



Final Evaluation Report for FCC-680-2011/009-00 Growing Resources for Enhanced Agricultural Enterprises & Nutrition (GREEN) in Benin, 2011-16

Evaluation conducted by Cosinus Conseils, Cotonou, Benin

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EXECUTIVE SUMMARY

The GREEN Project "Growing Resources for Enhanced Agricultural Enterprises and Nutrition" has been implemented since February 2012 by the American NGO Partners for Development (PfD), with funding from the US Department of Agriculture (USDA). This project aims to improve the productivity and incomes of 6,000 South Benin vegetable gardeners, through *(i) strengthening their capacities in production and marketing techniques; (ii) improving farmers' value chains and post-harvest capacities and (iii) improving access to micro financial services.*

In order to achieve these objectives, PfD adopted an implementation strategy based on the French term "faire-faire" (meaning practical teaching and learning) and strategic partners were selected to implement specific components. Thus, regional organizations of producers were empowered to implement trainings and to become effective advisory support and extension agents, PfD partnered with a Beninese microfinance institution (MFI), FECECAM, to provide loans to growers, explored a relationship with the Association of Agricultural Insurance (AMAB) to provide agricultural insurance, and partnered with ESOKO, a company based in Ghana, for the marketing information system. Other service providers were contracted for ad hoc support in capacity building.

The final evaluation of the project was based on information gathered from various stakeholders, including USDA, PfD project staff, vegetable growers and their organizations, support structures involved and other key structures (other programs and projects implementing organizations, such as CARDER of the Ministry of Agriculture (MAEP), donors including FAO, CTB, etc.). This information was analyzed to determine GREEN's coherence, relevance, effectiveness, efficiency and sustainability. A random sample survey of project beneficiaries was conducted with 400 beneficiaries, which is approximately 20% of the total targeted number who were to receive the total package of interventions, including technical training, access to micro-credit and the SMS messages of market prices. At the end of this process we can say that:

- 1- The Project GREEN was consistent with Benin agricultural policy.
- 2- Planned and GREEN activities were highly relevant as a whole with regards to the specific challenges faced by vegetable gardeners in the southern region of Benin. Examples of challenges addressed by GREEN include vegetable growers' difficulties accessing agricultural credit; non-compliance with safety standards for pesticide use; and lack of infrastructures/ materials adequate for irrigation, and post-harvest processing.
- 3- Overall the GREEN project was effective in its implementation of activities. Following are examples of the results:
 - a. In relation to objective 1, the project achieved 169% increase in crop production of the stakeholders, resulting from improved yields, increased cultivated area and increased number of production cycles in a year. This result was achieved for beneficiaries who received the total package of GREEN services.
 - b. In relation to objective 2, for the acquisition of market skills and reducing post-harvest losses, there is a greater formalization of commercial contracts between producers and traders, with a total of 51 contracts created (the goal was 6), while post-harvest losses were reduced by 64.3% (the target was 30%).
 - c. As for objective 3, addressing the facilitation of access to financial services, the GREEN project was successful in helping 2,012 growers obtain loans from FECECAM for a 101% achievement rate. The reimbursement rate as of 30 September 2015 is around 93% which is slightly below the targeted level by FECECAM (95%). Reimbursement actions are still ongoing.
- 4- GREEN's sustainability is observed through (i) the beneficiaries' increased knowledge of and integration into local markets; (ii) the significant improvement in productivity resulting from improved cultivation skills and knowledge and the equipment purchased through micro loans such as irrigation systems. However, some aspects of the project leave doubts about the lasting impacts in the absence of the GREEN project. This includes whether technical support of community based

volunteer expert farmers and the field agents will continue to be supported by the Professional Agricultural Organizations (OPA), as well as whether the Esoko SMS messages of market prices will continue without external funding.

- 5- The nutrition, hygiene and health component allowed actions to be carried out relating to (i) hygiene in production, post-harvest and consumption of vegetables, (ii) vegetable processing standards, (iii) nutritional benefits of consuming vegetables and fruits, (iv) the proper cooking and consumption of vegetables, and (v) prevention of non-transmissible diseases such as diabetes through good nutrition.
- 6- Interesting innovations have been introduced by the project and need to be capitalized and disseminated. These are: (i) the promotion of the value chain approach in the market gardening sector, (ii) the market information system by mobile telephones, and (iii) solar pumping equipment for irrigation in the horticulture farming system.

Following information and data analysis the evaluation concluded that the GREEN project met and often exceeded its objectives and goals. However a few specific points, such as questions about the sustainability of the project (see section sustainability) deserve to be appreciated and analyzed to ensure greater impact of future interventions in the vegetable gardening sector.

LIST OF ABBREVIATIONS

AME	:	Exclusive breastfeeding
AUP	:	Urban and Suburban Agriculture
CARDER	:	Regional Action Centre for Rural Development
ECOWAS	:	Economic Community of West African States
CeRPA	:	Regional Centre for Agricultural Promotion
CLCAM	:	Caisse Locale de Crédit Agricole Mutuel
CRM-MC	:	Regional Council of Market Gardeners of “Mono and Couffo”
CTB	:	Belgian Technical Cooperation
AVC	:	Added Value Chain
DSA	:	Directorate of Agricultural Statistics
PPE	:	Personal protective equipment
FCFA	:	Franc of the African Financial Community
FECECAM	:	Federation of Savings Banks and Mutual Agricultural Credit
FFS	:	Farmer Field School
GREEN	:	Growing Resources For Enhanced Agricultural Enterprises and Nutrition
IITA	:	International Institute for Tropical Agriculture
MFI	:	Microfinance Institution
INRAB	:	National Institute of Agricultural Research of Benin
INSAE	:	National Institute of Statistics and Economic Analysis
MAEP	:	Ministry of Agriculture, Livestock and Fisheries
NCD	:	Non-Communicable Diseases
ONASA	:	National Office of Support to Food Security
NGO	:	Non-Governmental Organization
OPA	:	Professional Agricultural Organization
PCM	:	Market Gardening Program
PfD	:	Partners for Development
NAIP	:	National Agricultural Investment Plan
PSRSA	:	Strategic Plan for the Agricultural Sector Recovery
PTAA	:	Agricultural and Food Technology Program
AWPB	:	Work Plan and Annual Budget
SCDA	:	Communal Sector for Agricultural Development
SCRIP	:	Growth Strategy for Poverty Reduction
SIM	:	Information System on Market
SPSS	:	Statistical Package for Social Sciences
TAP	:	Enhanced Production Techniques
URP-AL	:	Regional Union of Producers of Atlantique-Littoral
URP-OP	:	Regional Union of Producers of Ouémé Plateau
USDA	:	United States Department of Agriculture
VMIS	:	Vegetables Market Information System
WFLO	:	World Food Logistics Organization

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1. GENERAL BACKGROUND AND PURPOSE OF THE EVALUATION

1.1. Background of GREEN:

Vegetables are one of the thirteen priority sectors cited in the Benin Ministry of Agriculture's Strategic Plan to Promote Agriculture (PSRSA). This is due to their significant contribution to food security and nutrition, as well as the significant number of urban, suburban and rural jobs and income the sector generates. However, despite Benin's market gardening potential¹, local production does not cover the vegetable needs of local consumers. This is particularly the case during seasonal fluctuations in production, which causes shortages and higher prices for imported products of a number of vegetables such as okra, tomatoes, sweet and hot peppers, leafy greens and onions.

Vegetable farms in Benin are mostly small, with less than a hectare being cultivated during any production cycle. Only manual tools are used to prepare the earth and even watering is mainly by hand. The farmers have limited knowledge about modern farming methods, and usually choose the variety of vegetables and cultivation methods according to family or local traditions. As they are generally poor, vegetable farmers tend to use the cheapest, but less effective fertilizers and insecticides, further reducing crop quantity and quality. Fewer women are vegetable farmers due to added barriers to owning land and even less access to financial and human resources. The need therefore is to increase local production of quality vegetables to meet market demand by overcoming farming issues² that limit local vegetable production and consequently reduce Beninese farmers' share of the vegetable market.

GREEN is implemented in southern Benin by Partners for Development and targets 6,000 smallholder farmers within the six provinces of the south. The figure below shows the project area within a map of southern Benin and the table lists the provinces, cities and villages.

Provinces	Cities and Villages
Atlantique	Abomey-Calavi; Toffo; Allada; Kpomassè; Ouidah ; Sô-Ava; Tori-Bossito et Zè
Littoral	Cotonou
Mono	Athiémé ; Bopa ; Comè ; Grand-Popo ; Lokossa
Couffo	Aplahoué ; Klouékanmè ; Toviklin ; Djakotomey ; Dogbo ; Houéyogbé ; Lalo
Ouémé	Avrankou ; Adjohoun ; Dangbo ; Missérété ; Porto-Novo ; Sèmè-Kpodji
Plateau	Adja-Ouèrè ; Ifangni ;

Table 1: GREEN Project Intervention area (Source: Pfd)

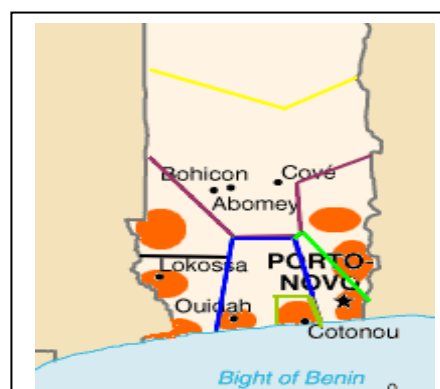


Figure 1: Map of southern Benin (Source: Pfd)

The GREEN project is funded by the United States Department of Agriculture (USDA), through its "Food for Progress" program for a total amount of \$3.8 million.

According to the USDA grant agreement, the project's main goal is to "contribute to the improvement of the living standards of horticulture farmers in southern Benin." For Pfd, achieving this objective requires the professionalization of the horticulture sector while developing stronger agricultural entrepreneurship.

The grant agreement states GREEN's three specific objectives as:

- Increase Vegetable Production and Improve Marketing Skills among smallholder farmers through training and extension.

¹ The soil and climate throughout all regions of southern Benin are optimum for growing vegetables.

² The limiting factors include: (i) low levels of training in modern methods and lack of technical support of farmers in the vegetable sector, (ii) difficulties in accessing quality inputs (seeds, fertilizers and pesticides), causing reoccurring insect infestations and crop diseases, (iii) lack of access to microfinance loans due to perceived high risk (iv) lack of modern tools and equipment for irrigation, processing and storage, (v) issues of land access, particularly in urban and suburban areas.

- ii) Improve Value Chain and Post Harvest Skills by building the capacity of farmer associations to provide improved services to their members.
- iii) Increase Financial Services Provided to Targeted Smallholders by increasing access to loans and training in business/financial management.

