Cowpea
Lagarta das cápsulas do algodoeiro	*Helicoverpa (Heliothis) armigera* (Lepidoptera: Noctuidae)	Common bean & Cowpea
Lagarta-das-vagens	*Marura testulalis* (Lepidoptera: Pyraustidae)	Common bean & Cowpea
Lagartas (roscas)	*Agrotis segetum & A. ypsilon* (Lepidoptera: Aleyrodidae)	Common bean & Cowpea
Mosca branca	*Bemisia tabaci* (Hemiptera: Aleyrodidae)	Common bean & Cowpea
Mosca do fejoeiro	*Ophiomyia phaseoli, O. spencerella* (Diptera:	Common bean & Cowpea

	Agromyzidae)	
Pulgão preto	*Aphis fabae, A. cracivora* (Hemiptera: Aphididae)	Common bean & Cowpea
Tripes	*Mgalurothrips sjostedti*	Common bean & Cowpea

Tabela 5.1.4. List of major weeds in Angola

Family name	**Scientífic name**	**Classifier**
	Pteridophyta	
Acanthaceae	*Justiça sp*	
	Dicotyledoneae	
Amaranthaceae	*Amaranthus hibridus*	L.
Asteraceae	*Acanthospermum xanthioides*	DC.
Asteraceae	*Ageratum conyzoides*	L.
Asteraceae	*Bidens biternata*	(Lour.)Merr.&Scherff
Asteraceae	*Bidens pilosa*	L.
Asteraceae	*Bidens steppia*	(Steetz) Sherff
Asteraceae	*Blumea lacera*	(Burm.f) DC
Asteraceae	*Crassocephalum rubens*	(Juss. Ex Jacq.) S. Moore
Asteraceae	*Crassocephalum sarcobasis*	(DC) S. Moore
Asteraceae	*Conyza stricta*	Wild
Asteraceae	*Emilia coccínea*	(Sims) G. Dan
Asteraceae	*Feliaia muricata*	Thunb.
Asteraceae	*Galinsoga parviflora*	Cav.
Asteraceae	*Pseudognaphalim luteo-album*	(L.)
Asteraceae	*Tagete minuta*	L.
Asteraceae	*Vernonia petersii*	Oliv. & Hiern
Asteraceae	*Vernonia poskeana*	Vatke & Hildebrandt
Capparaceae	*Cleome iberidella*	Welw.
Capparaceae	*Cleome monophylla*	L.
Chenopodiaceae	*Chenopodium ambrosioides*	L.
Convolvulaceae	*Ipomea eriocarpa*	R. Br.
Curcubitaceae	*Zehneria racemosa*	Hook.f
Fabaceae	*Caesalpina sp.*	
Fabaceae	*Chamaecrista mimisoides*	L.
Fabaceae	*Crotolaria aculeata*	de Wild
Fabaceae	*Crotolaria anthyllopsis*	Welw.
Fabaceae	*Crotolaria comosa*	Baker
Fabaceae	*Indigastrum costatum*	(Guill. & Perr.)
Fabaceae	*Indigofera subulifera*	Welw.
Fabaceae	*Sesbania pachycarpa*	DC.

Fabaceae	*Tephrosia melanocalix*	Welw.
Fabaceae	*Vigna sp.*	
Lamiaceae	*Leucas martinicensis*	(Jacq.) R. Br.
Malvaceae	*Hibiscus canabinus*	L.
Malvaceae	*Sida cardifolia*	L.
Meniospermaceae	*Cissampelos mucronata*	A. Rich
Oxalidaceae	*Oxalis semiloba*	
Portulaceae	*Portulaca oleraceae*	L.
Rubiaceae	*Calanda rubricaulis*	K. Schum
Rubiaceae	*Oldenlandia herbácea*	(L.) Roxb.
Rubiaceae	*Richardia scabra*	L.
Scrophulariaceae	*Alectra sessiliflora*	(vahl) Kuntze
Solanaceae	*Datura stramonium*	L.
Solanaceae	*Nicandra physoloides*	(L.)Gaertn
Tiliaceae	*Corchorus tridens*	L.
Tiliaceae	*Lasiosiphon sp*	
Tiliaceae	*Triumfetta annua*	L.
Verbenaceae	*Lipia sp*	
Commelinaceae	*Commelina benghalensis*	L.
Commelinaceae	*Commelina purpurea*	C.B. Clarke
Cyperaceae	*Abilgaardia hispidula*	(Vahl) Lye
Cyperaceae	*Cyperus distans*	L.
Cyperaceae	*Cyperus esculentus*	L.
Cyperaceae	*Cyperus rotundus*	L.
Cyperaceae	*Killinga Odorata*	Vahal
Cyperaceae	*Mariscus alternifolius*	Vahal
Cyperaceae	*Mariscus umbellatus*	Vahal
Cyperaceae	*Mariscus cylindristachyus*	Steud
Poaceae	*Cynodon dactylon*	(L.) Pers.
Poaceae	*Digitaria spp*	
Poaceae	*Eleisine indica*	Gaertum
Poaceae	*Eragrotis annualata*	Rendle
Poaceae	*Eragrostis chapelieri*	Ness
Poaceae	*Eragrotis superba*	Peyr
Poaceae	*Hyparrhenia rufa*	(Nees) Stapf
Poaceae	*Melinis repens*	(Willd.)Zizka
Poaceae	*Setaria sphacelata*	(Shumach.) Moss
Poaceae	*Sporobolus pyramidalis*	Beuv

Source: Thesis – weeds – Angola

5.2. Pests found in agriculture and Public Health

98. Pests found in agriculture and Public Health are considered all harmful organisms such as insects, weeds, or microorganisms. The details of the major field pests and diseases of elected crops under this project, including vegetables, maize, potatoes, cassava and beans are listed in table below.

Table 5.2.1 Vegetables

Pests	**Name**	**Portuguese name**	**Recomendations**
	Aceria = *Eriophyes tulipae*	Ácaro do Alho	-Culrural control -Biocontrol -Selective acaricide
	Aculops lycopersici	Ácaro do bronzeado	
	Agromyza sp	Minador	-Cultural control -Biocontrol -Setective insecticide
	Agrotis sp	Lagarta rosca	
	Bagrada picta	Percevejo da couve	-Botanicals -Biocontrol -Resistant varieties -Setective insecticide
	Bemisia spp	Mosca branca	
	Brevicoryne brassicae	Pulgao da couve/repolho	
	Diabroticas sp	Crisomélidos	
	Epitrix sp	Crisomélidos	
	Helicoverpa sp	Lagarta /Broca do fruto	-Cultural control -Strip intercropping -Biocontrol -Pheromone trap -Setective insecticide
	Heliothis sp	Lagarta /Broca do fruto	
	Lariomyza sp	Lagarta mineira	
	Macrosiphum euphorbiae	Afídeos	-Biocontrol -Setective insecticide
	Myzus persicae	Afideos	
	Mylabris occidentalis	Besouro das flores	-Setective insecticide
	Phyllophaga spp	Escaravelho do solo	-Cultural control
	Plutella maculipennis	Teia das couve	-Biocontrol
	Prodenia sp	Lagartas das folhas	-Biocontrol -Selective insecticide
	Solenopsis sp	Formigas	Cultura control -Setective insecticide
	Spodoptera sp	Lagarta dos frutos	-Biocontrol -Selective insecticide
	Trichoplusia sp	Lagarta medidora	
	Thrips tabaci	Trips	-Resistant varieties -Selective insecticide
	Tetranychus sp	Ácaros vermelho	-Biocontrol
Diseases	*Aspergillus niger*	Podridão dos bolbos	-Phytosaniry measures -Cultural control
	Alternaria brassicae	Mancha zonada	
	Alternaria porri	Mancha púrpura	

	Alternaria porri f. sp.dauci	Queima das folhas	-Resistant varietires
	Alternaria solani	Mancha concêntrica/ Pinta preta	
	Alternaria sp	Pinta preta	
	Botrytis sp	Podridão da cabeça	
	Bremia lactucae	Míldio	
	Cercospora capsici	Mancha cinzenta	
	Cercospora carotae	Pinta cinzenta das folhas	
	Cercospora sp	Mancha cinzenta	
	Cladosporium fulvum	Mancha olivácea	
	Colletotrichum capsici	Antracnoses	
	Colletotrichum gloesporoide	Anthracnoses	
	Corynespora melogenae	Mancha da folha	
	Deficiência de Boro	Necroses do fruto	
	Deficiência de cálcio	Necrose ou podridão apical	
	Deficiência de magnésio	Clorose internerval	
	Erwinia carotovora	Podridão mole	
	Fendilhamento longitudinal da raiz	Deficiência de Boro	
	Fusarium sp	Murcha	
	Helminthosporium sp	Mancha da folha	
	Leveillula taurica	Míldio	
	Peronospora destructor	Míldio	
	Phytophtora, Fusarium, Rizoctonia	Damping off	
	Phytophtora infestans	Queima ou Míldio	
	Pseudomonas solanacearum	Murcha bacteriana	
	Puccinia porri	Ferrugem	-Cultural control -Phytosaniry measures -Resistant varietires
	Rhizoctonia solani	Tombamento das mudas	
	Rhizoctonia sp	Aguado dos alfobres	
	Septoria lactucae	Manchas por septoria	
	Septoria licopersici	Pinta da folha	
	Stemphylum botryosum	Mancha amarela das folhas	
	Xanthomonas axonopodis pv vesicatória	Queda das folhas	
	Xanthomonas campestri	Podridão preta/ Queima dos bordes	

Nemathoids	*Meloidogyne* sp	Mal formação da raiz	-Cultural control -Phytosaniry measures -Resistant varietires
	Heterodera sp	Raízes bifurcadas	
Virus	Mosaic Tomato Vírus	Enrolamento do topo	-Cultural control -Phytosaniry measures -Resistant varietires
	Lettuce Yellow Vírus	amarelecimento borde da folhas	

