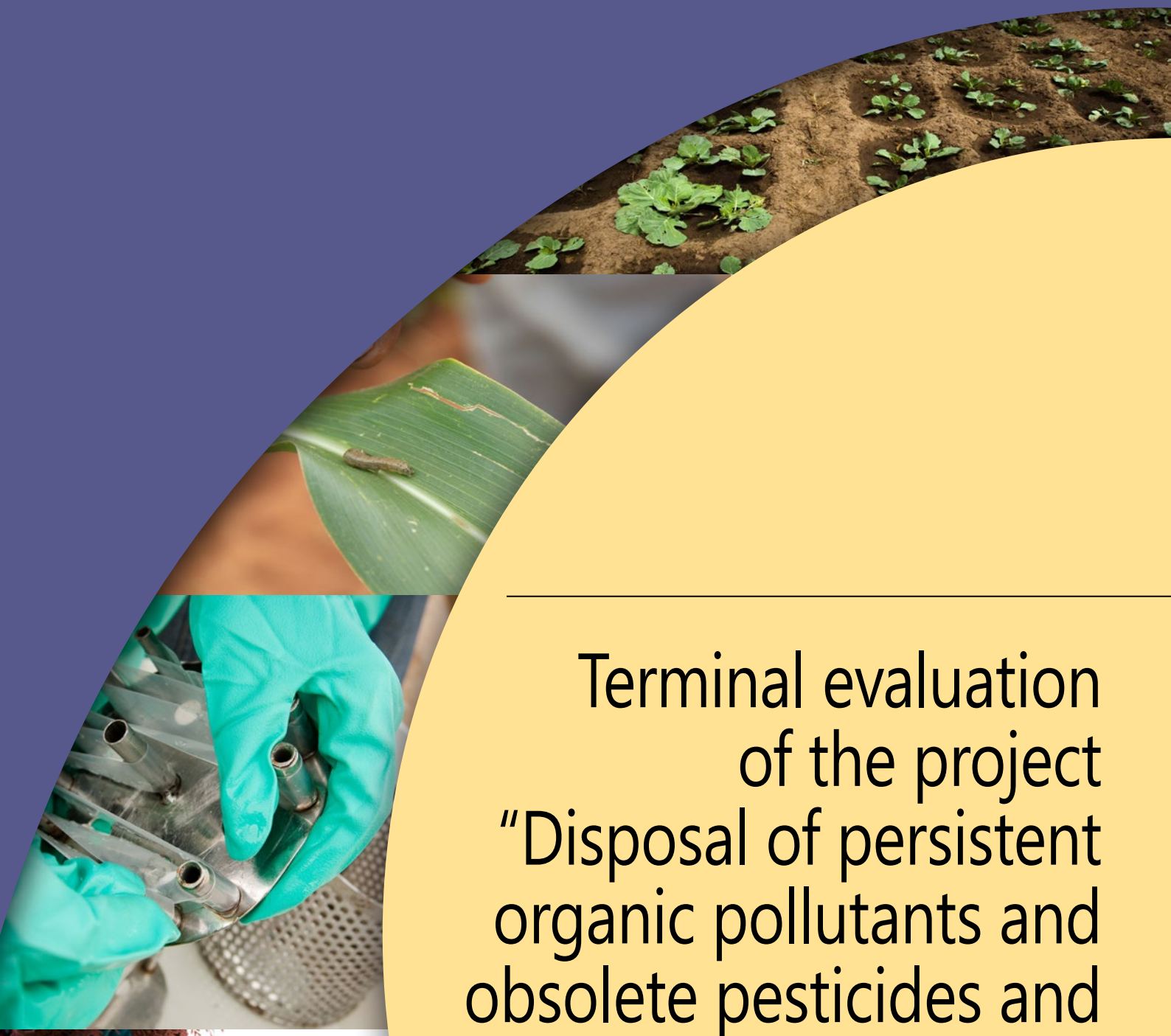
Food and Agriculture Organization of the United Nations

Project Evaluation Series
12/2021



Terminal evaluation of the project "Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin"

Project Evaluation Series
12/2021

Terminal evaluation of the project "Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin"

GCP/BEN/056/GFF
GEF ID: 4756

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2021

Required citation:
FAO. 2021. *Terminal evaluation of the project "Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin"*. Project evaluation series, 12/2021. Rome.

ISBN 978-92-5-135490-2

Cover photographs: ©FAO/Olivier Asselin, ©FAO/Steven Lazaro, ©FAO/Olivier Asselin, ©FAO/Olivier Asselin

Abstract

Context and methodology. This report concerns the final evaluation of Project " Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin" (project GCP/BEN/056/GFF), implemented by the Food and Agriculture Organization of the United Nations (FAO) and the Government of Benin from March 2015 to September 2021.

The terminal evaluation adopted a participatory and systemic approach to assess the performance of the project and state its findings and conclusions based on the literature review and data from interviews with stakeholders. Conditions for sustainability of outcomes and lessons learned were also analyzed.

Outcomes. The project contributed to the strengthening of Benin's capacity for post-registration management of pesticides. Three sites have been decontaminated and a fourth is in the process of being decontaminated, thus exceeding the target of two sites initially planned. However, the late signing of the contract (in April 2020) with the company in charge of the disposal of 213 tonnes of persistent organic pollutants (POPs) and obsolete pesticides and the COVID-19 pandemic have delayed and realistically postponed the disposal process to 30 June 2021. It developed, tested, and validated an empty pesticide container (EPC) management plan and strengthened the capacity of the non-governmental organization (NGO) Bethesda to collect and recycle EPCs. The project contributed to the revision of legislation and regulations on pesticide registration and control in accordance with international obligations and the common regional system of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS), the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (WAEMU), as well as the strengthening of national phytosanitary inspection capacities. The project also successfully tested alternative products and systems based on integrated production and pest management (IPPM) to reduce the use of POPs and chemical pesticides.

Target audience. FAO, the Global Environment Facility (GEF), the Government of Benin, farmers, farmers' organizations, NGOs.

Conclusions and recommendations. The project is highly satisfactory in terms of relevance and coherence. It is satisfactory in terms of effectiveness, sustainability and cross-cutting themes. However, efficiency and adaptive management are moderately satisfactory.

In its future interventions, FAO must further facilitate the engagement of all key institutional stakeholders. It must promote gender mainstreaming, knowledge management, ownership and consolidation of outcomes generated by the project as well as the institutionalization of the farmer field school (FFS) approach by the Government.

Contents

Boxes, figure and tables

Boxes

Figure

Tables

Acknowledgements

The terminal evaluation took place in the context of the COVID-19 pandemic and the restrictions imposed. Conducted remotely, it owes its success to the committed participation of stakeholders and final beneficiaries and to the remarkable support of the Project Management Unit (PMU), the FAO Representation in Benin, and the FAO Office of Evaluation (OED).

The evaluation team was led by Aimé Landry Dongmo, International Consultant, and consisted of Andrea Walter, International Consultant, under the supervision of Anne-Clémence Owen, OED Evaluation Officer. The evaluation team sincerely thanks the members of the project team at the FAO Representation in Benin, the Project Coordinator and the members of the PMU team, as well as to the focal points, implementing partners and consultants.

The evaluation team would also like to thank the officials of the Ministry of Agriculture, Livestock and Fisheries, the Ministry of the Living Environment and Sustainable Development, and the Ministry of Health for their much-appreciated participation in the interviews, with special thanks to the Secretary General of the Ministry of Agriculture, Livestock and Fisheries.

The evaluation team is particularly grateful to facilitators of farmer field schools, phytosanitary inspectors, farmers' group leaders and farmers who contributed to the success of the evaluation by providing useful information.

Finally, the evaluation team expresses its gratitude to the project officers at the GEF Coordination Unit (GCU) and the FAO Plant Production and Protection Division (NSP) in Rome, who supported in the preparation of this final evaluation and responded to its requests.

Abbreviations and acronyms

ABSSA	Benin Food Safety Agency
AWPB	Annual work plan and budget
CILSS	Permanent Inter-State Committee for Drought Control in the Sahel
DPV	Directorate of Plant Production
ECOWAS	Economic Community of West African States
EPC	Empty pesticide container
EPC	Empty pesticide containers
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer field school
GAP	Good agricultural practices
GCU	GEF Coordination Unit
GEF	Global Environment Facility
IPPM	Integrated production and pest management
LCSSA	Central Laboratory of Food Safety Control
M&E	Monitoring and evaluation
NGO	Non-governmental organization
NPMC	National Pesticide Management Committee
NSP	Plant Production and Protection Division
OBEPAB	Organisation Béninoise pour la promotion de l'agriculture biologique
PMU	Project Management Unit
POP	Persistent organic pollutant
PSC	Project Steering Committee
PSMS	Pesticide Stock Management System
SPVCP	Plant Protection and Phytosanitary Inspection Service
WAEMU	West African Economic and Monetary Union
ABSSA	Benin Food Safety Agency

Executive summary

Introduction

1. This terminal evaluation concerns the project " Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin" (project GCP/BEN/056/GFF), jointly implemented by the Food and Agriculture Organization of the United Nations (FAO) and the Government of Benin from March 2015 to September 2021. This project aimed at supporting the government in the disposal of persistent organic pollutants (POPs) and obsolete pesticides and to build capacity in their management at community and institutional level.

2. The terminal evaluation adopted a participatory and systemic approach not only to identify the outcomes achieved, assess their quality and inform stakeholders about the effects and changes generated on the beneficiaries, but also to identify outstanding or new issues and lessons that deserve to be considered in the design and implementation of future projects.

Main findings

The project is highly satisfactory in terms of its relevance and coherence.

3. The project is a continuation of project GCP/BEN/055/JPN15 which resulted in the disposal and destruction of approximately 452 tonnes of endosulfan and contaminated waste in 2015 and favours a comprehensive and reasoned approach to pesticide management and use.

4. The specific objectives and strategy of the project are aligned with the strategic priorities of the Government and its partners and are based on mastered approaches such as the farmer field school (FFS) approach and integrated production and pest management (IPPM).

5. The project strategy is based on well-established partnerships and its theory of change (TOC) is overall coherent and realistic. The activities related to setting up and monitoring farmer field schools, decontamination and training of phytosanitary inspectors (training of trainers) are the anchor points used by the project to arouse the interest of the populations and to encourage their engagement and participation.

The effectiveness of the project is satisfactory.

6. The project contributed successfully to the strengthening of Benin's capacity for post-registration management of pesticides. Gaps that exist at different stages of pesticide life cycle management (registration, importation, distribution/sale, agricultural and non-agricultural use, reduction of associated risks and hazards, disposal and management of associated wastes) have been identified. Corrective measures as well as innovative or alternative systems, including agricultural production systems based on few or no pesticides, have been put in place. The technical options tested by the project have overall been successful; some have initiated processes of adoption and innovation that deserve to be supported.

7. **Effect 1 of the project has been satisfactorily achieved.** The project has successfully decontaminated three polluted sites (Oganla, Malanville and Bohicon) and has planned to decontaminate a fourth site (Djassin), thus exceeding the target of two sites initially planned. These participatory processes made it possible to mobilise and consolidate national expertise in decontamination.

8. However, the project performance has been affected by the COVID-19 pandemic and by the late signing of the contract (in April 2020) between FAO and VEOLIA, the company in charge of the disposal of obsolete pesticides and POPs. The summary of achievements at the end of April 2021 was as follows: 117.2 tonnes of obsolete pesticides and POPs already repackaged out of the 213 tonnes planned; 71.6 tonnes of obsolete pesticides, POPs and related waste packaged in six containers and ready to leave the port; repackaging of pesticides from eight priority stores out of the 13 planned. However, project stakeholders were hopeful that the process of exporting the 213 tonnes of obsolete pesticides, POPs and related wastes to the country of destruction would be completed by 30 June 2021. This standpoint is considered likely by the evaluation team given the processes and conditions in place.

9. It should be recalled that before the disposal of POPs and obsolete pesticides, the project conducted a large-scale participatory inventory that identified a stockpile of 1 439.45 tonnes of POPs and obsolete pesticides. This figure, which is considerably higher than the 2012 inventory (504 tonnes of POPs and obsolete pesticides, including 380 tonnes of endosulfan) and the pesticide stock management system (135 tonnes of POPs and obsolete pesticides remaining after the closure of project GCP/BEN/055/JPN), has had the merit of alerting and mobilising the Government at the highest levels on the issue of safe management of pesticides along their life cycle.

10. **Effect 2 of the project has been achieved in a highly satisfactory manner.** The project developed, tested and validated a management plan for empty pesticide containers (EPCs) that includes awareness raising, training, pre-treatment through triple rinsing and destruction from below, tracking to collection points and their safe storing in village or communal stores, where they will be collected by the non-governmental organization (NGO) in charge of final recycling. This progress was consolidated by the signing of Order No. 097/MAEP of 18 December 2018 (Ministry of Agriculture, Livestock and Fisheries, 2018a.), setting the terms and conditions for the management of empty pesticide and biopesticide containers as well as the terms and conditions for the distribution of related costs.

11. To ensure a functional and sustainable EPC collection and recycling process, the project supported the capacity building of Bethesda and the upgrading of its waste treatment and agricultural production centre. Bethesda's new capacity was used to collect, process and safely recycle 5 465 EPCs from of ten villages in the Borgou and Alibori departments. While this amount of recycled EPCs is far below the project document target of 150 000 EPCs processed and recycled in Year 4, the operation allowed the EPC management plan to be tested and lessons learned to be capitalised upon to ensure the scaling up of the plan and the entire management system, including its financing. Indeed, the project chose to focus its efforts and resources on developing a national plan for sustainable EPC management rather than conducting a large-scale collection without ensuring its sustainability.

12. In its search for a sustainable EPC management plan, the project-built capacity and raised awareness among trainers, farmers, women and youth and other stakeholders on the risks of EPCs and risk reduction options (triple rinsing and perforation, pilot recycling plan testing) in the cotton and maize production areas. Trained farmers adopted the proposed processing, collection and storage system and began outreach to other community members.

13. The project developed a support document to set up a national EPC management system in Benin, including a business model and a feasibility study. However, this very informative document has not yet been shared with the government to install and operate the proposed management and financing system. Thus, its ownership is not yet effective. The proposed independent and non-

profit system works in favour of all importers (and resellers) and should therefore be financed by the latter using the polluter pays principle and the regulatory provisions in force in Benin.

14. **Regarding Effect 3, the project contributed satisfactorily** to the revision of legislation and regulations on pesticide registration and control in line with international obligations and to the common regional system of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), the Economic Community of West African States (ECOWAS), and the West African Economic and Monetary Union (WAEMU), as well as to the reinforcement of national phytosanitary inspection capacities. The project conducted inspection activities and diagnostic studies for the post-registration management of pesticides and proposed actions and strategies to be implemented to fill the gaps and promote compliance in the pesticide value chain in Benin. Although deemed relevant and realistic by government officials, their implementation requires resources to be integrated into annual work plans and budgets. The project proposed an improved quality control system for pesticides in Benin, including the role of analytical and sampling procedures in the inspection process. This control system was validated during a workshop held on 19 July 2019 in Cotonou.

15. To operationalise the new approach of the improved national pesticide inspection and quality control system, which takes risk into account, the project supported the training of 37 phytosanitary inspectors on pesticide inspection/control techniques and procedures and undertook technical and material capacity building, focusing on the two strategic entry points receiving a large flow of pesticides in Benin, i.e., the port and airport of Cotonou.

16. **Another satisfaction of the project concerns the achievement of Effect 4.** The project successfully tested and promoted alternative products and IPPM systems to reduce the use of POPs and chemical pesticides in cotton, maize and vegetable production. The pathogenic effect of a fungus (*Beauveria bassiana*) on cabbage aphid (*Lipaphis erysimi*) was demonstrated in the laboratory as well as the effect of *Metarhizium anisopliae* and Nuclear Polyhedrosis Virus [*HaNPV]* on a major pest of cotton and tomato (*Helicoverpa armigera*) in the field. In FFS, alternative systems (neem oil-based biopesticides, mechanical actions) combined with other good agricultural practices (nursery, organic fertiliser, threshold treatment, etc.) have helped to control pests of cotton, maize and vegetable crops, significantly reducing the quantities of pesticides usually used while safeguarding and, in some cases, improving yields and gross margins. The results of the IPPM products and systems tested deserve to be consolidated and some alternatives deserve to enter the registration process. More and more farmers are adopting the alternative systems that have been tested in FFS and are looking forward for better availability of these inputs as well as the development of a commodity chain and a specific label for IPPM products.

The efficiency and adaptive management of the project are at best rated as Moderately Satisfactory.

17. FAO, through its Representation in Benin, the Project Technical Unit within the Plant Production and Protection Division (NSP) and the Global Environment Facility (GEF) Coordination Unit (GCU), has provided ongoing technical assistance to the project. However, the quality of this assistance has been hampered by the slowness of the procurement process for goods and contracts and the validation of some project activities and is therefore rated as Moderately Satisfactory. However, the dynamism observed in the management of the project, both on the part of the Project Management Unit (PMU) team and the other stakeholders involved, makes it possible to rate the management of the project as "Satisfactory".

18. The project organized workshops to plan work and activities as well as to discuss, share and validate results, which facilitated the participation and involvement of the main stakeholders in

the chain of use and management of pesticides and related waste. Stakeholder participation is rated as Satisfactory, but with a weak point concerning the *Association Interprofessionnelle du Coton* (AIC), which was not sufficiently involved in the project. The project also suffered the consequences of the COVID-19 pandemic, an unforeseen risk that led to a halt in activities for nearly six months, thus delaying the deadline for safeguarding and disposing of obsolete pesticides and related waste.

19. Co-financing remains a weak link in the management of the project. The amounts shown in the co-financing tables attached to the various project implementation reports (PIRs) are inconsistent and do not allow for an objective assessment of the level of actual mobilisation. This shortcoming is compounded by the fact that the project did not organise any co-financing workshop during its implementation and that the figures given in the PIRs are neither commented nor explained. Based on the information obtained, co-financing is rated as Moderately Unsatisfactory.

20. The data generated by the project is important and a real reason for satisfaction. However, efforts/actions should be made to transform it into specific knowledge targeting different stakeholders and interested parties of the project. In view of this observation, knowledge management at this stage is judged Moderately Satisfactory.

21. Communication is rated as Moderately Satisfactory. A communication strategy has been developed and published in November 2019, in line with Recommendation 1 of the project mid-term review (MTR) conducted in June 2018. However, it is not yet used to ensure the popularisation of knowledge, build the capacity of stakeholders and bring about behavioural changes regarding the management and use of pesticides and related waste. The project internal communication worked well thanks to the rich documentation through the drafting of semi-annual and annual reports of the project. However, apart from the media coverage of some project activities as well as workshops and meetings of the country programming framework, external communication to potential project beneficiaries is not yet effective.

Sustainability is rated as Moderately Likely.

22. The project has generated positive effects on decision-makers, stakeholders, communities and final beneficiaries, and has strengthened the capacities of stakeholders in order to ensure the consolidation and sustainability of achievements. Concrete and potentially lasting effects were observed on the final beneficiaries of FFS. Several factors of sustainability were put in place starting with the proposed technologies, plans and strategies, followed by the involvement and capacity building of stakeholders and institutions, in order to ensure the continuity of the actions initiated by the project.

23. Several factors likely to promote the sustainability and impact of the project were developed. From its conception, the project has drawn lessons from the previous project GCP/BEN/055/JPN but also from other exemplary initiatives as detailed in the "Relevance" section. The project selected technologies that were tailored to the needs, potentially sustainable, and tested for a long time in similar contexts.

24. Though they are moderate, risks that may threaten sustainability exist and must be prevented, eliminated or mitigated. They concern, for example: the risk of low ownership of the project achievements by the Government after the project closure; the non-involvement in the project of certain key stakeholders of the POP and obsolete pesticides management and use chain (as in the case of AIC); and the non-application of strategies, rules and approaches proposed by the project (communication strategy, new decrees and orders signed, EPC management plan and proposed financing and overall management strategies, improved phytosanitary inspection strategy,

improved technologies and good agricultural practices for IPPM). However, FAO support remains a risk mitigating factor.

Cross-cutting issues are being addressed in a moderately satisfactory manner.

25. The project has made a very satisfactory contribution to environmental and social protection in Benin through the strengthening of the country's capacities for the safe and sustainable management of POPs, obsolete pesticides, chemical pesticides and related wastes and the sustainable reduction of environmental and health risks related to these different pollutants. However, the project design did not include specific indicators, targets and activities to ensure gender mainstreaming. The project's MTR (June 2018) had recommended "greater involvement of women in the implementation of project activities, particularly those of FFS", but the project has not implemented this recommendation, so gender mainstreaming remains weak.

26. The project has generated significant outcomes which, if scaled up, would make it possible to prevent, limit and eliminate in the medium term the various risks, risk factors and hazards associated with the use of pesticides and related waste. There are still some risks, although low.

GEF criteria rating table

GEF criteria and sub criteria	Rating[1]	Comments
A. Strategic relevance		
A1. Alignment with GEF and FAO Strategic Priorities	HS	See Section 3.1 Relevance and Coherence: To what extent is the project relevant and consistent with the Government of Benin's strategic priorities for sustainable agricultural development and environmental conservation and with FAO and GEF's strategic objectives?
A2. Relevance to national, regional and global priorities	HS	
A3. Complementarity with existing interventions	HS	
A4. Overall strategic relevance	HS	
B. Effectiveness		
B1. Overall evaluation of project outcomes	S	See section 3.2 Effectiveness: To what extent are the intended objectives of the project being achieved and what is the level of progress towards impact?
B1.1 Output delivery	S	
B1.2 Progress towards project outcomes and objectives	S	
B1.3 Probability of impact	HS	
C. Efficiency		
C1. Efficiency[2]	MS	See Section 3.3 Efficiency
D. Sustainability of project outcomes		
D1. Overall probability of sustainability	ML	See section 3.4 Sustainability: Are the project outcomes sustainable and what conditions are in place to strengthen sustainability and reduce the risks that may affect it? To what extent can progress toward impacts be attributed to the project over the long term?
D2. Sustainability in relation to financial risks	ML	
D3. Sustainability in relation to socio-economic risks	L	
D4. Sustainability in relation to institutional and governance risks	ML	
D5. Sustainability in relation to environmental risks	L	
D6. Catalysis and replication	L	
E. Factors affecting performance		
E1. Project design and preparation[3]	S	See Section 3.3 Efficiency and factors affecting performance: Was the project efficient and effective in the
E2. Quality of project implementation	S	

[1] See rating system in Appendix 2.
[2] Includes cost-benefit and timeline analysis.
[3] Refers to factors that affect the ability of the project to start at the planned time, such as the presence of sufficient capacity among implementing partners at the start of the project.

GEF criteria and sub criteria	Rating[1]	Comments
E2.1 Supervision of the project (FAO, Project Steering Committee)	MS	deployment of management and administration mechanisms?
E3. Quality of project execution	S	
E3.1 Project management and execution arrangements (PMU, Financial Management, etc.)	S	
E4. Co-financing and financial management	MU	
E5. Project partnerships and stakeholder involvement	S	
E6. Communication and knowledge management	MS	
E7. Overall quality of monitoring and evaluation (M&E)	MS	
E7.1 Design of M&E	MS	
E7.2 Implementation of the M&E plan (including financial and human resources)	MS	
E8. Overall evaluation of factors affecting performance	MS	
F. Cross-cutting issues		
F1. Gender and other equity dimensions	MS	See section 3.5 Cross-cutting themes: Have issues related to gender, vulnerable or disadvantaged groups, and environmental protection been integrated into the project and adequately addressed during implementation? Have issues related to gender, vulnerable or disadvantaged groups, and environmental protection been integrated into the project and adequately addressed during implementation?
F2. Human rights issues	--	
F3. Environmental and Social Safeguards	HS	
Overall evaluation of the project	**S**	

Conclusions

Conclusion 1. The project was well aligned with the strategic priorities of the Government, FAO and GEF and to the needs of environmental protection and limiting the exposure of populations to risks and hazards related to the management and inappropriate use of chemical pesticides and related wastes.

27. The project is a concrete contribution to implementing the priorities of sustainable development and environmental and social protection indicated in the strategic documents of the Government of Benin and its partners, including FAO and GEF. These strategic priorities meet the needs of the main stakeholders who manage and use the environment and its resources (water, soil, air) for different purposes (vital, productive, social, economic, heritage). Proof of this is the relevance of the project objectives and activities as confirmed by the general opinion of government officials and technical agents (ministries in charge of agriculture, environment and health), technical experts and contact persons from non-governmental organisations and civil society, the populations and farmers interviewed, and all the documentation used during this final evaluation. The project continued the positive momentum of innovation initiated by the previous project GCP/BEN/055/JPN and other initiatives. It capitalised on the achievements and lessons learned to move Benin towards better management and use of pesticides and related wastes throughout their life cycle.

Conclusion 2. Beyond the goal of disposing of 213 tonnes of POPs, obsolete pesticides and related wastes, which is on track to be achieved, the project has strengthened national capacity for the safe and sound management and use of hazardous pesticides and proposed a number of alternative systems

based on IPPM, thereby stimulating government ownership of the outcomes generated for wider dissemination.

28. The project has consolidated national technical expertise in pesticide life cycle management, prevention and mitigation of risks related to the use of chemical pesticides and empty containers. This expertise covers the following areas: i) inventory, safeguarding, recycling and disposal of obsolete pesticides, POPs and related wastes, including EPCs; ii) exploratory diagnosis, safeguarding, remediation of contaminated sites; iii) post-registration management, inspection and control of pesticides and related wastes; and iv) research and development and provision of alternative products and IPPM systems. A regulatory framework for better post-registration management of pesticides is in place and needs to be implemented. The FFS approach deployed by the project has shown all its value in supporting and advising farmers and has facilitated for the adoption of good practices based on IPPM and the reduction of the use of chemical pesticides. However, efforts should continue to consolidate the achievements made and improve the accessibility of these solutions to farmers. However, it was rather unfortunate that after 2016, Benin no longer contributed to the Pesticide Stocks Management System (PSMS). The PSMS access code assigned to the Ministry of Agriculture, Livestock and Fisheries in 2015 by FAO was used to populate the 2016 obsolete pesticides and POPs inventory data. Benin's access to this platform was then suspended after 2016; the Country Representation is hopeful to receive the codes again soon.

Conclusion 3. Overall, the project was well managed, but delays in some procurement or recruitment processes negatively affected its efficiency during implementation.

29. The project implementation mechanism generally worked well thanks to good collaboration between the Government of Benin and FAO, which could be seen through continuous support via Project Steering Committee (PSC) and PMU meetings and participation in workshops and missions. Stakeholders were well involved in the project and officials from the Ministries in charge of agriculture, environment and health were regularly informed of the activities carried out, the outcomes obtained and the actions to be considered for the future. Monitoring and evaluation, data management and internal communication worked well. The project benefited from continuous support from the FAO Representation in Benin and more discontinuous and ad hoc support from the Project Technical Unit (NSP) and GCU based at FAO headquarters in Rome. However, the efficiency of the project was diminished by delays in the processes of acquisition and validation of reports by the Project Technical Unit, management of co-financing, and the development of the communication strategy. The latter was not implemented, and this affected the visibility of the project.