Operationally, the GREEN project developed a model of technical and financial support to assist Benin's vegetable farmers as presented in figure 2 below:

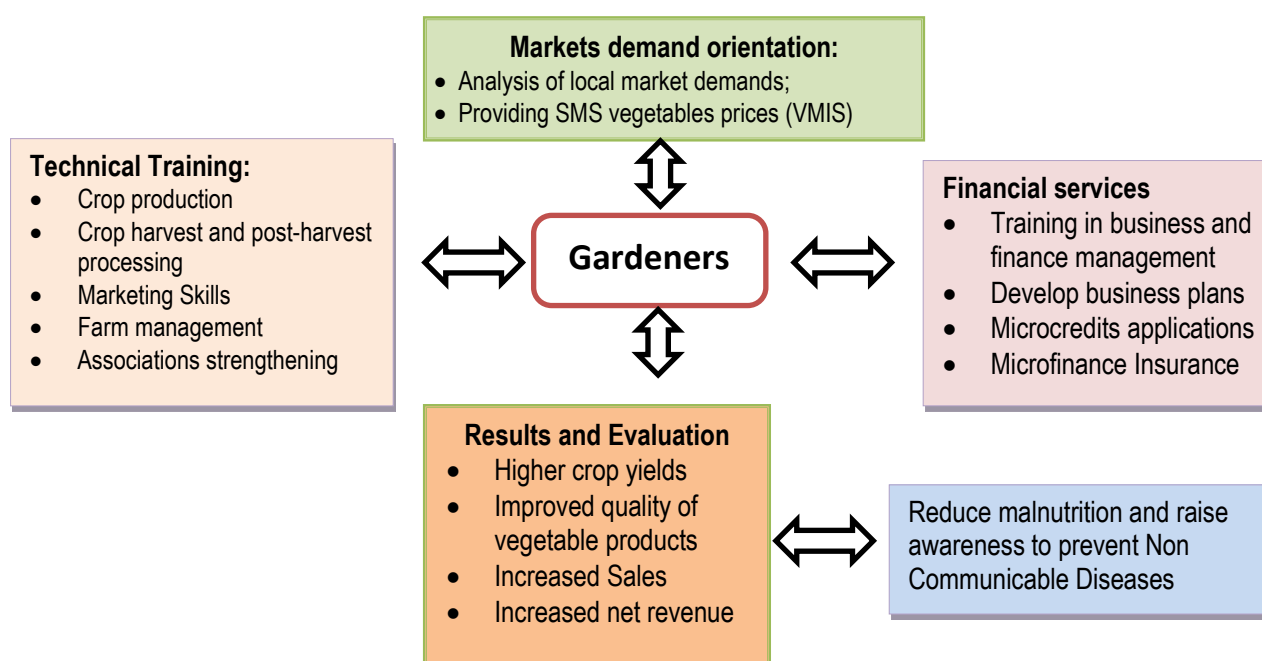


Figure 2: Implementation Model of GREEN Project (Source: PfD reports)

The GREEN agro-business development model is based on the market; it puts horticulture farmers (men and women) at the center of interventions and has four main themes:

- (i) Vegetable value chains and local markets demand analysis: Training producers to understand and meet the variety and quality of products demanded; providing product price information to negotiate sales; and establish direct market connections;
- (ii) Technical training and farm management capacity building: Training and mentoring of the three Regional Farmer Associations (URP-AL, URP-OP, and MRC-MC) to provide vegetable farmers with technical training and on-site support to improve crop production and vegetable quality;
- (iii) Procurement of inputs through access to microcredit: Training farmers in business and financial management to develop the solid business plans that are an essential part of credit applications and providing the local MFI with a loan guarantee to mitigate loan risk;
- (iv) Nutrition and disease awareness raising: Providing community workshops and training local health service providers in the nutritional benefits of including vegetables in the local diet; the need of early detection and the role of nutrition in mitigating non-transmissible diseases such as diabetes and high blood pressure.

It is therefore expected that implementing this model facilitates achieving impact through: (i) a market-oriented horticulture production, (ii) increased land productivity and crop production, (iii) improved quality of market garden product, (iv) increased share of local market sales; (v) greater farmer and community awareness about nutrition and prevention of common non-transmissible diseases.

As stated in the USDA agreement of the GREEN project, the indicators and life of project (LOP) targets to measure project activity expected outputs and outcomes are as follows:

Table 2: Indicators of outputs and outcomes of the GREEN Project

General Objective: contribute to improving the living standards of horticulture producers in southern Benin	
Specific Objective 1: Increase Vegetable Production and Improve Marketing Skills among smallholder farmers through training and extension	
<u>Outputs:</u> <ul style="list-style-type: none"> - At least 6,000 training days in improved cultivation technologies - 12,000 hours of extension visits - 6,000 farmers receive USG supported short-term agricultural sector productivity training - 500 farmers participate in electronic repayment and/or market information pilot 	<u>Outcomes:</u> <ul style="list-style-type: none"> - 80% of trainees adopt improved cultivation methods - 100% increase in production for targeted farmers - Cultivation season extended by 35% for targeted farmers - 50% reduction in pesticide abuse among targeted farmers - 70% of trainees are female - 4,800 farmers apply new technologies or management practices as a result of USG assistance
Specific Objective 2: Improve Value Chain and Post-Harvest Skills by building the capacity of farmer associations to provide improved services to their members	
<u>Outputs:</u> <ul style="list-style-type: none"> - Several business linkages are created each month between targeted farmers and buyers - 2,000 farmers trained in post-harvest technologies and value chain approaches - 2,000 members of producer organizations and community based organizations receive USG assistance 	<u>Outcomes:</u> <ul style="list-style-type: none"> - Net sales revenue from vegetables increases by 30% - 9,000 new seasonal jobs created - At least one signed sales agreements per department - Post harvest losses as a percentage of overall harvest declines by 30%
Objective 3: Increase Financial Services Provided to Targeted Smallholders by increasing access to loans and training in business/financial management	
<u>Outputs:</u> <ul style="list-style-type: none"> - 2,000 loans and skill trainings provided to horticulture farmers - 2,000 borrowers receive electronic market information - 250 crop insurance premiums purchased in pilot - 1,000 people with savings accounts or insurance policies as a result of USG assistance 	<u>Outcomes:</u> <ul style="list-style-type: none"> - Net income of borrowers increases by 50% - Loan repayment rates are at least 95% - 70% of loan recipients are women - Value of insurance recognized in surveys

Source: Logical Frame of GREEN Project

1.2. Purpose of the Final Evaluation

1.2.1. Scope and objective

The final evaluation of the GREEN project covers virtually the entire duration of the project from implementation on the ground in February 2012 until the time of this evaluation data collection at the beginning of January, 2016. It includes all the activities and interventions of the project. The evaluation

reviews the development model, approach and partners and the project's implementation strategies to achieve more efficient vegetable production, better market-oriented and increased income for vegetable producers.

The main objective of this evaluation was to conduct a systematic and objective measure of the project results in relation to the key performance output and outcome indicators, highlighting the points of success and noting constraints and shortcomings. The lessons learned and recommendations of this evaluation will not only document the implementation and results of the GREEN project, but will also provide valuable insight for other ongoing or upcoming projects of PfD and other development organizations, including public structures.

1.2.2. Major evaluation questions

The major questions of the evaluation focused on: (i) the relevance of project objectives to the targeted beneficiaries; (ii) the coherence and effectiveness of the project's approach and activities to produce the expected results and impacts; (iii) the efficiency of the project's implementation strategies to achieve the results; (iv) the sustainability of project activities and results and provisions that help guarantee continuity.

The evaluation questions were focused on each of the main themes of the enterprise development model of the GREEN project (see discussion about the project development model above). They strive to examine the project's activities and interventions, including its extensive technical and market training; work with local partners; farmer capacity building in basic business and financial management skills; and continuous efforts to make crop production and the producers more market oriented.

2. PROJECT EVALUATION METHODOLOGY

2.1. Methodological approach and mission planning

The methodology adopted for this evaluation was based on a participatory and consultative process involving all categories of stakeholders who contributed to the implementation of the GREEN project. The first step was to engage in dialogues and exchanges with these actors to understand their perceptions of the activities and then to compare this information to the results and effects of the project. The field analysis first focused on the project's staff and partners: their ability to collaborate and how effectively they interacted, including activities at the vegetable farm level and the impact of the interventions on the beneficiaries of the project.

The factors taken into account were: (i) the institutional organization used to implement the project; (ii) the effectiveness of the approach (the GREEN agro-business development model); (iii) the continuation of the project by farmers and their associations, support structures and various partners; and (iv) the level of achievement of expected results and impact in relation to the indicators defined at the start of project interventions.

These elements were crucial in the analysis of the relevance, coherence, effectiveness, efficiency and sustainability of project activities. Triangulation of information was ensured through a combination of document and data analysis techniques, and polling of market gardeners (men and women) and other stakeholders and discussions in focus groups. This method reduced judgment bias in order to ensure the validity of collected data.

The evaluation was conducted by combining:

1. Secondary data available to PfD and at the partners' level; these documents included activity reports, baseline study reports, the midterm evaluation, and partner assignment and supervision reports;
2. Visits of field activities and achievements of the GREEN project;
3. Key informant and one-on-one discussion interviews with groups of beneficiaries;
4. Structured surveys using a project beneficiaries' questionnaire.

The mission was carried out in four (4) phases as presented below (Figure 3).

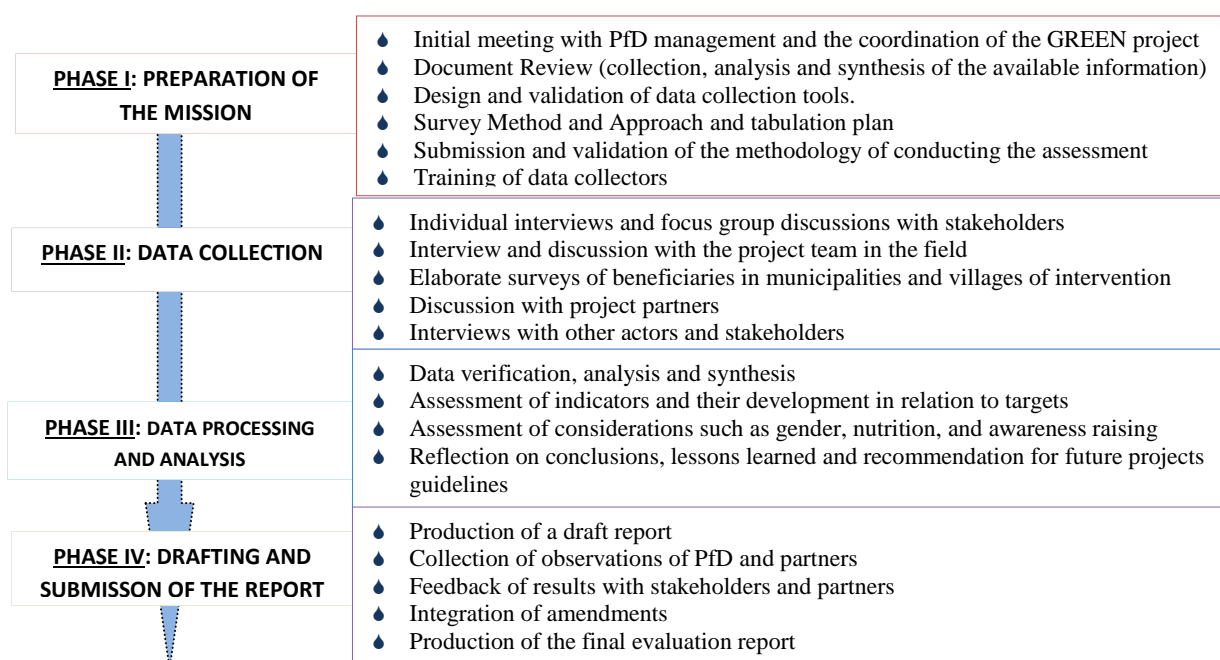


Figure 3: Main steps of the assessment (Source: Authors)

2.2 Targeted groups and type of data collected

Several strategic actors were met during the evaluation mission:

- PfD officials;
- Regional Producers Unions;
- Service providers (market information service such as the Esoko VMIS³ facilitators, and FECECAM, which provided the microfinance services)
- Agricultural administration services, including the MAEP (CARDER and SCDA, DSA, etc.);
- Resource persons identified in the cities and villages sampled;
- Professional organizations of market gardeners

The information collected from these actors focused on activities carried out during project implementation; the description and evaluation of the roles played; the strategies used and their assessment; the level of achievement of expected results; the constraints and solution proposed; expected outcomes and impacts and their achievement to date; and finally, the overall satisfaction of beneficiaries and partners. Specific interview questionnaires were used for this purpose.

At the level of the direct beneficiaries of the project (horticultural farmers), data collection was completed using two complementary approaches:

- Surveys of the targeted population of the beneficiaries of the project using a questionnaire, which was previously field tested during the baseline study and then refined and retested during the mid-term evaluation, and;
- Focus group discussions conducted with groups of market gardeners.

The data collected focused on questions about the types of support received from the project; the relevance and usefulness and quality of support received; the assessment of implementation strategies; perceptions on the project effects and impacts; and, sustainability of the activities and achievements.