Table 5.2.2 Maize

Pests	**Name**	**Portuguese name**	**Recomendations**
	Sesamia calamistis	Brocas do colmo	-Cultural control -IPM measures -Resistant varietires
	Chilo partellus	Brocas do Colmo	
	Busseola fusca	Broca do colmo/espiga	
	Rhopalosiphum maydis	Afideos	- Cultural control - IPM measures - Resistant varietires
	Aphis gossipii	Afideos	
	Agrotis segetum	Roscas	
	Spodoptera exempta	Lagarta invasora /do colmo / maçaroca	
	Acanthoplus stratiotes	Matirindinde	
	Zonocerus variategus	Gafanhotos	
	Phymateus viripides	Gafanhotos	
	Heliothis sp	Lagarta das espigas	
	Helicoverpa sp	Lagartas das espigas	
	Quelea – quelea	Pássaro de bico vermelho	
	Mastomys natalensis	Ratos	
	Heterotermes sp	Térmitas e Cupins	
Diseases	*Helminthosporium turcicum*	Mancha da folha	-Cultural control -Phytosaniry measures -Resistant varietires
	Helminthosporium maydis	Mancha da folha	
	Ustilago zea = U. maydis	Carvão comum	

	Erwinia sp	Podridão do colo	
	Diplodia macrospora	Podridão seca das espigas e grãos	
	Fusarium spp	Podridão das espigas	
	Sphacelotheca reiliana	Fungão da bandeira	
	Sphacelotheca sorghi	Carvão do sorgo	- Cultural control - Phytosaniry measures - Resistant varietires
	Ustilago sp	Carvão da espiga	
	Puccinia spp	Ferrugem	
	Sclerospora graminícola	Míldio	
	Diplodia zeae	Podridão do caule	
	Podridão escura da Maçaroca		
Virus	Maize Streak Vírus	Listrado da folha	

Table 5.2.3 Potatoes

Pests	**Name**	**Portuguese name**	**Recomendations**
	Agrotis segetum	Roscas	- Cultural control - IPM measures - Resistant varietires
	Myzus persicae	Afideos	
	Macrosiphum solanifolii	Afideos	
	Gnorimoschema operculella	Traça	
	Spodoptera exempta	Lagarta invasora	
	Anoplocnemis curvipes	percevejo das folhas	
	Gonocephalum simples	Escaravelho do solo	
	Tetranychus sp	Ácaros vermelhos	
	Solenopsis sp	Formigas	
	Heterotermes sp	*Térmitas /Cupins*	

Diseases	*Alternaria solani*	Mancha zonada /Pinta preta	- Cultural control - Phytosaniry measures - Resistant varietires
	Phytophthora infestans	Míldio/Requeima / Tizon tardio	
	Pseudomonas solanacearum	Mal murcho	
Nemathoids	*Meloidogyne* spp		- Cultural control - Phytosaniry measures - Resistant varietires
	Ditylenchus spp		
	Heterodera spp		
Virus	Mosaicos causados pelos Vírus A, X, Y (transmitidos por Áfidos)		- Cultural control - Phytosaniry measures - Resistant varietires
	Enrolamento da folha transmitido pelo *Myzus persicae*		- Cultural control - Phytosaniry measures - Resistant varietires
	Necrose do Topo (Vírus de vira –cabeça) transmitido por *Frankliniella* sp		- Cultural control - Phytosaniry measures - Resistant varietires

Table 5.2.4 Cassava

Pests	**Name**	**Portuguese name**	**Recomendations**
	Zonocerus variegatus	Gafanhotos	- Cultural control - IPM measures - Resistant varietires
	Phymateus viripides	Gafanhotos	
	Bemisia tabaci	Mosca Branca	
	Bemisa afer	Mosca Branca	
	Ferrisia virgata	Cochonilhas	
	Aonidomytilus albus	Escamas	- Cultural control - IPM measures - Resistant varietires
	Agrotis spp	Roscas	
	Tetranychus sp	Ácaros vermelhos	
	Mastomys natalensis	Ratos	
	Coptotermes formosanus	Salalé /Termitas	
		Mosca da mandioca	
		Toupeiras	
Diseases	*Mycosphaerella henningsii*	Mancha castanha foliar = Cercospora cassavae	- Cultural control - Phytosaniry measures - Resistant varietires
	Cercospora vicosae	mancha da folha	
	Colletotrichum gloesporoides pv manihoti	Anthracnose	
	Xanthomonas campestri	Murcha bacteriana/ Queima bacteriana	
	Xanthomonas axonopodis pv *manihotis*	Bacteriose/ Crestamento	
	Cassava bacterial blight	CBB	
	Uromyces manihotis	Ferrugem	
	Podridão mole		
	Seca da mandioqueira		
Nemathoids	*Meloidogyne spp*		- Cultural control - Phytosaniry measures - Resistant varietires
	Pratylenchus brachyurus		
	Rotylenchus reniformis		
Virus	CMD- Cassava Mosaic Disease		- Cultural control - Phytosaniry measures - Resistant varietires
	ACMV- African Casssava Mosaic Virus	(Virus do Mosaico das folhas)	
	EACMV- East African Cassava Mosaic Vírus Complex		
	EACMV-ug- East African Cassava Mosaic variante		

	Uganda		
	CMG- Cassava Mosaic Gemmivirus		
	ACMV+ EACMV		
	ACMV+ EACMV-ug		

Table 5.2.5 Beans

Pests	**Name**	**Portuguese name**	**Recomendations**
	Térmitas ou Salalé	Broca da vagem	- Cultural control - IPM measures - Resistant varietires
	Solenopsis sp	Formigas	
	Epicauta sp	Besouro das folhas	
	Prodenia litura	Lagarta das folhas	
	Myzus persicae	Afídeos	
	Mylabris occidentalis	Besouro das flores	
	Omphyomia phaseoli	Minador/ Fendilhamento do caule	
	Agrotis sp	Roscas	
	Acanthoscelides obtectus	Lagarta das vagens	
	Prodenia litura	Lagarta das folhas	
	Aphis fabae/ Aphis cracívora	Pulgão preto do feijoeiro	
	Ootheca mutabilis	Crisomélido das folhas	
	Epicauta velata	Besouro da folhas	
	Bemisia tabaci	Mosca branca	
	Tertranychus sp	Ácaros vermelhos	
	Spodoptera spp	Lagarta das vagens	
	Heliothis spp	Lagarta das vagens	
	Anoplocnemis sp	Percevejo das folhas	
		Gafanhotos	
		Pássaros	
		Grilos	

Diseases	*Cercospora arachidícola*	Mancha castanha	- Cultural control - Phytosaniry measures - Resistant varietires
	Cercospora personata	Mancha preta arredondadas	
	Puccinia arachidis	Ferrugem	
	Alternaria arachidis	Mancha zonada	
	Rhizoctonia sp	Podridão seca da raiz	
	Ascochita sp	Mancha por Ascochita	
	Colletotrichum sp	Anthracnose das folhas	
	Pseudomonas sp	Mancha bacteriana	
	Uromyces appendiculatus	Ferrugem	
	Colletotrichum lindemuthianum	Anthracnose	- Cultural control - Phytosaniry measures - Resistant varietires
	Glomerela cingulata	Anthracnose	
	Alternaria tenuissima	Mancha concêntrica das folhas	
	Phoma sp	Mancha de Ascoshyta	
	Phaeoisariopsis griseola	Mancha angular	
	Erysiphe poligoni	Míldio	
Nemathoids	*Meloidogyne* spp		
Virus		Mosaico comum do Feijoeiro -BCMNV	- Cultural control - Phytosaniry measures - Resistant varietires

5.3 Environmental, Occupational and Public Health Potential Impacts, Mitigation Measures and Monitoring

98. The use of agro-chemicals, especially pesticides, if not properly managed can lead to unwanted consequences to the Environmental, Occupational and Public Health. Uncontrolled use of pesticides produces negative impacts on the human body from the moment they are absorbed, mainly on the skin, the digestive system and on the lungs. Foreseeable risks are related to the following steps: product storage, handling, transportation, dosage during treatments particularly contamination of field agents (applicators) who could be exposed to pesticide effects if instructions related to product utilization standards are not sufficiently applied, use of grazing areas right after treatment, if the populations are not sufficiently informed and associated to preventive control. In recent decades, the dependence on chemical insecticides has led some cropping systems to a high frequency of insecticide resistance, now recorded in more than 500 insect species worldwide, pest resurgence, acute and chronic health problems, environment pollution, and uneconomic crop production. Excessive and indiscriminate use of pesticides endangers the health of farm workers and consumers of agricultural products worldwide (Thomas, 1999).

99. The negative impacts of uncontrolled use of pesticides affect to the environment:

- Modification of the soil microbial flora and pesticide residue content in the soil cause pollution.
- In the surface water, pesticides can cause pollutions and altered pH of water.
- Air poluition.
- Affect biodiversity: pest chemo-resistance, fauna poisoning and mortality, extinction or proliferation of species or group of species, breakdown of the food chain and loss of biodiversity.
- To the human health, pesticides can cause intoxication, poisoning and death

100. The excessive use of agro-chemicals such as herbicides can contaminate the water bodies through run off especially during the rainy season and/or water logging. The over concentration of toxic chemicals in water is a major health risk for the local population and aquatic/fish life. Another source of water pollution may be from the return flow of irrigation water heavy with pollutants and inorganic salts. Draining excess water contaminated with agro-chemicals from the irrigation fields into adjacent water bodies within the project area is also a source of water pollution.

101. Pollution from agrochemicals may also affect aquatic animals in water bodies. A host of animal diseases is associated with the implementation of irrigation schemes. Some of the common diseases are loiasis and brugian among large herbivores and encephalitic in birds. The animals can host vectors, pathogens and viruses, which can be transmitted into human beings by contact or through consumption of contaminated meat.

