



1.0 Section I: Project Summary Sheet

Reference Number of CORAF/WECARD¹ or World Bank project	CW/CGS/05/PNC/RDPAAO/01/2011-29	
Project Title:	PROJECT FOR THE DISSEMINATION OF TECHNOLOGIES FOR FRUIT FLY CONTROL IN WEST AFRICA (FSA-CORAF)	
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Partner Institutions	<ul style="list-style-type: none"> • Ecole Nationale Supérieure des Sciences et Techniques Agronomiques de Kétou/ ENSTA-Kétou, Benin • CIRAD / Persyst / HortSys • West African Fruit Fly Initiative (WAFFI) • IITA station / Biological Control Centre for Africa, Benin • Direction de l'Agriculture, Service de la Protection des Végétaux et du Contrôle Phytosanitaire, Benin • Dept. of Animal Biology & Conservation Science, University of Ghana, Ghana • Institut de Recherche Agronomiques de Guinée • Institut d'Economie Rurale (IER), Mali • Programs Crop Protection Directorate (DPV), Senegal • Institut National d'Etudes et de Recherches Agricoles (INERA), Burkina Faso • Centre National de Recherche Agronomique (CNRA), Cote d'Ivoire 	
Beneficiary Countries	Benin, Burkina Faso, Cote d'Ivoire, Niger, Nigeria, Ghana, Guinea, Mali, Senegal.	
Duration of Project	Start Date: 14/05/2014	Completion Date: 31/12/2016
Priority Area of CORAF/WECARD² :		
Project Budget (US\$)	Initial: US\$ 2 543 420	Final: US\$ 1 300 000

¹ CORAF/WECARD for Regional projects under WAAPP funding
World Bank= for WAAPP project implemented directly in countries

² Solely for Regional projects (competitive and commissioned)

1. Constraints/research problems that the project aims to solve:

The overall objective of the project is to promote the mango value chain by increasing productivity and improving quality and trade through the effective management of fruit flies in West Africa. It is comprised of two specific objectives of the project which are:

- Facilitate the adoption of fruit fly control methods by mango producers;
- Ensure capacity building of technicians and extension workers for the subsequent multiplication of training at the producer level;

2. Target groups and users

Technical officers of extension services (public and private), mango producers in the 9 countries implementing the project.

3. List of key results/recommendations

Results

- Conduct of baseline studies in the 9 countries implementing the project;
- The capacities of 28 project members (10 coordinators, 10 M & E managers and 8 experts) were strengthened in: (i) conducting or monitoring, in collaboration with a team, a project baseline study; (ii) developing and monitoring project monitoring, evaluation and performance plans; (iii) preparing producer technical fact sheets; and (iv) training of trainers for the use of these forms in the training of producers;
- Development of *a best bet options* "IPM package" comprising five technologies;
- 5 technical fact sheets in English and French;
- 25,000 copies of technical fact sheets distributed at the rate of 2,500 sheets per country (including the regional level), that is, 500 copies of each sheet distributed per country (including the regional level);
- A poster on the control technologies to be disseminated in "IPM package" presented at scientific workshops, symposia and scientific cafés (annex);
- 6 training videos for planters on the management of fruit flies were produced in French and English;
- Equipping 41 pilot orchards spread over 263 ha in integrated pest management materials;
- 240 trainers (including 20 women) trained in the dissemination of fruit fly control technologies (training of trainers);
- 1,217 producers trained in the establishment of a clean orchard and the use of technologies to control fruit flies;
- 5 innovation platforms created and functional;
- The space of the laboratory for the mass production of parasitoids by the SPV Benin has been rehabilitated and equipped with shelves in large numbers (the production capacity has increased by 10,000 parasitoids per year);

4. Dissemination of results and prospects for implementation

6 training videos on training of planters on the management of fruit flies developed and distributed on the CORAF/WECARD website (www.coraf.org), ACCESS AGRICULTURE (<http://www.accessagriculture.org/search/fruit%20flies/all/>; in French <http://www.accessagriculture.org/search/mouches/all/>; YOUTUBE;

- 5 Technical fact sheets distributed at the ACCESS AGRICULTURE and CORAF/WECARD sites;

5. Recommendations for follow-up and future activity

- The baseline study conducted as part of the dissemination project made it possible to collect the basic data needed that falls in line with the project performance; An ex-post study will be used to measure the impact of the project on variables such as productivity and income of producers.
- The *best bet control option* “IPM package” should be adopted as a control measure to be disseminated on a large scale by extension services through pilot orchards, training of producers using the *along season training* method with the appropriate teaching materials (video and technical fact sheet translated into local languages).
- Strengthening of simple control technologies with high adoption potential such as the sanitary method and the weaver ant method;
- Continue to support the players of the innovation platforms through training of producer trainers and training of other producers by trained players;

6. Lessons learnt

Implementation of project activities and especially meetings with target groups and beneficiaries helped to identify the following strengths and weaknesses:

6.1 Strengths

- The support of the traditional, administrative, political and decentralized structures of extension services and associations in the various countries implementing the project;
- A project team composed of experts in the management of fruit flies;
- The implementation of the project in mango production areas par excellence;
- The availability of financial resources to carry out the project;
- The availability of the project monitoring and evaluation team at the regional level facilitating the execution of the project.

6.2 Weaknesses

- Late transfer of funds resulting in late start of activities;
- Cessation of transfer of funds due to unavailability of funds;
- Unavailability of actors in administrative and research institutions;
- Late justification of funds provided;
- Late submission of technical reports by national coordinators;
- Abrupt cessation of project;
- An end-of-project evaluation has not been carried out.

7. Evaluation of project achievements (to be filled by project team)

Description	Notation	
Level of implementation	Scale: 1 to 4 See notes below	The level of implementation of the activities is satisfactory (3). All activities planned at the regional level in the logical framework and the project budget were carried out with the exception of the closing workshop of the project, while activities at the national level had varied implementation rates.

<p>Level of achievements of results</p>	<p>Scale: 1 to 4 See notes below</p>	<p>The level of achievement of the results is considered satisfactory (3). Several performance indicators are indicated in the project's performance plan. The two main objectives of the project were to: (i) strengthen the training capacity of the technical services on effective FF control for sustainable training of farmers in each participating country; and (ii) facilitate producers' access to effective FF control methods are generally achieved at 60%.</p>
<p>Interest and adoption:</p> <ul style="list-style-type: none"> • By producers • By extension officers • By researchers • Other actors (specify) 	<p>Scale: A, B, C See notes below</p>	<p>The results obtained are likely to be fully adopted by the actors (producers, extension officers, exporters). The potential impact can be assessed at scale A.</p>

Project Results Evaluation scale	
<p>4 Very satisfactory 3 Satisfactory 2 Unsatisfactory 1 Very unsatisfactory</p>	<p>A: Likely to be fully adopted B: Only certain Results are likely to be fully adopted C: Not likely to be adopted</p>

Section II: Main Report (Max 20 Pages)

1.0 Background

Fruit flies are a major constraint for the production of mangoes and since 2005 the damage due to these insect pests is becoming increasingly significant, especially with the invasive species *Bactrocera dorsali* which has spread in 19 African countries south of the Sahara. The consequences are enormous and can be summarized as a drastic reduction in yield and thus in the production and quality of the mango produced. Integrated fruit fly control technologies were developed and tested from 2008 to 2011 as part of the Regional Initiative for the Control of Fruit Flies in West Africa by CIRAD in Benin in collaboration with the Faculty of Agricultural Sciences (FSA) of the University of Abomey-Calavi (UAC) and other National Agricultural Research Systems (NARS) in West Africa.