2.3 Sampling method and survey used with garden farmers

Two (2) categories of beneficiaries were targeted for surveys:

- Group 1: vegetable gardeners, who were beneficiaries of only the training and in field advisory support;
- Group 2: vegetable gardeners, who benefited from the full intervention package, including the VMIS, microcredit as well as the training and in field advisory support.

The observation unit is the market gardener (vegetable farmer). The survey list was drafted using the general lists of GREEN beneficiaries, found at both the Regional Unions of Producers and PfD levels. **The survey basis** consisted of randomly selecting names from a comprehensive list of the two categories of beneficiaries above. Sampling was conducted according to the sample sizes indicated in the evaluation terms of reference, namely 100 respondents for Group 1 and 300 respondents for Group 2.

To meet the objectives of the evaluation mission, the consultants conducted a thorough document review and partner interviews. In addition, a random sample of project beneficiaries- those who participated in the group and in-field training sessions and received on-site advice support, and those who received the full package of project interventions, including receiving the SMS messages, getting access to microcredit loans and participating in the grouped trainings as well as receiving in-field mentoring and advice support. This was done to assess the effectiveness and impact of the GREEN agro-enterprise development model. The evaluating firm approaches GREEN's final evaluation by randomly selecting a statistically significant percentage of project beneficiaries from the six states where GREEN is implemented.

The evaluation methodology consisted of interviews, questionnaires, and focus group discussions with project beneficiaries and key stakeholders. Both qualitative and quantitative data were collected through objective and precise data collection tools, such as direct observation and carefully constructed questionnaires.

³Vegetable market information system

However, some findings were based on anecdotal information, such as estimating reduction in post-harvest losses, due to the fact that direct measurement will not be possible for all crops during the evaluation. Data collection for project performance outputs, outcomes and impact were collected using three primary methods:

1. Direct observation: of farmers' fields to measure the expansion and quality of crops; of markets to assess expanded business linkages established and the farmers' access to local markets; of chemical pesticides and fertilizer use to determine awareness about farmer safety and reduced abuse, etc.
2. Questionnaires: were administered to targeted farmers to assess their participation in GREEN training and related activities and to take their perceptions of the training into account. Project partners such as the farmers' unions also completed questionnaires. Please refer to Annex B for a sample copy of the mid-term assessment questionnaire as an indicative model;
3. Individual and Group guided discussions: these interviews gave additional information of a more anecdotal or personal nature, though they were guided by tailored questionnaires.

The Table 3 below shows the distribution of the sample population within areas of project intervention.

Table 3: Sample synthesis

Region (district)	Number of municipalities surveyed	Group 1		Group 2		Total	
		Size by municipality	Sample Size	Size by municipality	Sample Size	Size by municipality	Sample Size
Atlantique-Littoral	4	8	32	32	128	40	160
Mono-Couffo	4	9	36	11	44	20	80
Ouémé-Plateau	4	8	32	32	128	40	160
Overall	12⁴	-	100	-	300	-	400

The key topics covered in the survey questionnaires related to:

- Description of the market gardeners;
- Assessment of farmers' knowledge, skills and practice in vegetable production, processing and marketing;
- Assessment of the level of the profitability of individual farming operations and farmer net revenues from market gardening;
- Assessment of the living conditions of GREEN beneficiaries and their families

The final evaluation data collection survey lasted ten days, including travel time. The survey mechanism consisted of a two-person team (one or two data collectors and a supervisor) to cover two districts, or six teams in total, whose numbers varied depending on the size of the district. A total of 20 data collectors and six supervisors were deployed in the field. (See attached Survey Method and Approach). Field data collection supervision was provided by the consultant team.

2.4. Semi-structured interviews and focus groups

The team of consultants conducted interviews of key GREEN project PfD staff, the project partners (URP, AMAB, FECECAM) and structures involved in developing the agricultural sector (i.e., the Ministry of Agriculture's regional office, CARDER). These discussions yielded valuable information about the project implementation, including an assessment of the successes and challenges by these key actors. In this same vein, the consultants conducted individual interviews and/or focus group discussions with market gardeners in different regions of the GREEN project intervention area. The latter were selected in a random method using the beneficiary data base provided by the project team.

2.5. Tools used and data processing

Various data collection tools were used, including:

- Direct observation (visits of market gardening plots and sites);

⁴Allada, Zè, Sô-Ava, Cotonou, Comè, Grand Popo, Houéyogbé, Lalo, Adja-Ouèrè, Ifangni, Porto-Novo and Sèmè-Podji

- Interview guides for interviews and collection of qualitative information;
- Structured survey questionnaires for collecting quantitative data, which was field tested before general application;
- Data synthesis, analysis and reporting tools.

Following the field work, the consulting team analyzed the survey forms and interview guides, by first entering them into MS Access with an input mask designed for this purpose. The calculations and descriptive statistical analyzes using frequencies, averages, etc. were performed with the SPSS 2.0 and MS Excel software (for statistical graphics as bar graph and pie chart).

The results from the processing of the collected data combined with secondary data from activity reports, baseline study reports and the midterm evaluation reports were analyzed and discussed to produce this final evaluation mission report.

The project indicators were entered in accordance with methods of calculation defined in the baseline study. On this basis, the analysis determined: (i) the value of the differential GAP of indicators between 2012 and 2015 and (ii) the differential GAP of indicators of planned target for 2015.

3. FINDINGS AND OBSERVATIONS

3.1 GREEN project implementation partners

The GREEN Project was signed in September, 2011 and started field work in February 2012 in southern Benin for an initial three-year period ending September 2014. The activities were generally conducted according to schedule, despite some organizational constraints inherent in the start-up of development projects, which caused delays in activity implementation, such as contracting and training the field partners and hiring sufficient numbers of qualified project staff. An extension phase (October 2014 to March 2016) was implemented in order to complete activities already started, particularly in the nutrition and hygiene component.

3.1.1 The Market Gardeners

The vegetable farmers are the direct beneficiaries of the GREEN project's interventions. They are distributed in 29 towns within the six provinces of Southern Benin (see Table 1 in Section 1.1). The total project target was 6,000 market gardeners of whom 70% were expected to be women (however, due to a number of factors, far fewer women are vegetable farmers). The project goal was that the vegetable farmers would achieve the project's objectives by learning and adopting technologies and skills in order to significantly increase productivity of their farm commodities and increase market sales. The impact of the GREEN project was primarily measured among the market gardeners. The evaluation surveyors' visits of vegetable farms in the sample of communities found that producers, individually or in groups, benefited from support within the three major axes of the GREEN model (market orientation, crop production, harvesting and marketing training and access to microcredit), which significantly improved their crop production, the quality of their vegetable products, and resulted in increased sales and revenues.

3.1.2 The regional farmer associations

The GREEN project was implemented in the field in partnership with the Regional Associations of Farmers of the Ouémé-Plateau (URP-OP), Atlantique-Littoral (URP-AL) and the Regional Council of Market Gardeners of Mono Couffo (CRM-MC). The partnership agreements signed between these farmer associations and PfD built their capacities to provide as training and advisory support to member growers, and with the assistance of local technical agents recruited and managed by the GREEN project. A total of 25 field agents were recruited: Atlantique-Littoral (09), Mono-Couffo (07) and Ouémé-Plateau (09). The introduction of Model farmers was a success factor of the GREEN intervention mechanism. They facilitated the farmers' learning and rapid adoption of new crop production techniques and skills at all stages of project implementation.

Discussion with the URPs and the CRM-MC proved that the role assigned to them by PfD reinforced their services to their vegetable producer members. Formerly, producers at the grassroots often complained about the weak technical support they received from these umbrella structures. In the Atlantique-Littoral and Ouémé-Plateau regions, this partnership was timely for the URP as these organizations serve producers of different agricultural sectors including the vegetable sectors, which had been somewhat neglected. The GREEN project improved their image with this specific group of producers. In Mono-Couffo, the CRM-MC, which is focused on vegetable production, already had a strong connection with its principal membership of market gardeners, which facilitated project activities.

The establishment of field staff by the associations was an effective model for activity implementation and generated ideas for innovation and application strategies of the GREEN project. For example, the use of a staff close to producers and exclusively dedicated to GREEN activities from the beginning of the project was highly appreciated by the targeted farmers. However, the union relationship with the producers had issues, including:

- That some of the association leaders publicly embarrassed producers (cases of laziness or scam of producers were mentioned in some places);
- The involvement of association leaders in credit recovery, which negatively impacted their relationship with delinquent producers, although this has improved reimbursement rates.

In relation to the ownership by the associations of their roles in the partnership, it was noted that the URP and CRM understood their responsibilities. But the boundaries between the responsibilities of other actors and theirs became somewhat blurred during the implementation. Overlaps were noticed, for example in recoveries of loans, which should be the responsibility of FECECAM; however, the URP and PfD also participated in facilitation of loan recovery.

3.1.3 Other project partners

Besides the partnership with the regional farmer associations, the GREEN project partnered with several private specialized structures to provide technical support in the project areas of intervention:

- ESOKO (a Ghanaian company providing internet services) facilitated the establishment of an information system on the current price of market garden produce (VMIS) by mobile phone messages;
- The microfinance lending institution, the Federation of Agricultural Savings and Credit Mutual (in French, Fédération des Caisses d'Épargne et de Crédit Agricole Mutuel, FECECAM) funded small loans to the market gardeners;
- Peace Corps provided institutional support through a volunteer to assist in material development and practical training; and boosting enrollment of market gardeners on ESOKO platform to receive market information;
- The Mutual Agricultural Insurance of Benin (AMAB), conducted a study to determine if crop insurance could be adapted to vegetable growers (unfortunately this was not feasible);
- The Agriculture and Food Technology Program (PTAA) of the Ministry of Agriculture's National Institute for Agricultural Research (INRAB) trained facilitators and gardeners on processing technologies of vegetables (drying and preserves) and leaf vegetables. PTAA also provided support in the development of standards for several processed vegetables (pureed tomato and hot pepper, dried hot pepper, leafy vegetables, and onions, etc.), together with the Benin Agency for Standardization (ABENOR) and Directorate of Food and applied Nutrition (DANA).

3.1.4 Experience gained by project stakeholders

A major result of the GREEN project was the capacity building of market gardeners and their associations by PfD's technical support structures. Apart from a few cases where the contracted support agency partnerships were cut short⁵, most project structures and agents effectively fulfilled their duties. They played an important technical role by implementing the training and support activities within the key components of the GREEN model.

Similarly, the GREEN project enabled recruitment of agents that increased the human resources competencies in the regional farmer associations, and in particular with progressive mastery of value chain analysis skills in the market garden sector. Though the farmers themselves are likely to continue applying the learned skills and techniques that increased production and sales, the association empowerment approach had some problems in terms of leadership and their capacity and autonomy to continue actions initiated with GREEN. At this ending stage of the project, both young professionals hired for the project and the farmer associations involved are assessing the sustainability of this experience. The possibility of maintaining the entire pool of skills is dependent on wage payment that the associations may not be able to continue covering on their own.

⁵Case of AMAB and the WFLO

3.2 Activities and Results of the GREEN project

This section analyzes the project implementation and results from key activities of the three main components of GREEN's Agro-enterprise development model: 1. Market orientation; 2. Technical training; 3. Access to microcredit.

3.2.1 Project Implementation

In order to address the problems of market gardeners, GREEN interventions were based on a command lever of market analysis in order to help farmers produce to meet consumers' needs. The main improvements were in vegetable farmers' gaining knowledge about local markets and then gaining the technical production skills to meet the demand. The project field training activities can be articulated around four axes: a) capacity building through technical training; b) in-field mentoring of producers to apply new techniques to improve crop productivity and quality; c) facilitating access to financial services and market information; and d) the nutritional and dietary education as well as awareness raising about combating non-communicable diseases (NCDs) such as diabetes, high blood pressure and obesity.