102. Improper use of pesticides during storage is a concern as pesticide residues. Pesticide containers have been found to be reused at homes. Improper washing or cleaning could lead to harmful consequences where containers are reused as food or drink containers. The population groups at risk include women, children, elderly and rural farmers who are mostly illiterate and principal users of empty containers without proper treatment. An increase in pesticide containers in the project area is likely during the implementation stage and proper collecting system and disposal is required to minimize reuse of containers for domestic activities.

103. Large quantities of obsolete pesticides stocks constitute major risks to human and animal health, and the environment. Storage conditions of this toxic and hazardous waste are most often precarious.

104. The main challenges in crop production are mainly caused by biotic factors (insects, fungi, bacteria, viruses, nematodes, weeds, etc.) as well as abiotic factors (e.g. enviroments factors) elements), and together influence the production losses. In this regard, it is necessary that farmers be trained to acquire the practical knowledge and skills to identify and control these factors, through preventive and curative control strategies including IPM approaches.

105. Under this IPMF, during control of migratory pests using pesticides, training courses should be conducted for spraying teams covering topics including safety in the transportation, handling and spraying application methods and techniques of pesticides, storage, distribution disposal, cleaning of application equipment and empty containers. Applicators are supplied with complete sets of protective gears, with towels and soap (Fox et al 1997). For control of general pests the extension workers are recommend regularly conduct training on safe use of pesticides to minimize the risks associated with pesticide use. Awareness-raising programs and training on IPM techniques and safe use of pesticides shall be inclusive for women and vulnerable groups, since experience show that these are the most impacted persons by pest and pesticides use and storage (Alteri et al 2005). Thus, all important cautions related to the application of pesticides recommended by USAID (2007) for safe use of pesticide must be considered. Also WHO guidelines on the safe use of pesticides as well as follow the relevant World Bank Group Environmental, Health, and Safety (WBG EHS) guidelines, and Angola's legislation regarding plant heath "Regulamento de Sanidade Vegetal (DSV)" for pesticide management regulation used in agriculture and veterinary medicine.

106. Proposal of a monitoring matrix that would highlight potential impacts likely to be caused by the use of pesticides in this project, mitigations proposed and how to monitor the efficiency of those proposed mitigation measures. An example of a table of monitoring matrix is shown below:

Table 5.3.1 Monitoring Matrix for IPM

Pesticide management issue	**Potential impact**	**Mitigation measure**	**Indicators of monitoring**
Transportation and Storage	Accidental discharge, water-table pollution through leaching; Air pollution; Accidental contamination; Inconvenience of populations living in the proximity; Soil contamination.	Appropriate precautionary measures and protective gears worn for protection; Pesticides should be stored properly under lock and key; Compliance to the Legislation;	Number of accidents/injuries caused from inappropriate transportation; Water-table and air quality testing.
Handling Manipulation	Contamination of water sources through washing of containers; Accidental leaks; Soil pollutions through accidental spillage or intentional discharge; Water-table pollution and altered pH; Air pollution; Pest chemo-resistance; Fauna poisoning and modification of the microbial flora; Poisoning and mortality; Manpower reduction and/or biomass; Extinction/Proliferation of species or group of species; Food chain breakdown; Loss of biodiversity.	The operator must follow the instructions written on the label; Protective gears must be wore and follow recommended guidelines; Training of all Actors and Collaborators in Pesticide Management; Pesticides must be properly packaged and labelled according to WHO Standards, and should indicate the content, safety instruction warning and action to be taken in case of accident; The Pesticide should remain in its original container and its label.	Monitoring of exposure levels of pesticide applicators before the season, and regularly during the season, to determine the levels of exposure to applicators to ensure their health and safety; Types and level of use of alternatives to synthetic pesticides; Training number of Actors and Collaborators in Pesticide Management.
Excessive use of chemicals, disposal of containers in rivers and stream, use of non-authorized and/or non-labelled pesticides,	Decrease in water quality for consumption and irrigation; Proliferation of aquatic weeds; Loss of diversity in particular of aquatic species; Increase in soil toxicity.	Application of pesticides properly according to the Regulation (type, labelling and quantity); Promote recycling of pesticide containers; Monitor aquatic biodiversity and weeds. Use ofcultural and biological measures.	Number of farmers using pesticides properly; Number of aquatic weeds; Number of plant resource species (abundance); Patterns of water and soil qualities referred in the regulation; Number of farmers

			using cultural and biological measures;
Excessive use of chemicals, use of polluted water	Poor crop yield; Unacceptable levels of pesticide residues in harvested produce and in the food chain.	Regulatory application of pesticides (type, labelling and quantity); Promote the use of cultural and biological control measures	Productivity per crop; Quality of the product; Number of farmers using alternative non-chemical control measures.
Use of empty pesticide's packages, washed and disposed in rivers, consumption of polluted water, excessive use of chemicals	Poisoning of workers/farmers and detrimental effects on human health; Toxicity to fish.	Promote the recycling of packages; Regulatory application of pesticides (type, labelling and quantity); Monitor aquatic biodiversity and fishing activity; Promote aid training to farmers and extension officers.	Number of farmers recycling containers; Number of packages washed and disposed in the rivers; Patterns of water quality referred in the regulation; Fishing yields; Number of farmers and extension officers trained.
Application without Protective equipment	Increased number of accidents and injuries	Promote the use of protective equipment; Promote training of workers/farmers	Number of workers/farmers using protective equipment; Number of workers/farmers trained; Number of accidents/injuries per season.

Mitigation measure will be taken from WHO guidelines, WBG EHS guidelines, USAID guidelines and Angola legislation, and made specific on a case by case basis within the individual IPMPs to be prepared. The monitoring will be made specific and detailed in the individual IPMPs to be prepared.

5.4 Integrated pest management

111. Integrated pest management (IPM) is a sustainable approach that emphasizes ecosystem-based strategies that result in economical and long-term solutions to pest problems. Control must be considered in terms of both short-term and long-term strategies and objectives. The

short-term objective is most often the immediate removal of the current pest infestation. The long-term focuses on preventing a recurrence of the problem. The objective for IPM practitioners is to minimize risks to human health and the environment from the pest management actions implemented. IPM is a holistic approach that seeks to manage pests by using methods that are effective, economically sound, and ecologically compatible. IPM practitioners base decisions on information that is collected systematically as they integrate economic, environmental, and social goals (Radcliffe at al 2009).

112. Unlike traditional pest control, which relied almost exclusively on pesticides, IPM integrates all possible methods of pest control. The IPM concepts built on the original four components: (i) sampling systems; (ii) thresholds for determining the need for control; (iii) understanding and conserving the biological control capacity of the system; and (iv) the use of selective pesticides when needed. IPM has long been proposed as a more sustainable approach than reliance solely on pesticides and today has evolved well beyond these four components to accommodate a broader range of cultural controls, habitat manipulations and pest-resistant crops (Abrol and Shanka 2012).

113. Agriculture Organization of the United Nations (FAO) still captures the basic concepts of integration of multiple approaches. Broadly, IPM can be defined as 'the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agroecosystems and encourages natural pest control mechanisms (FAO, 2002).

114. Strategic components of IPM essentially set the structure and context of the production system (crop and surrounding landscape) and include decisions such as the choice of crop to be grown, choice of crop varieties, including those with pest resistance traits (conventional or GM), location of fields in relation to other crops or natural vegetation, the timing of planting and the rates of fertilizer to be applied. These are all components that could potentially moderate pest abundance or exposure of the crop to damaging pest densities. These strategic decisions might also include manipulation of the cropping landscape in ways that encourage the overall abundance and diversity of beneficial insects, which might then play a role in pest suppression within the crop. Decisions on these strategic IPM components may be made long before pests actually interact with the crop and, once made, these strategic decisions are essentially irreversible (Abrol and Shanka 2012).

115. Tactical components of IPM are those that form the real-time management of the crop during the growing season. There are many different tactical components that should be applied and these will vary greatly across production systems and pests, but the following are probably common across many:

- Regular crop sampling using well validated and pest-specific sampling systems.

- The use of action or economic thresholds that indicate the point at which pest management interventions are necessary or will be economically relevant.
- Integration of the abundance and impacts of beneficial insects in the crop through pest: predator ratios and so on.
- Augmentative release of beneficial species – predator or parasitoids – as a direct pest-suppression measure.
- The use of biological pesticides or selective synthetic pesticides that do not disrupt species other than the target pest.
- In-season management of nutrients and water to modify crop attractiveness to pests.
- Various cultural practices and tillage that directly impact on pests.

116. The role of IPM needs to be considered in the context of the overall production system. To do this, it is necessary to determine the role of different constraints in the production chain and to define where the greatest gains per unit investment can be made. Therefore, IPM is the farmers' best use of a mix of control tactics that are biologically, environmentally, economically and socially compatible with the farming system and farmers.

117. Farmers base their decisions on their knowledge and perceptions of pests, compatibility with their farming system, and relative advantages in terms of control of pests and yield. The implementation of IPM around the world has been going on for the last four decades, but the uptake of IPM has been slow. In developed countries, the challenge is to reduce the high use of pesticides, while in the developing world, the challenge is to reduce or maintain the low levels of pesticide use. The methodologies and initiatives for implementing IPM vary from country to country, from developed countries to developing countries, and from crop to crop.

118. All the actors involved with agriculture production systems, namely producers (farmers), consumers, researchers, extension agencies, and market and government agencies need to be the part of the IPM innovation system to increase the uptake of IPM.

119. IPM include vailable tools for ecologically sustainable plant health management and some listed above grouped into three types of interventions:

- Habitat management practices, including agronomic those recommended for controlling pests, selection of planting material free of contamination by pests and pathogens, fallow management that can redude undesirable weeds while maintaining desirable for natural enemies refuges.
- Biological control, special the conservation of natural present in the ecosystem, through cultural practices or habitat management that enhance their activity.
- Host-plant resistance, use of plants' characteristics such as antifeedants, repelents and antibiosis. Use bioltecnological tools that enhance the transfer of useful genes within and between plant species, in particular in the areas of resistance development in target pests and gene transfere from transgenic crops to their wild relatives.