Conclusion 4. The regulations, plans, strategies, and technologies developed and tested by the project are within the reach of the different categories of beneficiaries and are replicable thanks to the many capacities developed by the project.

30. The conditions for sustainability have been put in place during project implementation so that there are fewer risks that could limit the ownership and scaling up of project outcomes. However, some key stakeholders such as AIC or other private sector stakeholders responsible for developing and registering alternatives to chemical pesticides, were not fully involved in project implementation. The risk of weak government ownership and scaling up of the strategies, rules and approach proposed by the project is not minor and should be monitored. However, FAO support remains a risk mitigating factor.

Conclusion 5. The project achieved its environmental and social protection objectives, but the gender dimension could have been better taken into account during project design and implementation by starting with an analysis of women's specific needs.

31. Thanks to the project, Benin has increased and consolidated its capacities and tools to manage chemical pesticides throughout their life cycle, reduce their inappropriate use (in quantity and quality), their accumulation and the associated environmental and health risks. However, a thorough and prior analysis of the specific concerns of women and other vulnerable groups potentially affected by the management of pesticides and related wastes could have facilitated the implementation of specific actions to reduce their exposure to risks and strengthen their capacities for IPPM.

Recommendations

Recommendation 1. The design of projects for the sound management of chemical pesticides and action research on alternatives by FAO and the Government must integrate all stakeholders of this value chain and provide sufficient incentives to support the adoption of the proposed technologies and good practices. As such, a partnership framework with AIC and the private sector is needed to support, for example, production, availability and accessibility of quality biopesticides, and the setting up of a niche market for products obtained from low synthetic input agriculture systems.

32. Agricultural advisory and training organisations (as in the case of AIC) and the private sector, including importers, manufacturers, and distributors of pesticides and biopesticides, as well as traders and distributors of agricultural products, are key stakeholders in fostering and supporting the processes of adoption, dissemination, and promotion of technologies and good practices in pesticide management and use by farmers.

Recommendation 2. FAO should promote the ownership and consolidation of project-generated achievements and outcomes and the institutionalisation of the FFS approach by the Government.

33. FAO Representation in Benin should continue the dialogue with the Government and support it to: i) put in place in the very short term actions to monitor and secure all obsolete pesticides and polluted sites at risk and, in the medium term, mobilise financial resources for the disposal of secured POPs and obsolete pesticides and the remediation of relevant sites; ii) adopt and implement the EPC management system developed by the project, and promote enforcement; iii) institutionalise the FFS approach; and iv) develop and implement a partnership action-research program, including the continuation of field research on the pathogenic effect of a fungus (*Beauveria bassiana*) vs. cabbage aphid (*Lipaphis erysimi*), the facilitation and support to the registration process of promising biopesticides namely *Metarhizium anisopliae* and Nuclear Polyhedrosis Virus (HaNPV) against the major cotton and tomato pest (*Helicoverpa armigera*) and support to the production and availability of neem oil meeting the required quality standards.

Recommendation 3. FAO must support the Government in managing the knowledge generated by the project, implementing the communication strategy, developing new labels and, ultimately, contributing to the project visibility and sustainability.

34. The project's extensive documentation must be used to generate scientific and technical knowledge as well as advisory and decision-making tools that can be used to build the capacities of stakeholders and bring about behavioural changes regarding the management and use of hazardous pesticides and related wastes. It is also necessary to implement the communication strategy developed by the project in order to raise awareness, train and build capacity and thus contribute to changes in practices and behaviour of agricultural advisors, farmers, community

leaders and members of local or professional organisations and private operators. Supporting the development of new labels and markets for products from farming systems using low synthetic chemical inputs is also an important factor of sustainability insofar as it will lead to the adoption of the good IPPM practices proposed by the project. A study using a global approach to the cotton economy (the case of the municipality of Banikoara, one of the first cotton-producing municipality in Benin) also shows the need to support the evolution of current farming systems towards low synthetic input systems (Westerberg et al., 2017).

Recommendation 4. FAO needs to improve its mechanism for mainstreaming gender and vulnerable groups and mobilising co-financing when designing and implementing similar projects.

35. Women, as major stakeholders in agricultural production (vegetable and food crops) and in household management, are directly concerned with pesticide safe management and the elimination of risks associated with these chemicals and their containers. Actually, they use EPCs to store different products and are also exposed to pesticides during their use. However, they do not have easy access to training, including training in pesticide use and management, and IPPM systems. It is therefore important to incorporate activities, indicators, and targets specific to gender and vulnerable groups and to the mobilisation of co-financing in the design of similar projects, and to monitor their achievement during implementation. With respect to gender, FAO could further promote the use of specific tools it has developed and successfully tested to ensure social mobilisation (Community Listening Club or Dimitra Club) and resilience building (Village Savings and Loans Associations; income-generating activities; gender-mainstreaming FFS) of women and other vulnerable groups. More generally, as part of its dialogue with the Government, FAO should continue and accentuate its advocacy and support for the increase in the representation of women among technical managers and decision makers working for the development of the rural sector. With regard to co-financing mobilisation and management, FAO should strengthen the capacities of its agents involved in the implementation of the project at the country level and plan a set of specific activities and targets to be achieved. For example, depending on the specificities of the projects and countries, it could plan meetings/workshops of co-financing partners at a reasonable frequency with specific objectives to be achieved.

Lessons learned

36. The project has demonstrated that reducing the accumulation of obsolete pesticides must be done in a holistic manner and supported by a multi-stakeholder partnership, action research and capacity building for individuals (decision makers, development agents, farmers, direct beneficiaries and civil society), organisations (structures and entities involved in the chain of production, management and use of pesticides and biopesticides) and the enabling environment (regulatory framework, policies and coercive or incentive measures).

37. The systemic and multidisciplinary approach deployed, and the outcomes achieved by the project clearly show where the Government and its partners must focus their efforts to consolidate achievements or fill the gaps and to foster the progress towards impact and sustainability. In this regard, the project outcomes sufficiently demonstrate, for example, the value of having built and strengthened the capacity of the national decontamination team, combined laboratory and field research with the FFS approach to develop alternatives to chemical pesticides, and developed and tested an EPC collection plan, an EPC management system, including a financing model, and an improved phytosanitary inspection and control system. The project has demonstrated in an exemplary way the need to institutionalise several of these approaches and plans, but also the need to encourage the creation of new signs and labels to value the work of stakeholders who protect the environment and health by applying good practices.

1. Introduction

1.1 Purpose of the evaluation

1. This terminal evaluation concerns the project " Disposal of persistent organic pollutants and obsolete pesticides and implementation of sound pesticides management in Benin" (project GCP/BEN/056/GFF) jointly implemented by the Food and Agriculture Organization of the United Nations (FAO) and the Government of Benin from 22 March 2015 to the expected completion date of 30 September 2021. Required by the Global Environment Facility (GEF), the terminal evaluation aims at assessing the project performance, the conditions created to ensure the sustainability of outcomes, and the lessons to be learned for the design and implementation of similar projects.

1.2 Target audience

2. The terminal evaluation is intended to inform project stakeholders and its results will be used by:

   i. GEF – to assess the project outcomes and guide its future support;

   ii. FAO and in particular its Representation in Benin, the Technical Unit within the Plant Production and Protection Division (NSP), the GEF Coordination Unit (GCU), the project team (Task Force) and the Project Management Unit (PMU) – to measure and improve their performance in implementing GEF projects;

   iii. the Government of Benin at the executive and legislative levels – to assess the project outcomes and put in place the necessary conditions to enhance and sustain the achievements;

   iv. co-financing and implementing partners of the project – to assess their contribution and identify actions to be taken to consolidate and ensure the sustainability of outcomes and impact; and

   v. decentralised technical services, civil society organisations, input manufacturers, importers and distributors, advisory organisations and farmers in the agricultural sector – to assess their contribution to the project and the roles they must continue to play to ensure the sustainable management and use of inputs, and to significantly reduce the accumulation of obsolete pesticides and persistent organic pollutants (POPs) and their harmful effects on the environment and the health of the population.

1.3 Scope and objective of the evaluation

3. The terminal evaluation covered the entire project implementation period (March 22 2015 to the date of this evaluation, March 30 2021) and considered all stakeholders; it covers all project activities, components and intervention areas. The geographical area covered by the terminal evaluation is that of the project, i.e., the entire territory of Benin for activities of Components 1 and 3, and the departments of Borgou and Alibori in the cotton-growing zone for Components 2 and 4.

4. The terminal evaluation aims at identifying the outcomes achieved by the project, assessing the effects and changes generated on the beneficiaries, raising new or outstanding issues, and drawing lessons to guide the design and implementation of future projects. Its specific objective

is to answer the evaluation questions indicated in the terms of reference of the final evaluation and reorganised by the evaluation team in order to better meet the specificities of the project as well as the new models required by GEF. The detailed evaluation matrix is presented in Annex 4 (see summary in Box 1).

Box 1. Main evaluation questions

Evaluation Question 1 (Relevance). To what extent is the project relevant and consistent with the Government of Benin's strategic priorities for sustainable agricultural development and environmental conservation and with FAO and GEF's strategic objectives?

Evaluation Question 2 (Effectiveness). To what extent have the intended objectives of the project been achieved and what is the level of progress towards impact?

Evaluation Question 3 (Efficiency and factors affecting performance). Was the project efficient and effective in the deployment of management mechanisms, including project design, activity planning, financing and co-financing, monitoring and evaluation (M&E), Project Steering Committee (PSC) coordination and decision-making, stakeholder identification and participation, internal and external communication, and outputs and knowledge sharing?

Evaluation Question 4 (Sustainability and impact). Are the project outcomes sustainable and what conditions are in place to strengthen sustainability and reduce the risks that may affect it? To what extent can progress toward impacts be attributed to the project over the long term?

Evaluation Question 5 (Cross-cutting issues). Have issues related to gender, vulnerable or disadvantaged groups, and environmental protection been integrated into the project and adequately addressed during implementation?

1.4 Methodology

5. The terminal evaluation is based on a systemic and participatory approach that follows the United Nations Evaluation Group (UNEG) evaluation norms and standards (UNEG, 2016) and the evaluation terms of reference developed by the FAO Office of Evaluation (OED). The evaluation itself is based on the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (OECD, 2019) criteria (relevance, coherence, effectiveness, efficiency, impact, sustainability) and on cross-cutting issues under good evaluation practices and GEF expectations (gender mainstreaming, environmental safeguards, co-financing and stakeholder involvement). In line with the new FAO and GEF project cycle (cycle 7), the terminal evaluation also verifies compliance with the UN Common Country Programming: human rights based approach (HRBA); the right to food and the right to decent work; gender mainstreaming; sustainability (financial, socio-political, institutional and environmental); capacity building and results-based management.

6. The evaluation team is made up of an international consultant (team leader) specialised in the evaluation of agricultural development projects, environmental protection and action research on integrated agriculture-livestock-environment systems, and an international consultant (team member) specialised in the management/evaluation of social and environmental projects. The final evaluation team was supervised by OED.

1.4.1 Preparatory phase

7. The preparatory phase of the final evaluation took place in December 2020 through virtual preparatory meetings between the OED Evaluation Officer, the evaluation team, members of GCU based in Rome, the project team and the PMU based in Cotonou. These meetings helped to clarify the objectives of the evaluation, collect documentation, refine the methodology and plan the survey phase. During the preparatory phase, the evaluation team analysed project documentation, including: i) the project document (ProDoc); ii) Benin, GEF and FAO policy documents and strategic development frameworks; iii) the project's semi-annual and annual reports (project

progress report and project implementation review); iv) the mid-term review (MTR); v) the project steering committee's reports; and vi) the partners' activity reports. The data collected was used to reconstruct the project's theory of change (TOC) (see Figure 1), refine the evaluation questions, and develop an evaluation matrix with evaluation sub-questions (see Annex 4).

1.4.2 Survey phase

8. Project contact persons and managers in the implementing and executing partner structures as well as direct project beneficiaries (see Table 1) were identified from a list of stakeholders provided by the PMU. Given the COVID-19 pandemic and the measures put in place by FAO to address it, the interviews were conducted virtually using the most appropriate information and communication technologies for the situation: Zoom, Skype, phone call, WhatsApp.

9. The different categories of stakeholders were interviewed separately. Each interview session within a stakeholder category lasted one to two hours and involved, depending on the relevance, one or more stakeholders from the same organisation or department (see Appendix 1). The cell phone was specifically used to collect the opinions of final project beneficiaries who did not have access to the other information and communication technology tools mentioned above.

1.4.3 Data analysis and report writing

10. The analysis focuses on the five key criteria corresponding to the evaluation questions (see Box 1): i) relevance; ii) effectiveness; iii) efficiency and factors affecting performance; iv) sustainability; and v) cross-cutting issues.

11. The terminal evaluation report addresses each of the evaluation questions while highlighting the strengths and weaknesses of the implementation. It makes recommendations to stakeholders and draws lessons for the design and implementation of future Government of Benin, GEF and FAO projects.

1.5 Limitations

12. The terminal evaluation covered the entire project intervention area and considered all stakeholders but did not conduct any field visits. To mitigate this study weakness, the terminal evaluation conducted in-depth discussions during virtual interviews with project contact persons and beneficiaries (discussion groups) and systematically sought and solicited evidence (documents, data triangulation) to corroborate its findings.

Table 1. Project stakeholders

Type of stakeholders	Relevant organizations and stakeholders
Main implementing partners	**FAO:** - Project supervision team in Rome: Plant Production and Protection Division (NSP); GEF Coordination Unit (GCU); - FAO Representation in Benin: Representative, Program Officer, Project Team. **Ministry of Agriculture, Livestock and Fisheries:** - Project Steering Committee (PSC); - Project Management Unit (PMU).
Other Executing and Implementing partners	**Ministry of Agriculture, Livestock and Fisheries:** General Secretariat; Directorate of Plant Production (DPV); Plant Protection and Phytosanitary Inspection Service (SVPCP); Benin Food Safety Agency (ABSSA); Central Laboratory for Food Safety Control (LCSSA); National Agricultural Research Institute of Benin (INRAB); Departmental Directorates of Agriculture, Livestock and Fisheries; Division of Regulation and Control of Plants and Plant Products. **Ministry of Living Environment and Sustainable Development:** Benin Environment Agency; GEF Focal Point; Basel Focal Point; Project Focal Point. Directorate General of Environment and Climate. **Ministry of Health**: Project Focal Point. National Directorate of Public Health **Civil society organizations**: Bethesda – a non-governmental organization (NGO); *Organisation béninoise pour la promotion de l'agriculture biologique* (OBEPAB); *Société nationale pour la promotion agricole* (SONAPRA). **Project consultants:** Specialists in safeguarding, disposing of obsolete pesticides and decontaminating polluted sites, specialists in managing empty pesticide containers; specialist in pesticide and biopesticide control legislation; Specialist in farmer field schools (FFS); Specialist in FFS typology and M&E; Specialists in determining alternatives to chemical pesticides; Specialist in food spray alternatives/OBEPAB.
Co-financing partners	**Co-financing**: FAO, International Institute of Tropical Agriculture (IITA), CropLife International, ABSSA, OBEPAB.
Other relevant stakeholders	**Private sector:** Input importers and distributors (*Société Accueil Paysan Sarl*; LANTANA); other stakeholders in the agricultural production value chain; waste recycling industries; etc. **Other private** agricultural and environmental consulting **stakeholders.**
Intermediate and final beneficiaries	**Local communities, farming communities, farmer organizations:** National Council of Cotton Producers; farmers' cooperatives; village groups.

2. Background and context of the project

2.1 General context

13. Benin has become the leading cotton producer in Africa in 2019 and 2020 with 678 000 and 714 000 tonnes of seed cotton harvested respectively. However, the risk of food insecurity affects 43 percent of the population in rural areas and 25 percent in urban areas, or more than one-third (34 percent) of the population at the national level (WFP, 2014). The country has developed its second-generation National Plan for Agricultural Investments and Food and Nutrition Security (PNIASAN 2017-2021, Republic of Benin, 2017c) to accelerate its agricultural development around five strategic axes, one of which focuses on improving productivity and production of plant, animal, and fishery speculations.

14. One of the challenges of sustainable development in the agricultural sector is the supply, use and management of inputs in general and pesticides in particular. According to data from the Directorate General of Customs and Indirect Duties (from April 2019) acknowledged by Döhnert (2020) (see Annex 3), the quantities of pesticides formally imported amounted to 2 676 229 kg in 2017 and 4 465 773 kg in 2018 for cotton (an increase of 66 percent in one year) and 613 625 kg in 2017 and 184 938 kg in 2018 for other crops. To this must be added fraudulent imports or "black market pesticides," which occupy about 60 percent of total imports. The increase in pesticide imports follows the increase in cotton production, which rose by 420 percent between 2010 and 2020.

15. An initial inventory of POPs, obsolete pesticides, and related wastes conducted in Benin in 2012, identified 504 tonnes of hazardous products posing risks to the environment and people's health, leading the government to include their monitoring, control, and disposal in its operational priorities. The accumulation of stocks of obsolete pesticides, POPs and related wastes and the risks to the environment and health are linked to several factors (see details in Annex 1), including gaps in the legal and institutional framework, weak technical capacity for the sound management of pesticides throughout their life cycle, particularly with regard to inspections, packaging management and the use of alternatives.

2.2 Project description

16. The objective of project GCP/BEN/056/GFF is to support the Government of Benin in the disposal of obsolete pesticides and POPs and to build related management capacity at the institutional and community levels.

17. The project is structured in five components: i) safe disposal of POPs and other obsolete pesticides and remediation of heavily contaminated sites; ii) study and implementation of management systems for empty pesticide containers (EPCs); iii) strengthening of the regulatory framework and institutional capacity for sound pesticide management; iv) promotion of alternatives to POPs and other hazardous chemical pesticides; and v) monitoring and evaluation (M&E). The different components are supported by a cross-cutting communication.

Box 2. Main project information

Project GEF ID: 4756	Beneficiary country: Benin
GEF focal area: Chemicals (persistent organic pollutants)	**GEF Strategic Objectives: Chem-1, Outcome 1.4: Prevention of POP waste generation, its management and disposal, and management of POPs-contaminated sites in an environmentally sound manner.**
GEF implementing agency: FAO	**Date of mid-term review: 14 April 2018**
Date of approval of the project identity sheet: 9 January 2012	**Approval date by the CEO (GEF): 31 July 2014**
Expected start date: 1 October 2014	**Effective start date: 22 March 2015 (1st steering committee July 14-15, 2015)**
Initial closing date: 30 September 2018	**Revised closure date (four extensions): 21 March 2019; 21 March 2020; 21 March 2021; 30 September 2021**

18. The project budget amounts to USD 12 410 625 including USD 1 830 000 of GEF grants and USD 10 580 625 of co-financing (see Table 2). Co-financing is made up of 87.8 percent in cash and 12.2 percent in kind.

Table 2. Projected co-financing at the time of project approval

Source of co-financing	Co-financers	Amount (USD)	Type
Donor	GEF	1 830 000	Cash
GEF implementing agency	FAO	150 000	In kind
		3 152 125	Cash
Government of Benin	Benin Food Safety Agency	300 000	In kind
		4 250 000	Cash
	DPV (former Directorate of Agriculture)	500 000	In kind
Civil society organisation	OBEPAB	500 000	Cash
		500 000	In kind
Others	IITA	300 000	Cash
	CropLife International	868 500	Cash
		60 000	In kind
Total		**12 410 625**	

19. The project was jointly implemented by FAO and the Government of Benin. The following FAO services are involved in implementation: Country Representation, which is responsible for the operational, administrative and financial management of the project; the Pesticide Risk Reduction Unit within NSP, which is the lead technical unit; GCU at FAO headquarters in Rome; and the Project Coordinator, a full-time consultant recruited by the project.

20. Implementation by the Government of Benin is carried out by the Ministry of Agriculture, Livestock and Fisheries, which chairs a Project Steering Committee (PSC)[4] and leads the multi-stakeholder group of governmental and non-governmental institutions and organisations involved in the management of pesticide and alternatives to pesticides.

[4] The Project Steering Committee is chaired by the Secretary General of the Ministry of Agriculture, Livestock and Fisheries. It also includes the Director General of the Environment of the Ministry in charge of the Environment (Vice President), the Project Coordinator (Rapporteur) and the Head of the Plant Protection Service (Secretary), and representatives of other implementing structures as members.

21. PMU is based at the Ministry of Agriculture, Livestock and Fisheries and is responsible for the day-to-day management of the project, its effective implementation and monitoring of the annual work plans as approved.

22. Other project implementing partners are: Directorate of Plant Production (DPV); Benin Food Safety Agency (ABSSA); *Société nationale pour la promotion agricole* (SONAPRA); National Agricultural Research Institute of Benin (INRAB); Directorate General of Environment and Climate; Beninese Environment Agency; Directorate of Public Health; *Organisation béninoise pour la promotion de l'agriculture biologique* (OBEPAB); and the International Institute of Tropical Agriculture (IITA). The initial three-year duration of the project has been extended to 30 September 2021 or doubled.

2.3 Quality of theory of change and results framework

23. The project did not initially include a TOC, but did include: a results matrix with a baseline, indicators and targets, milestones and assumptions; an implementation strategy; and a risk assessment and mitigation measures. Based on these elements and other information from the Project Document, a project TOC was reconstructed by the evaluation team (see Figure 1 and Appendix 5a).

24. Though it is logical, coherent, and realistic in terms of planned activities, assumptions, and expected outcomes, the project TOC, nevertheless contains some indicators, targets, and assumptions that appear to be poorly formulated, overly ambitious, or illogical.

25. In component 2, indicator i): "75 000 empty containers rinsed three times, collected and stored until they are recycled in the third year; 150 000 planned for the fourth year" is quite relevant given the large amount of EPCs inventoried in Benin. On the other hand, the target seems too ambitious given that the plans and mechanisms for managing EPCs will only be put in place with the project. However, as we will see in Section 3.2.2.1, the project was able to appropriately redirect its efforts to the development of a functional EPC collection plan as a priority.

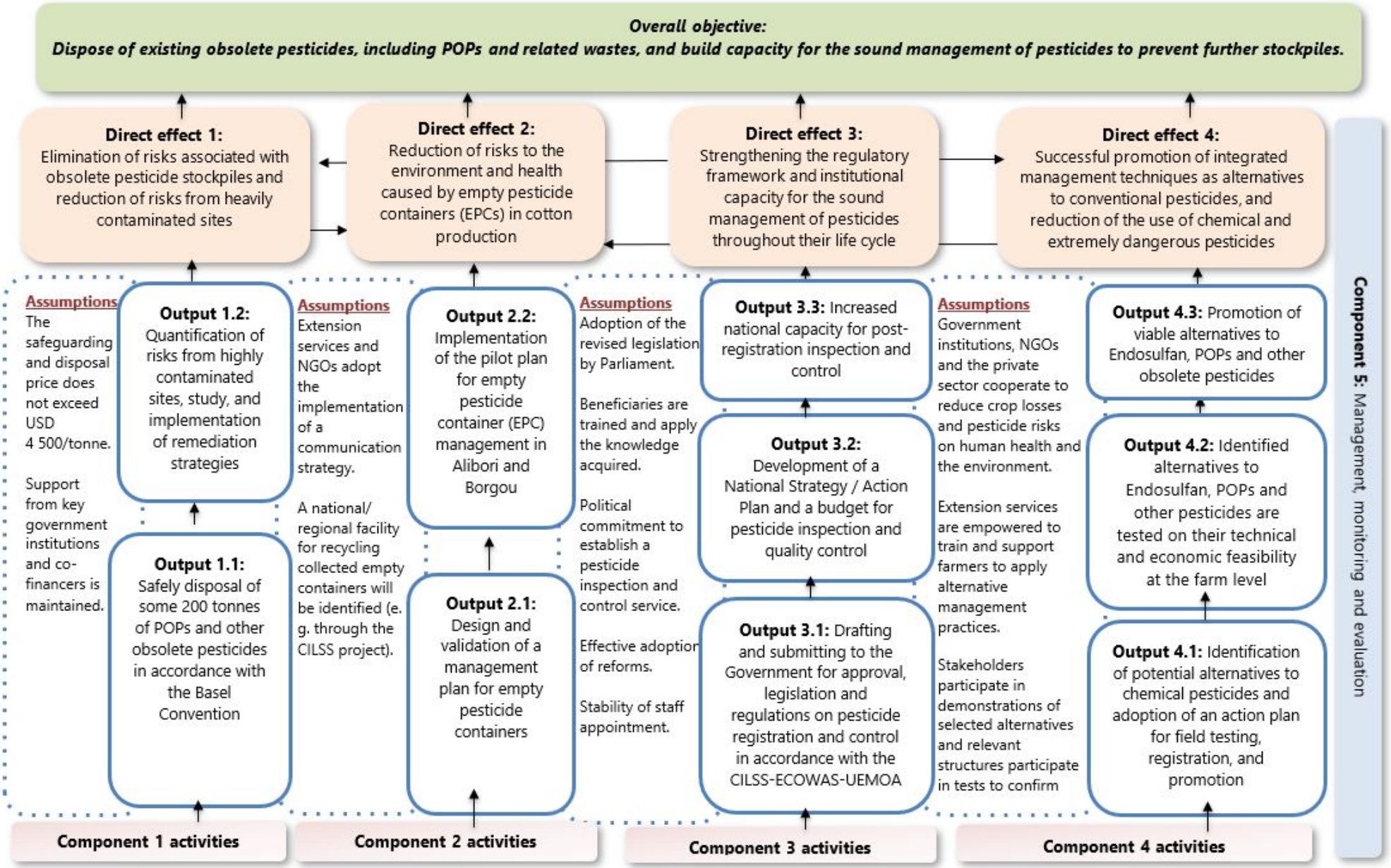
26. In Component 3, Year 3 stage: "Evaluation of the effectiveness of the National Pesticide Management Committee (NPMC) (minimum 25 percent improvement found)" and Year 4 stage: "The National system for pesticide inspection and quality control is operational (budget increased by 10 percent)", the draft does not specify how and on the base of which indicators the effectiveness of NPMC will be assessed. Furthermore, it is not certain that NPMC budget can be adequately set up or increased by the Government to allow it to function effectively.

