REPUBLIC OF TURKEY
ONDOKUZ MAYIS UNIVERSITY
INSTITUTE OF SCIENCES

# THE IMPACT OF THE PROJECT DEVELOPMENT AND AGRICULTURAL INVESTEMENT PROGRAM IN GABON (PRODIAG) ON THE AGRICULTURAL FARMS IN NGOUNIE PROVINCE

Tanguy NKOUAH YALI

MASTER'S DEGREE THESIS

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**Tanguy NKOUAH YALI**

**DEPARTMENT OF AGRICULTURE ECONOMICS**

**SAMSUN**
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## THESIS APPROVAL

This thesis work entitled **"The Impact of the Project Development and Agricultural Investment Program in Gabon (PRODIAG) on the Agriculture Farms in Ngounie Province"** prepared by Tanguy NKOUAH YALI has been recognized as a **Master's Degree Thesis** of the Department of Agriculture Economics of the Institute of Sciences of Ondokuz Mayıs University on of 16/12/2016 by the following jury.

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## ETHICS STATEMENT

This thesis which I prepared in accordance with the rules of the Ondokuz Mayıs University Institute of Science contains correct and complete information and that during all the stages of production I adhered to scientific ethics and all information sources from which I benefited from are indicated on the references section.

# ÖZET

Yüksek Lisans

GABON'DAKİ PROJE GELİŞTİRME VE TARIMSAL YATIRIM PROGRAMININ (PRODIAG) NGOUNİE İLİNDEKİ TARIM İŞLETMELERİNE ETKİLERİ

Tanguy Nkouah Yali

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Bu araştırmada, Proje Geliştirme ve Tarımsal Yatırım Programının (PRODIAG) Ngounie İlindeki (Gabon) tarım işletmelerine kısa dönemli etkilerini değerlendirilmesidir. Ülkede tarım sektörü, var olan potansiyeline rağmen gelişmemiştir. Tarım sektörünün gayri safi hasıladaki payı yaklaşık %5 olup, ülke yurt içi gıda talebi açısından büyük ölçüde (%60) ithalatçı ülkelere bağımlıdır. Araştırmanın verileri, Ngounie İline bağlı Douya-onoye ve Louesti-wano ilçelerinde PRODİAG'dan faydalanan çiftliklerden elde edilmiştir. Araştırmanın birincil verileri, Fransız Kalkınma Ajansının yayınladığı proje metni esas alınarak hazırlanan anket formlarıyla elde edilmiştir. Anketlerle elde edilen veriler SPSS programına girilerek temel tanımlayıcı istatistikleri (frekans dağılımı ve oranları, ortalama, standart sapma, minimum, maksimum) hesaplanmıştır. Proje uygulamasının işletmelerin sosyo-demografik, tarımsal ve ekonomik değişkenlerinde oluşturduğu değişimlerin istatistiki olarak anlamlı olup-olmadığı ise parametrik verilerde t-testi, parametrik olmayan verilerde ise khi kare testi ile ortaya konulmuştur. Projenin kısa dönemde işletmelerin üretimle ilgili çoğu değişkeninde önemli pozitif etkilerinin olduğu ifade edilebilir. Projenin etkisiyle çiftliklerin teknik kapasitesinde, tarımsal enformasyon ve girdilere ulaşımda, çiftçilerin örgütlenmesinde, tarımsal üretim ve gelirlerde önemli gelişmeler olmuştur. Çoğu değişkende yaşanan iyileşmelere rağmen çiftçilerin üretim sürecinde problemlerle karşılaşmaktadırlar. Bitkisel ürünlerin üreticileri tarımsal alet-ekipman, kiralık işgücü ve finansman temininde, sebze üreticileri ise tohum ve sera temininde sorunlarla karşılaşmaktadırlar. Hükümet ve konu ile ilgili politika kararlarını alanlar, çiftçilerin girdiler, enformasyon, finans ve katma değeri yüksek piyasalara erişimlerini kolaylaştırıcı sürdürülebilir mekanizmaları geliştirmelidirler. Bununla birlikte, çiftçilere mesleki olarak gelişmelerinin sağlanması ve verimliliğin artırılması konularında yardımcı olunmalıdır.