CORAF/WECARD, a sub-regional organization made up of NARS from 22 countries in West and Central Africa (WCA) following the identification and validation of priority research areas through baseline studies, at the end of 2011 launched a call for projects entitled "Research and Development on Agricultural Productivity in West Africa - Dissemination and adoption of agricultural technologies across countries in West Africa."

Within the context of the drastic reduction in mango production in West Africa (WA) and the call for projects by CORAF/WECARD, the FSA, in collaboration with other NARS of WA, submitted to CORAF/WECARD and obtained a project called "Fruit flies control technologies dissemination and capacity building of the West African fruits value chain stakeholders." The overall objective of the project is to promote the mango value chain by increasing productivity and improving quality through the effective management of fruit flies in West Africa.

Specifically, during this project, it was a question of:

- Facilitating the adoption of mango producers' methods for controlling fruit flies;
- Ensuring the capacity-building of technicians and extension workers for the further development of training at the producer level.

The expected results are:

- Capacity building on the integrated management of fruit flies is carried out at the level of partner local institutions involved in the project (technicians, extension workers, and producers) with the provision of teaching materials (technical fact sheets and video)
- Effective and efficient options for the management of fruit flies are available at the level of mango producers.

This regional project involves nine West African countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Niger, Nigeria and Senegal. The implementation of this project will cover three years (May 2014 - Dec. 2016).

2.0 Project Performance

• Trend analysis

Several sub-activities have been planned under the broad theme 1. *Building stakeholders capacity* of the logical framework have been carried out. Activity indicators have been achieved, namely: (i) The project documents have been well fine-tuned and the project is initiated at the regional and national levels; (ii) the project team has the necessary capacity to conduct the baseline studies; (iii) the project team has the best control options to disseminate; (iv) demonstration orchards are identified and equipped to serve as examples and training sites for producers; (v) five technical fact sheets for producers are developed and printed; (vi) a series of 6 producer training videos are developed; (vii) the mass production laboratory of parasitoids has sufficient space to increase its production of 10,000 parasitoids per year. The means of verification exist; (viii) trainers trained in the dissemination of fruit fly control technologies with adapted teaching materials; (ix) producers trained in the use of FF control technologies. Two performance indicators identified in the PITT (Annex 1) of the project, namely: i) five producer fact sheets are developed and ii) a series of training videos are produced at 100%. Two other performance indicators, namely: (i) well-trained trainers to conduct producer training on FF control with training materials developed by the project, and (ii) well-trained producers using the technology package proposed by the project are carried out at 66% and 26% respectively. Performance indicators such as the functionality of mango innovation platforms; the functionality of CNLMFs and the increase in the production performance of parasitoids have been generally reached at about 75%. The two main objectives of the project being: (i) to strengthen the training capacity of technical services on effective FF control for sustainable training of planters in each participating country; and (ii) To facilitate producers' access to effective FF control methods, are globally reached at 60%.

The direct and indirect actors impacted by the project as well as the areas covered are shown in Table 1.

Table 1. Direct and indirect actors impacted by the project as well as areas covered

Themes	Direct actors	Indirect actors	Areas covered
Orchards for monitoring fly populations	75	-	221
Pilot/Demonstration orchards equipped	41	-	241
Support to the CNLCF	-	56 (12)	-
Multi-actor platforms	404 (44)	-	-
Baseline study		2,091 (189)	-
Strengthening project team	28 (4)	-	-
Training/trainers	240 (20)	-	?
Training/producers	1,217	-	?
Total	2,005 (239)	2,117	?

(): Number of women

- **Main changes observed at the level of beneficiaries**

The production of the technical fact sheets and the series of videos validated by the producers and used during the training aroused the enthusiasm of the producers. Demonstration orchards serve as an example to producers who realize by themselves the difference in productivity of their orchards compared to the demonstration orchards. This leads them to a very noticeable change in the management of the FFs in their own orchards. Support to the CNLMFs and actions in favor of innovation platforms are accounted for by the project in terms of their revitalization so that they can better play their role of interface between the project, project beneficiaries, policy makers and serve as instruments for the sustainability of the project's achievements. After the training and establishment of pilot orchards, mobilization is now great from producers who convince themselves of the methods of fighting against fruit flies.

- **Gender aspect, environment and IAR4D**

These key aspects are taken into account in the implementation of the project. To strengthen the capacity of the regional project team, 4 women were involved. The project management committees at country level all involved women. In general, all the activities undertaken have seen the massive participation of young people and women. For example, the sessions held for the basic studies were attended by several women. Many women were invited to the training sessions organized by the regional coordination, notably during training on the collection of basic socio-economic data. The invited women served in a focus group on fruit flies in Benin. The activities started under the project had no negative impact on the environment. The IAR4D approach has been the guiding principle of the approach undertaken by the teams involved in the process of setting up the platforms, which gives hope for the success of the activity.

3.0 Achievement of Results

- **Finalization of project documents and information from the mango sector in the various countries on the start of the project** (Logical Framework Point 2.1 and 2.2)

A regional workshop to finalize and plan the project took place from 20 to 23 May 2014 in Cotonou. The objective was to bring together key project partners for a participatory planning towards a better understanding of the objectives, expected results, methodology and implementation plan of the activities. The workshop was attended by three members (National Coordinator, Head of Evaluation and Accounting Officer) of the Country Coordinating Team and the Regional Coordination Team, some CORAF/WECARD experts and officials. At the end of the workshop the project documents (logical framework, activities and methodological approaches, budget) were finalized and the project was officially launched. Accordingly, the AWPB and PITT were developed (Annex 1).

Stakeholders in the mango sector in all participating countries were informed of the objectives and expected results as well as the actual start of the project. This information was provided to stakeholders during the national launching workshops organized in all countries within the period from November 2014 to March 2015.

- **Strengthening the capacity of the project team** (Logical Framework Point 1.1)

The capacities of the project members, namely, the coordinators (10), the monitoring and evaluation officers (10) and some project experts (8), were strengthened on: (i) the preparation of maintenance guidelines for basic data collection; (ii) development of the monitoring and evaluation plan; and (iii) the preparation of producer fact sheets. These various capacity building exercises were carried out through regional workshops, namely: (i) Regional Training Workshop on Basic Socio-Economic Data Collection Methodologies (20-23 November 2014); (ii) Regional workshop on harmonization and implementation of the project monitoring and evaluation system (28-30 November 2015) (iii) Regional workshop on the development of technical fact sheets for farmers on the management of fruit flies in Africa West (23-26 April 2015).

All in all, the capacities of 28 project members, including 4 women, were strengthened on the terms cited above and are able to: i) conduct or follow up a baseline study; (ii) develop and monitor project monitoring and evaluation plans; (iii) produce producer fact sheets; and (iv) train trainers for the use of these forms in the training of producers.