3.2.1.1 Market orientation and information

As part of its market orientation activities for producers and crop production, PfD signed a partnership agreement with ESOKO, which set up an internet based platform for sending real-time information on markets prices of a variety of fresh vegetables. Prices reach the producers through SMS messages on their mobile phones. Agents within the markets are responsible for collecting market prices and forwarding them to the PfD manager who validates the prices and then sends them to ESOKO for distribution through the platform.

This service was set up to inform vegetable farmers of current prices in 22 markets of southern Benin. It was part of the market orientation component of the GREEN model that also included participatory training in analysis of vegetable value chains and market visits. If the farmer was willing to pay for the call, this service could also be used to publish producer offers or to sell their produce, but these opportunities were scarce or not used. GREEN facilitated the organization of regional workshops between market buyers and vegetable farmers, which expanded and successfully raised the initial awareness of farmers about market prices that is provided by the market information system.

3.2.1.2 Technical Training

A system of cascaded trainings (meaning that expert farmers are trained as master trainers, and then trained groups at the district and local levels) was set up for facilitators and producers of the three project areas. The production topics covered included:

- Participatory analysis of vegetable market demand and values chains;
- Technical instruction of improved cultivation and growing (for specific crops such as hot and sweet peppers, tomato, onion, and leaf vegetables);
- Correct and safe use of chemical fertilizer and pesticides;
- Post-harvest technologies for preserving vegetable crops;
- Financial management of market garden produce; credit management and drafting farm business plans;
- Safety standards and quality in vegetable production, post-harvest processing and marketing;
- Use of the vegetable market information system.

3.2.1.3 Advising and Mentoring Producers

Following the cascade trainings provided by project facilitators, a close advisory follow-up and support is provided to vegetable producers as part of the practical application of techniques learned and to assist farmers to resolve any problems encountered. The facilitators are assisted by exceptional producers identified in each of the project zones (2 to 3 per municipality) and given a token payment by the project to cover transportation costs incurred during their visits to neighboring farms. They played a key role within the GREEN project system through the in-field assistance they provided to other farmers.

The project's implementation was somewhat modified following recommendations from the mid-term evaluation. Specifically, within each regional intervention area (covered by the URP-OP, URP-AL, and CRM-MC), a team of six facilitators was set up to provide direct advisory support to producers. This team was coordinated by a GREEN project manager who ensured coordination of field activities and provided an interface between the facilitators and PfD project coordinators. In addition to providing technical training and mentoring, the facilitators also sought solutions to farmer problems. For example, in response to problems related to irrigation of crops (high cost of labor and gas for motor pumps), an innovation of solar powered irrigation was tested in six pilot sites within GREEN provinces, using pumps with photovoltaic solar panels. In this pilot initiative two types of pumps were tested: the GRUNDFOS submersible solar power pumps and LORENTZ PS surface 150. Both were found to be effective, though the GRUNDFOS was more effective with irrigation ponds.

3.2.1.4 Financial services and access to microcredit

As part of improving access to credit, PfD provided a guarantee fund of 50 million francs CFA (\$100,000) with FECECAM to cover financial risk linked to microcredit loans to vegetable farmers, which previously did not have access to credit. The guarantee fund enabled a total value of over three times the amount of the guarantee, or 150 million FCFA (\$300,000) in loans provided to the farmers. It currently generated \$327,000 in loan capital. The rate of interest until the end of the first contract in June 2014 was 18%.

However, for the second generation of credit, a preferential rate of 15% was given to the beneficiaries. A three-step selection process was used. As a first step, the facilitators of the farmer associations assisted the farmers draft solid business plans; the second step involved the Project Management team, which selected the best business plans to be submitted to FECECAM for consideration; and the third and last step was with FECECAM, which made the final selection of beneficiaries and provided the loan. This mechanism allowed the gardeners to invest in new equipment, to increase cultivation and to cover their operating costs. Several farmers within each of the project zones indicated that they were able to secure new loans from FECECAM and other microcredit companies on their own using the skills learned through the GREEN project.

3.2.1.5 Nutrition, hygiene and health activities

During the extension phase of GREEN, project activities included nutrition and hygiene: (i) awareness raising about the nutritional benefits of eating vegetables and fruits; (ii) awareness raising and practical demonstrations about hygiene related to the production, transportation, distribution, processing and consumption of vegetables; and (iii) workshops on good nutrition to prevent and reduce non-transmissible diseases, such as diabetes and high blood pressure. To supplement the awareness raising sessions, GREEN conducted practical training of community health agents, testing for NCD and cooking demonstration. The hygiene activities complemented other GREEN training on proper pesticide application practices, including correct dosage, time lapse before harvesting, and precautions to protect the health of field workers, such as wearing protective equipment of boots, gloves and gas masks.

The hygiene activities also included raising awareness about the proper transportation and storage of chemicals and disposal of empty containers, etc. They also focused on proper hygiene during post-harvest vegetable processing and how to ensure good product conservation and avoid contamination such as precautions when preparing, and packaging etc.). Quality standards were developed with the support of INRAB for several processed vegetables (such as pureed tomato and hot peppers, dried hot peppers, dried leaf vegetables).

The project widely communicated on proper nutrition and the need to eat vegetables to combat Benin's widespread malnutrition and prevalence of NCDs. These communications targeted not only producers and their field workers but also their families and other members of the community, encouraging greater consumption of vegetables and fruit. Media spots on the health benefits of consuming vegetables and fruit and on good hygiene practices during food handling were designed and aired a number of times both

through local radio and national television. In addition, SMS text messages about nutrition and hygiene were regularly sent to producers via the ESOKO platform.

GREEN activities to combat NCDs are conducted with the Ministry of Health via the local health centers. The community based workshops are focused on the early detection of diabetes, hypertension and breast cancer; raising awareness about the risk factors for NCDs; promotion of exclusive breastfeeding during the first six month of a baby's life; and how to conduct breast self-examination for early detection of breast cancer. In order to reach larger numbers, GREEN targeted school children, teachers and food vendors at schools to conduct hygiene and food safety awareness raising. In addition, hand-washing kits were provided to each of the schools.

4. RESULTS AND IMPACTS OF THE GREEN PROJECT

4.1. Has the project produced expected results?

Here, it is a question of measuring both the performance outputs of GREEN and beyond to determine the outcome results or changes realized in the behavior of the market gardeners, as well as changes the project realized within its environment. The immediate outputs and results achieved by PfD through GREEN are manifold. The following section presents first the performance results indicators and then the outcome and impact results of the GREEN project.

4.2 Synthesis of performance indicators

The methods used to measure the performance of the project in the field and its related indicators were stated in Chapter 1, (paragraph 1.1). It is presented again below in summary as stated in the September 2015 project report, and with an added column showing the rate of achievement.

Table 4: Summary of performance indicators achievement (Life of Project/Output Goals) as of September 2015

SPECIFIC GOALS	Target values	Mid-term evaluation	Results as of Sept 2015	Rate of achievement
Goal 1: Increase Vegetable Production and Improve Marketing Skills among smallholder farmers through training and extension				
6,000 producers (70 % of whom are women), trained in improved production techniques	6,000	6,667	7,606	127%
6,000 training days on improved production techniques	6,000	12,260	13,225	220%
12,000 hours of extension on the fields	12,000	40,440	42,456	354%
500 producers participating in an information system of market	500	2,107	2,578	516%
Goal 2: Improve Value Chain and Post-Harvest Skills by building the capacity of farmer associations to provide improved services to their members				
2,000 farmers trained in value chain techniques and post-harvest treatment.	2,000	4,123	4,270	214%
Business relations between producers and companies created	ND	186	1,859	-
Goal 3: Increase Financial Services Provided to Targeted Smallholders by increasing access to loans and training in business/financial management				
2,000 producers (70% women) trained in entrepreneurship and receive credits	2,000	1,510	2,012 credits	101%
2,000 borrowers receive market electronic information	2,000	1,510	2,012	101%
250 producers subscribed to the death insurance for the credit with FECECAM	250	400	357	143%
1000 producers use saving accounts with micro-finance institutions partners of the project	1,000	1,510	2,012 saving accounts	201%

Source: GREEN Activity Report (LogMon) as of September 2015

4.2.1 Objective 1: Increase vegetable production and improve marketing skills among smallholder farmers

By the end of September, the project output implementation rates highlight the following:

- 127% for the number of farmers trained in improved production techniques;
- 220% for the number of training days;
- 354% for the number of hours of extension provided by the facilitators;
- 516% for the number of producers participating in the information system of the market.

The significant positive results observed on these indicators were achieved through a combination of strategies such as “Farmers Field School (FFS),” which brings practical training sessions on-site, using actual fields to demonstrate the crop production techniques; cascading training using trained master trainers (training of facilitators and training of farmers by facilitators), and on-site farmer mentoring (the continuing action of extension/advisory support by facilitators and relay producers) to ensure the targeted vegetable producers are able to apply the training and to resolve any problems.

The survey showed that the training topics were beneficial to the farmers and in both category of beneficiaries⁶ (91% in Group 1 and 98% in Group 2), and were judged as being highly relevant to addressing technical and management problems, which also explains the high level of participation of vegetable producers (though 6,000 were targeted, 7,606 participated).

The same thing was observed for the vegetable price information system, introduced by GREEN; 82% (Group 1) to 85 % (Group 2) of producers found the messages highly relevant to understanding the local markets. It was the first time farmers had real time information about the markets, prices and fluctuation of vegetable products. Through the platform established with the assistance of ESOKO, the farmers received the information on their cellphones through SMS messages.

This method overcame the usual methods of market information based on newsletters in print format, which were obsolete by the time the producers received the information, as well as being more focused on other commodities (such as corn, soybean, cowpea, cassava, yams, and vegetable oils). Unlike these conventional systems, the GREEN VMIS offered an opportunity for vegetable producers to: a) know the evolution of prices and negotiate better prices; b) know new vegetable products demanded by the market and c) explore new markets through SMS reception and the opportunity to establish new business relationships.

Finally, producers were motivated to identify and discuss directly with buyers, which helped to establish permanent business linkages. The GREEN project initiated buyer-seller workshops, which complemented the SMS and established more formal sales and business relationships between the farmers and the market sellers.

4.2.2 Objective 2: Improve value chains and post-harvest skills

By this evaluation of the project, the indicator of trainings achievement rate in value chain and post-harvest treatment reached 214%. Regarding the connection with the market, no basic indicator value of this result had been set, but it was noted that 1,859 business relations were established between producers and vegetable sellers, most of whom are women. The establishment of business links was facilitated by the exchange visits organized between growers and traders. This action of the project brought the groups together and allowed the vegetable farmers to understand market needs and establish more formal business relationships.

In addition to the market and the SIM visits, GREEN organized three regional buyers and sellers’ meetings where traders exchanged with vegetable producers about their expectations (such as appropriate period of production for each crop, vegetable quality standards, types of vegetables demanded, etc.) and established bonds of trust for business (such as calendars of orders and product delivery, and deferred payment terms). These meetings increased the benefit of the initial increase in awareness by the market visits and the SMS price messages.

The “nutrition, hygiene and health” component under Objective 2 was not subjected to a needs gap analysis or part of the baseline data, as the framework of performance measurements had not included

⁶Category 1: producers who received only training and advisory support; Category 2: producers who received credit and the SMS market price messages in addition to training and advisory support (full package).

indicators for this component from the beginning of the project. However, significant results were observed. The collaboration with the District Health Centers (CCS) produced results such as the health awareness raising topics being broadcast on the radio and television.

In addition, 90 primary schools in the project zones benefited from project interventions (sensitization and training) of the schoolchildren, teachers and women responsible for school-based food catering. The themes of these interventions were: (i) the health benefits of eating vegetables; (ii) cooking demonstrations on how to keep the nutritional value of vegetables, (iii) combatting non-communicable diseases through good nutrition and early detection; and (iv) correct hand washing practices. Each of the 90 targeted primary schools were equipped by the project with 2 hand-washing basins, a supply of soap and towels.