**Anahtar Kelimeler**: PRODIAC, Tarımsal yatırım, Kısa dönem, Etki değerlendirme, Ngounie, Gabon

## ABSTRACT

Master's Degree

THE IMPACT OF THE PROJECT DEVELOMENT AND AGRICULTURAL INVESTMENT PROGRAM IN GABON (PRODIAG) ON THE AGRICULTURAL FARMS IN NGOUNIE PROVINCE

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This reseach aims to evaluate the short term impacts of the Project Development and Agricultural Investment Program in Gabon (PRODIAG) in Ngounie Province. While the country has an important agricultural potential, the agricultural sector is underdeveloped. The share of agriculture in GDP is approximately 5%. Gabon depends on the foreign country to meet domestic food demand. The PRODIAG aims to reinforce the local production and reduce poverty in rural area by considering the protection of environment. The data of research was collected from 80 beneficiary farms in the districts of Douya-onoye and Louesti-wano of Ngounie province. In order to collect the primary data of research, the questionnaire was arranged on the basis of the project document published by French Agency of Devlopment. The data was entered and analysied by means of Statistical Package for the Social Sciences ( SPSS). The basic descriptive statistics (frequencies, means, standard deviation, minimum, maximum) were calculated. The impacts of the project on the socio-demographics, agricultural and economic variables of the farms were analyzied by using parametric (t-test) and non- parametric (khi square) tests. The statistical analysis revealed that the project had important positive short term impacts on many variables. The project positively effected the farms on technical capacity, acess to agricultural information and inputs, organazing farmers, agricultural production and income. Despite the amelioration of certain indicator of the farms, they had some problems about production process. Thus, while the crop producers had some problems about accessing agriculture equipment, hired labor, finance.The vegetable producers had some problems about accessing seed and greenhouse. It is recemmended that the government and policymakers should develop some sustainable mechanizms for farms that they can access modern inputs, agricultural information, finance, high value added markets. However, the government should help farmers to develop their professional abilities and to increase agricultural productivity.



**Key Words:** PRODIAC, Agricultural investment, Short term, Impact assessment, Ngounie, Gabon.

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Tanguy NKOUAH YALI

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## ACRONYMS

| | |
|---|---|
| ADP | Agriculture Development Project |
| IPC | International Patato Centre |
| FAO | Food and Agriculture Organization |
| FCFA | Franc of Financial Cooperation in Africa (currency of Gabon) |
| FIDA | Fund International for Agriculture Development |
| EIA | Environment Impact Assessment |
| GDP | Gross Domestic Production |
| IGAD | Gabonese Institute for Development Support |
| LDC | Least Developing Country |
| MALFRD | Ministry of Agriculture, Livestock, Fisheries and Rural Development |
| MOV | Means of Verification |
| NAARI | Namulonge Agriculture and Animal Reseach Institute |
| NARO | National Agriculture Reseach Ogganization |
| NEPAD | New Partenship for Africa's Development |
| NGO | Non Governmental Organization |
| OECD | Organiztion for Economic Cooperation and Development |
| PASAC | Agricultural Policy for Food Safety and Growth |
| PRODIAG | Project Development and Agriculture Investment Program in Gabon |
| OVI | Objective Verifiable Indicator |
| OZI | Operation Zone Integrale |
| SIA | Social Impact Assessment |

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# 1. INTRODUCTION

Africa has a huge potential which could allow the continent to feed its population, to reduce food insecurity and also becomes a major contributor in the international food market. The continent of Africa represents 16% of the global population with a population of 1.1 billion people which constitute an important market for agricultural products.

In 2013 as compared to the other continents, Africa's agriculture consisted of largely small scale family farms less than 2 hectares and their total amounts were 33 million which represents 80% of the total farm. The current agricultural model has not a capacity to feed the world adequately. With such a state of matters, family farming, which has ensured 70% of the global food production as of today, is in comparative terms the most viable alternative for a secure food supply and sustainable nutrition (Anonymous, 2013b). The majority of Sub-Saharan Africa's population lives in rural areas, where poverty and deprivation are most severe. Since almost all rural households depend directly or indirectly on agriculture, and the largest contribution to the overall economy, agriculture would be a key component of growth and development. Africa has enormous resources (land, water, human); the poor performance of agriculture has often been due to underinvestment in physical, institutional and human capital (Diao et al., 2007).

Agricultural growth has powerful leverage effects on the rest of the economy, especially in the early stages of economic transformation, when it accounts for large shares of national income, employment, and exports. Through its linkages to the rest of the economy, agriculture can generate patterns of development that are employment intensive and favorable for the poor. However, although agriculture is generally an important component for Africa's development, its ability to generate growth and reduce poverty varies across and within countries, as well as across different agricultural sub-sectors (Diao et al., 2007).