- **Baseline/Reference studies** (Logical Framework Point 2.3)

The objective of the baseline study of the project is to shed light on the initial situation in the various countries regarding the control of flies and mango parasites in order to effectively assess the impact of the project. The results of the baseline studies will serve as a benchmark for monitoring and evaluating the progress of achievements and changes in mango production in countries.

During the reporting period, all participating countries analyzed and reported the data collected and thus had the baseline data needed in line with project performance. In Benin, the study covered 16 communes in the center and north, including 12 communes for the main sample and 4 communes for the control sample, with a sample of 219 farmers and 67 farmers respectively. In Mali, the individual survey covered 360 actors (224 men and 136 women) and the focus group on 170 actors in the mango sector, including 83 men and 87 women. In Senegal, the sample size surveyed was 227. The majority of surveyed growers have a good knowledge of fruit flies which, they say, lay eggs in fruits that eventually rot when they ripen. The losses incurred are substantial and vary from country to country (e.g. Benin 206,134.3 to 353.895 FCFA per year and per producer). To this end, producers use, and to a very small extent, the five modern methods of control proposed by the project.

- **Production and printing of technical data sheets** (Logical Framework Point 1.3)

The process of producing the technical fact sheets started first with the review of the fruit fly control technologies conducted at a regional workshop on 20-23 November 2014. This workshop identified the best fruit fly control options (*Best bet options "IPM package"*) to be transformed into technical sheets for producers. The selected technology package comprising five technologies, namely: (i) plant health of the orchard, (ii) mass trapping, (iii) biological control using parasitoids, (iv) food bait application (e.g. the GF120), v) biological control using predators.

Subsequently, a regional workshop held in Parakou on 23-26 April 2015 brought together 15 participants (experts in fruit flies), including 2 women from the various participating countries and two international consultants to prepare the technical fact sheets. They produced five technical fact sheets (one for each technology), French and English versions (Annex 9). Table 1 shows the title of the forms and the corresponding technology. The technical fact sheets produced were validated during the workshop by 15 producers, including two women involved in orchards. This validation helped to integrate the point of view of the producers in the final version of the sheets. A report that describes the experiences of the workshop

and shows the method to use: to optimize the use of technical fact sheets for producers and to use them as a basis for other communication tools (Annex 10).

Table 1. Headings of developed producer technical data sheets and corresponding control methods

N° Sheet	Title /heading		Technologies
	French	English	
1	Des vergers propres, sans mouches	A clean orchard has no flies	Plant health of orchard
2	La fourmi rouge protège vos fruits	Weaver ants protect your fruit	Biological control using predators
3	Des insectes utiles qui tuent les mauvaises mouches	Useful insects that kill bad flies	Biological control using parasitoids
4	Les aliments attirent et tuent les mauvaises mouches	Food to attract and kill bad flies	Bait application (e.g. the GF120)
5	Attirer et tuer les mauvaises mouches	Attract the bad flies and kill them	Mass trapping

The five technical fact sheets produced on the technology package have been multiplied to serve as a training medium. Twenty-five thousand (25,000) sheets were printed and distributed at the rate of 5,000 copies of each sheet, that is 500 copies of each sheet distributed per country (including the regional level). These printed sheets will henceforth help trainers in the intensification of these technologies in their countries and also help the fruit sector in West Africa to better deal with fruit flies. The technical fact sheets were used during training of trainers and producers. Its training sessions have been used to validate the fact sheets whose themes must be translated into videos for the horizontal training (Farmer to Farmer Training).

- **Production of videos** (Logical Framework Point 1.3)

The production of the videos constitutes the second step of the communication tools to be produced on the themes of methods of control of fruit flies selected at the workshop in November 2014 and already transformed into technical fact sheets. A series of 6 training videos of planters on the management of fruit flies was developed in French and English. The videos will be used to train producers in the horizontal training register (*Farmer to Farmer Training*). Table 2 shows the title of the videos and the summary of the content.

Table 2. Producer training video caption and summary of their contents

N°	Title		Contents
	French	English	
1	Lutte intégrée contre les mouches des fruits	Integrated approach against fruit flies	<i>Learn how fruit flies live, how to tell if they are present, and how to control them with an integrated approach</i>
2	La collecte des fruits tombés contre les MF	Collecting fallen fruit against fruit flies	<i>One of the best practices to control fruit flies is to destroy all fallen fruit in your orchard</i>
3	Piégeage de masse des MF	Mass trapping of fruit flies	<i>Male fruit flies are attracted by the smell of female fruit flies. This odour is called a pheromone</i>
4	Tuer des MF avec des	Killing fruit flies with food	<i>There are different types of fruit</i>

	appâts	baits	<i>flies, but all are attracted to food baits that are rich in proteins and sugar</i>
5	Les fourmis tisserandes luttent contre les MF	Weaver ants against fruit flies	<i>Weaver ants continuously guard their home trees to keep away any intruder, including fruit flies</i>
6	Encourager les fourmis tisserandes dans vos vergers	Promoting weaver ants in your orchard	<i>Learn how weaver ants live, how to promote them in your orchard against fruit flies, and how to reduce their nuisance</i>

These videos are available for free download at the following sites:

<http://www.accessagriculture.org/search/fruit%20flies/all/> English version:

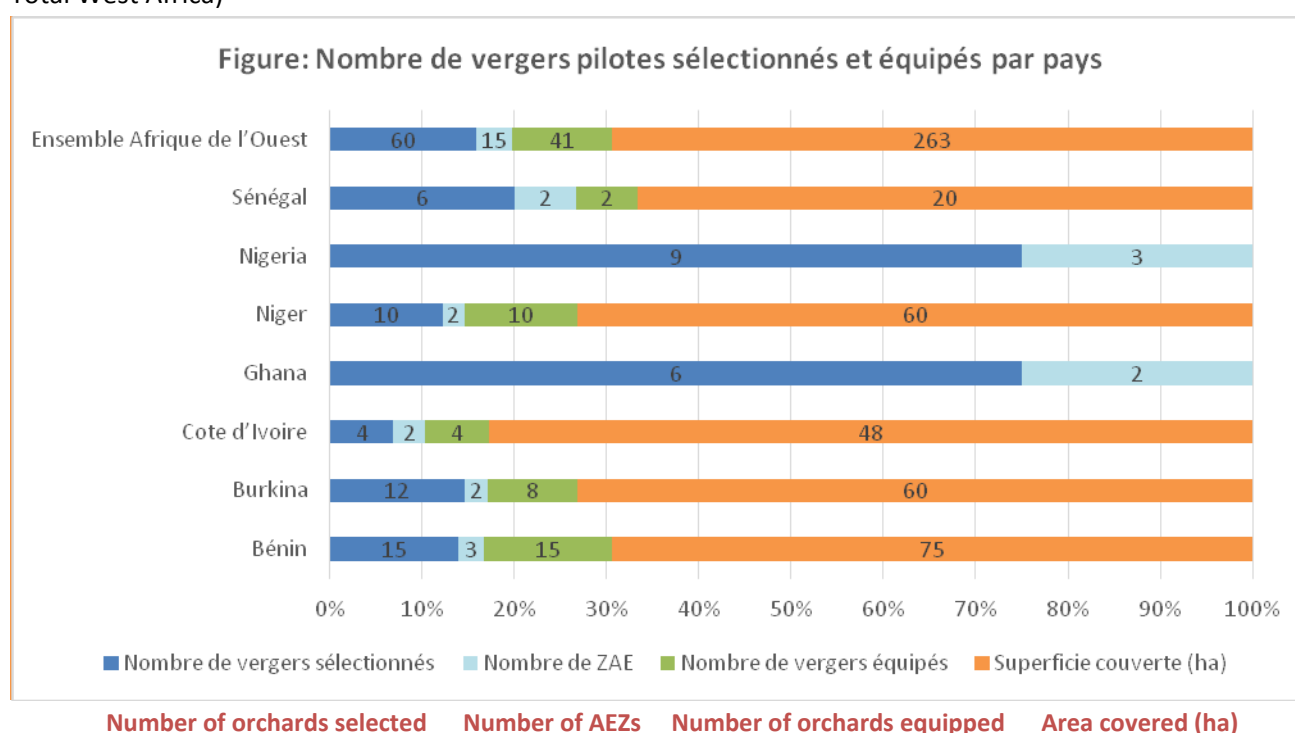
<http://www.accessagriculture.org/search/mouches/all/> French version