27. Besides, in Component 3, there is a non-conformity in the wording of Outcome 3.1 "Develop and present to the Government for approval of legislation and regulations on pesticide registration and control in line with international obligations and with the common regional system of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), the Economic Community of West African States (ECOWAS), and the West African Economic and Monetary Union (WAEMU). Indeed, the drafting and presentation of regulatory texts are regalian missions and are the responsibility of the Plant Protection and Phytosanitary Inspection Service (SPVCP) of DPV as regards phytosanitary regulations. Fortunately, as we will see later (in Section 3.2 on effectiveness evaluation), the project noticed this non-compliance early on and reoriented the activities of Outcome 3.1 to support the process of strengthening the regulatory framework for pesticide management in Benin. This change reoriented experts' work to support the process of harmonising national legislation with the CILSS-ECOWAS-UEMOA common regional system led by SPVCP with the support of the Sahel Institute. The draft texts proposed by the project legal experts in their reports were reviewed with stakeholders and made available to SPVCP.

Consequently, the latter supported the project through support missions and participation in text revision, drafting and validation workshops.

28. Also in Component 3, Hypothesis 1: "Timely adoption of the revised legislation by Parliament" is highly relevant, but also highly risky because lobbying interventions require time. By reorienting its intervention to support the process led by SPVCP, however, the project was able to contribute to the finalisation of various texts that were signed in 2018. The signing of these texts also confirms the relevance of the project's Component 3.

Figure 1. Theory of change of the project



3. Findings

3.1 Relevance and coherence: To what extent is the project relevant and consistent with the Government of Benin's strategic priorities for sustainable agricultural development and environmental protection and with FAO and GEF's strategic objectives?

3.1.1 Alignment with the Government of Benin's strategic priorities for sustainable agricultural development and environmental protection

Finding 1. The project contributes to Benin's commitment to sustainable development stated in the country strategic frameworks, including the National Development Plan (NDP) and PNIASAN. It is also consistent with partners' priorities and the international conventions ratified by the country.

29. The project is in line with the country's development vision set out in the NDP 2018–2025 (Republic of Benin, 2018g) and with the various actions to promote sustainable development set out in its Strategic Objective 3 "Ensure the sustainable management of the living environment and the emergence of regional development poles".

30. The strategic development option chosen in Benin's NDP is to make agribusiness, services and tourism the driving force of strong, inclusive and sustainable economic growth within the framework of a more effective national and local governance, by focusing on the development of human capital and infrastructure. The project is intended to strengthen the country's capacities in order to ensure environmental and social protection and to reinforce the factors of sustainability of Benin's development. Indeed, the overall NDP objective is to achieve sustained, inclusive and sustainable growth of 10 percent by 2025, based on the development of agribusiness, services and tourism. Achieving this growth requires the achievement of the NDP Strategic Objective 2 "Increase the productivity and competitiveness of the Beninese economy in a sustainable manner" and more specifically its Specific Objective 2.2 "Increase the overall productivity of production factors". To prevent or mitigate the risks that may arise from this increase in productivity, the NDP has provided for several actions aimed at promoting sustainable development under its Strategic Objective 3. These actions relate to mainstreaming the prevention of major risks (natural and technological risks) in the priorities of the national policy for regional development, environmental protection and natural resource development.

31. In its agricultural recovery plan, Benin is strongly committed to improving agricultural performance for efficient production. It is in this context that the Government has developed its 2017–2025 Strategic Plan for Agricultural Sector Development and its 2017–2021 PNIASAN (Republic of Benin, 2017c), which take over from the 2010–2015 Strategic Plan for Agricultural Sector Revival and Benin's National Agricultural Investment Program. The main objective of PNIASAN is two-fold: i) transforming agriculture for inclusive sustainable growth; and ii) building systemic capacity for outcome implementation and delivery. The project falls under Major Objective 1 and targets three of the four strategic action areas: i) increasing the production and productivity of agricultural value chains; ii) increasing the resilience of livelihoods and production systems; iii) strengthening natural resource governance.[5]

32. The project also contributes to the enforcement and strengthening of Benin's phytosanitary regulations. Component 3 of the project is consistent with certain provisions of Title II of the

[5] The fourth strategic action area entitled "improving markets, trade and value chains" is not targeted.

Phytosanitary Law (Republic of Benin, 1991) relating to the phytosanitary protection of the territory, in particular Article 15 of Chapter IV, which sets up approval as a prerequisite for importing, manufacturing, packaging, marketing and using phytopharmaceutical products, and Article 16, which established the control of these products. Component 4 of the project promotes biological control, as set out in Chapter V of Title II of the Phytosanitary Law.

Finding 2. The project is aligned with the country's international commitments on the environment.

33. Indeed, the Government of Benin ratified the Stockholm Convention (22 May 2001) on 5 January 2004, the Rotterdam Convention (10 September 1989) on 4 January 2004 and the Basel Convention (22 March 1989) on 14 December 1997. The National Implementation Plan (Republic of Benin, 2007) was developed and submitted to the Secretariat of the Stockholm Convention in June 2007. The project significantly supports the implementation of Benin's National Implementation Plan.

34. The operational components of the project are directly aligned with the priority actions of the National Implementation Plan: i) safe disposal of obsolete pesticide stockpiles and related wastes; ii) monitoring and preventing illegal use of obsolete pesticides in agriculture and public health; iii) strengthening regulatory and institutional frameworks for pesticide management throughout their life cycle; iv) building technical and institutional capacity in the area of pesticide management (training in pesticide stockpile management, inspections and quality control); and v) supporting the development and promotion of alternatives to chemical pesticides and in particular endosulfan.

35. Beside the abovementioned compliance, the project supports the Government in its process of strengthening the regulatory framework to boost and foster sustainable pesticide life-cycle management and in the promotion of alternative products and control methods to chemical pesticides. It contributes to the Government's initiative to make national regulations consistent with the regional regulations in force in the CILSS-UEMOA-ECOWAS region.

3.1.2 Alignment with Sustainable Development Goals (SDGs) and FAO-GEF strategic priorities

Finding 3. The project is aligned with Sustainable Development Goals (SDGs) 2, 3, 6 and 12 and FAO Strategic Objective 2 "Increase and improve the supply of goods and services from agriculture, forestry and fisheries in a sustainable manner". It contributes to achieving Output 2.4 "Health and environmental risks posed by organic chemical pollutants, in particular endosulfan and other pesticides, are minimized" of the FAO Country Programming Framework (CPF) 2017–2021 in Benin (FAO-Republic of Benin, 2017).

36. The project is aligned with four SDGs, namely: SDG 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; SDG 3 "Ensure healthy lives and promote well-being for all at all ages"; SDG 6 "Ensure availability and sustainable management of water and sanitation for all"; and SDG 12 "Ensure sustainable consumption and production patterns".

37. The project's design is in line with FAO's capacity building strategy. The strengthening of the regulatory framework aims at encouraging effective and sustainable life-cycle management of pesticides in the long run. The project has involved all stakeholders at different stages of its implementation, starting with the assessment of capacity building needs and the participation of stakeholders in the pesticide management chain – from import to recycling (including waste). The project has planned capacity building actions for individuals and organisations. In this regard, based on the lessons learned from the previous project (GCP/BEN/055/JPN), it planned to

integrate the project's stakeholder representatives into various learning processes, for example, the processes of disposal and remediation of contaminated sites, for which these representatives were part of the national decontamination team. In this vein, the project has planned to strengthen the technical and administrative capacities of phytosanitary inspectors by reinforcing the working equipment of pesticide control points at the borders of Benin (port and airport) in order to facilitate the implementation of the knowledge learned. Regarding the management of pesticide waste, the project also planned to identify and build the capacity of a national structure[6] active in waste management in Benin. The environment will be enabling if it is established an appropriate legal framework that will allow governmental, non-governmental and private stakeholders to consider the deployment of their activities with full knowledge of the facts (regulations). The same applies to the objective of harmonising national laws with the CILSS-UEMOA-ECOWAS regional regulations and setting up a structure to facilitate the post-registration management of pesticides. The project is also aligned with the basic principles and guidelines of the FFS approach developed and experimented for 25 years by FAO and its partners in Africa. In this regard, the project has planned the establishment of FFS in its Component 4, building on the achievements of the integrated production and pest management (IPPM) programme.

Finding 4. The project is perfectly in line with various environmental and social protection interventions in Benin and sub-regional initiatives regulating and supporting the sustainable development of the agricultural sector. It takes over from Project GCP/PRC/055/JPN.

38. The IPPM programme has been active in Benin since 2007 through: i) the project entitled "All-ACP Support Programme on Agricultural Commodities, including Cotton" (GCP/INT/045/EC) in Benin, Burkina Faso, Mali, and Senegal from 2007 to 2011; ii) the Sub-Regional Programme for Participative Training in IPPM that was initially implemented in Burkina Faso, Mali and Senegal (GCP/RAF/378/NET) from 2001 to 2006 and then integrated Benin in its second phase (GCP/RAF/009/NET from 2006 to 2011); iii) the project "Reducing dependence on POPs and other agrochemicals in the Senegal and Niger River Basins through integrated production, pest and pollution management" (EP/INT/606/GEF). This latest project is the first large-scale effort to comprehensively monitor pesticide use in agriculture in sub-Saharan Africa while continuing the work of the IPPM programme to develop safe, productive and sustainable agricultural systems through FFS.

39. The project is consistent and continuous with other subregional and national initiatives such as: Project GCP/INT/063/EC "Capacity Building related to Multilateral Environmental Agreements (MEAs) in African, Caribbean and Pacific (ACP) countries – Clean-up of obsolete pesticides, pesticides management and sustainable pest management" carried out between 2009 and 2013 through which FAO assisted the Government of Benin to carry out the inventory and centralisation of endosulfan stockpiles in order to prevent its illegal use pending its safe disposal; the subregional initiative "Regional pests and pesticides management and capacity building of the Member States of the Permanent Inter-State Committee for Drought Control in the Sahel" carried out between 2015 and 2020 for the development of a regulation aimed at harmonising the rules governing pesticide registration in the West African region and covering the Member States of CILSS, WAEMU and ECOWAS; Project GCP/INT/147/GFF "Disposal of Obsolete Pesticides including POPs and Strengthening Pesticide Management in CILSS Member States" in its Component 3 entitled "Strengthening the regulatory framework and institutional capacities for sound pesticide management".

[6] This is the BETHESDA, which has been identified and strengthened as described later in the effectiveness evaluation (Section 3.2).

Finding 5. The project is in line with FAO's capacity building strategy, but still fails to comply with FAO's gender equality recommendations: gender-specific activities, indicators and targets were neither foreseen in the project document nor integrated during implementation.

40. The project is aligned with the Benin CPF 2017–2021 (FAO-Republic of Benin, 2017) which has two priority areas on which FAO supports the Government: i) consolidating food and nutrition security in a context of climate change; and ii) improving sustainable management of natural and forest resources. More specifically, the project contributes to Output 2.4 "Health and environmental risks posed by chemical organic pollutants, in particular Endosulfan and other pesticides, are minimized", whose targets are: i) 204 tonnes of POPs and other obsolete pesticides are secured and eliminated with FAO support by 2021; ii) at least two sites contaminated by obsolete pesticides are remediated with FAO technical and financial support by 2021; and iii) seven FFS are established to promote alternatives to hazardous chemical pesticides by 2021.

41. The project is in line with the recommendations of the FAO Policy on Gender Equality (FAO, 2013) but in an insufficient manner, as no gender-related indicators or targets and no activities specifically targeting women and other vulnerable groups have been included. Yet, Component 4 of the project, based on the FFS approach, offered the opportunity to better integrate women into the project. It would also have been possible to plan specific activities and gender-sensitive indicators and targets, taking into account the sociological realities and current perceptions and orientations in the intervention area.

Finding 6. The project design is consistent with GEF priority strategies. The project contributes to achieving the GEF-5 Strategy on chemicals. It focuses in particular on CHEM-1 related to the management, prevention and disposal of POP wastes, and on the sound environmental management of contaminated sites.

42. The project complies well with GEF policy guidelines and requirements for co-financing, public participation, stakeholder engagement, monitoring and evaluation, application of the incremental cost principle, gender equality, and GEF environmental and social safeguards. Information on the amounts, sources and types of co-financing expected are detailed in the approved project document. The latter serves as a basis for assessing the level of effective mobilisation of co-financing.

43. The project objectives are aligned with GEF priority strategies, aiming at the disposal of existing POPs and other obsolete pesticides and providing for the remediation of heavily contaminated priority sites as well as regulatory and institutional capacity building to prevent future mismanagement.

Partial conclusion 1. Relevance

44. The Government, FAO, and implementing partners are well involved in the project and their specific responsibilities are indicated in the project document. Activities related to setting up and implementing FFS, decontamination and training of phytosanitary inspectors (training of trainers) are also the anchor points used by the project to arouse the interest of the populations and to encourage their engagement and participation.

45. Ultimately, the project's specific objectives and strategy are in line with the strategic priorities of the Government and its partners and are based on sound approaches (FFS approach; IPPM (see paragraphs 37, 38 and 39), well-established partnerships, and a coherent and realistic project TOC. The project is rated as Highly Satisfactory in terms of relevance and coherence.

3.2 Effectiveness: To what extent are the intended objectives of the project being achieved and what is the level of progress towards impact?

3.2.1 Direct effect 1: Elimination of risks associated with existing obsolete pesticide stockpiles and reduction of risks from sites heavily contaminated with pesticides

3.2.1.1 Progress towards the safe disposal of 213 tonnes of POPs and other obsolete pesticides safely disposed of in accordance with the Basel Convention

Finding 7. The disposal of obsolete pesticides has been delayed. However, according to the conditions put in place, it is very likely that the disposal of 213 tonnes of identified POPs and obsolete pesticides be effective by the new deadline agreed upon between FAO and VEOLIA (no later than June 30, 2021, according to the National Project Coordinator – NPC).

46. As a prelude to its disposal, the stockpile of obsolete pesticides and POPs was inventoried in a methodical and objective manner. The process began with the training of 90 agents, including six heads of phytosanitary surveillance and agricultural input control services and 84 communal phytosanitary inspection and plant protection agents, carried out from 12 to 21 August 2015 by CropLife International on awareness-raising materials. Holders of obsolete pesticides stockpiles and EPCs were identified from 17 August to 15 November 2015 and declared their stocks. The results from the stock declaration were shared with all parties involved in pesticide management during a national workshop on 10 December 2015. Subsequently, a follow-up inventory was planned and conducted in the field to verify the accuracy of the information identified during the stock declaration, especially at the level of new stores/depots, and to conduct a comprehensive assessment of stockpiles that had been built up.

47. The complementary inventory process started with the constitution of inventory teams and capacity building on the inventory methodology during a planning workshop (see Annex 3, in-house project document, January 2016) organised in January 2016. This was followed by the deployment of three inventory teams in all departments from 31 January to 27 February. The results of this additional field inventory were shared and discussed with stakeholders in May 2016 during a restitution workshop (see Annex 3, in-house project document, May 2016). As a result, 1 439.45 tonnes of POPs and obsolete pesticides were actually inventoried, exceeding the 533 tonnes of POPs, obsolete pesticides, and contaminated waste initially reported by the holders at the beginning of the inventory process.

48. The inventoried stock of POPs and obsolete pesticides (1 439.45 tonnes) far exceeds the residual stock of 135 tonnes of POPs and obsolete pesticides reported to the Pesticide Stock Management System (PSMS) after the endosulfan disposal by the GCP/BEN/055/JPN project.[7] Considering its resources and initial target, the project undertook the disposal of 213 tonnes of POPs and obsolete pesticides based on the following priorities: i) selection of POPs and obsolete pesticides (Classes Ia, Ib and II), classified as extremely hazardous; ii) selection of stores containing small amounts of high-risk POPs or obsolete pesticides; iii) selection of pesticides belonging to CropLife International member organisations. However, although the quantities of POPs to be disposed of by the project are small in relation to the stockpile, one of the merits of the project is that it was able to alert and mobilise government authorities to include sustainable pesticide management and the safeguarding of POPs, obsolete pesticides and other hazardous chemicals in the

[7] According to the main project document (ProDoc), the inventory conducted in 2012 by Project GCP/BEN/056/GFF counted 504 tonnes of obsolete pesticides (including 380 tonnes of endosulfan, 15 tonnes of dieldrin, 12 tonnes of lindane), plus 150 tonnes of other pesticide-contaminated waste.

government's priorities for protecting the environment and preserving the health of the population.

49. There is a considerable delay in the actual disposal phase, due to the slow process of contracting with VEOLIA (contract signed in April 2020) as explained in paragraph 140 of Section "Efficiency". Moreover, the COVID-19 pandemic resulted in a six-month postponement of activities. According to VEOLIA's work plan, reviewed in mid-March 2021, the actual export of POPs, obsolete pesticides and related wastes and their disposal is scheduled for no later than 30 June 2021.

50. Despite the delay, the project is effectively progressing towards the safe disposal of 213 tonnes of obsolete pesticides, POPs and related waste by 30 June 2021. Indeed, preliminary activities have already been completed: i) development of the environmental management plan (see Annex 3, in-house project document, Tiamiyou, October 2017); ii) contracting with the company VEOLIA (see Annex 3, in-house project document, 2020) for the safeguarding, stowage, transportation, export and disposal of 213 tonnes of POPs and obsolete pesticides existing in Benin; iii) routing and safe storage of POPs and obsolete pesticides in a central store; iv) obtaining authorizations in accordance with the Basel Convention;[8] v) mission carried out by VEOLIA's expert from 25 October to 17 December 2020 to meet with the authorities, comply with administrative and regulatory requirements and begin POPs and obsolete pesticides safeguarding operations; and vi) provision of appropriate materials and equipment for the work. The safeguarding operations actually began on 26 November 2020. The process progress status at the end of April 2021 was as follows: 117.2 tonnes of obsolete pesticides and POPs already repackaged out of 213 tonnes; 71.6 tonnes of obsolete pesticides, POPs and related waste stored in six containers and ready to leave the port; repackaging of pesticides from eight stores out of the 13 priority stores containing the pesticides to be disposed of.

3.2.1.2 Quantification of risks from highly contaminated sites, study and implementation of remediation strategies

Finding 8. The project successfully combined national and international expertise and used the planned budget to successfully undertake the decontamination of four polluted sites instead of the two sites initially planned.

51. The processes of identifying, quantifying, safeguarding and decontaminating sites polluted with obsolete pesticides and POPs contribute to the reduction of potential risks and negative effects of these pollutants on the environment and the health of populations.

52. Sites highly contaminated with POPs and other obsolete stockpiles were identified during inventory activities conducted in 2012. Considering the persistent toxicity in soil and the contaminants' odour which deteriorate health and generate environmental risks for the communities living in the vicinity, four sites were considered as priorities for further investigation: Djassin and Oganla in Porto Novo, Malanville in Alibori, and Bohicon.

53. Decontamination options (see Annex 3, in-house project document, Tiamiyou et al., March 2014) were previously identified by Project GCP/BEN/055/JPN for the Djassin, Oganla, and Bohicon sites[9] following investigative work by the international consultants[10] and the national decontamination

[8] The Ministry of Living Environment and Sustainable Development issued the Basel notification number BJ A4030/6P.7.20 for the transit of POPs and obsolete pesticides and a signed letter on 29 July 2020 to authorise the transfer of hazardous waste and various packaging materials to Switzerland.

[9] Djassin and Oganla are located in Porto Novo and Bohicon in the Zou Department.

[10] Joop Harmsen and Sylla Cheikh Hamallah from Alterra University in Wageningen, the Netherlands and former PASP in Bamako, Mali.

team. The project developed site-specific environmental management plans for Oganla (see Annex 3, in-house project document, April 2015) and Bohicon (see Annex 3, in-house project document, Tiamiyou, et al. October 2017) and updated those for Malanville (see Annex 3, in-house project document, Tiamiyou et al, October 2017) and Djassin (see Annex 3, in-house project document, Tiamiyou et al., March 2018) that had been initiated/developed under Project GCP/BEN/055/JPN. Decontamination operations at the Djassin site will only take place after the top layer of the depot has been removed by VEOLIA, the company responsible for safeguarding and disposing of POPs and obsolete pesticides.

54. The decontamination of Malanville (orthene 75 SP), Bohicon (thioral) and Oganla (methyl parathion and DDT, DDD and DDE) sites was successfully completed in accordance with the environmental management plan and using the African approach of risk reduction with soil remediation: landfarming is carried out with plant species such as vetiver and jatropha that have detoxification powers. These operations also include the installation of hazard signs and sampling to assess the evolution of the levels of methyl parathion residues in landfarming. The operations performed at each site are described in specific reports (see Annex 3, in-house project document, Tiamiyou, 2015).

55. The process of decontaminating sites contributed to the capacity building of the national decontamination team set up and made up of delegates representing the project stakeholders. This process has also helped to assess and confirm the capacity of the Central Laboratory for Food Safety Control (LCSSA) to analyse pesticide contaminated samples.

3.2.2 Direct effect 2: Reduction of risks to the environment and human health caused by the use of empty pesticide containers for cotton production

3.2.2.1 Design, testing and validation of a management plan for empty pesticide containers

Finding 9. The project developed, tested and validated a management plan for EPCs that includes awareness raising, training, pre-treatment through triple rinsing and destruction from below, tracking to collection points and finally to village or communal stores, where they will be safely stored and later on collected by the non-governmental organization (NGO) in charge of final recycling. This progress was consolidated by the signing of Order No. 097/MAEP of 18 December 2018 (Ministry of Agriculture, Livestock and Fisheries, 2018a.), setting the terms and conditions for the management of EPCs and biopesticide containers as well as the terms and conditions for the distribution of related costs. The implementation of this order will contribute to the prevention and sustainable reduction of the risks related to the inappropriate use of EPCs.

56. The analysis of the baseline situation of pesticides and EPCs in Benin highlighted factors to consider in the design of an EPC management plan (see Annex 3, in-house project document, Tiamiyou, December 2015, Sagbohan, September 2017 and October 2019). This includes considering: the importance of cotton and vegetable farming systems in the production of EPCs, the extent of dangerous EPC use and recycling practices by rural populations, the absence of specific legislation for sustainable EPC management, and the need for Benin to have such legislation. In vegetable production, for example, some farmer groups gather EPCs together and bury or burn them in a shallow pit. In cotton farming, an average of 1 500 000 litres of pesticides are imported by the *Association Interprofessionnelle du Coton* (AIC) during each cotton season and sold on credit to farmers, but without any associated system for EPC management/recovery. In general, farmers leave EPCs anywhere without sanitation treatment or without destroying them, and the populations reuse them on a daily basis to store products (water, oil, salt, milk, pap,

cosmetics, etc.) and for various other uses, thus exposing themselves to intoxication and/or associated chronic diseases.

57. Discussions with project stakeholders have established that the development of a functional system for managing EPCs requires, first and foremost, the training and education of farmers on the risks associated with the reuse of EPCs and the establishment of a system that obliges small subsistence farmers to return EPCs. To this end, the training of facilitators and FFS members and awareness raising of populations and stakeholders was planned and carried out as presented later in the report (see Section 3.2.4 on Effect 4).

58. The EPC management plan, developed and successfully tested by the project, works as follows (see Annex 3, in-house project document, Tiamiyou, December 2018): FFS members and other sensitised farmers triple rinse, drain, and destroy from the bottom the EPCs used at the beginning of the campaign. They then store each one in an intermediate bag with their lids removed. These bags are then transferred to the collection point where they are dumped into another larger bag. Each collection point receives two large bags. The collection points are chosen from among farmers based on their openness to innovation and development in the village, their availability and ability to mobilise other farmers, and the availability of an appropriate and secure storage facility, located outside of any residential unit. The collection points are equipped with personal protective equipment and control the quality of the EPCs rinsed and deposited by farmers. They also check whether EPCs are recognised by the AIC system, because only containers set up by the AIC mechanism are collected under the pilot scheme. Managers of the stores pertaining to village cotton cooperatives are also involved in the collection system for triple-rinsed EPCs and are responsible for making the stores available to receive the large grouping bags from the collection points. These bags are collected by the EPC recycling company.

3.2.2.2 Identification and capacity building of a waste collection, treatment and recycling structure

Finding 10. The project supported the capacity building of Bethesda and the upgrading of its waste treatment and agricultural production centre to meet standards, which allowed for the safe treatment and recycling of 5 465 EPCs. This amount of recycled EPCs is far below the Project Document target of 150 000 EPCs processed and recycled in Year 4. Indeed, the project chose to focus its efforts and resources on developing a national plan for sustainable EPC management rather than simply conducting a large-scale collection without ensuring the process continuity and sustainability. The operation allowed the EPC management plan to be tested and lessons learned to be capitalised upon to ensure the scaling up of the plan and the entire management system, including its financing.

59. Bethesda is an NGO, created in 1990 and classified as a public utility since 2008. It has been involved in waste treatment for about 20 years through its Community Development and Environmental Protection Department (DCAM), which works on water, waste, sanitation and agriculture issues with the objective of improving the health of direct beneficiaries by improving the quality of the living environment. Discussions with the project in 2015 led to the signing of a partnership agreement. The implementation of this agreement strengthened Bethesda's capacity for safe collection, treatment, and recycling and, more broadly, the upgrading of its environmental and safety management system (see Annex 3, in-house project documents, Bethesda, February and September 2019).

60. Bethesda has developed its environmental policy and implemented an environmental, health, and safety management plan (developed during the 9 January 2019 workshop) for its Waste Treatment and Agricultural Production Centre. To further implement its plan, its staff was provided with

personal protective equipment and trained on its use (see Annex 3, in-house project document, Bethesda, September 2020).

61. The upgrading of the centre took into account the requirements of the audit report drafted by the Beninese Environment Agency. A contingency plan, validated in June 2020, has been put in place to prevent and manage disasters or fires, and measures have been taken to clean the stores and maintain them in a continuous state of cleanliness. Thanks to the project, more than 30 pictograms were designed and installed inside the centre to ensure safety and warn against risks and dangers (prohibition, obligation and warning pictograms). In addition, staff capacities were strengthened to support the control and implementation of emergency and rescue measures. The project also facilitated the integration of staff medical monitoring, and a contract was established between Bethesda DCAM and Bethesda Hospital. As a result, all staff had a health check-up on 4 March 2020, following the guidelines set by the Bethesda DCAM occupational physician.

62. In order to control and safely treat the wastewater generated by the processing of EPCs before it is discharged into the environment, the project supported the strengthening of the Bethesda DCAM infrastructure. Four watertight tanks were built and connected to the laundries to ensure the treatment of the water generated by the washing of EPCs. The first two basins are each equipped with a valve to allow treated wastewater to pass through. The wastewater is checked twice before it goes into the third and fourth tanks and finally discharged into the environment from the last tank. The wastewater obtained after rinsing the containers is analysed by Bethesda's partner, IRGIB AFRICA, and if necessary, treated before discharge.

63. The project has supported: the upgrade of plastic shredding machines in the Pahou Centre in September 2019; the construction of a room (12.4 m^2) at the entrance to the site for visitors to wear personal protective equipment; and the construction of a concrete drying area for rinsed containers (56.55 m^2 area, 25 cm thick).