Gabon is a sub-Saharan country located in the Central Africa. The two major characteristics of the Gabonese economy are the dependency on oil industry and the foreign countries for food imports. With a rural population representing 13% of the total population, the agriculture sector is underdeveloped (Republic of Gabon, 2013).

In fact, the importations of the foodstuff represented 250 billion FCFA in 2008. The share of the sector to GDP was 7.3 % in 2004 which decreased approximately to 5.2% in 2007 and today approximately to 4.5% (PRODIAG, 2010).

In this matter, the Gabonese government and its economic partners implemented the Project Development and Agriculture Investment Program in Gabon (PRODIAG), in order to contribute significantly on the strengthening of the food security in the main urban centers and to reduce poverty in rural areas through improvement of the agricultural income.

PRODIAG has been led by Gabonese Institute for Development Support (IGAD). The project is implemented in all province. It was financed by Gabonese government and French Agencies for Development a total of 13.2 billion CFA (around 20 million euro) (PRODIAG, 2010). This study aimed to evaluate short term impacts of the project on the farms in Ngounie province.

The thesis was structured in six chapters. Chapter 1 introduces the general situation of agriculture in Africa and particularly in Gabon. Basically, it was based on the influence of the agriculture sector in economy and reduction of poverty.

Chapter 2 reviews the related literature within the scope of definition of agricultural development and the impact of the agriculture sector on economy growth and on poverty. It also dwelled on the importance of sustainable agriculture intensification throughout the different methods in order to ensure the sustainable development of the sector.

Chapter 3 gives information about the data and the methods used in this study. Moreover, the problem, objective and hypothesis of the research were introduced.

Chapter 4 discusses the effect of the agriculture sector in the Gabonese economy and presents the project PRODIAG such as its objectives, components and finance

Chapter 5 presents the research results after the analysis of the socio-economic and structural characteristic of the farms.

Chapter 6 comprises of the conclusions and the proposed recommendations.

# 2. LITERATURE REVIEW

## 2.1. Agricultural Development Project

Generally the development project is a set of activities undertaken by a team under the responsibility of the project manager, in order to respond to a need defined by the project in a limited time period and within a specific budget (Anonymous, 2016a). An agriculture project is an investment activity in which financial resources are used to create an asset that produces capital over an extended period of time (Gittenger & Price, 1982).

The agricultural development projects are the interventions in limited time and space with the objectives to improve the agriculture in an area of interest for the local population. Usually it's difficult to define the objectives of a project that targets collective interest. That is why it is important to respect the cycle of the project before implementation. The cycle of the project before implementation constitutes of the following components: identification, preparation, analysis and appraisal.

Identification is the stage to find potential project that must be implemented in order to meet the need that is most common to the population. After identification we have the preparation and analysis phase which is characterized by a feasibility study which should provide enough information on the viability of the project.

After a project was ended, it is generally appropriate to conduct a critical review or an independent appraisal. If a project is to be financed by a lending institution such as the World Bank or by a bilateral assistance agency, such as an external lender, it would probably want to do a more careful appraisal. The objective of any effort in project planning and analysis clearly is to have a project that can be implemented to the benefit of the society (Gittenger & Price, 1982). Possible benefits of an agricultural development project can be stated as food safety, improvement of productivity and income, increasing of agricultural products value. To reach those benefits, the variety of intervention are implemented throughout different type of public or paragovernmental project. The agricultural development project investment can be financed through several development actors such as NGOs, development bank, states, foundation, etc. Those actors do not seek their own interest, but they seek the collective interest.

## 2.2. The Impact of Agricultural Improvement on the Economy

Economic growth is the positive change of good and service in economy over a specific period. The most used indicator to measure growth is the GDP (Gross Domestic Production). Growth is a fundamental process of the economy. It is based on the development of the factor production, the access to natural resources and technical innovation (Anonymous, 2016b).

The economic growth of the country is ensured by the contribution of the different economic sectors. The agricultural sector is one sector whose share in GDP is usually one of the weakest in the most of African countries.