- **Establishment and equipment of pilot/demonstration orchards** (Logical Framework Point 1.2)

Seven countries (Benin, Burkina Faso, Côte d'Ivoire, Ghana, Niger, Nigeria and Senegal) have identified pilot orchards that will be used for practical training activities and, above all, for demonstrating the effectiveness of proposed control methods. These orchards were all chosen because: (i) they were in an area where the fruit fly had already been identified by producers as a main concern; (ii) the biophysical and socio-economic characteristics of the area are known; (iii) integrated pest management is promising (especially for countries that have incorporated biological control strategies), (iv) have a minimum area of 5 ha, (v) owner's consent is given. Figure 1 shows the number of orchards selected, the number of agro-ecological zones (AEZs) covered and the number of these orchards that have been equipped with the tools used in the different control methods selected in the technology package.

(Figure: Number of pilot orchards selected and equipped per country

Total West Africa)



- **Seasonal training of trainers** (Logical Framework Point 1.4)

The seasonal training consisted of the training of trainers (technicians/extension officers and leading producers) on the use of the “IPM package” (best control options for fruit flies). Five countries (Benin, Burkina Faso, Cote d'Ivoire, Niger, Senegal) organized this training of trainers’ session. Several methods of controlling fruit flies were taught to the participants using the five technical fact sheets prepared and validated by the regional coordination and the member countries of the Project. The five fact sheets relate to the five technologies or control methods retained and involve: (1) the sanitary method with augmentorium, (2) use of weaver ants, (3) application of GF-120, (4) mass trapping using the product Timaye, and (5) biological control with the release of parasitoids. The participants took a keen interest in the work in which they took an active part. The meetings have, in the light of the results achieved, satisfied the expectations of everyone. Participants were very satisfied/satisfied with the content of the training, the theoretical approach, the practical approach and the working frameworks. A total of 240 trainers, including 20 women and 41 leading producers, were trained in the dissemination of fruit fly control technologies.

- **Seasonal training of producers** (Logical Framework Point 1.5)

The seasonal training of producers consisted of training producers by the leading producers (trainers) assisted by the training technicians in their localities. In each locality the couple leading producer and technician trainers trained about thirty producers in a pilot orchard using technical/information sheets and training videos. Four countries (Benin, Burkina Faso, Niger, Senegal) organized this training session for producers in 31 pilot orchards. A total of 1,217 producers were trained in the establishment of a clean orchard and the use of fruit fly control technologies with adapted teaching materials (fact sheets and training videos).

- **Establishment and facilitation of innovation platforms** (Logical Framework Point 2.4)

Support for the platforms is a project strategy to influence institutional policies and to mobilize actors and resources around innovations in the mango sector. Three countries (Benin, Mali, Senegal) were able to set up their innovation platform within the framework of the project. Burkina Faso already had its platform established to which the project provided support for the operation. This support was mainly to organize training sessions on fruit fly control techniques for trainer producers in three mango-producing provinces, two in the west of the country (Banfora and Bobo-Dioulasso) and one in the Center-West (Koudougou). These trainings were intended for 90 trainer producers, including 20 women. They expressed their commitment to disseminate new theoretical and practical knowledge gained to other producers. In Benin, three platforms have been created in the main mango production areas in the country, namely Borgou-Alibori, Atacora-Donga and South-Center. A provisional office per production area has been established. Each of the platforms has a name, objectives and vision with a validated action plan during a coordination visit. This visit focused on a new clarification of the platform concept to all the players of each platform. Added to this was support for the definition of the vision, the objective and the mission of the platform. Each working session with the platforms ended with the validation of a minimum platform action plan for 2016. In Niger, the activity on the innovation platforms consisted of a national census of the potential actors and identification of potential areas where the platforms will be established.

- **Support for the functioning of the NFFCCs** (Logical Framework Point 3)

Support to the National Fruit Fly Control Committees (NFFCC) is also a strategy of the project to influence institutional policies, including the development of strategies within the context of the fruit fly issue. Benin, Senegal and Burkina Faso supported the operation of their already formalized NFFCCs. This support made it possible to restart the operation and activities of these NFFCCs. In Benin, the meeting funded by the project and supported technically by the national project team, enabled the NFFCC to have its annual work plan and budget (AWPB 2015-2016). As a direct benefit of this meeting, the NFFCC of Benin is practically the only country to have a AWPB on the due date for a meeting of the NFFCC of the various West African countries in Bamako. In Nigeria and Côte d'Ivoire, support activities consisted of steps to formalize the NFFCC. In these two countries, the meetings supported by the project made it possible to draw up and submit the formalization documents for signature.

- **Strengthening the production capacity of the laboratory for the mass production of parasitoides** (Legal Framework Point 4)

The space of the laboratory of mass production of parasitoids of SPV Benin has been renovated and equipped with shelves. The laboratory thus has sufficient space for the mass production of parasitoids and has increased its capacity to 10,000 parasitoids per year and will be able to have sufficient parasitoids for inundative release tests in 2016. (Figure 2 & 3 of the laboratory).