Furthermore, the provision of producers with 495 high-quality chemical sprayers and protective equipment kits, including rubber boots and gloves, coveralls and gas masks, enabled targeted market gardeners to protect themselves and their field workers while spraying the crops with chemical fertilizers and pesticides. The farmers were also trained on how to use the equipment as well as the proper storage, transportation of chemical and disposal of empty containers.

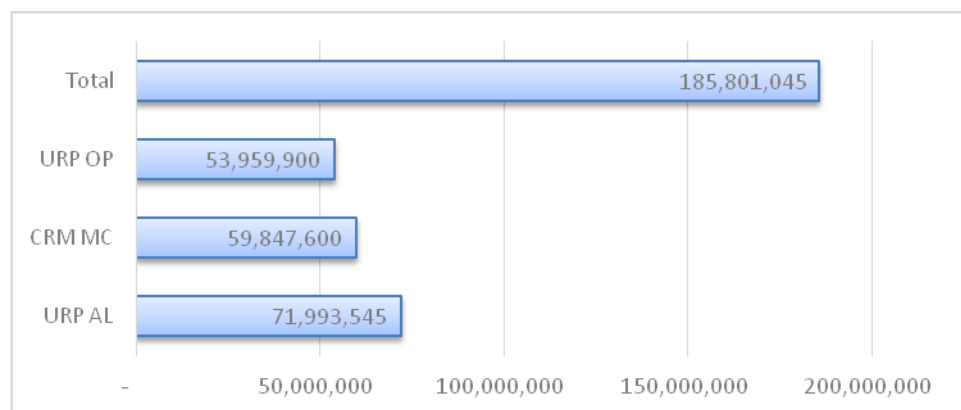
4.2.3 Objective 3: Increase financial services provided to targeted smallholders

The evaluation data collection confirmed that most indicator targets were achieved or surpassed. The output indicators achievement rate are presented as follows:

- 101% for training gardeners in entrepreneurship and the credit establishment;
- 101% for access to market information;
- 143% for the subscription to the death insurance, as part of the FECECAM credit;
- 201% for having a savings account with a microfinance institution.

Figure 4 summarizes the loans granted to producers throughout the project duration.

Figure 4: Credit in Francs CFA, granted to producers through the GREEN-FECECAM partnership



Source: from GREEN data

In the first cohort of credit, disbursed from 2013-2014, 142,999,895 FCFA (\$260,000) was loaned to producers and in the second cohort 42,801,150 FCFA (\$75,000) was loaned during 2015. A total of 185,801,045 CFA francs (\$335,000) were disbursed in 2,012 loans (more than 3 times the amount of the initial \$100,000 loan guarantee fund) to producers during the GREEN project. To receive credit, beneficiaries were required to open a bank account, which explains the high proportion of producers (201%) who met this requirement. In addition, all producers receiving credit were also included on the VMIS platform and trained on how to use the market price information.

With regards to the subscription of an agricultural insurance by market gardeners, subscription to products of AMAB were considered too expensive and did not meet the needs of the vegetable farmers, as the insurance refused to cover any of the common problems, such as flooding, pest infestation or plant diseases. Instead, death and disability insurance to cover the credit from FECECAM was introduced. This avoided groups or families from having to pay the debt of an individual that was deceased or disabled.

During the second round of credit, 357 growers benefited from this insurance, surpassing the targeted of 250, which accounts for an execution rate of 143%.

4.3 Synthesis of Outcome and Impact indicators

The following results table and narrative shows the indicators and outcome and impacts achieved under the three objectives as of January 2016 according to the data collected by the evaluation consulting team.

Table 5: *Outcome indicators of GREEN*

Indicators	Target Result	Mid-term evaluation	Final Evaluation	Achievement Rate
80% of trained producers adopt improved techniques	80%	82%	97%	121%
100% increase in production among targeted producers	100%	44%	169%	169%
Trained farmers increase their production cycle by 35%	35%	50%	95%	271%
50% of reduction in pesticide abuse among targeted farmers	50%	14%	59%	118%
70% of trained farmers are women	70%	38%	48.5%	70%
4,800 producers apply new technologies or management practices	4,800	6,667	7,390	154%
30% of increase in net income related to the sale of their products	30%	220%	226%	753%
9000 seasonal jobs created ▪ <i>SJ = Seasonal Jobs</i> ▪ <i>PJ = Permanent Jobs</i>	9000	4,526 SJ & 9,600 PJ	8,682 SJ & 4,570 PJ	147%
At least one sale agreement is signed by department	6	9	28	467%
30% reduction of post-harvest lost	30%	3	35.3%	117.67%
50% of increase in net income of producers who have received a credit	50%	223%	161%	322%
95% of reimbursement rate	95%	91.1%	93%	98%
70% of credit beneficiaries are women	70%	49%	36%	51%
Value of the subscription of a death insurance with FECECAM	NA	71%	72%	-

Source: *GREEN Logmons, midterm and final evaluation data*

4.3.1 Objective 1: Increase in productivity and vegetable production

According to data collected by the evaluation consulting team at the beginning of January, 2016, the GREEN project achieved the following outcome results:

- 97% of trained farmers adopted improved techniques or an achievement rate of 121%;
- 169% of increase in production of targets gardeners or a completion rate of 169%;
- 95% of extension of the production cycle or an achievement rate of 271%;
- 59% of reduction in pesticide abuse or an achievement rate of 118%;
- 48.5% of women trained or a completion rate of 70%;
- 7,390 farmers apply new technologies or an achievement rate of 154%.

Overall, these significant results were achieved by the producers applying the market orientation techniques and improved production technologies learnt during training. The results for beneficiaries were also due to gaining access to credit to procure inputs and install more efficient irrigation systems. The

results recorded in the project bi-annual reports were matched with data from field surveys conducted during this evaluation. The following was found: capacity building of farmers in crop management production increased knowledge and skills to improve vegetable farming and add product value. In fact, 98% of respondent producers acknowledged having benefited from training in improved vegetable production techniques.

The cumulative actions of capacity building, plus equipment acquisition had a multiplier effect on the performance of farms. Thus, vegetable production improved significantly (169% on average for the main crops) and plantings area increased 57% from 0.65ha to 1.02ha average. The increase in production included an increased number of crop cycles per year on the GREEN beneficiary farms and is confirmed by survey data shown in Table 6 below.

Table 6: Evolution of the number of main crops production cycle during the project speculation

Vegetable Crop	Number of production cycles before the project	Number of production cycle at the end of the project
Tomato	1.9	2.0
Hot pepper	1.2	1.4
Sweet Pepper	3	3.4
Lettuce	2.2	3.9
African eggplant	2.5	3.4
Amaranth	2.7	3.9
Source: Survey data		

Resolving farming issues that limited production:



Photo 1 : Manual watering (above) VS semi-automated watering with motor-pump



The difficulties of manual watering (requiring 15 to 20 liters each watering) was physically very difficult for farm workers and limited the cultivated areas. With GREEN access to credit, farmers procured gas-powered pumps and installed irrigation systems, which reduced labor costs and hardship, increased the field size and allowed farmers to produce all year long, even during the dry season. Gardeners are also able to diversify their crops and many have added new high added-value crops (such as cabbage, carrots, and African eggplant) along with growing larger crops of the more water sensitive vegetables (such as amaranth, and lettuce). The irrigation systems gave farmers the opportunity to produce according to the local market demand. This allows them to have a comparative advantage over producers who do not benefit from access to credit.

The survey also revealed that raising awareness and training on correct application of chemical pesticides decreased the abuse of chemical pesticides (59%). GREEN also raised awareness and assisted farmers to use protective equipment, which reduced the health hazard. However, for these indicators, in the absence of objective measurements of the

frequency and number of chemicals used and whether or not farmers used the protective gear, only observation and producers' statements could be used to collect this data.

The evaluation survey also looked at farmers' use of organic pesticides, which was found to be very low due to application issues, including:

- (i) The low availability of local organic pesticides ready for use and import registration difficulties of biological pesticides;
- (ii) The lower efficiency of biological pesticides compared to chemical pesticides;

- (iii) Consumers preferences for cleaner, brighter vegetable appearance, more easily achieved through chemical pesticides.

4.3.2 Objective 2: Strengthening value chain and post-harvest storage capacity

At the beginning of January 2016, the project values achieved according to data collected by the final evaluation consulting team of the outcome level indicators are:

- 226% increase in income related to the total gross sale or an achievement rate of 753%;
- 13,252 more jobs created or an achievement rate of 147%;
- 28 sales agreements signed by department 467% achievement rate;
- 35.3% reduction in post-harvest losses or 117% achievement rate.

In terms of new jobs, over 13,250 permanent and seasonal jobs were created (8,682 permanent) and 4,570 (seasonal) were created, surpassing the target of 9,000 seasonal jobs according to reports from the project management unit. These new jobs could be justified by the growing demand for labor created by the increased cultivated areas and number of production cycles. Survey data confirm these trends by calculating the number of work days required, rising from 4.2 to 5.2 to cultivate the increased planting cycles, which increased by 57% (0.65 to 1.02 ha).

Market-oriented production

Regarding creating and formalizing new business relationships along a number of vegetable value chains, 28 sales agreements were established between the vegetable farmers and market sellers. GREEN producers were trained on market oriented production, which means understanding which vegetables to grow to meet local demand. Training on the value chains included exchange visits between farmers and wholesalers traders of vegetable and with the ESOKO SMS messages of current prices, which enabled farmers to negotiate sales prices and know which vegetables are in greatest demand within the local markets.

GREEN farmers interviewed by the surveyors stated that they now gear production to the type and quality of vegetables demanded by the market sellers. A number have established sales with wholesalers, which gives them greater bargaining power. This is confirmed by the evaluation survey results that confirmed the number of contracts of 28 made by the end of September, though the initial goal of six, or one per state. This is a significant result as most business relationships are ad hoc informal agreements in Benin. Also, demand from markets has led to the introduction of new crops in the intervention area. These are: cabbage, onion, carrot, cucumber and pepper in Mono-Couffo and Chinese cabbage, thyme, coriander, spring onion, chives and turnip in the Atlantique-Littoral.

Capacity building actions for farmers on the technologies of drying and processing have opened other fields of sales and markets for the GREEN beneficiaries. The slumps in sales during the off-seasons and finding new markets for dried and processed vegetables increased sales through diversified production. Beneficiaries are now aware of this new niche they can exploit to increase revenues and better preserve unsold surpluses. Surveys conducted during the evaluation have shown a significant reduction (29%) of post-harvest losses.



Photo 2: Hand washing kit

Nutrition, hygiene and health

In terms of nutrition and hygiene, awareness campaigns and distribution of hand washing kits in schools contributed to raising awareness about the disease risk of dirty hands. Cooking demonstrations increased understanding about how to preserve nutrients and about good cooking practices. Indeed, the targeted market gardeners, and in particular women, claim to have acquired better cooking methods. These practices are beginning to be passed down from mothers to daughters, and among female members of a community or a farmers' group.

4.3.3 Objective 3: Improved access to financial services provided to farmers

The final evaluation conducted data collection of the outcome indicators at the beginning of January, 2016. The results were as follows:

- 161% increase in net income for producers who received total package of service, including training, market price information and credit;
- 93% for the loan repayment rate;
- 36% of women beneficiaries' credit;
- 72% of beneficiaries understood the importance of agricultural insurance products.

The GREEN beneficiaries receiving the total package of services (training on market orientated production; market analysis with the SMS messages; crop production training; micro-credit loans from FECECAM), increased their gross annual crop sales by 161%. Their average annual net income for the same periods increased by 226% due to increased volume sold and better negotiated prices. (See table 8 below)

Table 7: *Distribution of GREEN beneficiaries by level of income before and after the project*

GREEN farmers' evolution of annual vegetable crop sales and net income the beginning of the project (2012) to December 2015.				
Project Date	Project start (Feb 2012)	Mid-term (2014)	Project end (2015)	Percentage of Increase
Average Gross Sales	1,671,311 FCFA (\$2,786)	2,241,174 FCFA (\$3,735)	4,364,732 FCFA (\$7,275)	161%
Average Net Income	394,798 FCFA (\$658)	1,263,656 FCFA (\$2,106)	1,285,494 FCFA (\$2,142)	226%

Source: Survey data

Farmer Access to Credit

The evaluation survey found that access to credit was a major factor that enabled farmers to increase crop production, improve product sales and finally to increase their net income. The Table 8 presents a summary of the credit granted to producers throughout the project duration.