On a historical note, the agricultural revolution preceded the industrial revolution. In England, it was in the middle of the eighth century and in Japan, at the end of the nineteenth century. Most recently, in China and India, a fast agricultural growth has preceded the development of the industry. The increase of the agriculture productivity has caused an agricultural surplus which allows a decrease in the prices of foodstuffs which is the basis of the success of the structural change (World Bank, 2007). The surplus of agricultural income provides savings for investment in both urban and rural areas (Hart, 1998). Lower food prices, stimulated by technological change in agriculture, maintain low real wages in industrial sectors and thus foster investment and structural transformation (Diao et al., 2007).

Since the role of agriculture in the early stages of development constitutes a large contribution on national output, it employs the majority of labor force in most developing countries and the sector is integral to any thinking about development (Diao et al., 2007). During early stages of the development, the agricultural sector is an engine for the economic growth.

Golling et al. (2002) found that agriculture is important during the early stage of development. Using both cross-sectional and panel data for 62 developing countries for the period 1960 to 1990, the authors found that growth in agriculture productivity is quantitatively important in explaining growth in GDP per worker. This contribution accounts for 54% of GDP growth.

Agriculture contributes to the development as an economic activity as well as a livelihood, making it a unique instrument for development. As an economic activity in an agricultural country, it generates on average 29% of gross domestic product (GDP) and employs 65% of the workforce. Industries and services related to agriculture in

terms of value often contribute more than 30% of GDP in urbanized countries and those countries which transform raw materials. As a means of livelihood, according to estimations, farming is the livelihood of 86% of rural population. It employs 1.3 billion small farmers. Of the 5.5 billion people who are accounted in the developing world, 3 billion, live in rural areas. Of these rural people, about 2.5 billion people live in households involved in agriculture (World Bank, 2008).

### 2.3. Agriculture and Poverty Reduction

Theodore Schultz (1979) said that: "*Most of the people in the world are poor; therefore, studying the economy of poverty would bring us a lot of information on economic principles that really matter. Around the world, the poor depend mainly on agriculture for their income; therefore, studying agricultural economics would bring us a lot of lessons on the economy of poverty*".

In the world, 1.4 billion people live in the extreme poverty. In the least developing countries, 75% of the poor people reside in rural area and 925 million of them are underfed. To change this situation, FIDA, World Bank, and OECD recommended strengthening of the family agriculture type, accessing the rural population to the food markets with high value added and growing of the non-agriculture job (Cervante & Dewbre, 2010).

The agriculture sector is one of the principal employers in a developing country. It ensures an important part of the national income. Growth of agricultural sector is necessary to reduce poverty. The strong poverty-reducing effect of agricultural growth is due in part to its generation of both agricultural and non-agricultural employment. As mentioned earlier, agriculture is the largest employer in developing countries, either directly or indirectly engaging more than half of the labor force. This is particularly true in labor abundant economies where small farm households often account for large shares of the rural and poor population. A key relationship between growth in agriculture and poverty is that agricultural growth directly generates demand for rural labor (Diao et al., 2007).

Lastly numerous study research to quantify the report between agriculture and poverty. Brecani & Valdes (2007) found the relationship between agricultural growth and poverty. Their analysis was focused on three axis which according to them is the most important aspect. Among these aspects we have the job market, agricultural income and food price.

They concluded that if we consider the direct and indirect effects of agricultural growth, it contributes more than any other activity or sector in the reduction of poverty. Furthermore, the growth in agriculture is beneficial for the poor in the rural and urban areas and thus reduces poverty in a global manner in the country. Using data from India from 1951 to 1990, Ravallion & Datt (1996) found strong evidence that the urban–rural composition of growth matters to poverty reduction. While urban growth reduced urban poverty, its effect was not significantly different from zero in explaining the rate of poverty reduction nationally. On the other hand, rural growth reduced poverty both in the rural and urban areas and hence, had a significant and positive effect on national poverty reduction. In fact, it is known that in most of the least developed countries the main activity in the rural areas is agriculture. It is therefore necessary for African countries as Gabon to boost agriculture sector.

## 2.4. Sustainable Agriculture Intensification

### 2.4.1. Sustainable agriculture

Sustainable agriculture recognizes the principles of sustainable development in the agricultural production (Anonymous, 2016c). Unlike intensive agriculture which is characterized by a production system using the necessary quantity of inputs (fertilizer, pesticide, etc.) and seeks to maximize the production related to production factors (fertilizer, land, seed, etc.). The sustainable agriculture limits the utilization of inputs (pesticide, fertilizer) and practices which can have the negative impact over environment, farmer health and consumer. It targets to protect the biodiversity (Anonymous, 2016d).