Figure 2: Laboratory renovated under the project (Univ. Abomey Calavi-Benin)



Figure 3: View of the interior of the renovated laboratory (Univ. Abomey Calavi-Benin)

3.1. Medium-term effects of the dissemination project

- The results of the project dissemination made it possible to draft the research component of the ECOWAS PLMF project;
- The results of the baseline study under the dissemination project were used in various ways in the development and implementation of the ECOWAS PLMF project;
- The NFFCCs supported by this dissemination project constitute the basis for implementation of the ECOWAS PLMF project at the national level;
- The *Best bet option* "IPM package" developed, selected and disseminated by the dissemination project constitute the control methods implemented on a large scale by the ECOWAS project;

4.0 Perspectives for the adoption of technology/innovation

- 5 Technical fact sheets disseminated at the ACCESS AGRICULTURE and CORAF/WECARD site;
- 6 training videos of growers on the management of fruit flies developed and distributed at the CORAF/WECARD website (www.coraf.org); ACCESS AGRICULTURE <http://www.accessagriculture.org/search/fruit%20flies/all/>; <http://www.accessagriculture.org/search/mouches/all/>; YOUTUBE;
- Training of trainers and producers through the *along season training* method in pilot/demonstration orchards;

- The large-scale implementation of the *best bet control option* by the PLMF project will be able to clean up the production basins, thereby improving productivity (quantity and quality) and, consequently, producer income;

5.0 Proposed actions for project follow-up

- The baseline study conducted as part of the dissemination project made it possible to collect the basic data needed to measure project performance; A post-ante study will be used to measure the impact of the project on variables such as productivity and income.
- The *best bet control option* “IPM package” should be adopted as a means of controlling the fight to be disseminated on a large scale by extension services through pilot orchards, the training of producers using the *along season training* method with the appropriate teaching materials (video, technical fact sheet translated into local languages).

6.0 Key indicators for potential impact such as identified by project stakeholders

The key indicators of impact to be measured are:

- At least 10% increase in yield in project intervention areas;
- At least 5% increase in producer income in project areas;
- At least 25% increase in exports (quantity and quality) of mangoes in project areas;
- At least 50% of producers in the project area adopt technologies;
- Level of satisfaction of producers using the fruit fly control techniques disseminated within the framework of the project;

7.0 Lessons learnt

The implementation of project activities and especially meetings with target groups and beneficiaries made it possible to identify the following strengths and weaknesses:

4.1 Strengths

- Support from the customary, administrative, political authorities and decentralized structures of extension services and associations in the various countries of implementation of the project;
- A project team composed of experts in the management of fruit flies;
- Implementation of the project in areas of mango production par excellence;
- The availability of financial resources for the implementation of the project;

4.2 Weaknesses

- Late transfer of funds resulting in late start of activities;
- Cessation of transfer of funds due to lack of availability of funds;
- Unavailability of actors in administrative and research institutions;
- Abrupt cessation of project;
- Impossible to conduct an end-of-project evaluation;
- Late justification of funds provided;
- Late submission of technical reports by national coordinators;

Section III: Annexes

LIST OF ANNEXES

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- Annex 2: Indicators of Regional PDO
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- Annex 4: Results framework Benin
- Annex 5: Results framework Cote d'Ivoire
- Annex 6: Results framework Senegal
- Annex 7: Results framework Mali
- Annex 8: Indicators of PDO Niger
- List of publications: scientific articles, chapters of books, monographs, manuals, posters, flyers, etc.
- Photo gallery of key events of the project
- Copies of videos/films (links) of the project
- List of project team members and affiliated members

Annex 1: Performance Indicator Tracking Table

PLAN DE SUIVI DE PERFORMANCE DU PROJET DISSEMINATION TECHNOLOGIES CONTRÔLE MOUCHES DES FRUITS												
Performance indicator						Data acquisition					Reporting	
Indicateurs	Definition de l'indicateur	Unité de mesure	Donnée de référence	Cible			Source d'information	Methode/Approche de collecte de données	Frequence	Responsable	Methode d'analyse des données	Date limite de rapport
				2014-2015	2015 - 2016	2016 - 2017						
Objectif general: To promote mango value chain by productivity increase, quality and trade improvement in West Africa (WA)												
National statistics; data requests from other countries and published impact data on mango production	Increase in quantity of good quality mango for export in the main pilot project sites	Percentage	Base line studies to be conduct in each participant countries			25%	Projects' reports Agricultural production statistic report	Data collection (Bibliography review/statistic reports)	Annual reports	Project Team (Regional coordination)		juin-17
Objectif spécifique: 1. Build training capacity on effective fruit flies (FF) management at the Technical/Extension service level for further sustainable growers training in each participants countries												
Number of Technical/Extension staff most effective and motivated in FF management	Technical/extension staff, training capacity increased for mango FF management.	personne				360 (240)	Projects' reports	Data collection (Bibliography review/statistic reports)	Annuelle	Project Team (Regional coordination)		sept-16
Objectif spécifique: 2. Facilitate access of stakeholders/growers to control methods for growing FF free quality mango.												
Production records from project pilot sites	Significant reduction in FF infestation in pilot project sites	percentage	Base line studies to be conduct in each participant countries			35%	Projects' reports	Data collection (Bibliography review/statistic reports)	Annuelle	Project Team (Regional coordination)		juin-17
Output 1. Capacity building in IPM at local partner institutions, extension workers and farmers, including the provision of training material.												
Outut 1.1 Training material (fact sheets, videos) available and used for training												

Number of fact sheets developed to train growers	Fact sheets developed on technologies include in the "IPM package" to be disseminate by the project	number		5 (5)			Fact sheets; Projects' reports	Data collection (Bibliography review/statistic reports)	Once in mango season	Regional coordination / consultant		juin-15
Number of videos developed to train growers	Videos developed on technologies include in the "IPM package" to be disseminate by the project	number			5 (5)		Videos; Projects' reports	Data collection (Bibliography review/statistic reports)	Once in mango season	Regional coordination / consultant		juil-16
Output 1.2. Available Trainers for growers training on effective FF management using training materials developed by the project												
Number of staff trained to train growers on FF management	Well trained staff to conduct training of growers on FF management using didactics material developed by the project	number			360 (240)		Training's / consultance report	Data from reports	Once in mango season	National coordination / consultant		juin-16
Number of growers trained by using training material	Well trained growers on FF management using control package proposed by the project	number				3600 (930)	Training's / consultance report	Data from reports	Once in mango season	National coordination / Trainers		juin-17
Output 1.3. Innovation plateforms for mango value chain are funtional												
Number of meeting per year	Organised groupes discussions	number	0		9 (5)	9 (7)	Rapport de réunion	Collected report copies	Annual	M&E responsible at National level	Data collection (Bibliography review/statistic reports)	01/12/2015-2017
Output 1.4. CNLMF are funtional												
Number of meeting per year	Meeting	number	0		9 (5)	9 (5)	Rapport de réunion	Collected report copies	Annual	M&E responsible at National level	Data collection (Bibliography review/statistic reports)	01/12/2015-2017

OUTPUT 2. Effective and efficient options for FF management are available to mango growers in WA

Output 2.1. Parasitoids production increase

Performance on parasitoids production (Mass production)	Functional bio-control lab in supplying parasitoids to all participant countries and capacity building in parasitoids rearing and handling		Fomer report on parasitoids capacity production of the existing bio-control lab		1 (1)	1	Available equipment	Data from raports	Annual	Regional coordination /Lab responsible	Data collection (Bibliograp hy review/stat istic reports)	01/06/2016-2017
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Output 2.2. Growers use the control methods disseminated by the project

Number of growers using disseminated control methods	Control of mango fruit flies using sustainable methods	%	Base line studies to be conduct in each particip ant countrie s			1500	survey report		once at the end of the project	M&E responsible	Data collection (Bibliograp hy review/stat istic reports)	01/12/-2017
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Annex 2: Logical framework of the project