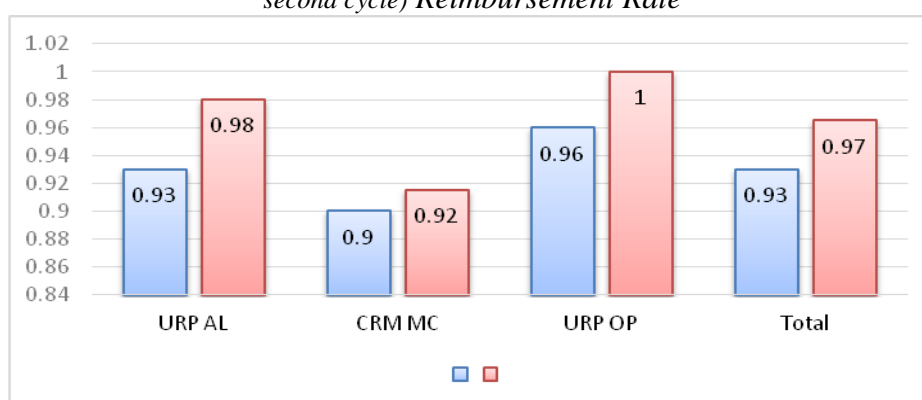
Table 8: Summary of credit from GREEN-FECECAM partnership

GREEN Region	1 st Cycle of Loans		2 nd Cycle of Loans		Total GREEN Credit
	Amount (FCFA)	Reimbursement Rate (%)	Amount (FCFA)	Reimbursement Rate (%)	
Atlantique-Littoral	54,446,995	93%	17,546,550	98%	71,993,545
Mono-Couffo	41,754,500	90%	18,093,100	91.5%	59,847,600
Oueme-Plateau	46,798,400	96%	7,161,500	100%	53,959,900
Total	142,999,895	93%	42,801,150	96,50%	185 801 045

Source: GREEN Report

Figure 5 presents the credit repayment rates:

Figure 5: Reimbursement rate by region according to credit cycles (blue is the first cycle of credit and red presents the second cycle) *Reimbursement Rate*



Source: from GREEN data

Concerning the credit, the following was observed:

- 1st cycle of credit: The average reimbursement rate was 93%. The Atlantique-Littoral (URP-AL) achieved 93% and the Oueme-Plateau (URP-OP) achieved 96%, the Mono-Couffo reimbursed at 90%. Unfortunately, in the second cycle of loans, the Mono-Couffo (CRM-MC) maintained the same lower reimbursement trend, achieving only 92%.
- 2nd cycle of credit: The average reimbursement rate to date is 97%. The URP-AL and URP-OP improved their reimbursement rates, achieving the repayment rates of 98% and 100% respectively. CRMMC has improved its performance slightly with a repayment rate of 92% (see Fig. 7);
- The total reimbursement of both cycles has an accumulated default of 7,987,806 CFA francs from a total credit of 185,801,045 CFAF, or an overall repayment rate of 95.70%. This is slightly above the repayment threshold allowed by FECECAM (95%) and certainly will increase before project closure as recovery actions continue at this time. This is a remarkable success. It should be noted however that the strong involvement of facilitators in these recovery operations puts them in conflict, at times, with the producers, who perceive these actions as contradictory to their training and advisory support role.

GREEN linked gardeners with FECECAM, giving this sector access to credit for the first time. Credits received helped improve the performance of the targeted market gardens (availability of inputs and labor). They also were able to increase production through procuring irrigation equipment which also raised the level of farm profitability and the well-being of households.

The evident success of Mr. Kokou Adjassou illustrates the impact of credit on farmers.

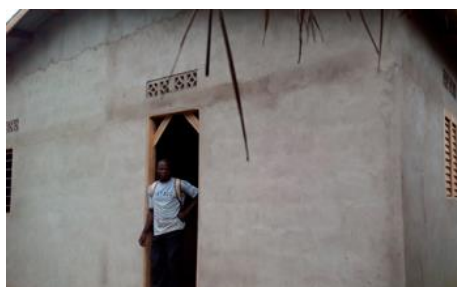


Photo 2 : Mr. ADJASSOU in front of his new house built using the income from his market garden

Mr. Adjassou is a farmer living in a village called Adohoun, in the Mono province. His specialties were corn, cowpea, and cassava, and a limited amount of vegetables, though he did grow peppers, African eggplant and tomato. He applied a number of GREEN's technical trainings to improve the quality of his vegetable crops and with the credit, Mr.

Adjassou expanded his operations and diversified his vegetable production. Profits from sales of his vegetables enabled him to finish building his house. Mr. Adjassou told us that: "It is thanks to GREEN that I own a new house." He added; "Once I finish paying off the credit with the sales of my latest crop of vegetables, I will be able to start furnishing our new house."

Mr. K. Adjassou will continue his membership in the CRM-MC and plans to apply for more credit from FECECAM even after the end of the GREEN project.

The evaluation credit survey data showed that virtually all the beneficiaries consider that credit was extremely relevant (97%), only 27% were satisfied with the amount of credit they received. Similarly, the majority of the beneficiaries (58.7% of market gardeners) felt that the credit repayment schedule was not suitable for market gardening. About the credit amounts, the decreased amount of loans between the 1st and 2nd cycles of credit was not to the liking of all beneficiaries. Frustrations were most felt in Ouémé-Plateau and Atlantique-Littoral. In these areas, many gardeners who had repaid their first round of credit were disappointed with the small amounts granted to them in the second round. While citing these complaints, it should be noted that some of the farmers are accustomed to projects that provide grants and subsidies rather than credit, which though loans provide the most flexibility to procure inputs as the farmer wishes, but also requires repayment.

4.4 The project innovations

A number of GREEN activities had significant results, and the project innovations have impressive potential. The findings, observations and data collected from beneficiaries on project activities (see 3.3.) highlight the results of the following innovations:

- The solar pumping system introduced on a pilot basis on some farms is an innovation useful to market gardeners and other farmers. This newly installed equipment represents a positive step in improving the irrigation of vegetable plots. While questions remain about its long term efficient use and maintenance, it has a potential to develop more efficient and cheap irrigation operations. Irrigation techniques using solar energy open up new prospects for sustainability of market garden production systems and environment protection through the promotion of renewable energy. In addition to the positive statements of southern vegetable farmers, gardeners from other regions (Borgou/Alibori) have expressed the desire to acquire new equipment.
- The attempt to design insurance for agricultural risks specific to vegetables was a first in the agricultural sector of Benin. Following a study conducted by a national insurance company called the Association of Agricultural Insurance of Benin (AMAB), they developed a policy for vegetables. However, the policy offered to the producers was not acceptable to GREEN farmers as it was too expensive and did not cover any of the most common issues such as weather or pest damage. However, it still served as a basis for the development of combining insurance with grants provided by the Belgian NGO, CTB in the Western State of Mono. In addition, the GREEN project negotiated to add life insurance for the credit beneficiaries to prevent other group or family members or family becoming burdened with the debt if the borrower died or became disabled. Both types of insurance deserve further study.
- The introduction of the vegetable market information system by a Ghanaian company called ESOKO in partnership with the Benin mobile telephone company Moov, was an innovation which helped the GREEN beneficiaries change agricultural practice and become market oriented. Even though use of the system was

limited by the high rates of farmer illiteracy, it opened new opportunities for the sector actors to master market prices, as well as the demand and flows of produce prices during the year. Formerly, without knowing the market prices, producers would be forced to accept wholesaler offers, which often come to the fields to buy vegetables.

However, with the ESOKO system, producers became used to the concepts of weighing and calculating margins for fixing selling prices. Beyond its use by the targeted GREEN vegetable farmers, this service could be used for other agricultural crops and may contribute to significant improvement in farmer incomes. It should also be emphasized that the potential of ESOKO services possible is still insufficiently exploited. For example, in addition to the price SMS, the system can post offers to buy and sell; provide technical advice; provide weather forecasts, etc.

In addition to the innovations mentioned above, other interventions of the GREEN project that should be capitalized include:

- The financing approach of producers through credit which, while not being new, better empowered growers and caused them to practice a more entrepreneurial approach to their farming operations;
- Initiation of vegetable producers to a market-oriented approach to production, and strengthening business links between vegetable producers and traders, were important steps towards establishing a sustainable business contract and guarantee long term market access.

4.5 Impact of the project

It can be stated that the GREEN project contributed to improving the standard of living of vegetable producers in Benin. In view of the overall objective, this expected impact is reflected in the answers to two major questions:

- (i) Did the vegetable producers targeted by GREEN increase production and income from vegetable sales?
- (ii) Has the GREEN project improved agricultural entrepreneurship within the vegetable sub-sector?

The results of the implementation of the three major components of activities and their effects in terms of behavior change of project beneficiaries showed globally:

- A change in knowledge, skills and practices that has significantly improved the productivity of vegetable farms, through (i) adopting new techniques and production technologies, and post-harvest management skills, (ii) improving marketing practices, and becoming market oriented in production; (iii) improving farmer hygiene and nutrition, etc.;
- Strengthened organizational capacity and vegetable organizational management;
- Increased beneficiary savings, first time access to credit, which resulted in an acceptable rate of reimbursement that allowed vegetable producers access to formal channels of financing their activities.

Recorded statements of beneficiaries' perception regarding their state of well-being, though subjective, indicate strong trends towards:

- Improving beneficiary access to the amount and quality of food (contribution to food security);
- Increasing beneficiary revenues;
- Improving farm working conditions (better equipment and reduced physical hardship);
- Improving production and growing conditions (such as improving production knowledge and skills, and reducing pest risks);
- Increasing income, which provides access to better basic services (education of children, housing etc.).

4.6. **Relevance, effectiveness, efficiency and sustainability of GREEN**

4.6.1 Relevance of project intervention

The GREEN project was specifically designed to improve production and address issues of the vegetable sub-sector in the south of Benin. Although part of the thirteen priority product chains of PSRSA, vegetables had so far benefited from only a few interventions of limited scope. The initiatives of other projects primarily gave grants for equipment without considering all the vegetable farmer cultivation needs. The agribusiness development model of development of GREEN is a holistic approach providing capacity building and solving problems that limited farmers' knowledge of and access to local markets. Both the farmer associations and the Ministry of Agriculture extension agency, CARDER confirmed the relevance the project. This integrated model, despite some noted challenges proved its effectiveness by producing significant field results during the three and a half years evaluated.

- **Goals aligned with target group needs**

The vegetable sector in Benin is hampered by several constraints, including: *a) lack of access to credit (due to significant risks), b) low water control, diseases and pests; c) high perishability of garden produce; d) low capacity of traditional production tools, e) limit market knowledge and access.*

The GREEN project addressed the needs of growers by activities providing: (i) Training for improved of crop production (including learning how to deal with diseases and pests), (ii) reducing post-harvest losses through improved harvesting techniques and preservation /processing of harvested vegetables; (iii) facilitating access to credit and; (iv) creating market oriented production and strengthening relations of producers to the market through a market information system and vegetable value chains approach. GREEN successfully addressed the vegetable gardeners' needs with innovative approaches and mechanisms that in large part are able to continue after the project end.

- **Effectiveness and efficiency of implementation to achieve project goals**

As previously stated, the objectives of the GREEN project are:

1. *Increase Vegetable Production and Improve Marketing Skills among smallholder farmers through training and extension.*
2. *Improve Value Chain and Post-Harvest Skills by building the capacity of farmer associations to provide improved services to their members.*
3. *Increase Financial Services Provided to Targeted Smallholders by increasing access to loans and training in business/financial management*

Strategies and approaches to achieve these objectives are based on: (i) creating a market oriented approach to production and (ii) implementing project activities with local agriculture partners of regional producers' associations. The strategy of putting the regional organizations of producers (URP and CRM-MC) as the field activity implementers facilitated a more sustainable approach to project activities.