Sustainable agricultural intensification is defined as producing more output from the same area of land while reducing the negative environmental impacts and at the same time increasing contributions to natural capital and the flow of environmental services (Pretty et al., 2011).

In other words, sustainable agriculture is a production system which ensures the food production is in accordance within the ecological, economical as well as social limits which guarantee the sustainability of the production process. Thereby, we can say that sustainable agriculture intensification is an augmentation of the production system which aims at improving the production while reducing input (fertilizer,

pesticide, land.) and the method having the negative impact on the biodiversity. But this production system must allow the farmer to live normally.

In this type of agriculture, the logic of sustainable agriculture is obeyed. For example:

- Biologic agriculture. The production system is characterized by natural fertilization usage, they use organic or vegetal fertilizer. It is respectful of the environment and the adapted agriculture practice.
- Reasoned agriculture. The production system aim to improve production results and control the chemical product used with the aim of limiting the impact on the environment.

Sustainable agriculture outcomes can be positive for food productivity, reduced pesticide use and carbon balances. Significant challenges, however, remain to develop national and international policies to support the wider emergence of more sustainable forms of agricultural production across both industrialized and developing countries (Pretty, 2007).

### 2.4.2. Crop variety improvement

The plant breeding is the process by which man modifies a plant species. This selection may have different aims, including adaptation to agricultural use or development of decorative varieties for horticulture. The criteria referred are diverse and depend on the final use of the target species; agronomic point of view is usually to improve productivity, taste, nutritional quality, appearance or resistance to disease and pests. Plant selection is a practice which appeared about 10.000 years ago, simultaneously with the domestication of plant species, the first farmers picking the seeds of the most interesting seeming plants to them and breeding the seeds of the plants which impressed them most from one year to another (Anonymous, 2016f). The use of the phytosanitary products in the agriculture aims at limiting the loss of harvest caused by diseases or parasites. The quantity of chemical products used in the food production has a negative impact on the environment and human health, but also increase the marginal cost of vegetable production. Limiting phytosanitary products goes in line with the sense of sustainable agriculture. The question is how to reduce or eliminate these chemical products and maintain the quality and quantity of the harvest. The variety improvement domain offer different solutions. Today sustainability is a subject of many agronomic project programs. In the field of plant seed, the selection of the

new variety is particularly advanced. The main objectives researched are usually disease resistance, production improvement, dry tolerance, quality improvement and environment adaptation (Anonymous, 2016f). The crop variety improvement has extended in many localities facilitated by the different agricultural programs and has allowed the amelioration of agricultural production in many areas of the world.

In Uganda, Namulonge Agriculture and Animal Research Institute (NAARI) worked to produce locally developed resistant varieties of the potato crop, and introduced new agro-ecological management in the form of water troughs between rows. The new early maturing varieties can be harvested at between 6 and 12 months compared with 19 months for old local varieties, which means more harvests are possible per unit of time. At the same time, yields have improved 5t/ha to 15t ha (Pretty et al., 2011).

Also in Uganda, International Potato Centre (IPC) with its partners National Agricultural Research Organization (NARO) have developed 19 new varieties of orange and non-orange sweet potatoes in the past 10 years, resulting in yields increasing from 4.4 to 10.0 t/ha. The cultivation of orange-fleshed sweet potato in Uganda has spread to 14500 farmers on 11000 ha (Pretty et al., 2011).

### 2.4.3. Soil conservation and management

The soil is the most important factor in the agricultural production. It is the fundamental support for agriculture. Today the soil conservation is a priority for sustainable food production. In other words, soil conservation means the maintenance of soil fertility. The intensive tillage has the negative impact on the physical, chemical and biological soil fertility. The intensive practices have many consequences such as:

- Soil erosion caused by the crusting and the compacting of the soil;
- Loss of biological activities of the soils caused by tillage;
- The soil pollution through the excessive use of the chemical products;
- Depletion of the chemical element in the soil (N, P, K…) caused by the succession of the cultures having the same nutrient needs.

The agricultural practices causing the loss of the chemical, physical and biological fertility of the soil and is a barrier to the durability of agricultural production, therefore to conserve the soil a set of cultural technics are practiced in order to maintain and improve the soil's agronomic potential, while keeping the

regular production efficient on the technical and economic side. The agricultural practices for the soil conservation is based on three principles such as constant coverage of the soil, reduction or suppression soil tillage and, culture rotation and diversification. Among the cultural method of soil conservation one of the most widespread production systems is the system of culture under vegetative cover.