HIERARCHY OF OBJECTIVES	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
General objective To promote mango value chain by productivity increase, quality and trade improvement in West Africa (WA).	Increase in quantity of good quality mango for export in the main pilot project sites.	National statistics; data requests from other countries; published impact data.	Socio-economic and political conditions remain favourable for production and export of mangoes.
Specific objectives 1. Build training capacity on effective fruit flies (FF) management at the Technical/Extension service level for further sustainable growers training. 2. Facilitate access of stakeholders/growers to control methods for growing FF free quality mango.	1. Technical/extension staff, training capacity increased for mango FF management. 2. Significant reduction in FF infestation in pilot project sites.	1. Number of Technical/Extension staff most effective and motivated. 2. Production records from project pilot sites.	Socio-economic and political conditions remain favourable for training. Access to pilot project sites is allowed.
Outputs 1. Capacity building in IPM at local partner institutions, extension workers and farmers, including the provision of training material. 2. Effective and efficient options for FF management are available to mango growers in WA.	1. Along season training and training workshop organised, technical sheets and along season training video developed and distributed. 2. Methods adapted, improved, developed and used by growers.	1. Number of publications and reports. 2. Number of training, workshops, reports and technical supports provided.	Access to pilot project sites is allowed.
ACTIVITIES			
1. Build capacity of stakeholders			
1.1. Build capacity of the project team	Experts and local staff appointed for preparing and executing project activities in the 9 WA countries	(a) Production records from pilot sites of the project, number of technicians and growers trained. (b) Number of reports. (c) Survey records from participant countries	Availability of qualified experts
1.1.1. Organize training workshop on base line data collecting and innovation platforms, economic analysis and harmonisation of M&E indicators	Well trained staff on base line data collection and establishment of innovation platforms	Workshop's report Number of trained staff	Staff institutions allow them to participate
1.1.2. Organize training on parasitoids rearing and handling	Well trained staff on parasitoids rearing and handling	Workshop's report Number of trained staff	

1.1.3 Organize learning and exchange visits	Exchange visits among project team members as well as local staff performed	Missions' reports	
1. 2. Set up the ToT and the scaling-up (FFF)			
1.2.1 Organize regional workshop on technology review and design of didactic materials and	- Identified Best bet options "IPM package" - Adopted design of didactic materiel to be developed	Workshop's report	The workshop should take place before the ToT
1.2.2. Establish Pilot Orchard (PO) (Identification and characterization of pilot orchard)	Identified & functional Pilot orchard as exemplifying major cropping systems or agro-ecologies	Number of reports	Selection of the pilot orchards before the running of the ToT
1.2.3 Providing materials for the PO (training demonstration orchards) of ToT & FFF	Available technical materials	Number of technical materials	Furniture of the technical material before the running of the ToT
1. 3. Develop didactic materials (Tech. Sheet; video;)			
1.3.1. Organize regional workshop on writing fact sheet and video script	Fact sheet developed Video script developed	Workshop report Number of fact sheets and video script	Didactic materiel developed before the ToT and FFF
1.3.2. Organize regional workshop on validation of fact sheet	Available validate fact sheet	Number of validate fact sheets	Fact sheets validate before the ToT
1.3.3. Develop video on using and results of the best bet options during the ToT	Available videos developed and reproduce	Number of videos	Videos developed before the FFF
1. 4. Run theToT	- One training of 40 trainers (Growers, technical staff / extension, exporters) per country.	- One workshop / two weeks during three months (mango season) / country - 40 technicians well trained to train growers	- All the trainers identified before the ToT. - Trainers' institutions allow them to participate to the national round as trainer
1. 5. Run the scaling-up round of ToT (Famers Field Fora)	- Twenty trainings of 20 growers / country performed	- One meeting / two weeks during three months (mango season) / country - 400 trained growers & able to control FF	- All the trainers identified before the along season training. - Trainers' institutions allow them to participate to the second round as trainers. - Socio-politic conditions of scaling up available.
2. Construct the project impact pathway with stakeholders			
2.1. Organize regional launch workshop	Project lauched at regional level	Workshop's report	
2.2. Organize national launch workshop	Project launched at national level	Workshops' reports	
2.3. Conduct of Base line studies	Available base line data	Study's report	Availability of qualified experts

			to conduct the study
2.4. Establish Innovation platforms	Established and functional platform	Meetings' reports	
2.5. Regional annual review and planning workshop	Project activities reviewed and well planned	Numbers of activities reviewed and planned for following year Workshops' reports	
2.6. Organize workshop project completion	Project closed	Closure workshop report	
3 Facilitate functioning of National Fruit Fly Committee (NFFC)	Functional NFFC I in each participating country.	Number of NFFC activity reports	Signature of decree creating the NFFC by the political
4. Reinforce production capacity of existing bio-control Lab	Functional bio-control lab in supplying parasitoids to all participant countries and capacity building in parasitoids rearing and handling	- Performance of parasitoids' production - Performance of project local partners' knowledge in parasitoids rearing and handling	Bio-control lab institution allow the reinforcement
5. Conduct preliminary survey on parasitism rate of native parasitoids	Available data on native parasitoids and parasitism rate	Survey's report	Availability of qualified experts/consultant to conduct the study
6. Implement a long term survey on FF population dynamic in each country	Available FF population dynamics data	Surveys' reports	Availability of qualified experts/consultant to conduct the study
7. Conduct study on economic cost benefit ratio of control	Available calculation of loss assessment in PO and economic threshold of fruit flies by using "IPM package" data & methods.	Study's report on loss assessment in PO and economic threshold of fruit flies by using "IPM package". Publication in peer review journal	All the experiments, training and capacity building done.
8. Coordinate, monitor and evaluate project activities and reporting			
8.1. M&E activities	Project well monitored & evaluated	M&E report	
8.2. Organize coordination visits	Project well coordinated & performed	Missions' reports & Projects' performance reports	

Annex 3: Indicators of the Regional PDO

	2014		2015		2016		CUMUL
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	
PDO indicators							

Indicator 1: Direct project beneficiaries of which 40% female- disaggregated by country/ Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays							2005
Male/Homme				956		810	1766
Female/Femme				42		197	239
Indicator 2: Beneficiaries who are using technologies generated by other countries/ Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet							8785
Male/Homme				693		7683	8376
Female/Femme				5		404	409
Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/ Technologies issues du Projet avec au 15% d'augmentation de la productivité par rapport au témoin - désagrégé par pays							
Indicator 4: Producers with knowledge of generated /released technologies by the Project- disaggregated by country/ Producteurs ayant acquis des connaissances sur les technologies développées par le Projet							15000
Male/Homme				0		14310	14310
Female/Femme				0		690	690
Indicator 5: Area under new technologies disaggregated by country/ Superficie couverte par les nouvelles technologies désagrégée par Pays							
				13640		28600	42240
Indicator 6: Processors/ producers who have adopted at least one new technology - disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays							3054
Male/Homme				1460		860	2320
Female/Femme				394		340	734