64. As a result of its capacity building, Bethesda was awarded a government tender for the collection and processing of EPCs in Benin's 77 municipalities. In addition, the experience of manufacturing flowerpots from recycled EPCs is a source of satisfaction for Bethesda, which considers this result as a real added value to its experience in waste management and recovery in Benin.

3.2.2.3 Awareness raising and capacity building on the risks related to using EPCs and prevention measures

Finding 11. The project-built capacity and raised awareness among trainers, farmers, women and youth and other stakeholders on the risks of EPCs and risk reduction options (triple rinsing and perforation, pilot recycling plan testing) in the cotton and maize production areas. Trained farmers adopted the proposed processing, collection and storage system and began outreach to other community members.

65. Awareness raising and capacity building of populations on the risks of EPCs and risk reduction options (triple-rinsing and perforation, test of the pilot recycling plan) in cotton and maize farming areas started with the training of 13 cotton-maize FFS facilitators and took place from 3 to 7 August 2018 in Kandi. In addition to the traditional IPPM modules and in particular the recognition and management of the armyworm on maize (*Spodoptera frugiperda*), this training integrated the management of risks related to the use of chemical pesticides, the management of EPCs and especially the triple-rinse method. FFS members were trained as described below, and a poster with safety tips and instructions on EPC management was made available to 13 FFS.

66. The project conducted a field mission (see Annex 3, in-house project document, Tiamiyou, November 2018) from 12 to 26 November 2018 that strengthened the technical capacity of

facilitators and raised the awareness of both facilitators and farmers on the dangers of pesticides and the routes of contamination during pesticide exposure. A total of 12 out of the 13 planned FFS were visited (including six FFS in the first year and six FFS in the second year) and 224 people (including 197 FFS member farmers and 27 non-FFS members) were successfully sensitised. Out of the 197 FFS farmers, 170 were men (86.3 percent) and 27 were women (13.7 percent). Awareness raising in Borgou and Alibori regions on chemical pesticide management and triple rinsing was a real opportunity for FFS farmers to express themselves on their own behaviours related to chemical pesticides. Stakeholders recommended that awareness, education and training on the risks and hazards of pesticides in general and ways to prevent them be expanded in the future to include all phytosanitary stakeholders and other members of rural communities (including pastoralists).

67. In order to prepare for the implementation of the pilot EPC management plan described above, the project carried out a monitoring and stakeholder awareness mission (see Annex 3, in-house project document, Tiamiyou, 2019). The mission took place from 7 to 13 May 2019. This awareness-raising mission coincided with the start of the cotton season, marked by the introduction of inputs (fertilizers and herbicides). It benefited nine villages, involving 157 farmers, out which 130 are former members of FFS (82.8 percent) facilitated by the project and 27 (17.19 percent) selected among other farmers. The other stakeholders (nine former FFS facilitators, six agents or advisors of the cotton sector) were also sensitised, as well as 12 women from the "Tous Unis d'Ina" women's group and nine women from the "GF SUN NA" in Ségbana, who promised to pass across the message through the local radio. These women also confirmed the widespread use of EPCs with the increasing use of herbicide by farmers for weed control and the generalisation of bad practices such as the increasingly frequent delivery of milk by Peulhs in EPCs to households, as well as the use of EPCs as containers for water drunk during field work. Approximately 282 students and 13 teachers from high schools and colleges in Borgou and Alibori participated in the awareness sessions. Two community radio stations took part in the awareness sessions (Radio Kandi FM 102.9 MHz and FM Banikoara) and produced a summary of the outreach document and the interview with the national consultant, then broadcasted information and messages on the topic of the overall EPC management.

68. Actions could be taken to broaden awareness to the different categories of phytosanitary stakeholders, including stockholders, professional applicators and farmers' professional organisations. Emphasis should be placed on the risks associated with pesticides, the routes of contamination and especially the techniques of triple rinsing chemical pesticide containers. It is also necessary to increase the frequency of awareness raising and training and to adapt it to all components of rural communities, including women's groups, schoolteachers, religious denominations (especially worshippers in mosques where containers are used for ablutions), street food vendors, pastoralist communities, honey producers (for the same reasons), and others (see Recommendation 2).

3.2.2.4 Development of a support document to set up a national system for empty pesticide container management

Finding 12. The project developed a support document to set up a national EPC management system in Benin, including a business model and a feasibility study (see Döhnert, 2020, Annex 3). This very informative document has not yet been shared with the government to install and operate the proposed management and financing system. Thus, its ownership by the Government is not yet effective.

69. The proposed independent and non-profit system works in favour of all importers (and resellers) and should therefore be financed by the latter using the polluter pays principle and the regulatory

provisions in force in Benin. This system is responsible for information management; awareness raising; coordination of EPC collection, transport and processing; environmental and social safeguards for each stage of the system; residues, possible EPC recycling; reporting; finance; and stakeholder training. Options for sustainable financing of EPC management have been studied by the project and recommendations made to the Government.

70. The drafted document highlights factors that influence the scope, costs and financing of a sustainable system for EPC management. These are, for example, laws, regulations, cropping systems, types of farms, types of containers, collection concept, logistics, seasonality, duration and frequency of collections, hazardousness level of EPCs, processing system and environmental management, health and safety, additional services (training of participants in the process, especially farmers, communication), administration, skills and responsibilities, illegal imports and fraud (counterfeiters).

71. While defining the system, it should be taken into account that Benin is characterised by small family farms. Their needs for the cotton seasons vary from year to year and are generally consolidated at a higher level, whether at the village, municipality or department level, and then centralised at the national level. It is also necessary to define stakeholders and their functions based on Order No. 097/MAEP of 18 December 2018 (Ministry of Agriculture, Livestock and Fisheries, 2018a.), setting the terms and conditions for the management of empty pesticide and biopesticide containers as well as the terms and conditions for the distribution of related costs.

72. In order to finance the EPC management system, the document recommends imposing a fee (eco-tax) of about USD 1 per kilogram of primary containers imported. This fee should cover all costs of the system, including awareness raising and training, establishment of collection centres, equipment (e.g., collection bags), operating costs such as logistics, pre-treatment, recycling, final disposal (where no recycling is feasible, incineration with thermal recovery is the recommended option), monitoring and administration. The import of pesticides into Benin is subject to an ecotax of 0.5 percent of the value of the pesticides to be imported, but this tax, paid to the National Fund for Environment and Climate, is not sufficient to finance EPC management.

73. Based on the Cameroonian model, in which the importer must present the pesticide registration (issued by the Ministry of Agriculture) and an environmental permit (issued by the Ministry of Environment), the document presents financing options for Benin by simulation. The Cameroonian model incorporates into the environmental permit (which is valid for one year) a list of fees that the importer must pay to the farmer for each EPC returned. This list of fees (or catalogue) for EPC recovery can be considered the minimum budget basis for the EPC management system. Thus, the environmental permit fee and a fee of one dollar per kilogram of empty containers can be used to finance the EPC management system in Benin.

3.2.3 Direct Effect 3: Strengthening the legal framework and institutional capacity for the sound management of pesticides throughout their life cycle

3.2.3.1 Harmonization of national laws and regulations related to pesticide registration and control, in line with international obligations and the CILSS-ECOWAS-UEMOA common regional system

Finding 13. The project identified weaknesses in the various texts (laws, decrees and orders) that govern the regulatory framework for pesticides in Benin. It contributed to the strengthening of this framework and promoted its implementation during the processes of reading, exchange and amendment, validation and finalisation of decrees and orders.

74. The mission assigned to NPMC is to coordinate the development and implementation of policy and regulations related to the rational management and control of pesticides and biopesticides. NPMC, chaired by the Director in charge of plant production, works in close collaboration with the registration and management bodies of the pesticide and biopesticide sector in the CILSS-ECOWAS-WAEMU area. It has a permanent secretariat provided by the Plant Protection Service and a Technical Commission in charge of the technical review of the dossiers submitted to NPMC. The project initially recruited a national consultant and an international consultant to develop the draft NPMC decree. However, administratively, the development of phytosanitary (pesticide management) regulations is the responsibility of SPVCP within the Directorate of the Plant Production. At the end of their mission, a memorandum on the shortcomings found in the draft NPMC decree developed by SPVCP was prepared and sent to the Ministry of Agriculture, Livestock and Fisheries for assessment and consideration. These shortcomings were taken into account during the workshop to review the draft NPMC decree.

75. The process of strengthening the regulatory framework, led by SPVCP, has thus benefited from the support of CILSS[11] and the project. Decree No. 2018-171 of 16 May 2018 (Republic of Benin, 2018a), on the creation, attributions, organisation, and operation of NPMC and Decree No. 2018-172 of 16 May 2018 (Republic of Benin, 2018b), setting the conditions for the application of community regulations on pesticide registration in Benin, were signed at the end of this process. These decrees fill in the gaps in the legal framework, particularly in terms of post-registration monitoring of pesticides. Indeed, there were only directives and standards on biopesticides, and only Article 3 of Regulation C/REG.3/05/2008 (ECOWAS, 2008a), on the harmonisation of rules governing pesticide registration in the ECOWAS region, served as a law.

76. These decrees were followed by the signing of orders: i) Inter-ministerial Order No. 041/MAEP/MEF/DC/SGM (Ministry of Agriculture, Livestock and Fisheries-Ministry of Economy and Finance, 2020), on the conditions for obtaining professional authorisations for the manufacture or repackaging, importation, distribution and application of pesticides and biopesticides in the Republic of Benin; ii) Ministry Order No. 089 of 2018 (Ministry of Agriculture, Livestock and Fisheries, 2018b), setting the conditions for labelling pesticides and biopesticides distributed in the Republic of Benin; and iii) Ministry Order No. 097 of 18 December 2018 (Ministry of Agriculture, Livestock and Fisheries, 2018a), setting the conditions for the management of empty pesticide and biopesticide containers as well as the conditions for allocating the related costs.

77. As Benin has simultaneously undertook the harmonisation of national texts with several other Community Regulations on agriculture in the ECOWAS-WAEMU space (ECOWAS, 2008b), the project also participated in the development of the following decrees: i) Decree No. 2018-173 of 16 May 2018 (Rep. of Benin, 2018c), instituting the Beninese catalogue of plant species and varieties; ii) Decree No. 2018-174 of 16 May 2018 (Rep. of Benin, 2018d), on the creation, attributions, organisation, and operation of the National Seed Committee in the Republic of Benin; iii) Decree No. 2018-175 of 16 May 2018 (Rep. Benin, 2018e), on the creation, attributions, organisation, and operation of the National Committee for the Approval and Quality Control of Fertilizers in the Republic of Benin; and iv) Decree No. 2018-176 of 16 May 2018 (Rep. of Benin, 2018f), establishing the modalities of management and quality control of fertilizers in the Republic of Benin.

[11] CILSS was mandated by WAEMU to implement the "Convention to support the strengthening of the mechanism on food security, locust control and pesticide management", signed on 7 November 2014 in its component on pesticide management, through the establishment and operation of NPMC in three WAEMU and CILSS Member States, namely Benin, Côte d'Ivoire and Togo.

3.2.3.2 Development of a National Strategy / Action Plan and a budget for pesticide inspection and quality control

Finding 14. The project carried out inspection activities and diagnostic studies for the post-registration management of pesticides. It also proposed actions and strategies to be implemented to fill the gaps and promote compliance in the pesticide value chain in Benin. Although deemed relevant and realistic by government officials, their implementation requires resources to be integrated into annual work plans and budgets (AWPBs).

78. According to studies conducted by the project (Annex 3, in-house project documents, Bouraima, September 2017, Hagenimana, November 2019) many of the problems observed in the field at the level of stakeholders involved in the management or use of pesticides stem from the inefficiency of the current pesticide post-registration system in Benin. Numerous cases of poisoning of rural populations, in particular cotton farmers, are regularly reported, as well as misappropriations of pesticides specific to the cotton sector for use in the food, horticultural and forestry sectors. Awareness-raising and education on the regulatory use of pesticides is largely insufficient, as are systematic inspections and controls at all stages of the pesticide life cycle. Inspections are limited to imports at border crossings. Many of these borders are porous, and compliance verification actions are sporadic, unplanned and undocumented, contributing to the existence of an illegal parallel market of uninspected and unregistered pesticides, the accumulation of large stocks of obsolete pesticides, and the misuse of containers (management of EPCs). In addition to the above factors, there is the low capacity of national laboratories to carry out conformity analysis of pesticide formulations, which limits the early detection of health and environmental hazards related to pesticide use; the lack of a cataloguing system or data bank where an inspector can record his reports; and the lack of financial resources, which limits the movement of phytosanitary inspectors.

79. To address these shortcomings and improve the capacity of the post-registration management system, the project proposed concrete actions and strategies structured around four pillars: awareness and compliance promotion, conducting inspections, enforcement and information sharing (database). However, the adoption and implementation of these measures requires funds to be included in AWPBs.

3.2.3.3 Strengthened national capacity for post-registration inspection and control

Finding 15. The project proposed an improved quality control system for pesticides in Benin, including the role of analytical and sampling procedures in the inspection process. This control system was validated during a workshop held on 19 July 2019 in Cotonou (Annex 3, in-house project document, Hagenimana, 2019).

80. The new measures applied in the framework of the administrative and political reform of the rural development sector provide for the synergy of several institutional stakeholders in the area of pesticide inspection and quality control in Benin. Under the governance of NPMC, two technical institutions have a predominant role: i) DPV through SPVCP, is in charge of defining pesticide inspection policies and strategies, training phytosanitary inspectors, organising and supervising the chain of command in terms of pesticide inspection, and phytosanitary monitoring related to pesticides in the field; and ii) the Departmental Directorates of Agriculture, Livestock, and Fisheries, through the Regulatory and Control Services and their technical units, are in charge of pesticide inspection and quality control.

81. Awareness raising among managers and key stakeholders involved in pesticide-related activities was undertaken during a workshop organised in July 2019, to share the findings of the study on

post-registration pesticide management and the conclusions of the evaluation related to the control and inspection capacity in Benin. Participants were representatives of NPMC member institutions and structures such as the National Chamber of Agriculture, the Chamber of Commerce and Industry of Benin, the national platform of farmers' organisations and agricultural producers of Benin, importers and distributors of pesticides.

82. To operationalise the new approach of the improved national pesticide inspection and quality control system, which takes risk into account, the project undertook technical and material capacity building, focusing on the two entry points receiving a large flow of pesticides in Benin, i.e., the port and airport of Cotonou.

83. The project supported the training of 37 phytosanitary inspectors on pesticide inspection and control procedures and techniques from 22 to 26 July 2019 in Bohicon. The knowledge acquired was relayed by the participating inspectors in order to reach all phytosanitary inspectors. Beneficiaries expressed their satisfaction with the content of the various presentations, the communication strategies adopted, the practical exercises proposed and the simulated case studies regarding pesticide inspection techniques. These presentations also included practical exercises in pesticide treatments/sprays in the form of short exposés conducted and discussed in working groups and then presented in plenary sessions.

84. The content of the training is included in Benin's Inspector Manual, whose technical quality is highly appreciated. Indeed, according to beneficiaries, this manual addresses the essential practical aspects concerning pesticides. Factsheets and flyers were published to better support training through the dissemination of training elements, phytosanitary techniques and other useful information such as the import, distribution and use of pesticides. This is an activity that was not included in the ProDoc but deemed relevant by the project's technical committee. However, the implementation modalities agreed upon with the relevant consultants could not be carried out, as the project prioritised, in its extension phase, the activity related to the disposal of obsolete pesticide stocks. A working forum between phytosanitary inspectors was created in July 2019 during the Bohicon training. It is still functional but only deals with issues concerning pesticides at the national level. Related administrative information such as communiqués on pesticides, publication of orders, decrees and other memos, information on pesticides at the community, regional and international levels and inspection methods and experiences, are not included. All the existing regulatory texts (laws, decrees and orders), as well as the series of newly published and disseminated orders, have been transmitted to the phytosanitary inspectors through the inspectors' forum; however, these newly published texts still need to be synthesised in the form of operational procedures so that the inspectors can use them easily.

85. The post-training follow-up (Annex 3, in-house project document, Bouraima, November 2019) found that the rate of restitution was around 85 percent (162 inspectors out of a total of 192 inspectors received the Inspector Manual and basic training), which means that most phytosanitary inspectors at the national level have acquired the necessary notions and are trained in the inspection and sampling of pesticides during controls. This training has generated great interest among the beneficiaries and deserves to be integrated into the Ministry of Agriculture, Livestock and Fisheries' AWPB to ensure the training of inspectors and the consolidation of their knowledge. The phytosanitary inspector manual should also be published and made available to every phytosanitary inspector in Benin.

86. Regarding the technical equipment of inspectors (personal protective equipment, inspector's kit, sampling materials, small laboratory materials, standard operating procedures, compliance promotional sheet), this important and decisive aspect of pesticide inspection and control is

unfortunately poorly equipped in the field. Indeed, phytosanitary inspectors generally do not have any work equipment apart from used items such as pairs of boots and gloves, magnifying glasses and unsuitable tweezers observed in some offices. Even personal protective equipment to ensure the safety of the inspector is not always available.

87. The follow-up mission suggested to the interviewed inspectors, more precisely to the Heads of the Plant and Plant Product Divisions of the Departmental Directorates of Agriculture, Livestock and Fisheries, that they actively collaborate with the Head of the Regulation and Control Service to which they report, in order to include their needs in the AWPB of their division. This will help to schedule the acquisition of priority equipment according to deadlines to be staggered in time. In this regard, the technical characteristics of this equipment have been communicated to them along with the approximate costs and the places where they can acquire it.

88. As for collaboration with other control bodies (law enforcement, customs and police), the mission was pleased to note the effective participation of the port's phytosanitary inspectors in the Joint Control Unit for containers of goods on the platform of the Port Customs Brigade.

89. The project has undertaken the strengthening of technical and material capacities by focusing on the two strategic entry points that receive important movements and flows of pesticides in Benin, namely the fumigation centre of the port and the airport. Based on the needs analysis (Annex 3, in-house project document, Bouraima, March 2019), computer equipment with an estimated value of XOF 3 032 128 (approximately USD 5 157) has been provided to facilitate the enforcement of the pesticide law through the capture of pesticide inspection and control compliance data. This equipment consists of two complete desktop computers with software, anti-virus, screen protectors; two laptops; two printers; two photocopiers; two voltage regulators; two inverters for computers.

90. Various working materials were also provided to these two control points: sampling equipment; storage and preservation equipment (different sizes of amber jars, glass jars with lids, polystyrene coolers, ice packs, freezers, refrigerators, voltage regulators, sample bins); decontamination and disinfection products; packaging and shipping materials; site demarcation/security tools; lighting equipment. The post-training follow-up mission found that items procured on the Beninese market were being delivered, but that other items to be procured internationally were behind schedule.

3.2.4 Direct Effect 4: Successful promotion of integrated management techniques as alternatives to conventional pesticides, and reduction of the use of chemical and extremely dangerous pesticides

3.2.4.1 Effectiveness testing of one biopesticide in the laboratory and two biopesticides in the farming environment

Finding 16. The project successfully tested and promoted alternative products and IPPM systems to reduce the use of POPs and chemical pesticides in cotton, maize and vegetable production.

91. In the laboratory, the project demonstrated the effectiveness of two isolates (out of four tested) of the fungus *Beauveria bassiana* on the cabbage aphid, *Lipaphis erysimi* (Annex 3, in-house project document, Doura Kpindou, March 2018). However, due to a lack of financial resources, the test was not conducted in semi-real and farmer settings but should be continued (See Recommendation 2).

92. In the farming environment, the effectiveness of the fungus *Metarhizium anisopliae* (*isolate Met 31*) and the *Nuclear Polyhedrosis Virus* (*HaNPV*) was tested on the caterpillars of *Helicoverpa armigera* (a major pest of cotton and tomato) and other carpophagous and phyllophagous caterpillars (Annex 3, in-house project document, Doura Kpindou, March 2018). The four treatments described below were tested on cotton and tomato (*Thorgal* variety):

    i. On cotton: (T1) *control with no pesticides or biopesticides*; (T2) Met 31, 50 g/ha; (T3) HaNPV 3.5 x 1011 virions/ha; (T4) conventional chemical pesticides (*Thalis 112 EC* and the binary acaricide *Pyro 672 EC*). Bioinsecticides were applied on threshold while chemical pesticides were applied according to the standard calendar application: *Thalis*, 35th, 50th and 65th day after cotton emergence, the binary acaricide (*Pyro 672 EC*) twice every 15 days after *Thalis* application.

    ii. On tomato: (T1) *control with no pesticides or biopesticides*; (T2) *Met 31*; (T3) *HaNPV*; (T4) *Decis* (deltamethrin, of the synthetic pyrethroid family). The different products were applied weekly, from day 19 to day 70 after transplanting, i.e., ten applications.

93. The cotton testing showed that the two biopesticides tested can reduce the densities of the different target pests and may be more effective in an integrated pest management programme, combining other management methods for other (stinging-sucking) pests. In cotton plots, the chemical (*Thalis, Pyro*) and biological (*Met 31 isolate, HaNPV*) pesticides tested significantly reduced lepidopteran pest population densities compared to the controls. Chemical pesticides tended to further reduce lepidopteran larval density, but with no significant difference from biological pesticides. Yields ranged from 569.4 ± 13.9 kg/ha (control treatment) to 1375.0 ± 104.9 kg/ha (chemical treatment). Yields were higher in the conventional treatment than in the other treatments. The insecticide *Thalis* 112 EC, used for the first three treatments, is made up of 48 g/l emamectin, 64 g/l acetamiprid effective against caterpillars and phloem-feeding insects. It acts by contact, ingestion, systemic and translaminar routes. In contrast, bioinsecticides, in addition to their specificity, are not systemic. Some caterpillars are often found inside the bolls, which makes it difficult for bioinsecticides to make contact.

94. The tomato trial confirmed the effectiveness of biopesticides *Met 31* and *HaNPV* on *H. armigera* larvae. Both biopesticides can be submitted for registration after further testing, including toxicity testing of the product on birds, fish, bees, soil organisms, etc. According to the trial results, both alternative products *Met31* and *HaNPV* reduced pest population density similarly. *Deltamethrin* significantly reduced *H. armigera* population density compared to *M. anisopliae* (*Met 31*). On the other hand, no significant difference was recorded between *HaNPV* and the pesticide *Decis (Deltamethrin)* regarding pest control. All products used had significantly higher yield than that of the control. The performance of the bio-virus was higher than that of the chemical pesticide (*Deltamethrin*) and the entomopathogenic fungus (*M. anisopliae*), but without significant difference.

3.2.4.2 Established farmer field schools (FFS)

95. The project has raised the awareness of farmers in its intervention zone, identified the villages and beneficiaries of the FFS approach, as well as the crops and alternatives to chemical pesticides to be tested and promoted in FFS. The training programs were developed and validated by stakeholders and potential FFS facilitators identified. The project trained a total of 30 facilitators, all of whom were agricultural technicians, through two rounds of training (Table 3).

Table 3. Some characteristics of facilitator and farmer training

Training of facilitators	Period	Trained facilitators	Established FFS	Farmers trained by facilitators	
				Total	of which women
1st series: vegetable-growing FFS facilitators	Sept. 2016 to February 2017	15 vegetable-growing FFS facilitators	17 vegetable-growing FFS (7 in Year 1 and 10 in Year 2)	348 vegetable-growing FFS (148 in Year 1 and 200 in Year 2)	46 women trained in vegetable growing
2nd series: cotton and maize FFS facilitators	June 2017 to June 2017	15 cotton and maize FFS facilitators	19 cotton and maize FFS (6 in Year 1 and 13 in Year 2)	360 cotton-maize FFS (120 in Year 1 and 240 in Year 2).	37 women trained in cotton cultivation

96. The training of facilitators was conducted sequentially throughout the crop cycle, alternating theoretical activities in classrooms and practical activities in the facilitator field school. Each training series had several training sessions combining theoretical and practical phases. For example, during the 26 June to 7 July 2017 training session, IITA built facilitators' capacity on cotton pest knowledge and management. A dozen FFS facilitators and about 15 farmers also benefited from theoretical and practical training on alternative methods to synthetic chemical pesticides on cotton, in particular food spray from 23 to 25 August 2017 in the municipality of Kandi (Annex 3, in-house project document, Vodouhe, August 2017).

97. These FFS are made up of an average of 20 farmers, 15 of whom belong to the small farm category and five to the medium and large farm category. The FFS set up during the first year are referred to as associated FFS, as they were set up almost simultaneously with the facilitator field school, which serves as a practical training tool for facilitators. These associate FFS are led by a pair of facilitators who apply the techniques learned in FFS under the supervision of the master trainer and the project's FFS expert.

98. Each group of facilitators trained during the first or second round of training received a training of trainers' session at the beginning of the second year of work, to better prepare for the implementation of consolidation FFS. Consolidation FFS are FFS set up by a group of farmers who had already participated in a first FFS the previous year.

3.2.4.3 Results of experiments and promotion of alternative systems in FFS

Finding 17. In FFS, alternative systems (neem oil-based biopesticides, mechanical actions) combined with other good agricultural practices (nursery, organic fertiliser, threshold treatment, etc.) have helped to control pests of cotton, maize and vegetable crops, significantly reducing the quantities of pesticides usually used while safeguarding, in some cases, improving yields and gross margins. More and more farmers are adopting the alternative systems tested in FFS and are looking forward for better availability of these inputs as well as a support in the development of a commodity chain and a specific label for IPPM products.

Farmer field schools for vegetable farmers (Annex 3, in-house project document, Raimi and Dansi, 2019)

99. In the first year, seven vegetable-growing (tomato and onion) FFS were installed in November 2016 in the villages of Madécali and Tomboutou in the municipality of Malanville and Birni Lafia in that of Karimama. The experimental set-up consists of plots under peasant practices and plots under good agricultural practices (GAP). The objective of pest management in the vegetable crop plots is to avoid the use of cotton pesticides on vegetable crops as practiced by farmers. In GAP

plots, neem oil is used for pest control and a registered insecticide (Emacot 30 mg) is used for shock treatment of *Helicoverpa armigera* caterpillars in case of invasion. Food spray is used to reinforce the action of natural enemies. The transplanting of seedlings is done with a string, respecting the precise spacing on GAP plots and by guess estimates (no precise spacing) on peasant practice plots. Peasant practice plots receive mineral fertilisation at a rate of 150 kg/ha of NPK and 50 kg/ha of urea. While GAP plots receive organic matter at a rate of 12 t/ha, followed by NPK as a cover at a rate of 75 kg/ha. In addition to the experiments, special studies are conducted to compare fertilizer rates. For example, 12 t/ha of organic matter versus 6 t/ha of OM combined with 75 kg/ha of NPK and 25 kg/ha of urea.