120. Angola has strong potential for agricultural production across the country and there are several areas of high potential in the Central highlands (Huambo, Bié and Malange

Provinces). The cropping pattern varies across the agro-climatic regions in the country. The Central Highlands is characterized by a high density of population and a high potential for agricultural production, including cassava, maize, beans, potato and horticulture. However, most of farmers are smallholders, with weak capacity and limited knowledge of improved agricultural practices and technology. The FFS approach to agricultural extension was very effective in enhancing smallholder farmers' capacity to use and generate new knowledge and adopt improved agricultural practices and technology. To ensure the success of this scaled-up of thematically enhanced FFS training that improve dissemination and adoption of appropriate recommented production and protection technologies of maize, beans, cassava, and irish potatoes to the farmers. Collaborative linkages between the project and international IPM groups will help to bring relevant expertise and supporting IPM resources developed elsewhere to strengthen national and local capacity to address pest problems faced by farmers of Bie, Huambo and Malange Provinces, develop a national IPM policy to encourage national and local compliance with international conventions and guidelines on pesticides management and usage.

6. PESTICIDE MANAGEMENT METHODS AND USAGE

6.1. Management methods

121. Farmer's generally response to pest problems through the application of synthetic pesticides based on calendar sprying. The calendar spraying can lead to repeated pesticide application and consequently to health and environmental problems and uneconomic crop production. Recently, IPM based control methods are available to minimize reliance on pesticides and emphasizes the contribution of other control methods (Thomas, 1999). According to the Radcliffe et al (2009), there is a need to careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment.

122. In Angola wide variety of pests and diseases causes economic damage and crop losses mainly on cereals, cotton and vegetable. Despite the availability of other pest control methods, producers heavily depends on chemical pesticides to control pests rapidly and effectively. The Cotton producers used different pesticides in large quantities because of the need to spray three ormore times during the crop cycle. In certain regions of the country are already traditional practices, as crop rotation or intercropping which are efficient in controlling some pests especially insects and fungus, and could be integrated in an IPM approach. Another example is the most common treatment to avoid pathogens that attack seeds by the exposure of seed to sunlight. When seeds are stored in containers, it is common to mix them with ash, cow dung or sand. Smoke treatment is a widespread practice for most seeds. In some areas, crushed eucalyptus or tobacco leaves or crushed hot peppers are used. Weed control is generally achieved through a combination of tillage-seedbed preparation by several passes of the traditional ox-drawn plough (or manually) and subsequent inter-row weed control cultivations in row crops.

123. The current pesticide use pattern indicates that pesticides are not used in the context of IPM. Comprehensive data on pesticides use are not available. Field observations indicate that in general farmers to not use proper protection equipment and reveal limited knowledge and application of safety practices. Therefore, there is the need of regular training on pesticide use for extension services and farmers in order to change in behavior and attitudes towards producers' dependence on pesticides. The IPPM/FFS concept should be adopted on crop production. The process of change is gradual and needs time to achieve it with success. In the detailed IPMP to be prepared for the MOSAP II sub-projects, the selection of pesticides sould be done considering the hazards and risks associated with pesticides, the criteria OP4.09, the target pests to be controled, availability of less hazardous products suitable for the target pests, the IPM strategy adopted and promotion of organic and biopesticides.

6.2 Negative impacts of uncontrolled use of pesticides

124. In recent decades, the dependence on chemical insecticides has led some cropping systems to a high frequency of insecticide resistance, now recorded in more than 500 insect species worldwide, pest resurgence, acute and chronic health problems, environment pollution, and uneconomic crop production. Excessive and indiscriminate use of pesticides endangers the health of farm workers and consumers of agricultural products worldwide (Thomas, 1999).

125. Uncontrolled use of pesticides produce negative impacts on the human body from the moment they are absorbed, mainly on the skin, the digestive system and on the lungs. Foreseeable risks are related to the following steps: product storage, handling, transportation, dosage during treatments particularly contamination of field agents (applicators) who could be exposed to pesticide effects if instructions related to product utilization standards are not sufficiently applied, use of grazing areas right after treatment, if the populations are not sufficiently informed and associated to preventive control.

126. All of these problems are particularly severe in developing countries, where pesticide use is poorly regulated and farmers often lack appropriate information or training (Thomas, 1999). People do not want to have reliance on chemicals and look for alternate strategies for pest control such as cultural, biological and biorational methods.

127. The impacts and risks associated with pesticide management methods and usage are influenced by the factor listed below:

- Transportation -lack of training, inadequacy of transport and emergency preparedness planning.
- Storage - lack of means, deficit in pesticide management training and inadequacy of facilities.
- Handling Manipulation - deficit in training and sensitization.

- Packaging disposal - deficit in training, education, sensitization, and non-availability of disposal facilities.
- Washing of containers - deficit in training, education and sensitization.

128. The negative impacts of uncontrolled use of pesticides affect to the environment:

- Modification of the soil microbial flora and pesticide residue content in the soil cause pollution.
- In the surface water, pesticides can cause pollutions and altered pH of water.
- Air poluition
- Affect biodiversity: pest chemo-resistance, fauna poisoning and mortality, extinction or proliferation of species or group of species, breakdown of the food chain and loss of biodiversity
- To the human health, pesticides can cause intoxication, poisoning and death.

129. Large quantities of obsolete pesticides stocks constitute major risks to human and animal health, and the environment. Storage conditions of this toxic and hazardous waste are most often precarious.

6.3 Assessment of knowledge and practices in pesticide management

130. The new industrial pesticides must be subject to environmental risk assessment to find what risks they may pose before they are actually marketed. Particularly stringent testing procedures are required for biologically active compounds such as pesticides and other biocides, which are deliberately released into the environment with the intention of causing toxic effects. There has been a tendency to carry out testing according to a strict protocol, employing. This fundamental, targeted approach to pesticide design can provide the basis for the discovery of more ecofriendly selective compounds. Small alterations in molecular structure can make the pesticide more selective and less harmful to beneficial organisms. In particular, pesticides can be designed that interact with specific forms of their sites of action that exist in pest species and confer resistance. Thus, in principle, insecticides can be designed that will interact with a particular form of a target site (e.g., acetylcholinesterase, a nicotinic receptor, or a sodium channel) that occurs in a resistant strain of a pest but that is not present, or at low incidence, in populations of beneficial insects (USAID 2007).

131. The sub-project specific IPMP to be developed for MOSAP II will detail the training courses to be conducted for spraying teams (during control of migratory pests using pesticides) covering topics, including safety in the transportation, handling and spraying application methods and techniques of pesticides, storage, distribution disposal, cleaning of application equipment and empty containers. The IPMPs will also set out the requirement for all applicators to be supplied with complete sets of protective gears, with towels and soap (Fox et al 1997).

132. During the control of general pests, the sub-rpoject specific IPMPs will recommend regularly conduct training on safe use of pesticides to minimize the risks associated with pesticide use. Awareness-raising programs and training on IPM techniques and safe use of pesticides shall be inclusive for women and vulnerable groups, since experience show that these are the most impacted persons by pest and pesticides use and storage (Alteri et al 2005).

133. According to the USAID (2007), important cautions related to the application of pesticides are given indications on important cautions for safe use of pesticide as listed bellow:

- Do not buy more pesticide than you'll need for a single season.
- Do not mix more pesticide than you'll need to treat the desired area.
- Do not apply sprays or dusts when leaves and small plants are continually moving because of the wind (this means a wind speed of 4 m/second).
- Do not apply pesticides during the hottest part of the day.
- Do not apply pesticides if you think it will rain within 12 hours.
- Do not eat, drink, smoke, or chew tobacco while applying pesticide.
- Do not carry tobacco, food or drinks with you while spraying.
- Do not get into the path of any spray drift, or let others get in its path.
- Do not try to blow out a plugged nozzle with your mouth.
- Do not keep working if anyone shows signs of pesticide poisoning (start first aid immediately).
- Do not wash contaminated clothes with any other clothing.
- Do not let water from washing contaminated clothes or equipment get into streams, ponds or wells.

7. GUIDELINES FOR THE PREPARATION OF SPECIFIC IPMPs

134. The preparation of specific IPMP for the sub-projects is a key tool for the promotion use of environmentally friendly practices (hygienic, cultural, biological or natural control mechanisms and the judicious use of chemicals) in pest control. They will set out the safe, effective, socially and environmentally sound pest management systems to be adopted for that sub-project; and provide a source of appropriate support and recommendations, for example from relevant WBG EHS Guidelines and the WHO guidelines for safe pesticide use. The IPMPs will ensure the compliance with regional standards laws and regulations, with World Bank safeguard policy OP 4.09, and with USAID requirements on pesticides procedures.

135. The preparation of specific IPMPs will strengthened the synergies with the programs, activities and on-going initiatives on pest and pesticide management, and clarify the expectations and responsibilities of different actors concern, and ensuring their effective participation in all the programs. To enhance the effective participation of all actors and

stakeholders, in the implementation of activities and their responsibilities, the activities of Research and Extension Phase for the preparation of the specific IPMPs are defined with output indicators (Table 7.1).