Annex 4: Indicators of the PDO Burkina Faso

	2014		2015		2016		CUMUL	Observation
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations		
PDO indicators								
Indicator 1: Direct project beneficiaries of which 40% female- disaggregated by country/ <i>Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays</i>				144	440	500	644	
Male/Homme				131	264	475	606	
Female/Femme				13	176	25	38	
Indicator 2: Beneficiaries who are using technologies generated by other countries/ <i>Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet</i>						7800	7800	Ici je fais référence à une étude de référence que nous avons conduite qui indique 52% de producteurs en utilisent. Aussi, les femmes intervenant dans la production la mangue représente 5% de l'ensemble des acteurs. C'est cette année, on était censé conduire une évaluation de l'adoption des technologies dans le cadre du projet mais malheureusement on ne dispose de fonds.
Male/Homme						7410	7410	
Female/Femme						390	390	
Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/ <i>Technologies issues du Projet avec au 15% d'augmentation de la productivité par rapport au témoin - désagrégé par pays</i>							5	05 technologies générées par la recherche ont été retenues pour la diffusion au BF à savoir: Sanitation, timaye, GF120, fourmis rouges et les parasitoïdes. Notons que ces quatre technologies sont le fruit d'une étroite collaboration entre plusieurs chercheurs de la sous-région Afrique de l'Ouest travaillant dans le domaine

Indicator 4: Producers with knowledge of generated /released technologies by the Project- disaggregated by country/Producteurs ayant acquis des connaissances sur les technologies développées par le Projet						13800	13800	ici je fais référence à une étude de référence que nous avons conduite qui indique 92% de producteurs connaissent les technologies. Aussi, les femmes intervenant dans la production la mangue représente 5% de l'ensemble des acteurs.
Male/Homme						14310	14310	
Female/Femme						690	690	
Indicator 5: Area under new technologies disaggregated by country/Superficie couverte par les nouvelles technologies désagrégée par Pays						28080	28080	
Indicator 6: Processors/ producers who have adopted at least one new technology -disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays						0	0	Une technologie a été importée de l'ICIPE (parasitoïdes) mais elle est en phase d'expérimentation au labo
Male/Homme						0	0	
Female/Femme						0	0	

Annex 5: Results Framework Benin

	2014		2015		2016		CUMUL
	Target/Cible	Achievement/ Realisations	Target/Cible	Achievement/ Realisations	Target/Cible	Achievement/ Realisations	
PDO indicators							

Indicator 1: Direct project beneficiaries of which 40% female-disaggregated by country/ Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays							
Male/Homme				90			90
Female/Femme				8			8
Indicator 2: Beneficiaries who are using technologies generated by other countries/Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet							0
Male/Homme							0
Female/Femme							0
Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/Technologies issues du Projet avec au 15% d'augmentation de la productivité par rapport au témoin - désagrégé par pays							0
Indicator 4: Producers with knowledge of generated /released technologies by the Project-disaggregated by country/Producteurs ayant acquis des connaissances sur les technologies développées par le Projet							0
Male/Homme							0
Female/Femme							0
Indicator 5: Area under new technologies disaggregated by country/Superficie couverte par les nouvelles technologies désagrégée par Pays							
				40			40

Indicator 6: Processors/ producers who have adopted at least one new technology -disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays							0
Male/Homme							0
Female/Femme							0

Annex 6: Results Framework Cote d'Ivoire

	2014		2015		2016		CUMUL
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	
PDO indicators							
Indicator 1: Direct project beneficiaries of which 40% female- disaggregated by country/ Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays							
Male/Homme				434			434
Female/Femme				4			4
Indicator 2: Beneficiaries who are using technologies generated by other countries/Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet							0
Male/Homme				693			693
Female/Femme				5			5

Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/ <i>Technologies issues du Projet avec au 15% d'augmenetation de la productivité par rapport au témoin - désagrégé par pays</i>							0
Indicator 4: Producers with knowledge of generated /released technologies by the Project- disaggregated by country/ <i>Producteurs ayant acquis des connaissances sur les technologies développées par le Projet</i>							0
Male/ <i>Homme</i>							0
Female/ <i>Femme</i>							0
Indicator 5: Area under new technologies disaggregated by country/ <i>Superficie couverte par les nouvelles technologies désagrégée par Pays</i>							
				13000			13000

Indicator 6: Processors/ producers who have adopted at least one new technology - disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays							0
Male/Homme				350			350
Female/Femme				4			4

Annex 7: Results Framework Senegal

	2014		2015		2016		TOTAL
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	
PDO indicators							
Indicator 1: Direct project beneficiaries of which 40% female- disaggregated by country/ Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays			253	158	95	107	265
Male/Homme			152	141		95	236
Female/Femme			101	17		12	29
Indicator 2: Beneficiaries who are using technologies generated by other countries/Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet			400		400		0
Male/Homme			60%	0	60%	0	0
Female/Femme			40%	0	40%	0	0
Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/Technologies issues du Projet avec au 15% d'augmentation de la productivité par rapport au témoin - désagrégé par pays							0

Indicator 4: Producers with knowledge of generated/released technologies by the Project-disaggregated by country/ Producteurs ayant acquis des connaissances sur les technologies développées par le Projet							0
Male/Homme							0
Female/Femme							0
Indicator 5: Area under new technologies disaggregated by country/ Superficie couverte par les nouvelles technologies désagrégée par Pays							0
Indicator 6: Processors/ producers who have adopted at least one new technology - disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays							0
Male/Homme							0
Female/Femme							0

Annex 8: Results framework Mali

	2014		2015		2016		TOTAL
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	
PDO indicators							

Annex 9: PDO indicators Niger

	2014		2015		2016		CUMUL
	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	Target/Cible	Achievement/Realisations	
PDO indicators							
Indicator 1: Direct project beneficiaries of which 40% female- disaggregated by country/ <i>Bénéficiaires directs du projet dont 40% de femmes- désagrégés par pays</i>							
Male/Homme				160			160
Female/Femme							0
Indicator 2: Beneficiaries who are using technologies generated by other countries/ <i>Bénéficiaires du projet qui sont en train d'utiliser des technologies issues du Projet</i>							0
Male/Homme							0
Female/Femme							0
Indicator 3: Technologies generated by the Project with at least 15% productivity increase over the control – disaggregated by country/ <i>Technologies issues du Projet avec au 15% d'augmentation de la productivité par rapport au témoin - désagrégé par pays</i>							0
Indicator 4: Producers with knowledge of generated /released technologies by the Project- disaggregated by country/ <i>Producteurs ayant acquis des connaissances sur les technologies développées par le Projet</i>							0

Male/Homme							0
Female/Femme							0
Indicator 5: Area under new technologies disaggregated by country/Superficie couverte par les nouvelles technologies désagrégée par Pays							0
Indicator 6: Processors/ producers who have adopted at least one new technology -disaggregated by country/Transformateurs ou producteurs ayant adopté au moins une nouvelle technologie - désagrégé par Pays							0
Male/Homme				250			250
Female/Femme				50			50

Clean orchards, without flies

Fallen fruits

In many mango and orange orchards, one sees fallen fruits with black spots. When you cut these fruits, you see small white worms. These are the babies of the fruit flies. At this point, no chemical can kill them.

Life of flies

Fruit flies bite fruit from different trees to lay eggs beneath the skin of the fruit. When the eggs hatch, they give small white worms that eat inside the fruit. The pricked fruits fall to the ground where the worms continue to grow.