100. The results obtained in facilitator field schools and FFS indicate a general advantage of GAPs over peasant practices and show the need for further research to consolidate the results. Economic analysis of onion production in the facilitator field school indicates a gross margin surplus of about XOF 300 000 per hectare in plots under GAPs compared to plots under peasant practices. In these FFS, onion yields in GAP plots (24 933 kg/ha equivalent to 217 bags of onions) are significantly higher than those of peasant practice plots (23 200 kg/ha equivalent to 184 bags of onions). In addition to a yield of about 2 t/ha, the onion obtained with GAP is also more remunerative – with a surplus of 33 bags/ha – because their larger bulbs occupy a greater volume compared to the small bulbs obtained with peasant practice. A bag of onion obtained with GAP weighs 115 kg compared to 126 kg for that obtained with peasant practice. On the other hand, in the special studies (Annex 3, in-house project document, Raimi and Dansi, 2019), onion yields under GAP are low (14 597 kg/ha,) because they did not receive the appropriate dose of organic matter.

101. Onion yields under GAP (in experiments and as an income-generating activity) are also higher than those of onion yields under peasant practice, see Table 4.

102. In contrast, tomato yields under GAP and peasant practice were almost similar in the experimental plots and are well below the national average yields, as is the tomato yield in the income-generating activity plots benefiting from GAP. This low tomato production is due to climatic variations that have affected crop development. In addition, in some FFS, such as Birni Lafia, cow dung applied as a bottom dressing to the tomato crop was not decomposed, and the heat from its decomposition slowed crop development and even destroyed part of the tomato crop.

103. Some of the contradictory or unexpected results found in the special studies and income-generating activities, while unsatisfactory, point out the need to have a good grasp of the different inputs (and combinations of inputs) used in alternative, non-toxic production systems, and call for further research in certain FFS or on certain topics.

Table 4. Yields (kg/ha) of onion and tomato in FFS and associated FFS (2016 to 2017 season)

Yields (kg/ha)	Experiments				Special studies (under good agricultural practices)	Income-generating activities (under good agricultural practices)	
	Onion		Tomato				
	Peasant practices	Good agricultural practices	Peasant practices	Good agricultural practices	Onion	Onion	Tomato
Facilitator field school	23 200	24 933	–	–	14 597	–	–
FFS	9 770	12 305	6 911	7 016	–	18 328	3 859

104. During the second year, ten vegetable-growing FFS were set up, seven during the first season and three during the second season (consolidation FFS). The first season FFS overall experimented good agricultural practices in comparison with peasant practices, while the second season FFS conducted consolidation experiments on good agricultural practices and special studies. Onions did not suffer any attacks and therefore did not require any special management during the season. On the other hand, tomato experienced many problems, including the ravages of *Helicoverpa armigera* caterpillars on tomato fruits. This situation has been recurrent for the past few years in the area. Nevertheless, some FFS have shown significant results, such as in Kambouo Tounga, where yields of up to 2 000 kg/ha were obtained using good agricultural practices. Given the difficulties encountered in the first year with tomatoes, participants expressed a desire to test a second variety alongside the old variety. Thus, the varieties *Tropisem* (old) and *Tropichem plus* (new) were tested for pest resistance. At the end of the test, farmers made the following observations: i) *Tropichem plus* is more resistant to drought and produces more fruits than *Tropisem*, but its fruits are smaller; and ii) *Tropisem* produces more leaves that protect fruits from sun rays, but on the other hand, reinforces the attack of *H. armigera*, which finds itself in a micro-climate that is favourable to its growth. In special study plots, the yields of *Tropisem* and *Tropichem plus* are respectively about 9 t/ha and 10 t/ha for the Tomboutou FFS and about 1 t/ha and 3 t/ha for the Birni Lafia 1 FFS. The *Tropichem plus* variety therefore appears interesting according to farmers, provided that the agro-ecosystem analysis can control *H. armigera* caterpillars.

105. Pest management has been the weak point of activities in tomato FFS. According to the FFS expert, the evolution of pests on tomato could have been controlled if there had been a strong emphasis on observing tomato plants as soon as flowers appeared. In fact, the observations of the agro-ecosystem analysis were superficial and young *Helicoverpa armigera* caterpillars had time to penetrate the fruits and develop; both tomato varieties were ravaged in the same way. A response plan was put in place to reduce the *H. armigera* caterpillar damage: completely clean tomato plots to collect infected fruits; reduce the frequency of watering plots; make a shock treatment with a recommended synthetic pesticide since the fruits were not yet physiologically mature to reduce the development of a new generation of Helicoverpa; continue with neem oil treatments until harvest. The implementation of this plan in the FFS of Birni Lafia 1 and 2, Karigui, Tomboutou 1 and Kambouo Tounga saved part of the tomato production.

Farmer field schools for cotton and maize farmers (Annex 3, in-house project document, Raimi and Dansi, 2019)

106. In the first year, six FFS associated with the training of cotton-maize facilitators were set up in the municipalities of Kandi, Ségbana, and Gogounou in Alibori and Bembèrèkè regions, Nikki and Kalalé in the Borgou region. On cotton and maize GPA plots, 5 t/ha of organic matter are spread, sowing methods used are line sowing and sowing in seed holes with a spacing of 0.8 m x 0.4 m, and the mineral fertilization dose is 150 kg/ha of NPK and 50 kg/ha of urea. On the cotton and maize peasant practice plots, seeding is also done in the peasant manner (without strict adherence to the recommended spacing) and the mineral fertilisation dose is 300 kg/ha of NPK and 100 kg/ha of urea.

107. On cotton plants, the management of the peasant practice plot complies with the conventional protocol for managing cotton pests (calendar treatment). This protocol recommends starting with chemical treatments from day 35 after emergence. Thus, FFS farmers spray Thalis 112 EC on days 35 and 50 after emergence at a rate of 0.5 litres per hectare, then Pyro 472 EC is sprayed on day 65 after emergence at a rate of 0.5 litres per hectare. From day 80 to day 95 after emergence, two treatments with Thalis 112 EC are made to manage the second peak of the carpophagus outbreak.

The last treatment, which takes place before the harvest of the seed cotton, is made with cotonix 328 EC which is at the same time a defoliant allowing to manage pests of the cotton boll opening period. The management of the GAP plot complies with the observation treatment protocol (IPPM protocol). At each weekly meeting, farmers, after analysing the agro-ecosystem, assess the situation of the field and decide on the actions to be taken by consensus. Each week, the producers spray a solution of neem oil and soap to treat a quarter hectare of cotton. This weekly treatment, called preventive, allows pests to be managed with the periodic spraying of food spray, which accelerates the development of natural enemies. In FFS, GAP cotton blocks underwent two or three shock treatments with Thalis 112 EC depending on the level of infestation of *Helicoverpa armigera* and other carpophagous pests. The results of the agro-ecosystem analyses in FFS and the associated cotton-maize FFS show that carpophagous pests are perfectly controlled on peasant practice plots with the conventional AIC treatment protocol. On the contrary, on BPA plots where neem oil treatment with food spray is favoured, the evolution of carp pests is observed throughout the cycle with strong peaks for *H. armigera* and Erarias. During these periods of high infestation, shock treatments with *Thalis 112 EC* were carried out to reduce the pressure of *Helicoverpa armigera* in particular, but at a very low frequency compared to their use in peasant practice plots.

108. In the second year, 13 cotton and maize FFS were established, including nine new ones from the first season and four from the second season. FFS tested the effectiveness of neem oils on cotton plants against *Helicoverpa armigera*, *Sylepta derogata*, *Earias spp, Dysdercus* and tested the control of fall armyworm on maize. Cotton production on the different FFS plots harvested in 2018 is highly variable across FFS (Table 5). Yields under GAPs are generally higher than the national average of around 1 000 to 1 200 kg/ha. The best yields of seed cotton were obtained in Wara with the Bio Phyto Neem oil and the Hoctus Bio oil. On the other hand, in Soumarou, Top Bio oil is the best, followed by Phyto Neem Bio oil. Phyto Neem Bio oil performed well on all FFS where it was tested.

109. For maize crop, the armyworm management test was the main activity. In control plots (peasant practice), despite three sprays of the Emacot pesticide, armyworms continued to develop in maize plots: a final treatment by introducing the pesticide spray at the level of the leaf sheaths and spikelets was necessary for the pest to be controlled. On the contrary, natural enemies were very scarce in these plots due to the use of Emacot. In GAP 1 plots (collection and crushing of caterpillars on maize plants), control was effective after two sprays. At the same time, the number of ants and spiders (natural enemies of caterpillars) increased significantly in maize plots after three sprays of food spray. In GAP 2 plots (neem oil and food spray plots), both products are sprayed weekly in maize plots from emergence to heading. In these GAP 2 plots, armyworms, while not overly prolific, remained present along with a wide variety of natural enemies (ants, spiders, wasps and others).

Table 5. Seed cotton yields in FFS in 2018

FFS	Experimental plots (kg/ha)		Special study plots			
	Peasant practices	Good agricultural practices	Bio phyto	Top bio	Agri bio	Octus bio
Soumarou	1 108	1 404	1 405	1 549	1 261	–
Gbessassi	–	–	–	–	–	–
Ina	272	268	–	300	264	240
Guessou south	316	280	420	288	132	–
Wara	–	1 836	1 657	1 381	–	1 441
Padé	844	792	–	–	–	–
Angaradebou	–	–	–	–	–	–
Pèdè	1 180	1 640	–	–	–	–
Godou	1 244	1 744	–	–	–	–
Kambara	1 000	1 288	–	–	–	–
Liboussou	668	1 060	–	–	–	–
Average	**829**	**1 145.78**	**1 160.67**	**879.50**	**552.33**	**840.50**

Note: Plot area: Peasant practices=0.25 ha; Good agricultural practices=0.25 ha; Bio Phyto Neem/Top Bio/AgriBio/Hoctus=0.083 ha.

110. The results of the fall armyworm control experiments show that the yields of plots under GAP 1 and GAP 2 are about one-third higher than the yields of plots under peasant practices. This difference can be explained by organic matter but also by the respect of technical processes. This method made it possible to eliminate armyworms after two sprays on the BPA 1 plot, whereas on the BPA 2 plot, control with neem oil continued until the heading. In the first season FFS installed during second-year activities, results in each of the nine FFS also indicate a higher yield in GAP (2 101 kg/ha) than in peasant practice (1 414 kg/ha) plots.

3.2.4.4 Summary of the effects generated on FFS beneficiaries and prospects for consolidation

111. The various project stakeholders are better informed about the opportunities that exist for alternatives to chemical pesticides and for expanding and promoting these alternatives. The capacities of the facilitators were strengthened during their initial training throughout the process of setting up and running FFS on the agropastoral field school approach, and particularly on the management of pesticides and EPCs. Several young technicians took the opportunity offered by the project to gain initial experience as agricultural advisors, which allowed them to strengthen their skills and improve their chances of finding similar employment with other rural development stakeholders or with AIC. At the FFS level, producers have become aware of the risks and dangers associated with the rampant use of pesticides and the need to reduce their use by adopting alternative techniques. Most FFS farmers have adopted triple rinsing and have participated in the process of collecting, storing and safely disposing of EPCs. Many of them report that they are helping to educate their communities against the use of EPCs to store food and daily use products.

112. Experimental plots, special studies and income-generating activities have been set up in vegetable crop FFS and farmers have participated well in the activities on these vegetable crop plots. GAPs and special studies carried out on these FFS have generally produced results (yields) that are similar or better than peasant practice results; many of the techniques developed have therefore been adopted by the farmers. Although there was no statistics of farmers adopting the techniques

developed by the project, the final evaluation found that several vegetable farmers have adopted the storage and use of organic matter and that almost all farmers have adopted the use of the vegetable nursery as GAP based on the addition of organic matter, sowing in rows and reducing the amount of seed used. More and more farmers are using neem oil in their own fields for pest control and more and more structures are distributing neem oil and other alternatives in the different localities. However, the availability of inputs remains a constraint to the adoption of these practices.

113. Initiatives have been taken by farmers and other partners to continue the process of innovation in vegetable growing. For example, there is an initiative of FFS farmers in Garou Tédji, Malanville and Karigui who continued the tomato experiments with an NGO that provided them with natural agricultural inputs (compost, neem oil,) on credit and promised to process and purchase the production. These producers were supported by some of the facilitators trained by the project and the master trainer. This initiative seems to have been successful because of observation techniques (included in the agro-ecosystem analysis) that allowed for the rapid identification of *Helicoverpa armigera* attacks and its control using Emacot 50 Wg. The implementation of FFS has also encouraged initiatives to consolidate or sustain the achievements made so far. For example, Madécali 1 and Garou Tédji FFS have each acquired a motor pump, following in the footsteps of the Madécali 2 (Iloua) FFS, which had acquired one in 2017 thanks to the revenue obtained from the sale of products, which allowed them to irrigate their crops without constraints. Farmers from the Garou Tédji FFS also managed to save funds to continue FFS activities for the following season.

114. Cotton experiments demonstrated that it is possible to obtain reasonable yields of maize and seed cotton if synthetic chemical pesticides are reduced to their recommended quantity and if they are replaced by natural or less toxic alternatives. Information gathered from second year FFS farmers indicates that many farmers have adopted some of the GAPs tested in FFS and are already applying them in their own fields (Annex 3, in-house project document, Raimi and Dansi, 2019). These include the preparation and use of food sprays, the increased use of organic matter in cotton growing, and the adoption of neem oil. This is the case for 40 percent of farmers in the Wara and Pèdè FFS, who now use neem oil as their main pest control product for cotton. As concerns maize, some farmers have adopted the manual *Psodoptera frugiperda* management method, which involves collecting caterpillars, mashing them, and then applying in maize sheaths and stalks.

115. The benefits and effects reported by farmers during the internal evaluation of FFS activities (Annex 3, in-house project document, Raimi and Dansi, 2019) and during interviews conducted by the final project evaluation team are consistent with the results observed when following up (Annex 3, in-house project document, Olou, 2019) a sample of beneficiaries of the cotton-maize FFS implemented between 2016 and 2018. These monitoring results complement and clarify the effects generated as follows: i) FFS farmers less used pesticides compared to control farmers; ii) the proportion of farmers performing calendar application decreased in Alibori among FFS participants; iii) the management of EPCs through the triple-rinsing and bottom puncture technique became a common practice so much so that about 50 percent of FFS participants apply it, whereas it did not exist among FFS participants in 2016; iv) the proportion of FFS farmers practicing agro-ecosystem analysis has increased significantly in Alibori and the proportion of FFS cotton farmers using neem oil as an insecticide has doubled in Alibori but declined in Borgou between 2016 and 2018; v) FFS farmers are using twice as much organic matter as before; vi) cotton yields increased between 2016 and 2018 among FFS farmers regardless of the department considered, while they remained constant among control farmers; and vii) across the sample, the average gross margin of FFS farmers is higher (XOF 210 146) than that of control farmers (XOF 196 043) for the 2018 to 2019 season.

116. However, the outcomes obtained by the project deserve to be consolidated and used to promote wider adoption of good pest, pesticide and EPC management practices. Indeed, the laboratory test of the effectiveness of *Beauveria bassiana* on cabbage aphid, which proved promising, was not followed by on-farm trials due to lack of resources. Similarly, the promising results regarding biological alternatives (*Metharizium* and *HaNPV Virus*) tested on cotton in FFS in 2017 were not continued in FFS in 2018, which did not allow for the consolidation of achievements nor the expansion of the range of alternative techniques usable by farmers. The difficulties encountered in the experimentation of conventional and alternative tomato farming techniques in FFS due to the fact that the tomato varieties grown in the area, especially in the dry season, are no longer adapted to the current environmental conditions (low resistance to heat, susceptibility to pests such as *Helicoverpa armigera* on adult plants and the white fly (*Bemisia tabacci*) in the nursery), leads many farmers to abandon tomatoes in favour of onions and rice. Monitoring the effects of FFS on a sample of farmers generated useful information, but some results raise questions about the reliability of the study.[12] Also, farmers who have adopted the alternative techniques proposed in FFS sometimes have difficulty acquiring the necessary inputs (neem oil, food spray, organic fertilizers, etc.).

117. In order to more dynamically support the innovation processes initiated by the project, it is necessary to facilitate the development and operationalisation of partnerships with the private sector, market gardening associations and AIC to facilitate the production and provision of these natural inputs to farmers. For example, the promotion of neem oil among vegetable farmers in Malanville and Karimama has been very successful, but this success was quickly mitigated by the lack of supply channels close to farmers. It is also necessary to support the implementation of the FFS approach by IPPM through multidisciplinary action research programs aimed at supporting alternative systems along each targeted value chain. Considering the constraints that affect the promotion of alternatives to synthetic chemical pesticides – in the context of a well-structured cotton sector that relies essentially on the use of chemical inputs granted on credit at the beginning of each season by AIC – it is necessary, following the example of organic cotton, to support the creation of an IPPM cotton label in order to enhance the benefits for productivity (higher yields of seed cotton), the environment, and the health of farmers. Overall, the results suggest that all stakeholders should advocate and provide incentives for IPPM-based production systems, value chains, and labels, while significantly reducing the use of hazardous chemical inputs (see Recommendation 1 and Recommendation 3).

Partial conclusion 2. Effectiveness

118. The project contributed significantly to the strengthening of Benin's capacity for post-registration management of pesticides. Thus, gaps that exist at different stages of pesticide life cycle management (registration, importation, distribution/sale, agricultural and non-agricultural use, reduction of associated risks and hazards, disposal and management of associated wastes) have been identified. Remedial actions as well as innovative or alternative systems (including agricultural production systems based on few or no pesticides) were implemented. The technical options tested by the project have overall been successful; some have been integrated in adoption and innovation processes that deserve to be supported.

119. The project alerted government authorities to the continued accumulation of obsolete pesticides, POPs, EPCs, and the associated risks and hazards. As a result, in addition to the ongoing goal of disposing of 213 tonnes of obsolete pesticides, POPs and related wastes, the Ministry of

[12] According to the study, "[the number of] farmers reporting pesticide poisoning increased between 2016 and 2018 for both FFS and control far"; "the average gross margin of FFS farmers monitored is lower (XOF 189,670) than that of control farmers (XOF 204,991) in Borgou."

Agriculture, Livestock and Fisheries has instructed the identification, in the very short term, of realistic options for the overall management of these pollutants and associated risks and hazards, to be submitted to the highest level (Council of Ministers) for inclusion in the Government's priority actions.

120. All in all, and despite the delay in achieving Effect 1, the project has generated several other expected outcomes and put in place the conditions necessary to progress towards impact, so much so that the effectiveness is considered satisfactory.

3.3 Efficiency and factors affecting performance: Was the project efficient and effective in the deployment of management and administration mechanisms?

Finding 18. FAO, through its Representation in Benin, the Project Technical Unit within NSP and GCU, has provided ongoing technical assistance to the project. However, the quality of this assistance was weakened by the slow process of recruiting the international company responsible for safeguarding and disposing of POPs and obsolete pesticides, which was initiated late and proved to be more complex than expected. This slowness was also observed to a lesser extent in the processes of acquiring additional equipment to strengthen the inspection capacity of the country's two entry points, formalising contracts and memoranda of understanding, and validating technical reports.

3.3.1 Project implementation strategy

3.3.1.1 Implementation mechanisms

121. Project implementation by the Government of Benin is carried out by the Ministry of Agriculture, Livestock and Fisheries, which leads the multi-stakeholder group of governmental and non-governmental institutions and organisations involved in the management of pesticide and alternatives to pesticides. The Ministry of Agriculture, Livestock and Fisheries also relied on the PMU, based in DPV, to coordinate and manage project activities. The project has focal points in the Ministries of Health and Environment who work directly with the PMU. The other national stakeholders of the project participate in project implementation as presented previously in Table 1.

122. Component 1 was executed by a national team, composed of members of the Ministries of Agriculture (SPVCP, ABSSA - see Republic of Benin, 2017a - LCSSA), Health and Environment, with technical and financial support from CropLife International. Component 2 saw the participation of waste treatment/recycling organizations (*Compagnie d'ingénierie sociale et environnement* and Bethesda), input importers and distributors such as LANTANA, *Société Accueil Paysan Sarl*, and farmers' organizations and village groups. However, SONAPRA, which was liquidated in 2017 by the government (Republic of Benin, 2017b), and the National Committee for the Approval and Control of Plant Protection Products, which was replaced by NPMC,[13] have not played their expected leading role in this component. In this context of institutional reform, the project has not been able to involve in a stronger and more formal way AIC, which plays a key role in supplying cotton producers with inputs. AIC provides support to seed cotton farmers through the extension of innovative technologies using school plots, demonstration or showcase and agricultural advice. It manages inputs (collection and transmission of the phytosanitary programme by the National Federation of Village Farmers' Cooperatives), coordinates the general supply framework

[13] NPMC created by Decree No. 2018-171 of 16 May 2018 (Rep. of Benin, 2018a) has, among other things, the missions of examining and approving pesticide registration applications prior to referral to the West African Pesticide Registration Committee and examining professional approval application files.

(validation of needs, call for tenders, reception, distribution), defines the transfer prices of inputs in a concerted manner, and ensures the accounting, management and recovery of input credits. As such, it deserves to be well integrated into Components 2, 3 and 4. FAO Representation in Benin justifies this absence by the suspension of the Framework Agreement between the Government and AIC in 2013 (Republic of Benin, 2013, Decree No. 2013-369), which only reinstated it in 2016 when the project, already designed, had started. Component 3 was initiated by the Ministry of Agriculture, Livestock and Fisheries (SPVCP in this case) with the participation of the Ministry of the Environment and input importers and distributors. Component 4 was co-executed by the International Institute of Tropical Agriculture and OBEPAB in close collaboration with the Ministry of Agriculture, Livestock and Fisheries (SPVCP, INRAB), farmers' associations and the Federal Union of Cotton Producers. However, Component 5, supervised by DPV, did not benefit as planned from the participation of NGOs to study and implement the communication strategy developed in November 2019 by a specialised consultant.

123. FAO, as the GEF Implementing Agency for the project, carried out continuous monitoring to ensure compliance with GEF policies and criteria and the achievement of results. It managed and disbursed GEF funds, provided technical guidance, verified the compliance of activity and output implementation with reference documents (ProDoc, work plans, budgets, procedures, rules and requirements of FAO), and reviewed and validated proposals for adjustments made by the PMU and stakeholders. It communicated frequently with the GEF on project progress and adjustments.

124. However, insufficient communication of the rules and procedures applied and delays in the acquisition of assets (including the recruitment of the company responsible for the safeguarding and disposal of obsolete pesticides) have led to a misperception and a negative perception of the project by some stakeholders. According to the latter, the project is managed from FAO headquarters in Rome; everything is decided in Rome while the FAO Representation in Benin has little decision-making power over project implementation. This feeling is reinforced by the mechanisms for acquiring certain materials by FAO and by the recruitment of VEOLIA within the framework of the project. Indeed, these processes were piloted from Rome by the project Technical Unit. Despite these shortcomings, the implementation mechanism as deployed is rated Satisfactory.

3.3.1.2 Project management and coordination

Finding 19. Despite the shortcomings observed in the procurement process for goods and contracts and the validation of certain project activities, the dynamism observed in the management of the project, both on the part of the PMU team and other stakeholders involved, makes it possible to describe the management of the project as Satisfactory.

125. The PMU is located within DPV of the Ministry of Agriculture, Livestock and Fisheries, which facilitates collaboration with SPVCP, which is the focal point within the Ministry of Agriculture, Livestock and Fisheries. The PMU permanent team consists of the NPC who works closely with the project focal points in the Ministries of Agriculture, Health and Environment and the FAO Programme Officer in Benin who constitute the extended team. PMU meetings usually involve the extended team, and, depending on the relevance of the agenda, national consultants and government technical officials. The PMU was supported by a Lead Technical Advisor based in the Pesticide Risk Reduction Unit of NSP of FAO in Rome, independent international consultants (five, including one woman) and national consultants with expertise in: i) safeguarding, disposal of obsolete pesticides and decontamination of polluted sites; ii) management of EPCs; iii) pesticide management; iv) pesticide control legislation and biopesticides; v) FFS approach; vi) FFS typology and M&E; vii) research and development on alternatives to chemical pesticides; and viii) development of alternatives and food spray.

126. The PMU served as the secretariat for the PSC, held project meetings, and organised and participated in various project and stakeholder workshops. Annual work plans and budgets as well as activity reports were regularly prepared on time, validated and presented at the PSC sessions. The Coordinator regularly participated in the various implementation and monitoring missions of project activities in the field. The PMU organised ten scheduled periodic meetings, nine of which were regular (the last known meeting of the evaluation team took place in February 2020) and one extraordinary (in December 2017). These meetings contributed to good project management and saw, in addition to the members of the extended PMU team, the fairly regular participation of the Director of Plant Production, the Technical Advisor for Food Research and Agriculture of the Ministry of Agriculture and the Head of Department for the Promotion and Monitoring of Plant Production. During these meetings, the activities carried out were presented to stakeholders and activities included in the AWPB were reviewed for formal approval by the PSC. The PMU also participated in quarterly and annual review and planning meetings organised by the FAO Representation in Benin and regularly prepared semi-annual reports which were all validated. In addition, the PMU coordinated ongoing project activities and facilitated partner involvement.

127. However, project implementation was hampered by several factors that were identified at an early stage during PMU meetings and brought to the attention of the PSC with relevant recommendations. In particular, the slowness observed in the processes of asset acquisition, contracting, and validation of project activities was raised, as well as their consequences on the project. In 2016, for example, the slow process of recruiting consultants involved in Component 4 implementation shifted the date for conducting focus groups and delayed the holding of the workshop for identifying alternatives. As a result, the planned schedule was not respected, and it was not possible to implement the cotton FFS planned for the 2016 to 2017 season on time. In 2018, a slowness was also observed in the process of validating project activities and completing the memoranda of understanding with IITA and Bethesda and in the start of the cotton-maize FFS activities. Indeed, the late completion of the training of trainers to facilitate FFS (June to December 2017) jeopardised the implementation of the cotton-maize FFS, as the last decade for cotton sowing was largely exceeded.

128. The delay in recruiting VEOLIA, the company responsible for safeguarding and disposing of POPs and obsolete pesticides, was one of the project's main management shortcomings. Indeed, the contract between FAO and VEOLIA was not signed until April 2020 and, due to the COVID-19 pandemic, VEOLIA did not start field activities until November 2020. This delay led implementers to refocus priority on Component 1, to the detriment of activities in other components that also deserved to be carried out during project extension periods. As a result, some alternatives that proved promising in the laboratory could not be pursued and consolidated: the case of the laboratory test of the effectiveness of the fungus *Beauveria bassiana* on the cabbage aphid (*Lipaphis erysimi*) and the case of biological alternatives (*Metharizium* and *HaNPV Virus*) tested on cotton in FFS in 2017 and not pursued in FFS in 2018 (see paragraph 116). Some contradictory, unexpected or promising results in FFS could not be verified, clarified and deepened either, and some initiatives to sustain or scale up the proposed good agricultural practices and technologies could not be planned or supported during the extension phases of the project. Regarding Component 3, the publication of factsheets, which was planned to support the continuation of the training of phytosanitary inspectors (see paragraph 84), could not be done due to lack of resources.