It is a form of no-till farming which is practiced in open field. The sowing is done across a stratum of culture, without any mechanic tillage intervention. In practice, the farmer implants an intermediate culture after harvest before future sowing. This intermediate culture is thereafter crushed with a roll or desiccated with an herbicide to receive a culture by direct seeding on the vegetative cover. The culture system under vegetative cover presents the advantages in economic, agronomic and environmental plans.

Considering how the environment is affected, the culture under vegetative allows the effective carbon sequestration, the reduction of water consumption, the reduction of fertilizer and pesticides which have a negative impact on the environment and food safety. We have also the reduction of agriculture itinerant therefore the deforestation will also be reduced, with advantages of this sort being met more in the tropical countries. From the agronomic perspective, the culture under vegetative cover allow the stimulation of the biological activity in the soil, increasing of the organic matter and water conservation in the soil, reduce evaporation and protect the soil against heavy rain. It also increases the culture's productivity. On the economical dimension, the benefits of the culture under vegetative cover are the reduction of time and hardness in the cultivating activities, reduction of production cost (decreased use of fertilizer, pesticide and fuel), stabilization or augmentation of production similar or superior to intensive agriculture (Anonymous, 2016h).

In Santana Calerina, South of Brazil, the use of spontaneous vegetation as cover plant has been a new achievement. Some of the species were considered as weeds. With the introduction of direct sowing over vegetative cover, these plant become useful. It was possible to associate these crop in existing production system, principally in area where onions and horticultural crops were being cultivated. The principally used are sweet grass *(brachiaria plantaginea)* and cushion grass (*digitaria sanguinalis*). The resulting biomass is slashed or desiccated before next crop (Anonymous, 2000b).

In France, the farmers who practiced the conventional culture of rice, wheat and soy using soil tillage and then minimum tillage had been facing erosion, slaking crust and compacting soil problems. These problems caused the decrease in yield. The sustainability of the production and longevity of the agricultural enterprises were compromised. The adoption of direct seeding under permanent vegetative cover with the association of the wheat with Lucerne as cover plant, barley with the white clover as cover plant proved to be beneficial. After adoption of the culture under cover vegetative system, the farmers have achieved a fertilizer and herbicide consumption decrease and a consumption of fuel decrease from 100 L/ha to 50L/ha. The yield of the culture increased from 3-4 t/ha to 6-7t/ha. The production cost decreased considerably (Menard, 2011).

## 2.5. Evaluation of Project Impact

### 2.5.1. Evaluation

In the literature, evaluation is defined as a process which integrates the control, the evaluation of the process, the cost and benefit of the impact. The evaluation is to recognize and measure the actions and effects of an implemented policy, program or project (Baker, 2000). From the evaluation should come a carefully considered recommendation about how to improve the appropriateness of each aspect of the project design so that plan for project implementation can be revised if the project is ongoing and/or so that future projects can be planned in a better way if the evaluated one has undergone completion (Gittenger & Price, 1982). We have different types of evaluation according to the time at which the evaluation is conducted during the course of the program. There are four different evaluation such as ex-ante evaluation, intermediate evaluation, final evaluation and ex-post evaluation. Ex-ante evaluation is done before the commencement of the project when the conception of the project is still ongoing. It aims at verifying the harmony between the objectives and the problem which the intervention targets to solve. Intermediate evaluation allows to reorient. It has the objective of verification in the middle of the project and monitoring if the program has proceeded according to plan or if there is any need for improvement. Final evaluation is done at the end of the program and serves to observe the short term consequences of the program. Ex-post evaluation is conducted after the program to evaluate the effects at medium and long term.

The impact evaluation purpose is to examine on a broader range whether the program has had the desired impacts on the target group which can be a household, an institution or a population and if these effects are attributable to the intervention made by the program. The impact evaluation can also explore indirect positive or negative consequences on the beneficiary (Anonymous, 2016h)

### 2.5.2. Tangible benefits of agricultural project

The word tangible originates from the Latin term “tangibles”. Tangible means anything that can be touched (Anonymous, 2016i). In the broad sense, it refers to anything that can be perceived in a precise manner. In the context of this work, the tangible benefit of an agricultural project refers to the noticeable benefits produced on the target group by the project.