Table 7.1 Key activities for the preparation of specific IPMPs

Activities	Envolved actors	Responsability	Output indicator
Planning workshop for Annual Work Plan (Research & Extension).	Agriculture, NGOs, Farmer & and farmer Organizations, Environment, Health, Private Sector.	To participate in the development of the plan.	Annual Work Plan developed.
Training of pesticide applicators.	The Plant Protection Services and NEMP.	The Plant Protection will conduct the training and NEMP will coordinate the.Training.	All stakeholders involved in the ADI research programs trained.
Research and Extension activities.	Department of Agriculture, Farmer Organizations and Private Sector, NGOs	To participate in the participatory research process.	ADI transfer technology to farmers and agriculture for adoption and dissemination
Procurement of Inputs	The Private Sector of pesticide importation	Provision of Agricultural inputs for research.	Timely availability of input enhanced
Pesticides management (Research & Extension)	Specialized Analyst Laboratories (Plant Protection, NEMP, Health, Water Resources).	NEMP will conduct pesticide formulation test and monitor storage and disposal; pesticide residue analysis. monitor water quality, and conduct soil analysis	Specialized Analysis Reports will be submitted
Monitor Exposure Level of pesticide applicators (research &extension)	Health	Health – monitors the health of pesticides applicators before and regularly during the season	Reports of level of exposure available and safety of applicators enhanced
Internal and external monitoring of trails. (Research & Extension).	ADI/EDA, NEMP and Health	ADI will conduct internal monitoring research developmental stages. NEMP and Health will conduct external monitoring of research developmental stages.	Reports available from all Actors
Monitoring and evaluation of Research Phases	Farmer Organizations, NGOs, Private Sector, MoA and WB	Conduct national monitoring and evaluation mission (periodic, mid-term and final evaluation).	Valuation reports submitted.
Training on IPPM /FFS.	MoA/ EDA, PPIU, FAO.	Conduct IPPM and IVM.	Reports submitted.

136. The research program activities testing pest control products or techniques and agricultural technologies will incorporate the following relevant activities:

e. Institutional Measures

- Establish a National Multi-Sectoral Coordination, Steering and Monitoring Committee involving relevant institutions and stakeholders (e.g. DSV and NEMP).
- Conduct a National Workshop to share the Integrated Pesticide Management Plan (IPMP).
- Conduct national planning workshop for development of Annual Work Plan and Budget
- Conduct mid-term and external evaluations.

- Strengthened National Laboratories with essential needs to perform services.
- Support for mobility for DSV, NEMP and Health, to enhance the implementation program activities.

f. Legislative and Regulatory Measures

- Support the harmonization of national Legislation with the Regional level.
- Expedite the Enactment of the Draft Plant Health Legislation for harmonization if required

g. Technical Measures

- Established and harmonize Pesticide Management Database.
- Support research and development of biological control, alternative control methods and demonstrations on the use of biopesticides.
- Training on Pesticide Management for actors and stakeholders involved in the implementation of participatory research and extension phase programs.
- Conduct test to determine exposure levels of pesticide applicators.
- Conduct sensitization and awareness campaigns on pesticide use and management in all the research intervention areas.
- Support for pest and disease monitoring and control for crop and storage pests.
- Strengthened Institutional Human Resource Capacity in Pest and Pesticide Management.
- Support for surveillance of vector borne diseases and control and long lasting insecticide treated bed nets.
- Capacity building of farmers and extension agents on IPM using the FFS approach.

8. CAPACITY BUILDING AND THE ACTION PLAN FOR INTEGRATED PEST AND PESTICIDE MANAGEMENT

137. Angola has not yet implemented a Pest and Pesticide Management Plan. The Plant Protection and Health Services (eg. DSV and NEMP) is the national institution recommended to implement the plan and achieved its objectives. The Project Implementation Unit (PIU) is responsible for coordinating the preparation of the IPMPs and will recruit a Project Manager/ Consultant with Pest Management background to ensure its effective implementation. The ADI/EDA, Health and Enviromental Services will work closely with the Project Implementation Unit (PIU) in the target Provinces of Project, and the knowledge gained will be shared with DSV and NEMP. It isexpected that this IPMP will cover the target selected crops (Vegetables, Maize, Potatoes, Cassava and Beans), which are targeted for Research and Dissemination by ADI/EDA under Angola Smallholder Agriculture Development and Commercialization Project.

138. The IPMPs will build on, and to some extend strengthened existing national capacities for the promotion of IPM, for the duration of the MOSAP II, and ensure compliance with the World Bank Safeguard Policies on Pest Management OP4.09. The IPMPs will address the Project needs to monitor and mitigate possible negative impact of any increase in the use of agrochemicals, particularly chemical pesticides by promoting ecological and biological control of pest management. The EDI/PPISC/PPIU will provide the support to the establishment of national data banks, monitoring system of pesticides poisoning and

Monitoring/Evaluation (periodic; mid-term and final evaluation), through co-ordinating the feedback obtained from the implementation of the IPMPs. Key information to be obtained to ensure the effectiveness of the monitoring feedback are set out below.

8.1 Priority issues identified

- Activities:

- Record stakeholders' overviews on crop and livestock pests.
- Conduct field diagnosis to specify pests that undermine fadama agriculture.
- Identify farmers' coping mechanisms and researcher recommended IPM options against the pests.
- Develop and explain historical profile of pesticide use and other pest control practices in the fadamas.
- Specify partnership opportunities at local, national and international levels to assist in the implementation of the PMP

- Milestones:

- Pest problems diagnosed and related IPM opportunities identified.
- Potential constraints farmers may face in the use of the technologies specified.
- Pest lists including quarantine pests and alien invasive species developed.
- Potential for improving existing pest control practices assessed.
- Pest monitoring schemes for early warning on alien invasive species and migratory pests are organized and functional.
- Action plan for location-specific IPM activities developed.
- PMP implementation mechanism developed by each specific location.
- Strengthening National Capacity in Promoting the adoption of IPM practices
- Training vegetable producers in pesticides management
- Strengthening national regulatory frameworks and institutional capacities
- Integrated Vector Management: surveillance of disease Vector populations in the country.
- Participatory Research and Development of IPM
- Coordination and inter-sectoral cooperation
- Monitoring and evaluation – environmental and sanitary impact control

- Performance indicators

- Type and nature of participatory methods for problem analysis.
- Documented information on the status of pests and natural enemies of pest and pollinators in fadama agriculture.
- Inventary of alien invasive species and quarantine pests.
- Types and availability of natural enemies for use in biological control of named pest.
- Types and availability of microbial pesticides and botanical pesticides to replace chemical pesticides (hannful pesticide regimes replaced by environmentally friendly alternative).
- Type and number of crop rotation schemes to reduce build up of named pest species.

- List of principal actors and of partners.
- Assumptions and risks related to social, economical and political situation remain stable.

- Strategic actions and measures to mitigate risks:

- Type and nature of participatory methods for problem analysis.
- Workshop for sharing and dissemination of the IPMP with national actors and stakeholders.
- Building capacity of farmers in IPPM and IVM activities in all Research and Extension intervention sites.
- Harmonize Pesticide Legislation with current regional legislations.
- Build capacity of actors and stakeholders in pesticides management, and FFS Village-Based Facilitators.
- Provide essential support to Analysis Laboratories (NEMP, ADI and Water Quality) to enhance the implementation of Project activities.
- Support monitoring of pest and diseases of agricultural and public health importance.
- Support to the National Muti-Sectoral Monitoring, Coordination and Steering Committee to enhance the timely implementation of their activities.
- Procurement of pesticides and inputs for ADI, to implement research and extension activities.
- Develop and establish a Pesticides Management Database.
- Develop IPM Database in Extension Information System for Producers and Extension Agents.
- Support for Sensitization Awareness Campaign on pesticides management and its related aspects.
- Procurement of Personal Protective Equipment and Cholinesterase Test Kits.
- Strengthening of Institutional Human Resource capacity in Pest and Pesticide Management.

139. The expected results of these activities is to develop a common understanding of key pest problems and agree on corrective action by membees of ADI and other relevant stakeholder groups. Government and development partners remain commited to international conventions and guidelines on safe use of pesticides. Critical mass of staff trained remain within the Bie, Huambo and Malange cornunities.

8.2 Strategy for intervention and pesticide management action plan

140. The strategy for intervention and pesticide management action plan will focus on developing and sustaining institutional and human capacity to facilitate informed decision making by farmers, and empower farmers to integrate scientific and traditional knowledge to solve location-specific problems, and respond to market opportunities. Poor communication

between farmers, extension agents and researchers has often led to poorly-targeted research or to poor adoption of promising options generated by research. The full benefits of investments in agricultural research thereby remain' untapped under these circumstances. Farmer participatory research and participatory learning approaches in capacity building efforts help to bridge this gap and make research results more understandable and useful by farmers. This is particularly the case in knowledge intensive disciplines such as IPM. In IPM, there is the need for farmers to accurately identify and diagnose pests and pest problems, understand trophic relationships that underpin biological control opportunities, and use such knowledge to guide pesticide and other kinds of interventions. Through the participatory approaches, MOSAP II will build local capacity to ensure rapid spread and adoption of ecologically sound and environmentally friendly management practices in Bie, Huambo and Malange communities. The farmers will learn biological and ecological processes underpinning IPM options, and use the newly acquired knowledge to choose compatible methods to reduce losses in production and post-harvest storage.

141. The diagnosis of pest problem and IPM opportunities will provide baseline information that will enable to develop a shared vision on felt needs and IPM strategies. Through informal interviews, field visits, and planning meetings, MOSAP II stakeholder groups will develop joint understanding of the key issues affecting production and develop a common IPM plan based on agreed concerns.

142. Strategy for intervention and pesticide management action plan starts from the technical guidelines of appropriate measures to mitigate the risk of pesticide use as elaborated below:

- Institutional measures:

- Establish a National Multi-Sectoral Coordination, Steering and Monitoring Committee involving relevant institutions and stakeholders (e.g. The Hazardous Chemicals and Pesticides Management Board).
- Conduct a National Workshop to share the Pest and Pesticides Management Plan.
- Conduct national planning workshop for development of Annual Work Plan and Budget.
- Conduct mid-term and external evaluations.
- Strengthened National Laboratories (ADI, NEMP and Health) with essential needs to perform services for the MOSAP II.
- Support for mobility for EDI/ EDA, PPISC, PPIU and Health, to enhance the implementation program activities.

- Legislative and Regulatory Measures:

- Support the harmonization of national Legislation with the Regional level.
- Expedite the Enactment of the Draft Plant Health Legislation for harmonization if required.