By anchoring these rural organizations as the central field actors, it was possible to reach a large number of gardeners. Furthermore, playing this role provided these structures the opportunity to develop and strengthen their own capacity to deliver more and better services to their members, which is in line with the key objectives of GREEN. This is especially important in the current context, where public agricultural structures are less active in sectors other than cotton. Therefore, producer organizations have a key role in boosting other sectors in general and in this case, gardening.

The technical training on crop production and market orientation helped strengthen the technical services of these regional associations while the financial and business management training assisted them to be more efficient managers. In addition, it was noted that the associations are now able to help the market gardeners with their applications for credit, supporting the GREEN finance access objective.

- **Project coherence with country strategies and other interventions**

The GREEN project implemented by PfD-Benin is in harmony with the strategic documents that guide the agricultural sector in Benin. Comparing GREEN to the Strategic Plan for Agricultural Sector Recovery (PSRSA) and the National Agricultural Investment Plan (NAIP 2011-2015), the objectives and project intervention are perfectly in line with the "Development of market gardening sector" sub-program. The support of PfD through GREEN is especially relevant as the project addresses virtually all of issues of this sub-program.

It should also be noted that the GREEN choice of intervention areas and the target group are in line with the development orientation of "pro poor". Moreover, the GREEN strategy and approach raised no perceptible contradictions or possible conflicts with other active projects in the vegetable sub-sector. However, GREEN's synergy and complementarity with other donor or government funded projects, which should underpin similar projects was not very clear.

4.6.2 Sustainability of project interventions

Sustainability indicators were not explicitly defined in the agreement document of the GREEN project. However, sustainability of GREEN can be seen as gardeners will continue to implement action that significantly increase their crop productivity (labor, yield and production) and will continue with being marketed oriented (volumes sold and remunerative prices for fresh and/or processed products, plus continuing formalized business relationships).

The analysis developed above on the results (3.3) and effect (4.1 to 4.3) of the project show that most of the above elements of sustainability are established at this stage of project completion. However, the question of GREEN sustainability also arises in terms of ensuring that the support provided by the project will be maintained and reproduced by local actors / beneficiaries after closure.

Stakeholder analysis and approach of their linking (see 3.2) shows some weaknesses in the reproducibility of the project's transfer of its mechanisms and methods to its field partners. In other words, are these actors able and willing to continue the support activities initiated by the project? This aspect of GREEN's intervention sustainability requires that the resources to carry out these activities are available and that the public and private structures of the vegetable sector become more financially independent. The box below outlines the needs of the associations to continue activities:

- ✦ The URP AL and OP and the CRM MC find ways and means to finance training in the technical skills strengthened by the project (and through the facilitators and farmer mentors);
- ✦ The information system on the market within the gardening sector actors should continue and be strengthened through logistical arrangements with other donors, allowing a broad use of the tools developed and to update them regularly;
- ✦ The associations continue to support gardeners in entrepreneurship, and professionalization;
- ✦ FECECAM continues to work with the associations to continue funding microcredit loans to the vegetable farmers.

Following is a sustainability analysis of GREEN intervention areas:

- **As part of capacity building and technical support for producers**, the GREEN project used facilitators recruited by the regional umbrella organizations of producers (URP, CRM). These agents are under fixed-term contract, and it is likely that this technical support will stop after the project ends. This is the same for the producers used as local farmer mentors. From the perspective of sustainability, it would be desirable for these effective technical support agents to continue training market gardeners that could gradually make a snowball effect to allow all the vegetable value chain actors to be trained.

In this perspective, CARDER, the Ministry of Agriculture regional training institute, should be trained on the various production and marketing techniques. Furthermore, PfD should ensure the publishing and

distribution of specific sheets and technical manuals, which could also contribute significantly to the sustainability of these technical training gains.

- **With regard to access to financing**, the project's capital guarantee fund positively facilitated producers' access to credit with FECECAM and with more flexible terms. Though at the end of the project this system could falter too, as it is uncertain FECECAM will continue to provide loans without the warranty offered by GREEN to cover credit risk. However, a number of GREEN farmers have been able to secure microcredit based on their learned business management skills of drafting solid business plans and on establishing good credit rating by timely reimbursements. To ensure new and continued microcredit lending, other donor support should be sought for additional loan capital guarantee funding.

- **Access to market information by ESOKO** was a success with gardeners, because it offered a new and practical method for agricultural producers to understand and respond to the local markets. It should be continued and strengthened; particularly in developing the tools for purchase and sales. However, the durability of this system depends primarily on the ability of producers to organize and to set up a subscription mechanism and information gathering system. This could be achieved by incorporating other agricultural sectors in order to increase the number of subscribers and reduce costs. It appears that the VMIS, although it is considered as an interesting innovation, has questionable sustainability as it leaves questions about after GREEN sources of financing.

Specifically, access to this SMS service requires approximately 5,000 subscribers for the license category of "Platinum" and would cost about 92 million CFA francs per year and without the costs of staff training, maintenance and support of market agents. PfD has only 2,500 subscribed gardeners and each of them would have to pay a monthly fee of 2,000 CFA francs for the service in the absence of GREEN. This amount is considered too high by market gardeners who prefer to share the information received among them rather than subscribe individually. Therefore, as stated, the sustainability of such information device requires other donor funding and increasing the number of subscribers by extending it to other crops and other regions.

- **Irrigation techniques by solar energy** opens up new prospects for sustainable vegetable production systems within a context of reducing costs and protecting the environment by promoting renewable energy. However, the initial high cost of the technology requires a pooling mechanism among farmers to share the costs of the initial investment. Thus, the equipment must be installed primarily to functional groups. Establishing a system of renting the equipment or providing groups with credit could also be considered. Further sustainability questions about the availability of spare parts and specialized technical staff for maintenance are also key issues to be resolved to facilitate the adoption and diffusion of the innovation.

Other socio-economic constraints that could affect the sustainability of the GREEN project are:

- a) Lack of a consultative framework for stakeholders and mechanisms to create synergy among projects / programs operating in the gardening sector;
- b) Weak support mechanisms to assist vegetable growers in adapting to and recovering from periods of extreme climate;
- c) Government's continued focus on the cotton sector at the expense of others crops, such as vegetables;
- d) Lack of formal supply and distribution systems of the specific inputs required by vegetable crops and farmers.

4.7 Project Implementation Issues

The implementation mechanisms of the GREEN project were relatively simple, and the PfD project management unit was light due to delegating activities to the strategic field partners. Interviewed actors agreed that it functioned well and often commented on the ease of collaborating with PfD. The project partnered with the regional farmer associations, which were trained by GREEN field agents in technical and membership service skills before carrying out capacity building training of targeted vegetable farmers.

For example, the project facilitators trained the association staff on how to assist the farmers to develop business plans, which are an essential part of applying for credit.

However, in the latter part of the GREEN project, problems arose in loan repayment in some localities as the microcredit institution called FECECAM was not playing its role to recover the loans. This necessitated a stronger involvement of the GREEN field agents, the URPs and the CRM-MC and the PfD management team to ensure maximum loan repayments. This caused confusion with a few of the farmers, as they saw this as somewhat contradictory functions (loan recovery VS assistance) and in some places⁷ negatively impacted the relationships among actors.

At the beginning of the GREEN project a couple of partner initiatives were not successful. This is the case of the initiative to provide crop insurance, which was explored with a local agricultural insurance company called AMAB. Though they conducted a study into whether vegetable farmers could be insured against loss, the initiative was cut short as the feasibility study indicated that they could not cover the most common issues of vegetable farming, such as loss due to weather or insect infestations.

The second unsuccessful venture at the beginning of the GREEN project involved the World Food Logistical Organization (WFLO), which was contracted to research post-harvest management to reduce loss. However, it quickly became apparent that they did not understand farming in the West African context and recommended inappropriate technology, such as expensive refrigerated storage units, which none of the farmers could afford and there is no technical maintenance available in Benin. In this case, the error was quickly noticed by PfD, who corrected the intervention to produce post-harvest management results through improved harvesting techniques and stronger market connections that reduced transport time.

In the partnership structure of the project it appears that opportunities were missed for additional partnering and synergies with other institutions that could have collaborated and/or supported the interventions of GREEN. Examples include:

- The Ministry of Agriculture, Livestock and Fisheries and its decentralized structure called CARDER, which has a role in the development of the agricultural sector. While recognizing the efforts of PfD to share information with them about GREEN activities, their involvement in its implementation was limited to sporadic meetings. Though this technical branch of the Ministry of Agriculture was not formally associated with the project activities at the beginning of the project, there was improved cooperation later in the project, following a recommendation of the mid-term evaluation. Specifically, field agents of the DPFA and CARDER participated in GREEN's semi-annual partner and stakeholder meetings. These sessions also involved other NGO interested in the agricultural sector, and were opportunities for exchange and discussion of activities implementation and those planned for the following semesters.
- The market gardening program (PCM) of INRAB could also have shared research and technologies with the GREEN project. The project did, however, partner with INRAB for post-harvest technologies, standards and PfD used textbooks designed by INRAB.
- The lack of direct involvement of public authorities; in particular, the municipalities, which are important actors for issues affecting urban and peri-urban market gardening. These local government authorities are important to vegetable farmers, who often rent the fields, including the providing authorization to establish irrigation, solving problems of land ownership and renter security, etc.

These partnerships could have assisted the GREEN project in terms of building mechanisms of mutual reinforcement and capitalization of results, which in turn, could promote the sustainability of some of the project interventions.

⁷ The most instructive cases are seen in municipalities of Comè and Dangbo.

- **Issues with the Gender Performance and Results Indicators:**

As previously noted in the output and outcome indicator results section, the number of women farmers benefiting from the GREEN interventions did not meet the targets. This was the case for both the training and credit activities. Specifically, women represented only 48% against a target of 70%. This is explained by the fact that a lower proportion of women are farmers. The causes of the gender inequality are issues of land access for women, and the high cost of establishing the garden. Though groups of women do farm, individual women are more likely to be wholesalers and retail market sellers.

5. CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

5.1. Conclusions about the GREEN project

Overall, the evaluation mission found that despite a few shortcomings previously noted, GREEN positively impacted vegetable gardeners in southern Benin. The positive impact included improved production practices, providing greater market access and giving vegetable farmers access to credit. The project also contributed to ongoing efforts in community nutrition and health.

The analysis of the main results and evaluation questions on the relevance, coherence, efficiency and sustainability of the project, identified the strengths and weaknesses relating to GREEN's implementation. A number of gains should be capitalized by other projects and initiatives, but a few shortcomings were also noted.

Results and Impact:

1. As virtually all of the indicator result rates achieved more than 100%, the overall performance of the project was very good;
2. The implementation strategies of the project including the partnership with the farmer associations and the involvement of support structures, created a dynamic field based learning, dialogue and exchange; facilitating improved cultivation and increased crop production and revenues within the vegetable sub-sector;
3. By providing a loan capital guarantee fund to FECECAM and training the producers on drafting solid business plans, GREEN facilitated the vegetables gardeners access to credit, most for the first time;
4. The market-oriented approach of GREEN enabled vegetable producers to have a more rational, market-demand production approach.

In addition:

- GREEN interventions are consistent with national strategies and complemented the intervention of other partners; it also provided concrete answers to the major constraints hampering the development of the gardening sub-sector, through approaches and mechanisms more responsive to the farmers' production issues and needs;
- Coupling the participatory analysis of value chains with technical training, advisory support and the SMS system of market price information, led to the development of formal business relationships. The combination of these elements resulted in more than 2,000 vegetable farms with improved productivity and competitiveness and increased revenues.
- Efforts in initiating vegetable growers to comply with recommended phyto-sanitary standards and good practices of hygiene and nutrition, helped improve the quality of production and the safety of vegetable products and farmers. In addition, with the innovations such as introducing solar-powered irrigation, new models were introduced for modernizing vegetable farms while helping to safeguard the environment.