129. Another constraint, and not the least, concerned the technical and human resources of the PMU. The project inherited outdated equipment from the previous project (GCP/BEN/055/JPN) which had regular breakdowns. Until 2016, the PMU still did not have a laptop or desktop computer, an

appropriate camera for taking images while carrying out activities, or an internet access device. The permanent staff of the PMU, limited to the Project Coordinator, had to hire, at its own expense, the services of an assistant in order to respond to the multiple tasks and demands related to project management. The Ministry of Agriculture, Livestock and Fisheries had problems with the unavailability of drivers, and the project ran out of drivers on several occasions, which led the Coordinator to use her own vehicle and to cancel some planned field missions. Damage to this personal vehicle during these professional missions was not covered by the project despite the Coordinator's requests. In order to manage the budget efficiently and due to the delay in Component 3, the Coordinator's contract was split so that it would only be activated during the actual work periods of Component 3. This choice proved to be inappropriate, as the Coordinator had to carry out several activities outside the contract. However, this situation did not affect the commitment and dynamism of the Project Coordinator. The delay in the safeguarding and disposal of POPs and obsolete pesticides is caused by the slowness in recruiting VEOLIA and not by a poor management of the PMU process.

130. Other difficulties encountered in the field include the problem of the Djohounta site (Kpassagon district, Bohicon municipality), which is heavily contaminated with obsolete pesticides (mostly non-biodegradable) and could not be safeguarded. The project design does not include resources to compensate and relocate populations. The site does not belong to the State, it is privately owned. The owner wanted to develop a fish farming project on it. Testing contaminated soil samples from Djohounta and Oganla by LCSSA was very expensive compared to the project budget. Thus, negotiations were done with LCSSA to reduce the number of samples to be tested.

131. The PMU made several recommendations to solve or anticipate the occurrence of implementation problems and challenges. Among other things, it was recommended that the Ministry of Agriculture, Livestock and Fisheries i) report to the ministerial authority on activities related to pesticide management; ii) institutionalize the FFS approach as an agricultural extension tool; iii) lobby subregional institutions for the creation and implementation of a national database for pesticide management; iv) ensure that the Integrated system for Pesticides Management in West Africa (SIGEPAO) takes into account the evaluation of pesticide-contaminated sites; v) formalise collaboration between phytosanitary inspectors and customs officers by integrating the national authority in charge of phytosanitary inspections and controls (pesticides) into the "Joint Container Control Unit" at the port and, by extension, wherever customs and the inspection of pesticides/plants and plant products must collaborate; vi) consider the regrouping and safeguarding of pesticides seized at the national level in identified stores; and vii) make provisions at the national and budgetary level to appropriately manage the remaining stock of obsolete pesticides.

132. Recommendations to the Ministry of Living Environment and Sustainable Development focused on the remediation of the heavily contaminated Djohounta site, while those to the Ministry of Health focused on the need to collect information and include data on pesticide-related poisonings in the Ministry's annual statistical yearbook. The PMU was asked, among other things, to: i) reformulate the activities carried out that contribute to the achievement of the results of Component 3; ii) clearly define the mission of the component leaders; and iii) develop communication strategies for the execution of activities in order to give visibility to the project among all stakeholders involved in the project. It has been repeatedly recommended to FAO Headquarters to accelerate the procurement procedures for recruiting the international company specialised in the safeguarding and disposal of POPs and obsolete pesticides in order to start securing activities in the first quarter of 2020. The various problems identified, and the recommendations made were brought to the PSC, which reviewed and validated them.

3.3.1.3 Project steering

133. The PSC, established by Order No. 209 of the Ministry of Agriculture, Livestock and Fisheries on 19 August 2015, is chaired by the Ministry of Agriculture, Livestock and Fisheries Secretary General. The Director General of Environment of the Ministry of Living Environment and Sustainable Development is the Vice-President of this PSC, the Project Coordinator serves as rapporteur while the Head of the Plant Protection Department is the Secretary. Representatives of other implementing structures are members.

134. The project has organised four sessions of the PSC (December 2015, January 2017, March 2018, January 2019) which have reviewed, amended and validated AWPBs and activity reports and made recommendations to improve project implementation. During the March 2018 session, the committee requested the PMU to provide an update to the Ministry of Agriculture, Livestock and Fisheries on POP and obsolete pesticides contaminated foci/sites and to develop a roadmap that clearly defines the tasks to be carried out and the responsibilities with deadlines from March 2018 to February 2019 for the POP and obsolete pesticides safeguarding and disposal operations. At its January 2019 session, the PSC requested that consultations be conducted with the Project Technical Team to speed up the procurement procedures for recruiting the international company responsible for safeguarding and disposing of POPs and obsolete pesticides. It was recommended that SPVCP finance or co-finance the safeguarding and destruction of the Kotopounga obsolete pesticide stockpile (Natitingou municipality, Atacora region).

135. These recommendations were brought to the attention of project stakeholders and authorities, and some resulted in concrete decisions and actions. These include, for example the awareness raising of municipal and local authorities and the owner of the contaminated Djohounta site on health and environmental risks; the prohibition of the establishment of a fish pond on this site as planned by the owner; the inclusion of the decontamination of the Djohounta site in the AWPB of the Ministry of Living Environment and Sustainable Development; the training of two Ministry of Agriculture, Livestock and Fisheries executives (DPV and INRAB) in Lomé on the use of SIGEPAO (Integrated system for Pesticides Management in West Africa), designed to control the flow of pesticide imports into ECOWAS countries through the submission of online files for pesticide registration and as part of the operationalisation of the West African Pesticide Registration Committee. Negotiations with the LCSSA also allowed for the analysis of ten soil samples and the comparison of the results with those of the reference laboratory (Alterra, Wageningen), which concluded that the LCSSA had sufficient capacity to monitor the quality of pesticides and soils. The work of the steering committee is rated as Satisfactory.

3.3.2 Partner involvement

Finding 20. The project organised workshops to plan work and activities as well as to discuss, share and validate results, which facilitated the participation and involvement of the main stakeholders in the chain of use and management of pesticides and related waste.

136. Examples of this are: the workshops for planning and presenting the complementary inventory of obsolete pesticides; the workshop for informing and raising awareness among the various stakeholders on pesticide management in the Republic of Benin by CILSS; the validation workshop of the "Health Safety and Environment Plan" for the safeguarding, stowing, exporting, and disposal of obsolete pesticides in Benin; the stakeholder workshop to agree on potential alternatives to POPs and other hazardous synthetic chemical pesticides; the validation workshop of the improved national pesticide inspection and control system and awareness raising of key stakeholders in the pesticide sector; training workshops and the training of FFS facilitators;

validation workshops of the draft laws and decrees on biopesticides in the Republic of Benin; the validation workshop of the GEF regional ProDoc on the management of pests and pesticides.

137. Regular working meetings were held with the Ministry of Agriculture, Livestock and Fisheries officials (Secretary General, Minister's Advisor, Director of Plant Production and others) to ensure continuous information and ownership of the project. The complementary inventory of POPs and obsolete pesticides and the workshop for the restitution of the results were important moments that mobilised the main officials of the project stakeholders. The project carried out an exploratory survey in 16 villages to gather the needs of farmers regarding alternative systems. Awareness raising resulted in over 200 applicants per village at times, but only 20 per village were needed, including five women. Awareness-raising activities on empty containers and the introduction of FFS generated a high level of acceptance among farmers, rural communities and development stakeholders in the project area. Farmers were sensitised on EPCs and FFS participants were trained on the triple-rinsing method and mobilised to sensitise and train other members of their community network. The decontamination processes involved the participation of the national decontamination team, composed of stakeholders from relevant structures and workers. These participants were trained in the safe handling of chemicals. Stakeholder participation is rated as Satisfactory, but with a weak point concerning AIC which was not sufficiently involved in the project.

3.3.3 FAO technical assistance

Finding 21. Although continuous and procedurally compliant technical assistance support is provided by FAO to the project, delays in some processes have reduced effectiveness, such that technical assistance is rated as Moderately Satisfactory.

138. The project was managed in accordance with FAO technical assistance procedures and involved FAO Country Representation, the Pesticide Risk Reduction Unit in NSP, and GCU, all of which provided ongoing support to the project. The FAO Representation in Benin supported the project and participated in the capacity building of the Project Coordinator on management procedures. It monitored the project through annual workshops for the planning, presentation, discussion and validation of AWPBs and the analysis and revision of semi-annual reports. The Country Representative's Programme Officer was part of the larger PMU and actively participated in PMU and PSC meetings. The Country Representation supported the PMU, particularly in managing certain critical issues or anticipating certain issues, but also in drawing the attention of the authorities to important issues related to project implementation. The Country Representation also worked in collaboration with the FAO Lead Technical Officer (NSP) and GCU and gave its approval on AWPBs, semi-annual and annual project reports submitted by the PMU. However, some processes (development of terms of reference) were managed directly between the PMU and the project's Main Technical Unit. The Country Representation did not monitor all operational activities, conducting only one field monitoring mission. The lack of a monitoring and evaluation budget and the absence of a Resident Representative were cited as reasons for this situation. It was reported to the evaluation team that "project activities were closely monitored by the Country Representative between 2015 and 2017, but since the departure of the Representative, activities have not been monitored with the same rigour." Field activities were mainly monitored by the Project Coordinator, her assistant and the consultants hired for this purpose.

139. The main shortcoming of the project is that the technical assistance did not allow the disposal of POPs and obsolete pesticides to be carried out within the time frame specified. Indeed, the project's Technical Unit under NSP and the Contracts and Procurement Service[14] at FAO

[14] FAO's CSLP Division. See http://www.fao.org/unfao/procurement/general-information/en/.

headquarters in Rome encountered difficulties in recruiting the international company responsible for safeguarding and disposing of POPs and obsolete pesticides.

140. The recruitment process only started in November 2018 although it was planned in 2016 (second year of the project). The tender was drafted and published in November 2018 and closed in January 2019. The review of the companies' bids was further delayed in April 2019 due to requests for clarifying the necessary technical specifications in the companies' bids and an extension of approximately two months requested by the bidders. The evaluation of bids only began in April 2019: the companies were overloaded throughout the proposed bidding period, which made it difficult to get financially acceptable price proposals for the project.

141. The selection and contracting process took two years. After the evaluation of the bids, the technical report was submitted to FAO procurement services in Rome. This service validated the report and ensured the administrative management of the selection process of the company, which led to the signature of the contract between FAO and the company VEOLIA in April 2020, almost four years after the date initially planned. This delay was also compounded by the Covid-19 pandemic and the very long delays in VEOLIA providing the project with the necessary documents to start the administrative procedures and obtain the Basel notification number required to finalise the contract.

3.3.4 Planning

142. The results framework guided the execution of the project through the development of AWPBs, which were approved, implemented, monitored and evaluated by the various authorised bodies, namely executing and implementing partners, the Technical Unit in collaboration with the Country Representation, GCU at FAO and the PSC. However, their implementation was compromised by many of the difficulties already mentioned (late recruitment of VEOLIA, delays in the signing of some memoranda of understanding, splitting of the Coordinator's contract). This delay has led FAO to request, from GEF, a first extension from March 2019 to March 2020, followed by a second extension at no cost from 22 March 2020 to 21 March 2021 with a budget revision. The project is scheduled for completion in September 2021.

3.3.5 Risk management

Finding 22. Risks of political instability and extreme weather conditions did not occur. However, the project suffered the consequences of the COVID-19 pandemic, an unforeseen risk that led to a halt in activities for nearly six months, thus delaying the deadline for safeguarding and disposing of obsolete pesticides and related waste.

143. The project identified several risks during its preparatory phase. General risks categorised as low did not materialise during project implementation. For example, the risk that funds would be insufficient to secure sites did not occur; instead, the project engaged in securing four sites, exceeding the planned two sites. This is thanks to the lessons learned from the previous project (GCP/BEN/055/JPN) and to the use of national expertise remotely supported by the international expert. In addition, institutional arrangements were very favourable to project execution. The project was able to take advantage of the harmonisation of the national regulatory framework with regional regulations to achieve its objectives. Thus, the objectives under components 1, 2, and 3 were well suited to the needs of SPVCP, as discussed in Section 3.1 on Relevance.

3.3.6 Co-financing

Finding 23. Based on the information obtained, co-financing is rated as Moderately Unsatisfactory. Co-financing remains a weak link in the management of the project. The amounts shown in the co-financing tables attached to the various project implementation reports (PIRs) are inconsistent and do not allow for an objective assessment of the level of actual mobilisation. This shortcoming is compounded by the fact that the project did not organise any co-financing workshop during its implementation and that the figures given in the PIRs are neither commented nor explained.

144. The GEF grant (USD 1 830 000) was made available to FAO and the financial statement as of 31 March 2021 shows a use of USD 1 596 679 and a balance of USD 233 321. On the other hand, out of the USD 10 580 625 in co-financing funds (excluding the GEF grant) foreseen at the time of signature, the project has mobilised only USD 6 928 500.

145. The interview with the project coordinator made it possible to establish the following: out of a planned co-financing of USD 868 500, CropLife International provided USD 568 500 to the project to carry out the complementary inventory of POPs and obsolete pesticides for which it was responsible and paid USD 300 000 to FAO headquarters to contribute to the financing of POP and obsolete pesticides safeguarding and disposal activities. As for ABSSA, its co-financing planned at USD 4 550 000, was entirely mobilised at the rate of USD 300 000 in kind and USD 4 250 000 representing donations of equipment and materials received from other partners to strengthen the capacities of LCSSA (proof in the form of a listing of all or part of the equipment acquired is expected from the NPC). This capacity building has provided LCSSA with sufficient capacity to analyse pesticide and contaminated soil samples and to monitor pollution indicators as part of the decontamination process for polluted sites. The co-financing planned by DPV (i.e., USD 500 000 in kind) is considered fully mobilised (according to the NPC) but only partially mobilised (USD 300 000) according to the FAO Representation in Benin. This co-financing from DPV is made up of the cost of housing the PMU at DPV, as well as operating expenses (water, electricity, maintenance costs, communication, etc.) and accommodation for PSC meetings at ABSSA. Co-financing funds provided by OBEPAB in kind and by IITA in cash are also considered to be mobilised by these structures in the framework of the activities carried out for the project. On the other hand, no information was obtained concerning the mobilisation of the cash co-financing (USD 500 000) planned by OBEPAB. In addition, the numerous clarifications requested by the evaluation team on the cash co-financing of USD 3 152 125 planned by FAO were only partially obtained. The amounts themselves could be verified, with, for example, a contribution mobilised through project GCP/BEN/055/JPN. However, it remains unclear how this amount and other FAO cash co-financing contributes to project GCP/BEN/056/GEF. Thus, in terms of both efficiency and factors affecting performance, co-financing has been somewhat flawed.

3.3.7 Monitoring and evaluation

Finding 24. Monitoring and evaluation is considered Moderately Satisfactory in both its design and implementation. The project's monitoring and evaluation has generated a significant amount of data that has been used to prepare the semi-annual and annual reports (PIR), but which still deserves to be used to inform, raise awareness and build the capacities of stakeholders and the public.

146. The indicators and targets of the project outcomes were sufficiently clear, and their monitoring was based on a mechanism structured around the Coordinator and the project consultants. The project's monitoring and evaluation system was simple, but relevant, coherent, and realistic in terms of the project's activities and indicators. The Project Coordinator and her assistant regularly participated in field monitoring missions in all project components. The project consultants in all four components provided information in the activity reports and thus fed data into the

monitoring and evaluation system. Post-intervention monitoring missions were also conducted by consultants. This is the case of the post-training follow-up of phytosanitary inspectors, which allowed useful lessons to be drawn on the capitalisation of achievements and the conditions to be put in place to amplify the effects and guarantee sustainability (see paragraphs 85 to 88). The activity reports prepared by the project based on the data submitted to the PMU were generally validated. However, greater involvement of the Country Representation in the field monitoring of activities would have given more weight to the information reported by the project consultants and thus fostered the ownership and promotion of activities and outcomes by the FAO Representation in Benin. This ownership is useful for guiding future interventions and supporting and underpinning the dialogue with the Government on the scaling up and institutionalisation of FFS and high environmental value production systems, based on the low use and better management of POPs and obsolete pesticides.

3.3.8 Data management

Finding 25. The data generated by the project is important and a real reason for satisfaction. However, efforts/actions should be made to transform it into specific knowledge targeting different stakeholders and interested parties of the project. In view of this observation, knowledge management at this stage is judged Moderately Satisfactory.

147. One of the positive aspects of this project is the reporting and good documentation of activities. Almost all the activities carried out, including workshops and missions conducted under the project, resulted in reports. A count of documents generated by the project between 2016 and 2017 indicates no less than 43 consultant activity reports, 14 workshop and mission reports, 22 quarterly, semi-annual and annual reports, ten reports and other activity reports (see Annex 3). This valuable source of information deserved and still deserves to be exploited to generate scientific and technical knowledge as well as advisory and decision support tools useful for different types of stakeholders in the chain of management and use of pesticides, biopesticides and related wastes. This information is also useful for generating communication materials on project activities and outcomes in order to raise awareness, train and build capacity and contribute to changes in practices and behaviour of agricultural advisors, farmers, community leaders and members of local or professional organisations and private operators, etc.

148. Thanks to the project, the project National Technical Coordinator and the National Consultant on the EPC management system participated in a training including a workshop on EPC management organised by FAO from 12 to 16 October 2015 in Lyon, France. They also visited the company ADIVALOR, where they were presented the French EPC management and recycling system (Annex 3, in-house project document, Sagbohan, 2015). The project constituted and involved a national decontamination team in the decontamination and bio-remediation operations, thus strengthening national knowledge and skills in this area. This is also the case for the national teams that participated in the planning and execution of the complementary inventory of POPs and obsolete pesticides. LCSSA's expertise and technical capacity to analyse samples of chemical pesticides and pesticide-contaminated materials was audited and acknowledged thanks to the project (see paragraph 135). This functional laboratory can participate in the monitoring of pollution indicators in sites that are polluted or in the process of decontamination. It can also be a key stakeholder for future projects or similar interventions in Benin and in the sub-region. Another positive aspect of knowledge management is that the various workshops organised or involving project stakeholders served as a framework for analysis, validation and sharing of knowledge used or generated by the project.

3.3.9 Communication

Finding 26. Communication is rated as Moderately Satisfactory. A communication strategy has been developed and published in November 2019, in line with Recommendation 1 of the project MTR conducted in June 2018. However, it is not yet used to ensure the popularisation of knowledge, build the capacity of stakeholders and bring about behavioural changes regarding the management and use of pesticides and related waste.

149. The project ensured internal communication through the preparation of various semi-annual and annual reports, as already mentioned. The project carried out a MTR in 2018 whose recommendations were followed by concrete actions, except those on gender and on increasing the frequency of PMU meetings.

150. The project has developed a document called "Communication Strategy", published in November 2019, to guide and support communication for stakeholders and the different stakeholders and beneficiaries in the chain of management and use of pesticides and related wastes, including EPCs. This document presents two major areas of intervention: the first is on institutional communication and the other is oriented towards advocacy, social mobilisation and communication for behavioural change. It outlines the gaps that need to be filled as well as the targets, channels and tools for communication per target and the communication plan. However, the strategy was developed too late, which prevented the project from implementing it. The quality of its content strongly calls for capitalisation in order to ensure the dissemination, the sustainability of achievements and the advocacy to mobilise the interest and commitment of stakeholders/decision-makers on the relevant perspectives and opportunities opened by the project. These are related to the institutionalisation of the FFS approach, the scaling up of the EPC management plan, the decontamination of the sites polluted with POPs and obsolete pesticides, and the development of agricultural systems with low use of chemical inputs.

Finding 27. The project internal communication worked well thanks to the rich documentation through the drafting of semi-annual and annual reports of the project. However, apart from the media coverage of some project activities as well as CFP workshops and meetings, external communication to potential project beneficiaries is not yet effective (see Finding 26).

151. Regarding decontamination operations, the FAO Representation in Benin set up a communication unit that systematically recorded all operations throughout the project. Interviews were organised to monitor the progress of sensitive operations. It is also foreseen that the project will include the drafting of press articles, their publication in state and private newspapers, as well as the production of an informative documentary to be broadcasted on television channels.

152. The project developed and used various communication materials (posters and manuals) to raise communities' awareness on the hazards associated with the use of EPCs, build the capacity of both facilitators on the FFS approach and farmers on IPPM, chemical pesticide reduction and the EPC triple-rinsing method and to strengthen the instruction of phytosanitary inspectors on good inspection practices. These theoretical trainings were combined with practical trainings.

153. In order to achieve the four expected effects, the project, as explained in the "Effectiveness" section, has applied and promoted several good practices[15] that deserve to be capitalised on and communicated to encourage decision-making and the implementation of actions that contribute

[15] To assess them in detail, reference should be made to the following paragraphs or sections: 46, 50, 52, 53, 54 and 55 for Effect 1; Finding 9, Finding 10, Finding 11 and Finding 12 for Effect 2; Finding13, Finding 14 and Finding 15 for Effect 3; Finding 16, paragraphs 92, 93, 99, 100, 104, 105, 107, 108, 110 and 114 for Effect 4.

to the improvement and change of practices and behaviours. Annex 2 includes a list of these good practices and important factors to consider in order to promote and ensure the sound management of chemical pesticides and their reduced use and associated risks.

154. For a more global and complete communication on the project and in particular on the risks and dangers related to chemical pesticides but also on the good practices of risk reduction and protection of the environment and populations' health, it is necessary that the project, during its extension period, mobilise in the short term the FAO Representation in Benin, the Government and the other partners to integrate this activity in their AWPB (see Recommendation 3).

Partial conclusion 3. Efficiency

155. The project implementation mechanism has worked well thanks to good collaboration between the Government of Benin, which is the main executing agency for the project, and FAO, which is the GEF executing agency for this project. However, there were delays at several key points in the implementation process, such that the project experienced a significant delay in achieving its main deliverable, which was the disposal of 213 tonnes of POPs and obsolete pesticides. There was also a delay in the development of the communication strategy, which was not implemented as planned. As a result, the project's efficiency is rated as Moderately Satisfactory.

3.4 Sustainability: Are the project outcomes sustainable and what conditions are in place to strengthen sustainability and reduce the risks that may affect it? To what extent can progress toward impacts be attributed to the project over the long term?

3.4.1 Project progress toward impact

Finding 28. As presented in the "Effectiveness" section, the project has generated positive effects on decision-makers, stakeholders, communities and final beneficiaries, and has strengthened the capacities of stakeholders in order to ensure the consolidation and sustainability of achievements. Concrete and potentially lasting effects were observed on the final beneficiaries of FFS.

156. Through its achievements and outcomes, the project has enabled the Government on the one hand to have a better picture of current POP and obsolete pesticides issues and risks and on the other hand, to adopt a global management approach beyond the quantities disposed of by the project. Thus, the identification and safeguarding of hazardous pesticides and contaminated sites are actions that are part of Ministry of Agriculture, Livestock and Fisheries priorities and have largely prepared the ground for presentation to the highest level of government (Council of Ministers) in order to integrate them into the government's priority actions. Government ownership is facilitated by the government's focus (not just since the GCP/BEN/055/JPN project) on POP and obsolete pesticides disposal, and the ongoing communication and sharing of results with stakeholders, including the highest level of Ministry of Agriculture, Livestock and Fisheries leadership. Specifically, elements that have sent out alarm signals and generated the Ministry of Agriculture, Livestock and Fisheries' commitment and mobilisation at the highest level include: the results of the complementary inventory of POPs and obsolete pesticides; the identification of risk factors and levels of contamination of consumer product sites by POPs, pesticides and pesticide-related wastes; and the successful piloting of clean-up activities, chemical pesticide and pesticide-related waste management plans, and IPPM systems.

157. Stakeholders in the chain of management, marketing, monitoring and use of synthetic chemical pesticides involved in the project, are better informed and aware of the risks and hazards

associated with these inputs, as well as the opportunities and alternatives available to significantly reduce and prevent these risks and hazards. The regulatory framework has been strengthened. The capacities of agricultural advisors (FFS facilitators), phytosanitary inspectors, farmers (FFS members) and organisations involved in the management and use of pesticides and the recycling of pesticides and related wastes have been reinforced and positive effects have been observed on the know-how and practices of these stakeholders.

3.4.2 Conditions put in place to ensure sustainability

Finding 29. Several factors likely to promote the sustainability and impact of the project were developed. From its conception, the project has drawn lessons from the previous Project GCP/BEN/055/JPN and from other exemplary initiatives as detailed in the "Relevance" section. The project selected technologies that were tailored to the needs, potentially sustainable, and tested for a long time in similar contexts.

158. The safeguarding and remediation of contaminated sites was based on cost-effective, locally available and replicable techniques after the end of the project by a national team of experts. The technologies and best practices tested in FFS are relevant, contextually appropriate, effective, and within the reach of farmers. The quality and availability of these technologies for farmers can be further facilitated by local stakeholders and with reasonable incentive support from the Government. The triple-rinsing method proposed by the project, followed by the collection and safe recycling of EPCs, are technologies and systems that are accessible and usable by rural community members and linked to a recycling company (Bethesda). The promising results in FFS are expected to be multiplied at different levels in the country. In addition, bioremediation and phytoremediation used to decontaminate sites has allowed the development of national expertise. It is less expensive than the excavation method (which involves destruction abroad). The expansion of the use of the PSMS[16] to different departments makes it possible to monitor pesticide stockpiles and their evolution on a daily basis. In addition, this system facilitates not only the management of stockpiles in the framework of risk management plans, but also the access to pesticide information to different parties (list of registered pesticides, product withdrawal and other useful information).

159. The attention of government authorities at the highest level has been mobilised and national capacity for quantifying risks from highly contaminated and remediation sites has been strengthened. The project developed a plan for the management of EPCs and proposed an appropriate management system, including a financing plan. The capacity of Bethesda was strengthened, and it was given its first national mission to collect and recycle EPCs in 77 departments. Trainers, farmers and other stakeholders directly involved or targeted by the project have a good understanding of it and their capacities are strengthened in the identification and management of risks related to obsolete pesticides, POPs, EPCs and contaminated soil. The project developed a support document to set up a national EPC management system in Benin, which includes an implementation plan to ensure the sustainability of the collection and management of EPCs.