- Technical Measures:

- Established and harmonize Pesticide Management Database.
- Support research and development of biological control, alternative control methods and demonstrations on the use of biopesticides.
- Training on Pesticide Management for actors and stakeholders involved in the implementation of participatory research and extension phase programs.
- Conduct test to determine exposure levels of pesticide applicators.
- Conduct sensitization and awareness campaigns on pesticide use and management in all the research intervention areas.
- Support for pest and disease monitoring and control for crop and storage pests.
- Strengthened Institutional Human Resource Capacity in Pest and Pesticide Management.
- Capacity building of farmers and extension agents on IPM and IVM using the FFS approach.

8.3 Monitoring and evaluation plan

143. The monitoring and evaluation (M&E) of MOSAP II planned activities will be detailed in the IPMPs. Monitoring will be supported by data collection and analysis in order to check whether the implementation of activities is being carried out as expected and to move to immediate adaptation, if necessary. This involves a short-term evaluation activity to help take a real-time action. The frequency of the monitoring will depend on the type of information available, however monitoring will continue throughout the implementation of the action plan.

8.3.1 Monitoring

144. Comprehensive monitoring will be carried out in every Province (Bie, Huambo and Malange) by MOSAP II Coordination Units. It will be organised through periodical field visits. The Monitoring will be coordinated and made available to actors involved in the implementation and who, as much as each of them is concerned, are interested in the monitoring. The coordination of the monitoring and evaluation set out in each IPMP will include:

- Establishment of Multi-sectoral Steering, Coordination, Monitoring and Evaluation Committee. Members will be gathered from the Plant Protection Service, NEMP and Health Services, ADI/EDA, Water Resources, Program, Farmer Organizations, relevant NGOs and Steakholders. The Committee missions will include: organizing a workshop for the preparation of a response strategy and operational action plan; defining the charter of responsibilities for the action plan and its implementation; approving field intervention sites, and coordinating the comprehensive monitoring of the IPMP activities.

- Community monitoring will be conducted by ADI/EDA during the Research Phase and the Extension Phase. During the Extension Phase it will be conducted by Plant Protection Services (DSV), NEMP and Health and Services. The DSV will conduct internal environmental monitoring of the operation sites. The NEMP Services will conduct external environmental monitoring of the operation sites. Health will be responsible for the external health monitoring in operation sites.
- Mid-Term Evaluation will be conducted by a Consultant. To determine the correct development of the IPMP as well as the mid-term results. Donors and beneficiaries will fully participate in this evaluation.
- The External evaluation will measure the effectiveness of the project as well as its performance and to identify lessons learnt. This evaluation will be integrated into that of MOSAP II.

145. Activities that require regular monitoring and evaluation during project supervision missions will be described in the IPMPs and include the following:

- IPM capacity building in membership of Producers, numbers of women farmers who have successfully received IPM training in IPM methods; evaluate the training content, methodology and trainee response to training through feedback.
- Numbers of women farmers that attended the IPM training; assess farmers understanding of the importance of IPM for sustainable crop production.
- Numbers of women farmers who have adopted IPM practices as a crop protection strategy in their crop production efforts; evaluate the rate of IPM adoption.
- Number of crop production systems that is IPM applied by farmers (if the numbers increasing and at what rate).
- How has the adoption of IPM improved the production performance of Producers?
- Major benefits that members of FFSs derive by adopting IPM (increse in crop production, in farm revenue, improvement in the health status of farmers, and improvement in the level of knowhow of before and after adoption of IPM practices).
- Numbers of IPM Networks/FFS operational and types of activities undertaken.
- Extent to which pesticides are used for crop production.
- Efficiency of pesticide use and handling.
- Level of reduction of pesticide purchase and use for crop production.
- Number of IPM sub-projects successfully funded from competitive grants.
- Number of IPM participatory research projects that have been completed.
- Influence of the results of IPM participatory research on implementation of IPM and crop production.
- Overall assessment of activities that are going well, activities that need improvements and remedial actions required.

8.3.1.1 Monitoring indicators

146. The monitoring indicators at level of every Province to be followed during the implementation of both research and agricultural extension activities by Environmental Focal Points (NEMP), Research Scientists, Plant Protection Services (DSV), Environmental Agencies and Health Services for countries are as follows:

- Monitoring during the planning and execution of agricultural research activities, regulatory provisions as well as environmental and social requirements contained in the outline shall be integrated and complied with.

- Monitoring during the extension phase of research projects will concern essential components described as follows: state of water resources, hydrometry and water quality; soil chemical fertility; pedology and soil degradation; soil physical property; soil utilisation; animal and plant life development within the biodiversity; ecology and protection of the natural environment; pollution; nuisance and safety during operations.

- Monitoring Health and Enviroment: toxicity level of the products used; available quantity of protection equipments; level of knowledge about good management practices (pesticides, empty packages, etc.); level of impacts on domestic animals, aquatic organisms and fauna; toxicity level of decomposed substances; water resources contamination level; Status of emergency preparedness; Compliance with regulatory requirements.

- Monitoring of storage/pesticide and empty packages management conditions: % of available and adequate storage facilities; level of risks associated with transportation and storage; level of mastery of spraying methods; number of equipments for disposing of functional packages, quantity of packages disposed of.

- Monitoring staff training (Information /public awareness): number of training sessions organised; number of officers trained as per category; number of farmers adopting integrated control, good practices for pesticide management; % of people reached through awareness campaigns; level of user knowledge about the products and the risks involved; traders/distributors' knowledge level about the products sold.

8.3.1.2 IPMP monitoring responsabilities

147. The community monitoring will be carried out by Research Institutions during the experimentation phase. During the extension phase, the community monitoring will be carried out by National Plant Protection and Health Services. The frequency of using alternative pest control methods will be evaluated as well. Special attention will be given to the monitoring and evaluation of the following points: checking non target groups in order to determine whether the campaign against pests and harmful insects does not pose any danger to other living organisms not targeted by this campaign; entomological surveys to control the vector population and the effectiveness of treatment programmes; operator health monitoring;

and the choice of pesticides based on their environmental risks **(See annex table, envirommental plan and monitoring social safe guard)**.

8.3.2 Evaluation

148. Two evaluations will be carried out: a mid-term evaluation and an external evaluation in the course of the month that follows the end of the implementation in order to maintain the objectives of the action plan. The mid-term evaluation will be carried out by a consultant. It will be intended to determine the correct development of the management plan as well as mid-term results. Financial partners, beneficiaries of the project and other partners involved will fully participate in this evaluation. The external evaluation will involve measuring the effectiveness of the project as well as its performance and to identify lessons learnt. This evaluation will be integrated into that of MOSAP II.

8.4 Training of actors involved in pests and pesticides management

149. The success of IPM depends largely on developing and sustaining institutional and human capacity to facilitate informed decision making by farmers, and empower farmers to integrate scientific and traditional knowledge to solve location-specific problems, and respond to market opportunities. Poor communication between farmers, extension agents and researchers has often led to poorly-targeted research or to poor adoption of promising options generated by research. The training of actors involved in pest and pesticide management will be described in the IPMPs and will follow the Farmer Field School (FFS) approach. FFS is a group-based learning process that has been used by a number of governments, NGOs and international agencies to promote IPM technologies.

150. FFS is built upon an adult non-formal education approach – the field is the classroom and learning occurs through learning by doing, experimentation, observation and reflection. The IPM a training program is defined and implemented for farmers, farmer leaders, district extension workers, the training will be crop based with farmers being organized into groups led by a farmer leader to ensure ownership and sustainability of this best practice.

151. The traning of actors involved in pests and pesticides management in IPM/FFS will be implemented at ADI/EDA with field action by farmer groups which will receive training and advisory services from FFS Facilitors/Trainers, appropriate NGOs, and community leaders who would have graduated from Training of Trainers (TOT) sessions. Training at all levels will be based on participatory learning modules for capacity building in IPM information delivery. The participants will be equipped with skills in facilitation, group dynamics, non-formal education methods to encourage adult learning. Farmer training will focus on farmers' group learning for informed decision making on IPM issues. Group learning will be experiential through farmer-led field trials and discussions on practical aspects of crop

production and pest management including indigenous knowledge/tecbnologies. Farmer group learning will be facilitated by TOT trained men and women extension agents.

152. Group decision making will be achieved through AgroEcosystem Analysis (AESA) involving a comparison of IPM practices with normal farmer practices. At each AESA, farmers observe, record and monitor changes in soil, crop and trophic relationships affecting crop growth. Farmers analyse and discuss their findings and recommend corrective action based on the results of their own analyses. Group learning helps to increase scientific literacy, ownership of biological and ecological information and knowledge, and informed decisions making habits in the communities. For participatory extension, the each community of target project area (Bie, Huambo and Malange) will establish new farmer learning groups in the community. Also trained farmers will be expected to promote secondary adoption of proven options. For example, each farmer trained will train at least 10-15 new farmers through demonstrations and farm visits. Additionally the farmers will organize field days to train other farmers and explain new or improved IPM practices they have learnt. Field day participants will include representatives of national and local policy makers from government, development agencies, researcher institutes, national extension services, NGOs, and rural and national press media.

153. The training modules will concern the risks associated with pesticide handling, sound management methods (collection, disposal, storage, transportation, and treatment), adequate behaviours and good environmental practices, facilities and equipments maintenance, protective measures and measures to be adopted in case of intoxication, etc. A special emphasis will be laid on the requirements for a secure storage in order to avoid a mix up with other products of common domestic use as well as on the reuse of empty packages. It is recommended to train trainers by leading them to come out with a guidebook on good pesticide management practices rather than giving them a passive training. The contents of the training modules are indicated below (traning modules):

- Information on risks as well as health and safety advice
- Rules governing the storage and the conservation of pesticides by farmers
- Basic knowledge about risk handling and management procedures
- Carrying of protective and safety equipments
- Risks associated with pesticide transportation
- Handling, loading and offloading procedures
- Vehicle equipments
- Protective equipments
- Outline of treatment and operation procedures
- Health and safety in connection with the operations
- Emergency and relief procedures
- Technical procedures
- Maintenance of equipments
- Emission control
- Process and residue monitoring

- Biological monitoring of pesticide exposure

8.5 Information and awareness raising among users and the general public

154. Awareness raising is a key factor in the safeguard of the population against harmful effects of pesticides. Sensitization campaigns in the form of workshops, training, radio programmes and press releases and field visits are on-going activities as part of the task of the enforcement personnel.