Photo : J-F VAYSSIERES

Larvae of flies in mango

After 7 days the worms come out of the fruit and enter the soil. In the soil these little worms become fruit flies. The flies fly away and will bite the other healthy fruits on the trees. These pricked fruits fall to give life to new flies. As such, the number of flies will increase in your orchard and destroy other healthier fruits.

Collection of fallen fruits

As soon as the fruits are formed, collect all the fallen fruits, even the small ones once a week.

Pick up any fallen fruit from other fruit trees that are in your orchard or around it.

Destroy the picked fruits to prevent them from giving new flies. There are many ways.

Give the freshly picked fruit to the animals, or bring the oxen to eat in your orchard.

Tie up the fruits in black plastic bags without a hole. Put these bags in the sun for 3 days to kill all the eggs and worms in the fruit.

You can also pour the fruit collected into holes or barrels in your orchard and close them. Or pour the fruit into a net cage so that the flies do not fly away. Never leave fruit on the ground in the open air.



Fruits picked up and put in black bags and left in the sun

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Edited by Jeff Bentley and Paul Van Mele, Agro-Insight

Red ants protect your fruits

FICHE
TECHNIQUE

Fruit flies

In many fallen fruits one finds white worms that are the babies of the fruit flies. Worms cause great losses and can prevent export.

Red ants, watchman of mangoes

When the red ants are on the fruit, the flies do not have time to lay eggs: they will be chased away or eaten. These ants leave on the fruits smells that the flies recognize and which makes them flee.

Red ants live in families in the trees. Their nests are chambers of gathered sheets. The ants from different families fight and kill each other, leaving black spots on the fruit.

It is not good for the red ants to walk on the ground as they can disturb you and be killed by black ants or by farm work.

How to use red ants

The more trees with chambers of red ants you have in your orchard, the more your orchard is protected. Avoid killing the red ants and destroying their chambers.

To see if the red ants are from the same family, take one of the ants from a tree with a stem or leaf, and lay it in the middle of other red ants on a nearby tree. If these ants fight, they are from different families. Then cut the branches that make a bridge between these two trees. The red ants will no longer fight and leave black spots on the fruit.

When the red ants are from the same family on two nearby trees, connect these trees with a rope or a stick so that it does not interfere with the farm work.

To bring the red ants to a tree that does not have them, connect this tree to another tree that has red ants. If there are black ants in the tree, first put animal intestines at the bottom of the tree to attract and kill them.

To avoid red ant bites, use poles to harvest the fruits, or smear ash on the body if you need to climb the tree.



Photo : J-F VAYSSIÈRES

Ants eat the larvae of the flies



Do not destroy ant chambers

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Useful insects that kill the bad flies

FICHE
TECHNIQUE

The bad flies

In orchards, bad flies cause enormous losses. They lay eggs in the fruit which causes them to rot and fall. Often producers do not know what causes the fruits to fall and treat their orchard with insecticides. But treatments cannot kill all the flies.

Beneficial insects

There are beneficial insects that kill the eggs and larvae of the flies. Unfortunately, these useful insects are easily killed by insecticides.

The collection of fallen fruits and their destruction eliminates beneficial insects. These insects are smaller than flies. By putting the fallen fruit into a cage covered with fine netting, the useful insects can come out. But after 30 days, the flies die in the cage.

Preserving beneficial insects

Beneficial insects are naturally present in orchards or are introduced by researchers. To preserve them, do not treat your orchard with strong insecticides.

You can kill the flies without killing any beneficial insects.

Set up at least 4 cages covered with fine nets per hectare that allow beneficial insects to pass through, not worms and flies.

When collecting, keep lots of fruit and put them in a cage. Use a different cage every week.

Avoid putting too many fruits to ease the release of useful small insects.

Leave each cage closed for 30 days to kill all the flies in the cages.

At the end of the 30 days, 4 cages will be filled. Empty the first cage and refill it. Do it every week with another cage until the end of the harvest.



A useful insect attacks eggs of flies in mango



Fallen mangoes placed in a fine mesh cage

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Edited by: Jeff Bentley and Paul Van Mele, Agro-Insight

Food attracts and kills the bad flies

FICHE
TECHNIQUE

The bad flies

Fruit flies do a lot of damage in the orchards of mangoes, oranges, guavas and many other fruits. The small white worms are their larvae found in fallen fruits where insecticides cannot kill them. So treating your orchard with insecticides is a waste of money. The worms will grow and become flies and they will attack your healthy fruits.



Fruit fly which lays eggs in a mango

A toxic mixture against flies

Bad flies are attracted to protein-based foods, such as yeast. Flies need protein to live and develop their eggs before laying.

These foods mixed with insecticides are called food bait. The baits give off odours that attract flies. When bad flies are attracted by a bait, they eat it and die.

Kill the fly

These food baits can be used in traps or as a treatment product.

Products sold on the market, such as GF 120 and Torula yeast, should be mixed with water to treat orchards. Liquid yeast which is a waste product of beer manufacturing can also serve as bait.

For products sold, carefully read the instructions on the carton or can of the product to mix the product with water.

Wear gloves, goggles, boots, trousers, long-sleeved shirt, nose mask and hat before preparing the solution.

Begin applying the bait when the fruit is 3 centimeters wide and continue until the end of the harvest. Treat a patch of about one meter over one meter of foliage of each mango tree, until the bait drips from the foliage.

Every week, treat another branch. Do not treat when there is wind. As rains wash the leaf bait, resume treatment after a heavy rain.



Trap with yeast and insecticide attracts and kills flies

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Attract and kill the Bad flies

FICHE
TECHNIQUE

Mangoes fallen in orchards

Many fallen mangoes have worms inside. These worms are the larvae of bad flies that cause mangoes to fall and can cause total loss.

The power of odours

There are several types of bad flies that are all attracted by certain odours. Liquid or solid products sold in shops contain these odours and sometimes are already combined with an insecticide. These products are very effective, but each attracts only one type of fly. Some of these products contain the odour of methyl eugenol or terpenyl acetate.



Photo : J-F VAYSSIÈRES

*Larvae of fruit flies
in a fallen mango*

With traps, it is not necessary to treat your orchard with insecticides.

In the open air, these odors become less strong after a few weeks and need to be replaced to continue attracting flies.

Attract and kill bad flies

To attract and kill flies with attractive products, traps must be used to protect these products from the rain. You can buy traps or you can make your own traps with empty plastic bottles.

Make at least 3 openings about 3 centimeters at the top of the bottle that will allow the wind to disperse the smell and attract the flies into the trap. Put yellow paint to attract the flies from far away.

Pierce the cover to pass a metal wire through. Attach the attracting product to the wire inside the bottle. If the product does not contain an insecticide, attach an insecticide pellet to the wire. Close the bottle and hang the trap to a branch, within easy reach. Place the traps in the shade to prevent the sun from reducing the potency of the product.



*Fly trap made with an
empty bottle*

Place 10 to 40 traps per hectare as soon as the fruit is seen. Read the product instructions to find out how many traps to place. Empty them each time they are full.

Replace the products in the traps once a month until the end of the harvest.

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