160. The strengthening of the legal framework and national capacities for the management, inspection and post-registration control of pesticides and biopesticides constitutes a foundation for the sustainability of other project achievements. The successful promotion of integrated management techniques as alternatives to conventional pesticides and the reduced use of chemical and highly

[16] The FAO Pesticide Registration Toolkit is a decision support system designed for use by pesticide registrars in developing countries to facilitate the evaluation and approval of pesticides. This toolkit is a kind of virtual registration manual that registrars can consult regularly. Visit the following web page: http://www.fao.org/pesticide-registration-toolkit/fr/ (web page visited on 14 August 2021).

hazardous pesticides by farmers, also opens up prospects for the development of production systems and labels based on agriculture using few synthetic chemical inputs.

3.4.3 Risks affecting sustainability

Finding 30. Though they are moderate, risks that may threaten sustainability exist and must be prevented, eliminated or mitigated. They concern, for example: the low ownership of the project achievements by the Government after the project completion; the non-involvement in the project of certain key stakeholders of the POP and obsolete pesticides management and use chain (as in the case of AIC); and the non-application of strategies, rules and approaches proposed by the project (communication strategy, new decrees and orders signed, EPC management plan, proposed financing and overall management strategies, improved phytosanitary inspection strategy, improved technologies and good agricultural practices for IPPM). However, FAO support remains a risk mitigating factor.

161. Farmers who have adopted the proposed alternative production systems wish to have better availability of the necessary natural inputs (neem oil, organic matter and adapted seeds). Wider adoption could be observed if specific support were provided and if commodity chains and labels were developed to better value farmers' efforts. One option to be explored is the institutionalisation of the FFS approach, which has proven its worth in the framework of the project. In addition, the project has not succeeded in integrating the gender dimension. Moreover, support for women in disseminating the successes of FFS and alternatives to chemical pesticides could prove insufficient.

162. The communication strategy developed has not been implemented. The achievements in terms of new perceptions on the current issues and challenges related to the management and use of pesticides and biopesticides, rules put in place, know-how, good practices and technologies learned and mastered in the field as well as lessons learned from implementation, have not yet been promoted on a larger scale. It is necessary to communicate more widely on project issues and achievements to encourage scaling up.

163. As already indicated in Section 3.3, the weak involvement of AIC in the project – whereas it plays a predominant role in the supply of inputs to cotton farmers and in coaching and technical advice – is not likely to encourage the adoption of the good IPPM practices tested in FFS. The positive results obtained in FFS show the need to support manufacturers and distributors of biopesticides in order to enable the registration and availability of quality alternatives in sufficient quantities for the benefit of farmers. To promote IPPM-based production systems and alternatives to chemical pesticides, it is necessary to build and support a commodity chain and label for cotton and vegetable products based on low chemical pesticide use.

164. Thus, although OBEPAB (as provider) and Bethesda (as beneficiary and provider) are stakeholders, the non-involvement of consumer and environmental organisations in Benin does not allow civil society to advocate for the consolidation of achievements and the continuation of activities to protect the health of populations and the environment beyond the completion of the project.

Partial conclusion 4. Sustainability

165. These shortcomings and risks identified could be addressed either by the Government or through cooperation projects between FAO and the Government. FAO's advocacy and support to the Government is a potential factor in mitigating these risks (see Recommendation 3).

166. Given the sustainability conditions put in place and the level of control of risks that could threaten the outcomes achieved and progress towards impact, the sustainability of the project is rated as Moderately Likely.

3.5 Cross-cutting themes: Have issues related to gender, vulnerable or disadvantaged groups, and environmental protection been integrated into the project and adequately addressed during implementation?

3.5.1 Gender mainstreaming

Finding 31. The project design did not include specific indicators, targets and activities to ensure gender mainstreaming. The project's MTR (June 2018) had recommended "greater involvement of women in the implementation of project activities, particularly those of FFS", but the project has not implemented this recommendation, so gender mainstreaming remains weak.

167. The project did not include specific gender-related activities, indicators, or targets to guide and implement the commitment made in the project document. This shortcoming could not be remedied during implementation and the representation of women was generally low in the various project activities (Table 6). For Component 4, for example, 27 percent of facilitators are women and 12 percent of FFS members are women. The awareness of 12 women from the "*Tous Unis d'Ina*" women's group and nine women from the "GF SUN NA" women's group in Segbana was also raised on the pilot EPC management plan, as well as 157 farmers (gender not specified) and 15 development support stakeholders (gender not specified). However, the fact that the project is managed by a female National Coordinator is a source of satisfaction.

Table 6. Gender distribution of participants and beneficiaries of project activities

Structures and activities	Women	Men	Total	% of women
PMU	1	0	1	100%
Extended PMU team (NPC, 3 focal points, 1 Lead Technical Advisor, 1 FAO-Benin Program Officer)	2	4	6	33.3%
National and international consultants	1	12	13	7.6%
Project launch workshop	15	37	52	28.8%
PMU meetings (11 sessions)	30	88	118	25.4%
Project Steering Committee meetings (4 sessions)	13	71	84	15.5%
National decontamination team (3 sites)	8	28	36	22.2%
Workshop to plan the complementary inventory	1	12	13	7.6%
Workshop to present the complementary inventory	5	20	25	20%
Diagnostic activities within focus groups (see mid-term review)	93	460	553	16.8%
Facilitators of vegetable crop and cotton-maize FFS	8	22	30	26.6%
Participants from the vegetable-growing FFS	46	302	348	13.2%
Participants from cotton-maize FFS	37	323	360	10.3%
Workshop on potential alternatives to POPs and other chemical pesticides from 31 August to 1 September 2016	6	34	40	15.0%
Awareness raising/follow-up of cotton-maize FFS (2018 season) on the risks of EPCs from 12 to 26 November 2018	27	197	224	12.1%
Training/awareness raising of farmers and stakeholders on EPC triple rinsing (157 + 15) from 7 to 13 May 2019	-	-	172	-
Awareness raising of members of women's groups on EPC triple rinsing from 7 to 13 May 2019	21	-	-	-
Training workshop for phytosanitary control agents (37 beneficiaries + 5 others) from 22 to 26 July 2019	7	35	42	17.0%

Note: Data developed by the evaluation team from project documents and interviews.

168. The figures in Table 6 highlight that efforts could have been made to significantly improve gender equity, women's capacity building and empowerment. Three levers could be mobilised. The first is based on the use of appropriate tools for the awareness raising and mobilisation of women and youth (Community Listening Club or Dimitra Club, Village Savings and Loan Associations) that have been successfully applied by FAO in similar contexts. The second lever could be planning and implementing prevention and awareness-raising/training activities targeting women's priority needs in the management and use of pesticides and EPCs. Indeed, women use EPCs to store various food products and are also very involved in market gardening, where they must deal with pests. A third lever, which goes beyond the scope of this project alone, concerns increasing the representation of women in decision-making and technical support positions: agricultural facilitators and advisors, technical experts, and executives in the ministries of agriculture, environment and health in particular. This third lever suggests that FAO and GEF projects must integrate and continue to advocate for the training and promotion of women in these technical and decision-making positions.

169. In general, women are considered more vulnerable than men (Eissler et al., 2021) due to their culturally defined roles as wives and mothers, limited access to natural resources, and limited influence in decision making. For example, they must get permission from their husband to participate in an association or cooperative. This limits their participation in the agricultural value chain.

170. All these findings demonstrate the need for an in-depth gender diagnosis at the preparatory phase of the project to identify specific needs and determine actions to address them (FAO and ECOWAS, 2018 and FAO, 2020).

3.5.2 Environmental and social protection

Finding 32. The project has generated significant outcomes which, if scaled up, would make it possible to prevent, limit and eliminate in the medium term the various risks, risk factors and hazards associated with the use of pesticides and related waste. There are still some risks, although low.

171. In 2017, the project drafted the environmental management plan for the safeguarding and disposal of 213 tonnes of POPs and obsolete pesticides. In order to carry out pesticide risk reduction operations, the project also developed specific environmental management plans for Bohicon, Malanville and Djassin sites and appropriately took over the environmental management plan for Oganla sites developed under Project GCP/BEN/055/JPN. The project also implemented the activities planned in its various components and thus, directly contributed to environmental and social protection.

172. As presented in Section 3.2 "Effectiveness", the project is definitely progressing towards the safe disposal of 213 tonnes of POPs, obsolete pesticides and related waste by 30 June 2021. Three sites have been decontaminated and a fourth will soon be. The country now has confirmed expertise in exploring contaminated obsolete pesticide and POP sites and in safeguarding and decontaminating them. Empty containers have been treated by the triple-rinsing method, then collected, stored, transported and recycled in a secure manner. A functional plan for the management, processing (triple rinsing), collection, storage and recycling of EPCs has been successfully tested and the country has enhanced capacity for EPC management. Options for financing the system have been proposed to the Government. Their adoption and implementation would ensure sustainable EPC management. Strengthening legislation and capacity to inspect pesticides throughout their life cycle is a significant step towards reducing unregistered and smuggled pesticides whose uncontrolled or abusive use poses significant risks to the environment and human health. Alternative techniques and products as well as IPPM systems exist to reduce the use of POPs and chemical pesticides on cotton, maize and vegetable production.

173. There is a general awareness among both policy makers and the general public who regularly misuses and mismanages chemical pesticides and EPCs. As noted in Section 3.2 "Effectiveness" and Section 3.4 "Sustainability", efforts need to continue to ensure that the plan and management system developed and tested by the project are scaled up.

174. The upscaling of the outcomes achieved by the project would make it possible to prevent, limit and eliminate in the medium term the various risks, risk factors and hazards associated with the use of pesticides and related waste. Risk factors include: poor compliance with good phytosanitary practices (spray preparation, under- and over-dosing); use of cotton pesticides on food crops; very low use of personal protective equipment; use of EPCs to store food and beverages; throwing EPCs everywhere or on garbage heaps; the use of EPCs by the most vulnerable, such as women (to keep food and cosmetics) and children (toys); the non-use of triple-rinsing, draining and

perforating on containers; the almost total absence of organisation and collection of containers from farmers.

Partial conclusion 5. Cross-cutting dimensions

175. The project has made a very satisfactory contribution to environmental and social protection in Benin through the strengthening of the country's capacities for the safe and sustainable management of POPs, obsolete pesticides, chemical pesticides and related wastes and the sustainable reduction of environmental and health risks related to these different pollutants.

176. Though considerable, efforts made during implementation to integrate women and youth were insufficient. Gender mainstreaming is rated as Moderately Satisfactory.

4. Conclusions and recommendations

4.1 Conclusions

Conclusion 1. The project was well aligned with the strategic priorities of the Government, FAO and GEF and to the needs of environmental protection and limiting the exposure of populations to risks and hazards related to the management and inappropriate use of chemical pesticides and related wastes.

177. The project is a concrete contribution to implementing the priorities of sustainable development and environmental and social protection indicated in the strategic documents of the Government of Benin and its partners, including FAO and GEF. These strategic priorities meet the needs of the main stakeholders who manage and use the environment and its resources (water, soil, air) for different purposes (vital, productive, social, economic, heritage). Proof of this is the relevance of the project objectives and activities as confirmed by the general opinion of government officials and technical agents (Ministries in charge of agriculture, environment and health), technical experts and contact persons from non-governmental organisations and civil society, the populations and farmers interviewed, and all the documentation used during this final evaluation. The project continued the positive momentum of innovation initiated by the previous project GCP/BEN/055/JPN and other initiatives. It capitalised on the achievements and lessons learned to move Benin towards better management and use of pesticides and related wastes throughout their life cycle.

Conclusion 2. Beyond the goal of disposing of 213 tonnes of POPs, obsolete pesticides and related wastes, which is on track to be achieved, the project has strengthened national capacity for the safe and sound management and use of hazardous pesticides and proposed a number of alternative systems based on IPPM, thereby stimulating government ownership of the outcomes generated for wider dissemination.

178. The project has consolidated national technical expertise in pesticide life cycle management, prevention and mitigation of risks related to the use of chemical pesticides and empty containers. This expertise covers the following areas: i) inventory, safeguarding, recycling and disposal of obsolete pesticides, POPs, obsolete pesticides and related wastes, including EPCs; ii) exploratory diagnosis, safeguarding, remediation of contaminated sites; iii) post-registration management, inspection and control of pesticides and related wastes; and iv) research & development and provision of alternative products and IPPM systems. A regulatory framework for better post-registration management of pesticides is in place and needs to be implemented. The FFS approach deployed by the project has shown all its value in supporting and advising farmers and has facilitated for the adoption of good practices based on IPPM and the reduction of the use of chemical pesticides. However, efforts should continue to consolidate the achievements made and improve the accessibility of these solutions to farmers. However, it was rather unfortunate that after 2016, Benin no longer contributed to the PSMS. The PSMS access code assigned to the Ministry of Agriculture, Livestock and Fisheries in 2015 by FAO was used to populate the 2016 obsolete pesticides and POPs inventory data. Benin's access to this platform was then suspended after 2016; the Country Representation is hopeful to receive the codes again soon.

Conclusion 3. Overall, the project was well managed, but delays in some procurement or recruitment processes negatively affected its efficiency during implementation.

179. The project implementation mechanism generally worked well thanks to good collaboration between the Government of Benin and FAO, which could be seen through continuous support via PSC and PMU meetings and participation in workshops and missions. Stakeholders were well

involved in the project and officials from the Ministries in charge of agriculture, environment and health were regularly informed of the activities carried out, the outcomes obtained and the actions to be considered for the future. M&E, data management and internal communication worked well. The project benefited from continuous support from the FAO Representation in Benin and more discontinuous and ad hoc support from the project Technical Unit (Plant Protection Division) and GCU based at FAO headquarters in Rome. However, as explained on paragraphs 139 to 142 (Section 3.3.3), the efficiency of the project was diminished by delays in the processes of acquisition and validation of reports by the Project Technical Unit, management of co-financing, and the development of the communication strategy. The latter was not implemented, and this affected the visibility of the project.

Conclusion 4. The regulations, plans, strategies, and technologies developed and tested by the project are within the reach of the different categories of beneficiaries and are replicable thanks to the many capacities developed by the project.

180. The conditions for sustainability have been put in place during project implementation so that there are fewer risks that could limit the ownership and scaling up of project outcomes. However, some key stakeholders such as AIC or other private sector stakeholders responsible for developing and registering alternatives to chemical pesticides, were not fully involved in project implementation. The risk of weak government ownership and scaling up of the strategies, rules and approach proposed by the project is not minor and should be monitored. However, FAO support remains a risk mitigating factor.

Conclusion 5. The project achieved its environmental and social protection objectives, but the gender dimension could have been better taken into account during project design and implementation by starting with an analysis of women's specific needs.

181. Thanks to the project, Benin has increased and consolidated its capacities and tools to manage chemical pesticides throughout their life cycle, reduce their inappropriate use (in quantity and quality), their accumulation and the associated environmental and health risks. However, a thorough and prior analysis of the specific concerns of women and other vulnerable groups potentially affected by the management of pesticides and related wastes could have facilitated the implementation of specific actions to reduce their exposure to risks and strengthen their capacities for IPPM.

4.2 Recommendations

Recommendation 1. The design of projects for the sound management of chemical pesticides and action research on alternatives by FAO and the Government must integrate all stakeholders of this value chain and provide sufficient incentives to support the adoption of the proposed technologies and good practices. As such, a partnership framework with AIC and the private sector is needed to support, for example, production, availability and accessibility of quality biopesticides, and the setting up of a niche market for products obtained from low synthetic input agriculture systems.

182. Agricultural advisory and training organisations (as in the case of AIC) and the private sector, including importers, manufacturers, and distributors of pesticides and biopesticides, as well as traders and distributors of agricultural products, are key stakeholders in fostering and supporting the processes of adoption, dissemination, and promotion of technologies and good practices in pesticide management and use by farmers.

Recommendation 2. FAO should promote the ownership and consolidation of project-generated achievements and outcomes and the institutionalisation of the FFS approach by the Government.

183. FAO Representation in Benin should continue the dialogue with the Government and support it to: i) put in place in the very short term actions to monitor and secure all obsolete pesticides and polluted sites at risk and, in the medium term, mobilise financial resources for the disposal of secured POPs and obsolete pesticides and the remediation of relevant sites; ii) adopt and implement the EPC management system developed by the project, and promote enforcement; iii) institutionalise the FFS approach; and iv) develop and implement a partnership action-research program, including the continuation of field research on the pathogenic effect of a fungus (*Beauveria bassiana*) vs. cabbage aphid (*Lipaphis erysimi*), the facilitation and support to the registration process of promising biopesticides namely *Metarhizium anisopliae* and Nuclear Polyhedrosis Virus (*HaNPV*) against the major cotton and tomato pest (*Helicoverpa armigera*) and support to the production and availability of neem oil meeting the required quality standards.

Recommendation 3. FAO must support the Government in managing the knowledge generated by the project, implementing the communication strategy, developing new labels and, ultimately, contributing to the project visibility and sustainability.

184. The project's extensive documentation must be used to generate scientific and technical knowledge as well as advisory and decision-making tools that can be used to build the capacities of stakeholders and bring about behavioural changes regarding the management and use of hazardous pesticides and related wastes. It is also necessary to implement the communication strategy developed by the project in order to raise awareness, train and build capacity and thus contribute to changes in practices and behaviour of agricultural advisors, farmers, community leaders and members of local or professional organisations and private operators. Supporting the development of new labels and markets for products from farming systems using low synthetic chemical inputs is also an important factor of sustainability insofar as it will lead to the adoption of the good IPPM practices proposed by the project. A study using a global approach to the cotton economy (the case of the municipality of Banikoara, one of the first cotton-producing municipality in Benin) also shows the need to support the evolution of current farming systems towards low synthetic input systems (Westerberg et al., 2017).

Recommendation 4. FAO needs to improve its mechanism for mainstreaming gender and vulnerable groups and mobilising co-financing when designing and implementing similar projects.

185. Women as major stakeholders in agricultural production (vegetable and food crops) and in household management, are directly concerned with pesticide safe management and the elimination of risks associated with these chemicals and their containers. Actually, they use EPCs to store different products and are also exposed to pesticides during their use. However, they do not have easy access to training, including training in pesticide use and management, and IPPM systems. It is therefore important to incorporate activities, indicators, and targets specific to gender and vulnerable groups and to the mobilisation of co-financing in the design of similar projects, and to monitor their achievement during implementation. With respect to gender, FAO could further promote the use of specific tools it has developed and successfully tested to ensure social mobilisation (Community Listening Club or Dimitra Club) and resilience building (Village Savings and Loan Associations; income-generating activities; gender-mainstreaming FFS) of women and other vulnerable groups. More generally, as part of its dialogue with the Government, FAO should continue and accentuate its advocacy and support for the increase in the representation of women among technical managers and decision makers working for the development of the rural sector. Regarding co-financing mobilization and management, FAO

should strengthen the capacities of its agents involved in the implementation of the project at the country level and plan a set of specific activities and targets to be achieved. For example, depending on the specificities of the projects and countries, it could plan meetings/workshops of co-financing partners at a reasonable frequency with specific objectives to be achieved.

5. Lessons learned

186. The project has demonstrated that reducing the accumulation of obsolete pesticides must be done in a holistic manner and supported by a multi-stakeholder partnership, action research and capacity building for individuals (decision makers, development agents, farmers, direct beneficiaries and civil society), organizations (structures and entities involved in the chain of production, management and use of pesticides and biopesticides) and the enabling environment (regulatory framework, policies and coercive or incentive measures).

187. The systemic and multidisciplinary approach deployed and the outcomes achieved by the project clearly show where the Government and its partners must focus their efforts to consolidate achievements or fill the gaps and to foster the progress towards impact and sustainability. In this regard, the project outcomes sufficiently demonstrate, for example, the value of having built and strengthened the capacity of the national decontamination team, combined laboratory and field research with the FFS approach to develop alternatives to chemical pesticides, and developed and tested an EPC collection plan, an EPC management system, including a financing model, and an improved phytosanitary inspection and control system. The project has demonstrated in an exemplary way the need to institutionalise several of these approaches and plans, but also the need to encourage the creation of new signs and labels to value the work of stakeholders who protect the environment and health by applying good practices.

Bibliography

Akinhola Adechian, S., Nasser Baco, M., Akponikpe, I., Imorou Toko, I., Egah, J. and Affoukou, K. 2015. Les pratiques paysannes de gestion des pesticides sur le maïs et le coton dans le bassin cotonnier du Bénin. *VertigO - la revue électronique en sciences de l'environnement*, 15(2), September 2015. (also available at https://doi.org/10.4000/vertigo.16534)

Association nationale des organisations professionnelles d'éleveurs de ruminants. 2014. *La situation actuelle de l'élevage et des éleveurs de ruminants au Bénin. Analyse et perspectives*. Gogounou, Benin.

ECOWAS. 2008a. Règlement C/REG.3/05/2008 portant harmonisation des règles régissant l'homologation des pesticides dans l'espace CEDEAO. Abuja.

ECOWAS. 2008b. Règlement C/REG.4/05/2008 du 18 mai 2008 portant harmonisation des règles régissant le contrôle de la qualité, la certification et la commercialisation des semences végétales et plants dans l'espace CEDEAO. Abuja.

ECOWAS. 2010. Règlement C/REG.21/11/10 du 26 novembre 2010 portant harmonisation du cadre structurel et des règles opérationnelles en matière de sécurité sanitaire des végétaux, des animaux et des aliments dans l'espace CEDEAO. Abuja.

ECOWAS. 2012. *Règlement C/REG.13/12/12* du 2 décembre 2012 relatif au contrôle de qualité des engrais dans l'espace CEDEAO. Abuja.

Stockholm Convention on Persistent Organic Pollutants. 2001. *Stockholm Convention on Persistent Organic Pollutants*. 22 May 2001, entry into force on 17 May 2004.

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. 1998. *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*. 10 September 1998, entry into force on 24 February 2004.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. 1989. *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. 22 May 1989, entry into force on 5 May 1992.

Eissler, S., Diatta, A.D., Heckert, J. and Nordehn C.N.A. 2021. A qualitative assessment of a gender-sensitive agricultural training program in Benin: Findings on program experience and women's empowerment across key agricultural value chains. International Food Policy Research Institute. Washington, DC.

FAO. 2013. FAO Policy on Gender Equality. Rome.

FAO. 2019. *Boîte à outils pour l'homologation des pesticides*. (also available at http://www.fao.org/pesticide-registration-toolkit/fr/) (web page visited on 12 August 2021)

FAO. 2020. Empowering women to leave no one behind. *FAO* [online]. (also available at http://www.fao.org/news/story/fr/item/1319950/icode/) (web page visited on 12 August 2021).

FAO. 2021. *Family Farming Knowledge Platform. (*also available at: http://www.fao.org/family-farming/background/fr/) (web page visited on 12 August 2021)

FAO and ECOWAS. 2018. Profil national genre des secteurs de l'agriculture et du développement rural – Bénin. Gender Country Assessment Series. Cotonou, Benin.

FAO and Republic of Benin. 2017. Cadre de programmation pays du Bénin 2017–2021. Porto-Novo.

Institut national de la statistique et de l'analyse économique. 2015. *Enquête modulaire intégrée sur les conditions de vie des ménages (EMICoV-2015)*. Rapport préliminaire. Cotonou, Benin.

Institut national de la statistique et de l'analyse économique. 2018. *Annuaire statistique*. Cotonou, Benin.

Institut national de la statistique et de l'analyse économique. 2019a. *Évolution de la production halieutique 1998–2018*. Cotonou, Benin.

Institut national de la statistique et de l'analyse économique. 2019b. *Tableau de bord social 2015. Profils socio-économiques et indicateurs de développement*. Tome 1. Cotonou, Benin.

Institut national de la statistique et de l'analyse économique. 2020. Note sur la pauvreté en 2019. Résultats de l'enquête harmonisée sur les conditions de vie des ménages (EHCVM) dans l'UEMOA en 2018–2019. Cotonou, Benin.

Institut national de la statistique et de l'analyse économique et ICF. 2019. *Enquête démographique et de santé au Benin, 2017–2018*. Cotonou, Benin and Rockville, United States of America.

Kamau-Rutenberg, W. 2018. La Parité Hommes-Femmes dans le secteur agricole africain. Une nécessité en termes d'innovation. *OMPI Magazine*, April 2018. (also available at https://www.wipo.int/wipo_magazine/fr/2018/02/article_0006.html)

Ministry of Agriculture, Livestock and Fisheries. 2015. *Arrêté du 19 août 2015*. Porto-Novo.

Ministry of Agriculture, Livestock and Fisheries. 2018a. Arrêté n° 097/MAEP du 18 décembre 2018 fixant les modalités de gestion des emballages vides de pesticides et de biopesticides ainsi que les modalités de répartition des frais y afférents. Porto-Novo.

Ministry of Agriculture, Livestock and Fisheries. 2018b. Arrêté n° 089 de 2018 fixant les modalités d'étiquetage des pesticides et des biopesticides distribués en République du Bénin. Mise à jour de l'arrêté 93-186/MDR/MF/DC/CC/CP du 22/04/1993 relatif à l'étiquetage, l'emballage et la notice technique des produits. Porto-Novo.

Ministry of Agriculture, Livestock and Fisheries-Ministry of Economy and Finance. 2020. *Arrêté interministériel n° 041/MAEP/MEF/DC/SGM/CJ/DPV/SA/032SGG20 du 17/07/2020 fixant les conditions d'obtention des agréments professionnels pour la fabrication, le conditionnement ou le reconditionnement, l'importation la distribution et l'application des pesticides et des biopesticides en République du Bénin*. Porto-Novo. (also available at https://www.service-public.bj/public/services/service/PS00437) (web page visited on 21 September)

Organisation for Economic Co-operation and Development (OECD), Development Assistance Committee. 2019. *Better criteria for better evaluations. Adapted definitions and principles of use*. OECD-DAC Network on Development Evaluation (EvalNet). Paris.

Republic of Benin. 1991. Loi n° 91-004 portant réglementation phytosanitaire. Porto-Novo.

Republic of Benin. 2007. Plan national de mise en œuvre de la Convention de Stockholm. Porto-Novo.

Republic of Benin. 2013. Décret n° 2013-369 du 23 septembre 2013 portant abrogation, à titre de régularisation, du décret n° 2009-091 du 23 mars 2009 portant approbation de l'Accord-cadre entre l'État et l'Association Interprofessionnelle du Coton (AIC). Porto-Novo.

Republic of Benin. 2017a. Décret n° 2017-433 du 10 août 2017 portant attributions, organisation et fonctionnement de l'Agence béninoise de sécurité sanitaire des aliments. Porto-Novo.

Republic of Benin. 2017b. Décret n° 2017-019 du 11 janvier 2017 portant nomination de liquidateur de la Société nationale pour la promotion agricole. Porto-Novo.

Republic of Benin. 2017c. Plan stratégique de développement du secteur agricole (PSDSA) 2025 et Plan national d'investissements agricoles et de sécurité alimentaire et nutritionnelle PNIASAN 2017–2021. Final version, May 2017. Porto-Novo.