In terms of pertinence and coherence of the intervention: GREEN proved to be innovative in its approach to the market-gardening sector, through a model of agribusiness development which combines reinforcing capacities and solving the principal problems of knowledge about and how to meet local market demands. GREEN objectives are aligned with the needs of the target groups and the approach of interventions accomplished the project's objectives. In addition, the project supported the Ministry of Agriculture's objectives and strategies, as well as other interventions in the sector.

In terms of efficacy of the project: GREEN's approach of an integrated agro-business model and strategy of partnering with the farmers' associations made it possible to achieve the three specific goals of the

project, with more than satisfactory rates of achievement for virtually all the indicators and it is evident that the results and impacts are ascribable to the actions of the project. A few points of non-achievement were noted, and in particular the question of gender equity and agricultural insurance, as well as the late implementation of certain activities such as hygiene, nutrition and health, and the innovative irrigation by solar energy.

Durability of the interventions: The interventions of GREEN project allowed an appreciable increase in the productivity (work, outputs and productions) and improvement in farmer market knowledge and market oriented production, which increased local products in the market (marketed volumes and remunerative prices of the fresh and/or processed products). The durability of these effects is likely to remain as the skills and processes taught by the project enabled the producers to increase production and sales revenues. The continued access to microfinance will be dependent on the good credit record of the producers, and therefore will also continue for those who repaid GREEN facilitated credit in a timely manner. The Esoko SMS market information is not likely to continue, though farmers surveyed indicated that they had saved the messages for future reference.

5.2 Limitations and/or deficiencies:

The following limitation and/or weaknesses were noted:

- The unfortunate implication of project facilitators in credit recovery, which caused negative elements in their relationship with the producers in some localities where the farmers were delinquent in loan repayments;
- The lack of interaction of the regional associations of producers in relation to other stakeholders, which could further limit their ability to continue providing adequate and sustainable services to growers after the project ends; activity
- The non-viability of agricultural insurance due to misunderstanding of the insurance objectives by AMAB, which resulted in an inadequate and expensive policy which was rejected by the GREEN producers;
- Factors affecting the sustainability of the ESOKO VMIS: a) the sociological aspects of Benin, which tends to deny the monetary value of information; b) the low levels of literacy among the farmers, particularly of women, limiting exploitation of information available on the SIM platform; c) the high cost of setting up the platform that makes it unsustainable.

These shortcomings and constraints do not fundamentally undermine the value of the GREEN project intervention model. Rather, they show the extent of the challenges that need to be met in short and mid-term to preserve the dynamics of the project and ensure capitalizing its results, and achievements.

5.3 GREEN Project Lessons Learned:

- *Agricultural insurance:* To date, support for vegetable producers in underwriting agricultural insurance products is not the right option because the products offered by AMAB are not in tune with the current needs of vegetable producers (will not cover weather or insects).
- *Credit:* Though microfinance credit is essential to GREEN's agro-enterprise development model and in order for targeted farmers to meet market demand and increase production, a rigorous system of evaluating applications and monitoring repayments needs to be in place. This system must be managed by both the microfinance lending institution and the farmer associations as well as supported by the project. This will reduce the repayment difficulties observed in some regions (such as the Mono - Couffo).
- *Producers' capacity building:* The need for training farmers is real and will continue. This field based activity should be met by the farmers' associations and Ministry of Agriculture regional training institution, CADRE. The agents should continue training on cultivation skills and knowledge as requested by vegetable producers.

- *The market information system:* The VIMS product offered by Esoko through the project is not sustainable by GREEN beneficiaries as there is not a critical mass of subscribers necessary to pay for the running costs of the platform. Therefore, it cannot be sustained without project funding.
- *The photovoltaic irrigation:* The cost of photovoltaic technology associated with irrigation remains above individual farmers' incomes. One possible solution is for groups to share the initial equipment costs.

5.4. Recommendations: what are the after-GREEN prospects?

The GREEN project will end in a few months, providing the opportunity to respond to the following recommendations of this final evaluation:

- PfD should organize as quickly as possible with all stakeholders the reviewing of achievements of the project and transfer technical and management knowledge and skills, to potential partners, which could continue the activities (public structures, decentralized Authorities, OPA, NGOs, other projects and programs, etc.). To facilitate this process, all the technical training documents and information on the processes, mechanisms and innovations made by GREEN, should be collected and provided to these organizations. For example, the new IFAD project is specifically designed for gardening sector (PADMAR), and has already indicated that it plans to capitalize on the achievements of the GREEN project.
- To continue the internet based information system of relaying agricultural markets on an electronic platform is now considered by all stakeholders as an important management tool for producer-merchant relations in the gardening sector and in other agricultural sectors as well. It would be advisable to bring other structures to study ways and means to take over (government agencies, or other donors). The Belgian NGO, CTB, has indicated its interest in taking over the system and PfD should assist them in capitalizing on the GREEN experience.
- The installation of irrigation systems using solar energy occurred during the extension phase of the GREEN project. However, the initial results show that this system can provide substantial savings to the vegetable farmers if a large number of groups, including those of women, have access to it. It is an achievement that must be maintained and consolidated by involving technicians (rural development and equipment) from CARDER, project coordinators with a market gardening component and financial institutions for support to producers wishing to modernize their farms. Currently the German NGO, GIZ, will provide a 40% grant to farmers installing solar systems. This could encourage groups to support the initial high cost of the systems. In addition, as the solar panels and pump are guaranteed for 25 years, the groups would realize profit once the cost of acquisition is covered.
- The project GREEN has left open the issue of agricultural insurance, which could assist farmers with a safety net for growers in case of calamities, such as the increasingly volatile weather due to climate change. It is necessary that other support structures for market gardeners review the feasibility and mechanisms of establishing this service.

Attachment: Survey Method and Approach

I. Target population and observation units

The target population is the set of small vegetable producers in southern Benin who received support from the GREEN project. Two (02) categories of farmers will be studied:

- Category 1: vegetable gardeners, who were beneficiaries of only the training and in field advisory support;
- Category 2: vegetable gardeners, who benefited from the full intervention package, including the VMIS and market demand activities (market visits and regional market-seller and vegetable farmer workshops), microcredit as well as the training and in field advisory support.

The observation unit is the market gardener (vegetable farmer).

II. Survey basis and sampling method

2-1. Survey basis

The survey list will be drafted using the complete lists of GREEN beneficiaries, found at both the Regional Unions of Producers and PfD levels. The survey will be based on randomly selecting names from lists of the two categories of beneficiaries noted above.

III. Sample size

According to the study Terms of Reference, the size of the Group 1 sample (Gardner-beneficiaries of training and follow-advice) is 100 respondents and that of Group 2 (Gardner-beneficiaries receiving the full intervention package) is 300 respondents.

Following is the distribution of the number of credit beneficiaries per municipality and the sample size of Group 2:

- ✓ twelve (12) municipalities will be investigated, four (04) municipalities by region;
- ✓ The size of the Group 2 sample is 32 surveys by municipality in both the regions of the Atlantique-Littoral provinces and Ouémé-Plateau provinces and 11 surveys in the Mono-Couffo provinces.

❖ Eligibility criteria for municipalities

In choosing the municipalities, it is necessary that the selected municipalities have at least the number of beneficiaries in the two categories to study, plus a margin for possible replacement of selected gardeners. To do this, the eligible municipalities in the provinces of Atlantique-Littoral and the Ouémé-Plateau provinces are those with a minimum number of 42 beneficiaries of credit, adding a margin of at least 10 respondents on the sample size of 32 surveys in each region. In the Mono-Couffo provinces, eligible municipalities are those with a minimum number of 17 beneficiaries of credit, a margin of at least 6 respondents on the size sample of 11 individual surveys.

❖ Inclusion of Gender

The mission will seek representation of women in the sample as their relative weight in the target population or where appropriate, at a rate of representation of at least 40%.

Table 1: Sampling Synthesis

Region (province)	Number of municipalities surveyed	Group 1		Group 2		Total	
		Number of Surveys per municipality	Sample Size	Number of Surveys by municipality	Sample Size	Total Surveys by municipality	Sample Size
Atlantique-Littoral	4	8	32	32	128	40	160
Mono-Couffo	4	9	36	11	44	20	80
Ouémé-Plateau	4	8	32	32	128	40	160
Overall	12⁸	-	100	-	300	-	400

The districts sampled are as indicated in the table below:

Table 2: Municipalities selected for survey

Region	Province	Municipality
Atlantique-Littoral	Atlantique	Allada
	Littoral	Cotonou
	Atlantique	Sô-Ava
	Atlantique	Zè
Mono-Couffo	Mono	Comè
	Mono	Grand popo
	Mono	Houéyogbé
	Couffo	Lalo
Ouémé-Plateau	Plateau	Adja-Ouèrè
	Plateau	Ifangni
	Ouémé	Porto-Novo
	Ouémé	Sèmè-Podji

IV. Distribution of interviewers and controllers

The final evaluation is expected to take eight (8) field days including two days of travel time. The number of questionnaires to be completed per day per interviewer is 4 questionnaires. The survey system is made of a team (interviewers and controller) for two municipalities, or a total of 6 teams.

Given the sample size by region, an evaluation team will be composed of a (01) controller and four (04) interviewers in the regions of the Atlantique-Littoral and Ouémé-Plateau provinces. It will include one (01) controller and two (02) interviewers in the Mono-Couffo provinces. The team composition is summarized in the table below.

Region	Province	Municipality	Number of Controllers	Number of Interviewers
Atlantique-Littoral	Atlantique	ALLADA	1	4
	Littoral	ZE		
	Atlantique	SÔ-AVA	1	4
	Atlantique	COTONOU		
Mono-Couffo	Mono	Comè	1	2
	Mono	Grand Popo		
	Mono	Houéyogbé	1	2
	Couffo	Lalo		
Ouémé-Plateau	Plateau	Adja-Ouèrè	1	4
	Plateau	Ifangni		

⁸Allada, Zè, Sô-Ava, Cotonou, Comè, Grand Popo, Houéyogbé, Lalo, Adja-Ouèrè, Ifangni, Porto-Novo and Sèmè-Podji

Region	Province	Municipality	Number of Controllers	Number of Interviewers
	Ouémé	Porto-Novo	1	4
	Ouémé	Sèmè-Podji		
Total			6	20

Annex 1 : Distribution of the number of credit beneficiaries per municipality

Region	Municipality	Number of male farmers surveyed	Number of female farmers surveyed	Total
Atlantique-Littoral	ABOMEY CALAVI	30	9	39
Atlantique-Littoral	ALLADA	27	16	43
Atlantique-Littoral	COTONOU	51	9	60
Atlantique-Littoral	KPOMASSE	22	28	50
Atlantique-Littoral	OUIDAH	30	12	42
Atlantique-Littoral	SÔ-AVA	126	35	161
Atlantique-Littoral	TORI-BOSSITO	7	8	15
Atlantique-Littoral	ZE	20	23	43
Mono-Couffo	Athiémè	16	0	16
Mono-Couffo	Bopa	9	5	14
Mono-Couffo	Come	13	22	35
Mono-Couffo	Djakotomey	7	12	17
Mono-Couffo	dogbo	2	0	2
Mono-Couffo	Grand popo	27	28	55
Mono-Couffo	Houéyogbé	9	11	20
Mono-Couffo	Klouékanmey	4	11	15
Mono-Couffo	Lalo	3	15	18
Mono-Couffo	Lokossa	5	3	8
Mono-Couffo	Toviklin	5	3	8
Ouémé-Plateau	Adja-Ouèrè	25	65	90
Ouémé-Plateau	Adjohoun	11	56	67
Ouémé-Plateau	Akpro-Missérété	6	24	30
Ouémé-Plateau	Avrankou	8	58	66
Ouémé-Plateau	Dangbo	59	21	80
Ouémé-Plateau	Ifangni	22	30	52
Ouémé-Plateau	Porto-Novo	19	35	54
Ouémé-Plateau	Sèmè-Podji	35	24	59