155. There is the need for creating awareness on good use of pesticides and chemical fertilizers. The awareness should seek to disseminate modern conservation methods, traditional granary systems that are very effective as well as biological and natural pest control methods. At the level of importers and traders, it is essential to introduce a requirement that the products must be sold with detailed and simple handbooks providing information on the best use and the risks. In the same way, users must be cautioned about the quality of the products and the methods used for their conditioning.

156. At public level, the media should regularly organise extension programmes. The risk of intoxication by chemical products poses a serious problem for public health. Specific actions by public services and the willingness to put in place regulations through legal texts remain marginal. It is essential to develop long-term strategies and effective approaches to inform and sensitise all stakeholders (street traders, wholesalers, agricultural users, rural populations, and others).

157. Information and awareness programmes, especially for the general public in general, and decisions makers in particular, are essential for reducing the risks of infection and intoxication by pesticides, and in the end, for true behavioural change. These programmes will be multifaceted and will rely on supports from several sources. Public media can play a relatively important role in creating awareness among the general public and users. National agricultural structures, NGOs and Farmer Associations/Movements, territorial communities as well as community health structures will be involved in the public awareness.

8.6 Cost of activities proposed in the IPMP

158. The Budget for IPMP implemention is related to the preparation of Specific Pest Management Plans, Pamphlets and Brochures Preparation, Awareness and Training. Total of US$ 210,000 will be required to effectively implement the PMP over a five-year period. The detail budget is shown in the following table:

Table 9.8.1 Costs to be discussed according final planning action plan tasks

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Total (usd)**
PMP specific		50,000					50,000.00
Pamphlets and Brochures Preparation			10,000				10,000.00
Awareness and training				50,000	50,000	50,000	150,000.00
							210,000.00

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10. APPENDICES

10.1 List of registered or banned pesticides

COMERCIAL NAME	ACTIVE SUBSTANCE	TOXICOLOGICAL CLASS	REGISTRATION NUMBER	CAMPANY
INSECTICIDAS				
Sevin 5pp	Carbaril	II	IN 001	Agran
Mortein Target Actellic	Pirimifos Metil+ Permetrina	II	IN 002	Syngenta
Soleol M	Óleo de verão		IN 003	Agran
Sevin 85 wp	Carbaril	II	IN 004	Agran
Agror 40 cpe	Dimetoato	II	IN 005	Agran
Demand 2,5 cs	Lambda Cyhalotrina	II	IN 006	Syngenta
Malaton 50 s	Malatião	III	IN 007	Agran
Icon 2,5 cs	Lambda- cyhalotrin	II	IN 008	Syngenta
Selecron 500 ec	Profenofos 500	II	IN 009	Syngenta
Thunder 14% 5- O-TEQ	Betaciflutrina 45 g/ll + Imidaclopride 100 g/l		IN 010	Bayer
Endopec	Endossulfão 350 g/l	II	IN 011	Sapec
Eforia 045 zc	Tiametoxam 30g/l + 15g/l lambda-cyhalotrina		IN 012	Syngenta
Duduthrin 5 % Ec	Lambda cyalotrina	II	IN 013	Goldenagric
Delta	Deltametrina 25 g/l	II	IN 014	Sapec
Malation 5 p	Malation	III	IN 015	Agran
Twigathoate 40% Ec	Dimetoato	II	IN 016	Goldenagric
Twigaphos 48% Ec	Clorpirifos	II	IN 017	Goldenagric
Super Guard Dust	Permetrin + pirimifos-metil	II	IN 018	Agran - Avima
Deltagran 2,5 ec	Deltametrina	II	IN 019	Agran
Endoagran 35 ec	Endosulfão	II	IN 020	Agran
Larvin 37.5 % sc	Thiodicarbe 375 g/l	II	IN 021	Bayer
Sumigran 50	Fenitrotião	II	IN 022	Agran
Tamagran 585 Sl	Metamidofos técnico (Condicionado)	Ib ?	IN 023	Agran

Thiodan 35 % ec	Endossulfão 350 g/l	II	IN 024	Bayer
Twigacyper 55 Ec	Cypermetrina 50 g/lt	II	IN 025	Goldenagric
Larvex 100	Ethoxy (1) Óleo Ácido e Álcool Cetosearyl		IN 026	TecnoServe
Dynamec 018 ec	Abamectina 18 g/l	II	IN 027	Syngenta
Alpha-Zipper	Alfa-cipermetrina 10%	II	IN 028	Sapec
Buldock 5% ec	Beta Ciflutrina 50 g/l		IN 029	Bayer
Confidor 35 sc	Imidaclopride 350 g/l	II	IN 030	Bayer
Confidor 20% sl	Imidaclopride 200 g/l	II	IN 031	Bayer
Actellic 50 ec	500 g/l Pirimifos Metilo	II	IN 032	Syngenta
Pacha	15g/l Lambda- Cialotrina + 20g/l Acetamiprida	II	IN 033	Syrius
Zipper	Cypermetrina 100g/l	II	IN 034	Sapec
Furanpri	Clorpirifos 50 g/kg	II	IN 035	DVA-Agro
Mesurol 80% wp	Metiocarbo 800g/kg (condicionado)	Ib ?	IN 036	Bayer
Confidor 70 wg	Imidaclopride 700 g/kg	II	IN 037	Bayer
Politrin KA315 ec	300g/l Profenofos+Lambda Cialotrina 15 g/l		IN 038	Syngenta
Corsário	Imidaclopride 18g/l ou 17,8%(p/p)	II	IN 039	Sapec
Ciclone 48 ec	Clorpirinfos 48g/l ou 48,4%(p/p)	II	IN 040	Sapec
Leni 50 ec	Deltametrina 50 g/l	II	IN 041	Cegonha
K-Optimal	15g/l Lambda- Cialotrina + 20g/l Acetamiprida		IN 042	Cegonha
Cigogne c	Cipermetrina 50g/l + Chlorpyrinfos 500 g/l	II	IN 043	Cegonha
Kart	Kartap 500 g/l	II	IN 044	Cegonha
Acamat	Abamectina 18 g/l	II	IN 045	Cegonha
Bofirius	Carbofuran 5%	Ib ?	IN 046	Sirius
Chlorius	Chlorpyrifos-Ethyl 480g/l	II	IN 047	Sirius
Montaz	250g/kg Imidacloprid + 200g/kg Thiram	II	IN 048	Sirius

Cipclorius	Cipermetrina 50g/l+Chlorpyrinfos 500 g/l	II	IN 049	Syrius
Malation ulv	Malation	III	IN 050	Agran
Desirius	Deltametrina 25 g/l	II	IN 051	Sirius
Antuka	3g/kg Permetrin + 16g /kg Pirimiphos methyl	II	IN 052	Cegonha
Insector	Imidaclopride + Thirame	II	IN 053	Cegonha
Fiprorius 0.3 G	Fipronil 0.3%	II	IN 054	Sirius
Fiprorius 50 sc	Fipronil 50 g/l	II	IN 055	Sirius
Ultracid 420 Ec	Metidatião 40 %	Ib ?	IN 056	Syngenta
Indorius	Indoxacarbe 155%	II	IN 057	Sirius
Biorius	Baciloturgiensis e var.kt	III	IN 058	Sirius
Fixe 80	Fipronil 800 g/kg	II	IN 059	Cegonha
Carbofurão-Sapec	5% Carbofurão (gr)	Ib ?	IN 060	Sapec
Dimetec	Dimetoato 400 g/l	II	IN 061	Sapec
Fitanol	Óleo de verão		IN 062	Sapec
Judo Forte	Lambda-Cialotrina 15 g/l + Profenofos 15 g/l	II	IN 063	Sapec
Judo Top	Lambda- Cialotrina 15g/l + Dimetoato 400 g/l		IN 064	Sapec
Malatiol	Malation 50 g/l+Óleo M 750		IN 065	Sapec
Malaton 5p	Malatião	II	IN 066	Sapec
Monopec	Monocrotofos 400 g/l	Ib ?	IN 067	Sapec
Poney	Acefato 75%	II	IN 068	Sapec
Fastac 100 ec	Alfa cipermetrina 100 g/l	II	IN 069	Basf Agromundo
Zipper 200	Cipermetrina 200 g/l	II	IN 070	Sapec
General	Carbofurão 50 g/kg	Ib ?	IN 071	Cegonha
Decis Forte 10% ec	Deltametrina 100 g/l	II	IN 072	Bayer
Acamat Super	Piridabena 150 g/l	II	IN 073	Cegonha
Vectron	Etofenprox 20%		IN 074	Sumitomo
Boreal	Abamectina 18 g/l	II	IN 075	Sapec
Regentway 20% sc	Fipronil	II	IN 076	Agroway