Republic of Benin. 2018a. Décret n° 2018-171 du 16 mai 2018 portant création, attributions, organisation et fonctionnement du Comité national de gestion des pesticides (CNGP). Porto-Novo.

Republic of Benin. 2018b. Décret n° 2018-172 du 16 mai 2018, fixant les modalités d'application des règlements communautaires sur l'homologation des pesticides en République du Bénin. Porto-Novo.

Republic of Benin. 2018c. Décret n° 2018-173 du 16 mai 2018, instituant le catalogue béninois des espèces et variétés végétales. Porto-Novo.

Republic of Benin. 2018d. Décret n° 2018-174 du 16 mai 2018, portant création, attributions, organisation et fonctionnement du Comité national des semences végétales en République du Bénin. Porto-Novo.

Republic of Benin. 2018e. Décret n° 2018-175 du 16 mai 2018, portant création, attributions, organisation et fonctionnement du Comité national d'agrément et de contrôle de qualité des engrais en République du Bénin. Porto-Novo.

Republic of Benin. 2018f. Décret n° 2018-176 du 16 mai 2018, fixant les modalités de gestion et de contrôle de qualité des engrais en République du Bénin. Porto-Novo.

Republic of Benin. 2018g. Plan national de développement (PND) 2018–2025. Porto-Novo.

United Nations Evaluation Group (UNEG). 2016. *Normes et règles d'évaluation.* New York City, United States of America.

World Food Program. 2014. Comprehensive Food Security and Vulnerability Analysis (CFSVA). Rome.

Westerberg, V., Golay, A., Houndekon, V. and Costa, L. 2017. *L'économie de la dégradation de terre, le cas de la commune de Banikoara. Le coton est-il vraiment l'or blanc à Banikoara?* German International Cooperation (GIZ) and The Economics of Land Degradation, Bonn, Germany (also available at https://www.researchgate.net/publication/321918105_Le_coton_est-il_vraiment_l%27or_blanc_a_Banikoara_L%27economie_de_la_degradation_des_terres_au_Benin_cas_de_la_commune_de_Banikoara) (web page visited on 12 August 2021)

Appendix 1. People interviewed

Last name	First name	Organization	Position
Ableto	Mathias	LCSSA	Head of the Chemistry Unit
Adanguidi	Jean	FAO Representation in Benin	Assistant to the Representative in charge of the programme
Adekambi	Pascal	Ministry of Living Environment and Sustainable Development	GEF focal point
Adossou	Eric	Ministry of Agriculture, Livestock and Fisheries	Service head, DPV
Ahouandjinou Megleto	Isabelle	Société Accueil Paysan Sarl	Input importer and distributor
Aïdji	Delphin	Ministry of Living Environment and Sustainable Development	GEF focal point
Akoho	Kakpo Etienne	*Compagnie d'Ingénierie Sociale et Environnement* / Bethesda	Executive Director
Akpakpo	Géraldine	Vegetable-growing Farmer Field School	Facilitator
Alamon	Yessifou		National consultant specialised in pesticide and biopesticide control legislation
Assogba Komlan	Françoise	Ministry of Agriculture, Livestock and Fisheries	Secretary General
Bio Ali	Sabi Goré	Union communale des coopératives villageoises des producteurs de coton	
Bio Sanni	Fadel	Gbessassi Bouka, Kalalé	Facilitator
Bio Tourou	Baní Gouda	Conseil national des producteurs du coton du Borgou	President
Bio Yerima	Mouhaman Sanni	FAO Representation in Benin	Programme Assistant
Bouraïma	Yacouba		National Consultant specialised in Pesticide Management
Braun	Geneviève	FAO Rome, FAO-GCU	Programme Officer
Capo-Chichi	Ulrich	Phytosanitary control post / Airport	Head
Dagbeto	Samuel	Division of regulation and control of plants and plant products/ Departmental Directorate of Agriculture, Livestock and Fisheries (Zou)	Head
Dansi	Donatien	Farmer Field School	Master trainer
Darboux	Isaac	LANTANA	Importer
Djogninou	Claude	Société nationale pour la promotion agricole (Former SONAPRA)	Former head / Environmental and Health Service
Donoumassou	Simeon Pulcherie		Lawyer/Focal point of Basel, Rotterdam and Bamako Conventions
Dossou-Yovo	A. Alice	Padé, Kandi	Facilitator
Douro Kpindou	Ouorou Kobi	International Institute of Tropical Agriculture	National Consultant/Specialist in the identification of alternatives to chemical pesticides
Fade Odo	Rodrigue	Liboussou, Ségbana	Farmer
Gbessemehlan	Jacques	Ministry of Living Environment and Sustainable Development	Project Focal Point

Last name	First name	Organization	Position
Gomez	Christian	FAO Representation in Benin	Assistant to the Representative in charge of administration and finance
Hossou	Epiphane	Benin Food Safety Agency	Director General
Leode	Pélagie	Phytosanitary control post / Port	Head
Morebotsane	Kuena	FAO Rome, FAO-GCU	FLO
Olou	Dénis		National Consultant/Typology and M&E of FFS
Orou Sidi	Mounirou	Village Group (VG) / Gbessassi Bouka, Kalalé	Secretary
Perminova	Roxana	FAO Rome, NSP	Officer
Raïmi	Gafarou		National consultant in FFS
Sagbohan	Jacqueline	FAO Representation in Benin	Project Coordinator
Sarè	Rafiatou	Cotton-maize Farmer Field Schools	Facilitator
Tiamiyou	Ibouraïma		National Consultant/Specialist in EPC management
Totin	Isidore	Ministry of Health	Project Focal Point
Vodouhe	Davo Simplice	OBEPAB	National Consultant/Specialist in Food Spray alternatives
Zoffoun	Yves Joël A. Enagnou	ONG BETHESDA, Centre de traitement des déchets et production agricole (CTDPA)	Head of the Centre
Zoglobossou	Roland	Ministry of Agriculture, Livestock and Fisheries, DPV	Director

Appendix 2. GEF criteria rating table

GEF criteria and sub criteria	Rating[17]	Comments
A. Strategic relevance		
A1. Alignment with GEF and FAO Strategic Priorities	HS	See Section 3.1 Relevance and coherence: To what extent is the project relevant and consistent with the Government of Benin's strategic priorities for sustainable agricultural development and environmental protection and with FAO and GEF's strategic objectives?Relevance and coherence: To what extent is the project relevant and consistent with the Government of Benin's strategic priorities for sustainable agricultural development and environmental protection and with FAO and GEF's strategic objectives?
A2. Relevance to national, regional and global priorities	HS	
A3. Complementarity with existing interventions	HS	
A4. Overall strategic relevance	HS	
B. Effectiveness		
B1. Overall evaluation of project outcomes	S	See Section 3.2 Effectiveness: To what extent are the intended objectives of the project being achieved and what is the level of progress towards impact?
B1.1 Output delivery	S	
B1.2 Progress towards project outcomes and objectives	S	
Effect 1	MS	
Effect 2	S	
Effect 3	S	
Effect 4	S	
B1.3 Probability of impact	HS	
C. Efficiency		
C1. Efficiency[18]	MS	See Section 3.3 Efficiency
D. Sustainability of project outcomes		
D1. Overall probability of sustainability	ML	See Section 3.4 Sustainability: Are the project outcomes sustainable and what conditions are in place to strengthen sustainability and reduce the risks that may affect it? To what extent can progress toward impacts be attributed to the project over the long term?
D2. Sustainability in relation to financial risks	ML	
D3. Sustainability in relation to socio-economic risks	L	
D4. Sustainability in relation to institutional and governance risks	ML	
D5. Sustainability in relation to environmental risks	L	
D6. Catalysis and replication	L	
E. Factors affecting performance		
E1. Project design and preparation[19]	S	See Section 3.3 Efficiency and factors affecting performance: Was the project efficient and effective in the deployment of management and administration mechanisms?Efficiency and factors affecting performance: Was the project efficient and effective in the deployment of management and administration mechanisms?
E2. Quality of project implementation	S	
E2.1 Supervision of the project (FAO, Steering Committee)	MS	
E3. Quality of project execution	S	
E3.1 Project management and execution arrangements (PMU, Financial Management, etc.)	S	

[17] See rating system in Appendix 2.

[18] Includes cost-benefit and timeline analysis

[19] Refers to factors that affect the ability of the project to start at the planned time, such as the presence of sufficient capacity among implementing partners at the start of the project.

GEF criteria and sub criteria	Rating[17]	Comments
E4. Co-financing and financial management	MU	
E5. Project partnerships and stakeholder involvement	S	
E6. Communication and knowledge management	MS	
E7. Overall quality of M&E	MS	
E7.1 Design of M&E	MS	
E7.2 Implementation of the M&E plan (including financial and human resources)	MS	
E8. Overall evaluation of factors affecting performance	MS	
F. Cross-cutting issues		
F1. Gender and other equity dimensions	MS	See Section 3.5 Cross-cutting themes: Have issues related to gender, vulnerable or disadvantaged groups, and environmental protection been integrated into the project and adequately addressed during implementation?
F2. Human rights issues	--	
F3. Environmental and Social Safeguards	HS	
Overall evaluation of the project	**S**	

Appendix 3. Rating scales

Rating Scale for outcomes

Rating	Description
Highly Satisfactory (HS)	The level of outcomes achieved clearly exceeded expectations and/or no shortcoming was noted
Satisfactory (S)	The level of outcomes achieved was within expectations and/or no or minor shortcomings were noted
Moderately Satisfactory (MS)	The level of outcomes achieved was more or less as expected and/or moderate shortcomings were noted
Moderately Unsatisfactory (MU)	The level of outcomes achieved was somewhat below expectations and/or significant shortcomings were noted
Unsatisfactory (U)	The level of outcomes was significantly below expectations and/or significant shortcomings were noted
Highly Unsatisfactory (HU)	Only a negligible level of outcomes was achieved and/or serious shortcomings were noted
Unable to assess (UA)	The information available is insufficient to assess the level of achievement of outcomes

Rating scale for factors affecting performance (each element is rated separately, monitoring and evaluation is treated differently)

Rating	Description
Highly Satisfactory (HS)	There were no shortcomings and the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management, exceeded expectations.
Satisfactory (S)	There were few or no shortcomings and the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management, met expectations.
Moderately Satisfactory (MS)	There were some shortcomings and the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management, more or less met expectations.
Moderately Unsatisfactory (MU)	There were significant shortcomings and the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management, was somewhat below expectations.
Unsatisfactory (U)	There were significant shortcomings, and the quality of implementation was significantly below expectations.
Highly Unsatisfactory (HU)	There were serious shortcomings and the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management.
Unable to assess (UA)	The information available is insufficient to assess the quality of design and preparation/project implementation/project execution/co-financing/partnerships and stakeholder participation/communication and knowledge management.

Rating Scale for M&E Design and Implementation (overall M&E design; design and implementation assessed separately)

Rating	Description
Highly Satisfactory (HS)	There were no shortcomings and the quality of M&E design or implementation exceeded expectations.
Satisfactory (S)	There were few or no shortcomings and the quality of M&E design or implementation met expectations.
Moderately Satisfactory (MS)	There were some shortcomings and the quality of M&E design or implementation more or less exceeded expectations.
Moderately Unsatisfactory (MU)	There were significant shortcomings, and the quality of M&E design or implementation was somewhat below expectations.
Unsatisfactory (U)	There were significant shortcomings, and the quality of M&E design and implementation was significantly below expectations.
Highly Unsatisfactory (HU)	There were serious shortcomings in M&E design and implementation.
Unable to assess (UA)	The information available is insufficient to assess the quality of M&E design and implementation

Rating scale for sustainability

Rating	Description
Likely (L)	There is little or no risk to sustainability.
Moderately likely (ML)	There are moderate risks to sustainability.
Moderately Unlikely (MU)	There are significant risks to sustainability.
Unlikely (U)	There are serious risks to sustainability.
Unable to assess (UA)	Unable to assess expected impact and magnitude of sustainability risks.

Appendix 4. Table of the project co-financing

Name of co-financer	Category of co-financer	Type of co-financing	Co-financing at the beginning of the project (Amount confirmed upon approval by the DG/approval by the project design team) (USD)			Amount of co-financing secured as of project closing date (USD)		
			In kind	**Cash**	**Total**	**In kind**	**Cash**	**Total**
GEF	Bilateral or Multinational Organisation	Grant	0	1 830 000	1 830 000		1 830 000	1 830 000
ABSSA	Government	Grant	300 000	4 250 000	4 550 000			
DAGRI/Ministry of Agriculture, Livestock and Fisheries	Government	Beneficiaries' contribution	500 000	0	500 000	300 000	0	300 000
OBEPAB	Private sector	Grant	500 000	500 000	1 000 000			
IITA	Research institute	Grant	0	300 000	300 000			
CropLife	Private sector	Grant	0	868 500	868 500	0	868 000	868 000
Shell via CropLife	Private sector	Grant	60 000	0	60 000	75 000		
FAO	Non-profit organization	Grant	150 000	3 152 125	3 302 125			
Total (USD)			**1 510 000**	**10 900 625**	**12 410 625**			

Appendix 5a. Activities contributing to the project theory of change

Component 1 activities

For Outcome 1:

1.1.1 Communication campaign and inventory of privately held stockpiles from CropLife International, followed by environmental management plan and evaluation team to dispose of up to 200 tonnes of obsolete pesticides and related waste.

1.1.2 Safeguarding of up to 200 tons of obsolete pesticides and related waste.

1.1.3 Disposal of obsolete pesticides and related waste.

For Outcome 2:

1.2.1 Rapid environmental assessment of heavily contaminated sites and prioritization.

1.2.2 Development of a conceptual site model for the highest risk sites (based on the results of the Environmental Impact Assessment plan) and specific remediation/risk reduction plans for selected sites.

1.2.3 Implementation of Remediation/Risk Reduction Plans for two selected sites.

Component 2 activities

For Outcome 1:

2.1.1 Need for assessment and situation analysis.

2.1.2 Identification of collection and processing centers, transportation, temporary storage facilities per village and final storage per department.

2.1.3 Assessment and identification of a national or regional facility for the treatment and recycling of different types of empty containers (based on the results obtained, see 2.1.1 and 2.1.2).

For Outcome 2:

2.2.1 Instruction to 208 farmers on the risks associated with EPCs as well as the techniques of triple rinsing and field spraying of the residue from the rinses.

2.2.2 Collection and processing centers (sorting of different types of containers), transportation, temporary storage facilities per village and final storage per department.

2.2.3 Evaluation of the empty container management plan and recycling strategy.

2.2.4 Action plan to improve the empty container management strategy.

Component 3 activities

For Outcome 1:

3.1.1 Drafting of proposed legislation, decrees and orders and all related documents.

3.1.2 Consultation and review of draft legislation.

3.1.3 Submission of the revised legislation to the Government for approval.

For Outcome 2:

3.2.1 Validation of the strategy by stakeholders.

3.2.2 National workshop to review and adopt the strategy and establish the NCPM.

3.2.3 Training and support for the national strategy/action plan

For Outcome 3:

3.3.1 Development of a training plan and equipment for pesticide inspection and control.

3.3.2 Equipping two points of entry for pesticide inspection and quality control.

3.3.3 Training staff in pesticide inspection and control.

3.3.4 Evaluation of the most cost-effective strategy for pesticide quality analysis: use of a regional or international laboratory or upgrade of a national laboratory.

Component 4 activities

For Outcome 1:

4.1.1 Ongoing data collection on pest management practices.

4.1.2 Entry and analysis of data collected on pest management practices through the Pest Monitoring and Management System.

4.1.3 Identification of potential crop protectants and/or alternative practices to hazardous chemical POPs and pesticides.

4.1.4 Workshop with parties to agree on identified potential alternatives and on the strategy for field testing, registration and promotion.

For Outcome 2:

4.2.1 Development of protocols (with IITA) and effectiveness testing of identified alternatives, in collaboration with the West African Committee for Pesticides Registration (COAHP) and PIP-COLEACP, (Europe-Africa-Caribbean-Pacific Liaison Committee).

4.2.2 Field testing of selected alternative products to confirm their economic and technical feasibility.

4.2.3 Value chain assessment.

4.2.4 Submission of alternatives to endosulfan, POPs and PO to COAHP for registration

For Outcome 3:

4.3.1 Training of trainers of extension agents, agricultural advisors, and guide farmers to alternative methods.

4.3.2 Training of farmers (FFS, study groups, etc.).

4.3.3 Preparation and implementation of a communication strategy on the impact of EPC, on human health and on the environment; promotion of registered alternatives.

Component 5 activities

5.1 Preparation of interim project reports.

5.2 Mid-term and final evaluation reports.

5.3 Dissemination of "good practices" and "lessons learned" through publications and other means, specified in the communication strategy.

Appendix 5b. GEF Matrix to evaluate the achievement of project outcomes

Project strategy	Indicators[20]	Baseline[21]	Mid-term target[22]	End-of-project target	Level of achievement at final evaluation[23]	Achievement rating[24]	Justification of rating
Objective: Dispose of existing obsolete pesticides, including POPs and related wastes, and build capacity for the sound management of pesticides to prevent further stockpile.							
Direct effect 1 Elimination of risks associated with existing obsolete pesticide stockpiles and reduction of risks from sites heavily contaminated with pesticides.	**Indicators:** i) Destruction of some 200 tonnes of POPs and other obsolete pesticides in an environmentally friendly manner. ii) Reduction of the risk of exposure/level of contamination of at least two contaminated sites (50 percent reduction).	i) 504 tonnes of obsolete pesticides and 150 tonnes of related waste inventoried in 2012. 380 tonnes of endosulfan in the safeguarding and disposal phase at USD 4 500/tonne (funded by GCP/BEN/055/JPN). ii) 11 sites identified and inventoried with contaminated soil uploaded into PSMS. Five priority sites for survey. Three surveys completed and Environmental Impact Assessment and environmental management plan drafted. Risk reduction at three sites will be undertaken (Bohicon, Oganla and Djassin by GCP/BEN/055/JPN). iii) New pesticide landfill sites reported in 2013.	**Year 1:** - Development and approval of risk reduction strategies and completion of the safeguarding. - Development and approval of risk reduction strategies for two contaminated sites and start of work. **Year 2:** - Risk reduction on one newly prioritised contaminated site.	**Year 3:** - Assessment of risk reduction measures carried out. **Year 4:** - Disposal of obsolete stockpiles completed. - Risk reduction on one newly prioritised contaminated site.		**S**	Despite the delay, the project is making good progress towards the safe disposal of 213 tonnes of obsolete pesticides, POPs and related waste by 30 June 2021. In addition to the prior administrative and contractual activities already completed, the record of achievement as of 30 March is as follows: 117.185 tonnes of obsolete pesticides and POPs repackaged out of 213 tonnes; 71.57 tonnes of obsolete pesticides, POPs and related waste already stored in six containers and ready to leave the port; obsolete pesticides from eight stores – out of the 13 priority stores containing the obsolete pesticides and POPs to be disposed of – are already packaged. Three sites polluted with obsolete pesticides and POPs have been decontaminated (Djassin, Oganla and Bohicon) and the Djassin site (fourth) will follow the same decontamination process. The process has contributed to the strengthening of national capacities in decontamination, which is an asset when considering the decontamination of other sites in Benin.

[20] Data from the Logical Framework and Scorecards.
[21] Data from the Logical Framework and project document.
[22] If available.
[23] Color code explained at the bottom of the table
[24] See the six-point rating scale for progress in achieving outcomes: (HS), (S), (MS), (MU), (U), (HU) (see Appendix 3. Rating scales).

Project strategy	Indicators[20]	Baseline[21]	Mid-term target[22]	End-of-project target	Level of achievement at final evaluation[23]	Achievement rating[24]	Justification of rating
Direct effect 2 Reduced risks to the environment and human health caused using EPCs in cotton production.	**Indicator:** i) 75 000 empty containers rinsed three times, collected and stored until they are recycled in the third year; 150 000 planned for the fourth year.	i) 3.9 million containers imported over five years (from 2009 to 2014); 0.5 million per year in cotton-growing areas, 8.8 tonnes of containers in the national inventory.	**Year 1:** - Development of the management plan for EPCs. - Reviewing proposals for recycling options. - Setting up collection and recycling centres. **Year 2:** - Launching of pilot collection plans in the regions of Alibori and Borgou (including the triple-rinsing awareness program).	**Year 3:** - Continuation of pilot collection plans in the regions of Alibori and Borgou. - Evaluation of the pilot collection plan carried out in the two regions. **Year 4:** - Review of a proposal to strengthen the pilot collection plan		**HS**	The project successfully tested a pilot plan to reduce the risks associated with the reuse of EPCs (strengthened the capacity of the Bethesda's Centre for waste treatment and agricultural production (CTDPA)) and proposed a sustainable EPC management system with a feasibility study and a business model including financing options. Authorities at different levels, civil society and rural community members have become truly aware of the risks and hazards associated with EPCs and are increasingly applying the good practices learned regarding appropriate EPC treatment, storage, transport and recycling methods. As a result, the Ministry of Agriculture, Livestock and Fisheries has signed an order regulating the management of EPCs, and Bethesda was awarded the government's tender for the collection and processing of EPCs in Benin's 77 municipalities. The main shortcoming is that the EPC management system proposed by the project remains to be shared and discussed with stakeholders.
Direct effect 3 Strengthening the regulatory framework and institutional capacity for the sound management of pesticides throughout their life cycle.	**Indicators:** i) Revision of national legislation in accordance with international and regional obligations adopted by the fourth year of the project. ii) NPMC and Pesticide Inspection and Quality Control System are in place and shall be	i) Currently, Benin's legislation does not reflect the regional CILSS-ECOWAS-WAEMU harmonisation of which it has been a part since 2012. ii) The competent agencies in pesticide control transferred to ABSSA are not yet operational. The Registration Committee, the National Committee for the Approval and Control of Plant Protection Products, does not have access to the official government budget,	**Year 1:** - Meetings to review existing laws and workshops in order to align them with Benin's regional and international commitments. - Development of a national strategy/action plan. - Setting up of NPMC. **Year 2:**	**Year 3:** - Finalisation of the draft revised legislation and approval process. - Evaluation of the effectiveness of the NCPM (min. 25 percent		**S**	The project significantly contributed to the revision of legislation and regulations on pesticide registration and control in accordance with international obligations and the common regional system of CILSS-ECOWAS-WAEMU. Thus, thanks to the project, six decrees have been drafted and signed, including the one on the creation, attributions, organisation and operation of NPMC (Decree No. 2018-171 of 16 May 2018), the one setting the conditions for the application of community regulations on pesticides registration in the Republic of Benin

Project strategy	Indicators[20]	Baseline[21]	Mid-term target[22]	End-of-project target	Level of achievement at final evaluation[23]	Achievement rating[24]	Justification of rating
	operational during the third year of the project.	but is funded by registration fees. There is no national strategy or sustainable funding mechanism for pesticide control.	- Two main entry points well equipped for pesticide inspection and quality control. - NPMC is made operational (responsibilities, staff, budget, etc.).	improvement noted). **Year 4:** - Approval of the revised legislation - The National system for pesticide inspection and quality control is operational (10 percent budget increase)			(Decree No. 2018-172 of 16 May 2018) and those relating to the management of plant species, varieties and seeds (Decree No. 2018-173, Decree No. 2018-174) and the management of fertilizers (Decree No. 2018-175, Decree No. 2018-176). Several decrees were drafted and signed with the support of the project, including the Ministry of Agriculture, Livestock and Fisheries decree of 18 December 2018 setting the conditions for the management of empty pesticide and biopesticide containers and the inter-ministerial decree of 31 December 2018 on the conditions for obtaining professional authorisations for the manufacture, packaging or repackaging, importation, distribution and application of pesticides and biopesticides. The project proposed an improved national pesticide inspection and control system. It strengthened the essential equipment and materials of two inspection points of entry and built the technical and administrative capacities of 37 inspectors, responsible for facilitating the implementation of this improved system.
Direct effect 4 Successful promotion of integrated management techniques as alternatives to conventional pesticides, and reduction of the use of chemical and extremely	i) Number of farmers trained in integrated management alternatives through FFS ii) Percentage reduction in the use of pesticides on cotton and other crops among trained farmers (objectives to be	i) Currently no biopesticides are registered (the biopesticide law is in the process of being adopted). ii) In total, 52 alternatives have been identified, 37 of which are short-term and 15, long-term. Of the 37 short-term alternatives, nine are cultivation methods already applied in vegetable production, six apply integrated management to	**Year 1:** - Completion of pest and pesticide management database and reference gap filling. **Year 2:** - Identification and field testing of alternatives (FFS).	**Year 3:** - Completion of extension agents' training. **Year 4:** - Completion of farmers' training.		**HS**	The project successfully tested and promoted alternative products and IPPM systems to reduce the use of POPs and chemical pesticides in cotton, maize and vegetable production. The pathogenic effect of a fungus (*Beauveria bassiana*) on cabbage aphid (*Lipaphis erysimi*) was demonstrated in the laboratory as well as the effect of *Metarhizium anisopliae* and Nuclear Polyhedrosis Virus (HaNPV) on a major pest of cotton and tomato (*Helicoverpa armigera*) in the field. In FFS, alternative systems (neem oil-based

Project strategy	Indicators[20]	Baseline[21]	Mid-term target[22]	End-of-project target	Level of achievement at final evaluation[23]	Achievement rating[24]	Justification of rating
dangerous pesticides.	determined during the years 1 and 2).	cassava, maize, bananas and vegetables. iii) Successful experiences in cotton cultivation without the use of chemicals in OBEPAB projects.					biopesticides, mechanical actions) combined with other good agricultural practices (nursery, organic fertiliser, threshold treatment, etc.) have helped to control pests of cotton, maize and vegetable crops, significantly reducing the quantities of pesticides usually used while safeguarding, in some cases, improving yields and gross margins. The results of the IPPM products and systems tested deserve to be consolidated and some alternatives deserve to enter the registration process. More and more farmers are adopting the alternative systems tested in FFS and are looking forward for better availability of these inputs as well as the development of a commodity chain and a specific label for IPPM products.

Colour code for the evaluation of indicators

Green = achieved	Yellow = in progress	Red = not in progress

Annexes

Annex 1. Risks from pesticides and persistent organic pollutants and sustainable management challenges

https://www.fao.org/3/cb7328en/cb7328en.pdf

Annex 2. List of good practices and knowledge applied or generated by the project

https://www.fao.org/3/cb7329en/cb7329en.pdf

Annex 3. In-house project documents

https://www.fao.org/3/cb7330en/cb7330en.pdf

Annex 4. Project evaluation matrix

https://www.fao.org/3/cb7331en/cb7331en.pdf

Office of Evaluation
evaluation@fao.org
www.fao.org/evaluation

Food and Agriculture Organization of the United Nations
Rome, Italy

CB7881EN/1/12.21