Vidate 10 G	Oxamil 10%	Ib ?	IN 077	Cegonha
Acarius	Abamectina 18 g/l	II	IN 078	Syrius
Vidate L	Oxamil 240 g/l	Ib ?	IN 079	Cegonha
Actellic 50 ec	Pirimifos Metilico	II	IN 080	Agran
Pirifway	Clorpirifos 480 g/l Ec	II	IN 081	Agroway
Insectido 5 Ec	Lambda cialotrina 50 g/l	II	IN 082	DVA Agro GmbH
Ondjila	Benzoato de Emamectina		IN 083	Cegonha
Actellic 1 p	Pirimifos Metilo	II	IN 084	Agran
Binferius	Binfetrina 100 g/l	II	IN 085	Sirius
Karate 5 ec	Lambda- Cyalotrina	II	IN 086	Syngenta
K-othrine wg 250	Deltamentrina 250 g/kg	II	IN 087	Sheba (Bayer)
Matacarius	Hexitiazox 50 g/l	U	IN 088	Sirius
Cyperin	Cipermetrina 200g/l	II	IN 089	Agrom) Plaskem
Politrin C 440 ec	Profenofos 400 + Cipermetrin 40		IN 090	Syngenta
Suntap	Hidrocloreto de Cartape 500 g/l		IN 091	Plaskem (Agrom)
Bastião 3 G	Imidaclopride 30 g/kg	II	IN 092	Cegonha
Agror 20 cpe	Dimetoato	II	IN 093	Agran
Sevin 25 ulv	Carbaril	II	IN 094	Agran
Onjila 50 Wg	Benzoato de Emamectina 50 g/kg		IN 095	Cegonha
Sumigran ulv	Fenitrotião	II	IN 096	Agran
Fixe 50 Ec	Fipronil 50 g/L Ec	II	IN 097	Cegonha
Moran 150 Ec	Indoxacarbe 150 g/l Ec	II	IN 098	Cegonha
Belt	Flubendiamida 480 g/l		IN 099	Bayer (Fertiangola)
Tudobem	Metomyl 250g/kg wp	IB ?	IN 100	LouisDreyfus
Ferticlopride	Imidaclopride 200g/l	II	IN 101	Fertiangola
Fertiphos	Clorpiriphos 480g/l	II	IN 102	Fertiangola
Fertimectina	Abamectina	II	IN 103	Fertiangola

Ferticiper	Cipermetrina 100g/l	II	IN 104	Fertiangola
Abamate	Abamectina 18g/l	II	IN 105	Taurus
Judo	Lambda cialotrina 100g/l	II	IN 106	Sapec
Falathion 570 Ec	Malatião 600g/l	III	IN 107	Fertisem
Dean	Benzoato de emamectina 12g/l + Imidaclopride 50g/l		IN 108	Louis Dreyfus
Adressway 5% Ec	Lufenuron		IN 109	Globalway
Activa 25% WDG	Tiametoxan		IN 110	Globalway
Lalotrina 5% Ec	Lambda cyhalotrin	II	IN 111	Globalway
Primeiro 35%Sc	Imidaclopride	II	IN 112	Globalway
Regentway 80% WDG	Fipronil	II	IN 113	Globalway
Karapri EC	Lambda cyhalotrin 50 g/l	II	IN 114	DVA - AGRO
Termidor 25	Fipronil 25 g/lt	II	IN 115	Agromundo-Basf
Deltapri	Deltametrina 25 g/lt	II	IN 116	DVA Agro
Fertialfa	Alfa-cipermetrina 100g/l Ec	II	IN 117	Fertiangola
Ciclopri	Clorpirifos	II	IN 118	DVA Agro
Fertidelta	Deltametrina 50g/l Sc	II	IN 119	Fertiangola
Fertifenil	Dimetoato 400g/l Ec	II	IN 120	Fertiangola
Fertikare	Lambda-cyhalotrin 100g/l Ec	II	IN 121	Fertiangola
Fertithio	Endosulfão 350 g/l Ec	II	IN 122	Fertiangola
Cesarina	Ciromazina 100 g/lt	III	IN 123	Louis Dreyfus
Fertiopty	Lambda-cyhalotin 15g/l + Acetamiprid 20g/l Ec		IN 124	Fertiangola
Epicure 0,4%	Abamectina 4g/l 97%	II	IN 125	Agromundo-Nulandis
Regent	Fipronil 80g/kg	II	IN 126	Agromundo
Lambada K 45	Lambda-cyhalotrin 18 g/l + Acetamipride 30 g/l		IN 127	Taurus
Lambada	Lambda-cyhalotrin 50g/l	II	IN 128	Taurus
Abamec	Abamectina	II	IN 129	Globalway

Profitina	Profenofos 40% + cipermetrina 4%		IN 130	Globalway
DiPel Df	Bacillus thurgiensis subs israelensis	III	IN 131	Agromundo(sumitomo)
Sumipleo	Piridalil, 500 g/lt		IN 132	Agromundo
Delta	Deltametrina	II	IN 133	Globalway
Mectina 1,8% EC	Abamectina 18 g/l	II	IN 134	Agromundo Nulandis
Fertipronil	Fipronil 200g/l	II	IN 135	Fertiangola
Dafipri	Dimetoato 40%	II	IN 136	DVA Agro
Lagapri	Indoxacarb 15%	II	IN 137	DVA Agro
Kohinor 350 SC	Imidaclopride	II	IN 138	Dispec
Lamdex 5 Ec	Lambda-cyhalotrin 50g/l	II	IN 139	Dispec
Pyrinex 480 Ec	Clorpirifos	II	IN 140	Dispec
Aceta Star 46 Ec	Acetamipride 16 g/l + Bifentrina 30 g/l	II	IN 141	Dispec
Servus 25 Ec	Deltametrina 25 g/l	III	IN 142	Dispec
Karapri	Lambda cyhalotrin 50g/l	II	IN 143	DVA Agro
Deltapri	Deltametrina 25 g/l	IV	IN 144	DVA Agro
Ciclopri	Clorpirifos 480 g/l	II	IN 145	DVA Agro

10.2 Improved management practices and pesticide management measures for consideration in IPMPs

- Pest-tolerant varieties
- Recommended agronomic practices
- Use of trap crops to concentrate pest populations
- Conservation, enhancement and integration of predators into pest management
- Rigorous and regular crop sampling
- Use of combined pest and damage thresholds
- Preferential use of selective insecticides
- Effective resistance management strategies
- IPM components applied outside the crop season
- Selection of rotation crops to reduce pest carry-over
- Management of weeds and crop regrowth that are overwinter pest hosts
- Optimization of fertilizer strategies to avoid excessive plant growth
- Selection of varieties matched to region and pest complex
- Selection of appropriate seed insecticide treatments

10.3 Basic principles of integrated pest management for consideration in IPMPs

IPM is a component of IFS. In the past farmers were encouraged to apply crop protection products on a routine basis. However, it is now recognised that it is far better for the environment and farm profitability to monitor pest populations and the resulting damage and only take action when a certain threshold has been reached. IPM incorporates this procedure but also adopts a range of other practices, which over all seek to optimise the use of crop protection products and to use them, generally, in a more sustainable manner. The main principles are given below:

- Integration of all farm management activities throughout the annual cycle of production, not just during the cotton season.
- Applying best practice agronomy to ensure a healthy crop.
- Rigorous sampling of pests, beneficial insects and damage, linked to well validated thresholds.
- Conservation and utilization of beneficial insects.
- Preferential use of selective insecticides.
- Pre-emptive management of resistance to insecticides and GM traits.
- Extension support through communication and training.

10.4 Persons met

The present document summarizes the key findings resulting from the disclosure of the PMP preparation among the stakeholders, in line with the World Bank disclosure policy that generally contain the following elements: principles of disclosure; exceptions to disclosure; routine disclosure; and request driven disclosure. Disclosure of documents (including a summary of the project, and a summary of environmental assessment) in the local language, at a public place accessible to project-affected groups and local non-governmental organizations. In-country disclosure of information is the responsibility of the borrower, in this case MoA. Disclosure in the InfoShop is the responsibility of the World Bank.

The development of the PMP benefited from consultations established during the field mission as well as from other contacts and previous visits to the sites where MOSAP is being implemented. Inputs were received from the provincial implementation units of MOSAP, including coordinaters, technicians and officers as well as from the design team of MOSAP II, including heads of offices and technicians from IDA, EDAs, FAO and the WB.

The public participation meetings were attended mostly by the representatives of formal government and non-government entities and they provided valuable comments on how the PMP project should be carried out once they are defined. Visits to Bié, Huambo and Malanje Provinces and communities provided the chance to meet and discuss with individual farmers, associations and community leaders (community, municipal and provincial administration and traditional/informal leaders), suppliers and market structures and responsible people (Chinguar PAPAGRO, supermarkets machinery, seeds and inputs suppliers).

Public consultation meetings were held in the target areas of the proposed PMP project (Bié, Huambo and Malanje Provinces, including Municipalities and Communes). The Public Consultation meeting was fulfilled for both public consultation meetings during the elaboration and the disclosure of the completed PMP report. The main objective of public participation process was to inform the stakeholders about the proposed PMP project as well as gathering their views and opinions about the project that contributed to the identification and assessment of potential positive and negative impacts and the respective mitigation measures to be taken into account during the preparation of the PMP report.

During elaboration of PMP, the public participation process provided the opportunity for stakeholders to participate actively in the PMP elaboration having expressed their concerns, expectations and comments about the project and the environmental impacts. Stakeholders' views were included in the impact evaluation process, and recommendations were made in the PMP report to take into account such contributions during the design and implementation of specific PMP projects once the exact location and scope of the PMP project becomes known. Subsequent to completion of the PMP report, disclosure process was through continued interaction with stakeholders using contacts gathered during public meetings. E-mail contacts were used to reach out stakeholders and inform them about the availability of the PMP in the MoA offices for their review and comments. The E-mail to stakeholders

included the executive summary of the PMP report (Portuguese and English versions), and stakeholders were invited to provide further comments or feedback as needed.

In the conclusions, the meetings, both with focal groups and public meetings, allowed to the following remarks:

- Public participation process is a didactic undertaking and people need to know more about the importance of participation at policy, plans and projects.
- Need to publicize the project and make available documents for discussion.
- Definition of a clear communication strategy with the beneficiary communities and stakeholders, as a way to publicize the activities under the MOSAP II project and those to be developed in the long term, in order to manage expectations.
- Need to ensure intersectoral coordination and participation early at policy, plans and project level to minimize interferences which affect the public during the implementation PMP activities.