Tangible benefits of agricultural projects can arise either from an increased value of production or from reduce costs (Gittenger & Price, 1982). This is why agricultural projects may differ each other, but almost all of them target to have an impact on production and/or production cost. The common tangible benefits, which are targeted by most of the projects, include increased production, quality improvement, change in time of sale, change in location of sale and change in production forms (Gittenger & Price, 1982).

Increased physical production is the most benefit of agriculture project. An irrigation project allows better water access or control and then farmers can obtain higher yields. A credit project make resources available for a farmer to increase both the operating expenditures for current production for fertilizers, seed or pesticides and other investments.

The benefit from an agricultural project may take the form of an improvement in quality of product. Many agricultural projects support farmers by different methods. Some projects aim at improving production quality whilst others aim at giving most value to the products, to face up to the competition but also for public health needs. The livestock development project in Ecuador, which extended loans to producers of beef cattle, assumed that ranchers would not only increase their cattle production but also improve the quality of their animals so that the average live price of steers per kilogram would rise from 5.20 to 6.40 Ecuadorian Sucre over a twelve year development project

The activities in the project oriented toward the investment in agriculture product by means of storage and conservation. The benefit will arise from marketing facilities that allow the products to be sold at a time when price are more favorable. Indeed, agricultural products of perishable nature can be one barrier to selling to the management. A grain storage project may make it possible to hold grain from harvest period, when prices are seasonally low, and then sale later in the year when prices would rise.

The transport of the product is, in most of the times, a limiting factor for farmers to access better markets. Transport is usually expensive for them. That is why the benefit from many agriculture projects can be in the form of investment in transportation tools/machinery or any other form of transportation support. The fruit and vegetable export project in Turkey included provision of trucks and ferries to transport fresh produce from southeastern Turkey to outlets in the European market. The benefit of such projects arise from the change in locational value.

The processing of the agriculture product allows to give added value to the product, most of agriculture project includes this activity. Some African countries extend the processing of cassava and convert it to starch. Starch has the added value in industry. In Himchal Pradesh of Northern India, the value of apples produced by farmers is increased. The best fruit is sold for fresh consumption, while fruits of poorer quality is used to make a soft drink concentrated. In the process, the total value of the apples is increased.

### 2.5.3. Evaluation process method

#### 2.5.3.1. Definition

In evaluating the impact of an agricultural project, indicators of impact are identified by the test hypotheses regarding the intended effect of a project. Testing these hypotheses represents the standard challenge of any impact evaluation, which is determining what would have happened in the absence of the project. To infer a causal connection between a project and an impact indicator depends both on the data that are used for the analysis as well as the empirical methods that are employed (Winter et al., 2011).

The key issues in evaluating agricultural projects is that what makes them different from many other projects. The agricultural projects are designed to improve

production or the returns to agriculture. The indicators used in agricultural evaluations focus on the production process through measures such as gross margins, crop prices, yields, productivity, agricultural investment, spending on agricultural inputs, technology adoption, changes in land use patterns, crop and varietal diversification. As agricultural production is only one component of a rural household, there are other economic activities influencing decisions with respect to agriculture. Therefore, an appropriate evaluation of an agricultural intervention requires detailed information on agricultural production and the socio-economic activities of the household (Winter et al., 2011).

#### 2.5.3.2. Logical framework

It's a tool which has been developed in 1970 and used throughout the development organizations. Logical framework is a document which summarizes in table form the information of the project: results, activity, risk, programming, and resource. In other terms, it is a tool of conception, of conduct which integrates the monitoring and the evaluation (Anonymous, 2016j).

In the same direction, Coleman (1987) developed a logical framework approach to monitoring and evaluating agricultural and rural development projects. He presents the horizontal logic. The objectives of the horizontal logic is to measure the resources and the results of the projects, through the Objectively Verifiable Identification Indicator (OVI) and Means of Verification (MOV).

OVI represents a set of criteria which will indicate in concrete terms that expected results have been achieved for example the OVI for input are quantity, quality, cost location and other characteristics of the resources used in the project. In this logical framework approach, the MOV ensures that the previously defined OVI can be measured effectively. The MOV have two roles (Coleman, 1987):

- They confirm that the indicators chosen are realistic, and they specify how the indicators can be verified.
- They facilitate project evaluation by establishing in advance how the criteria for success should be verified.

An MOV must be associated with each OVI. The MOV allows the identification of the sources of information, the data collection technic and the type of information collected and then the evaluation of the project can go on in a more easy way.

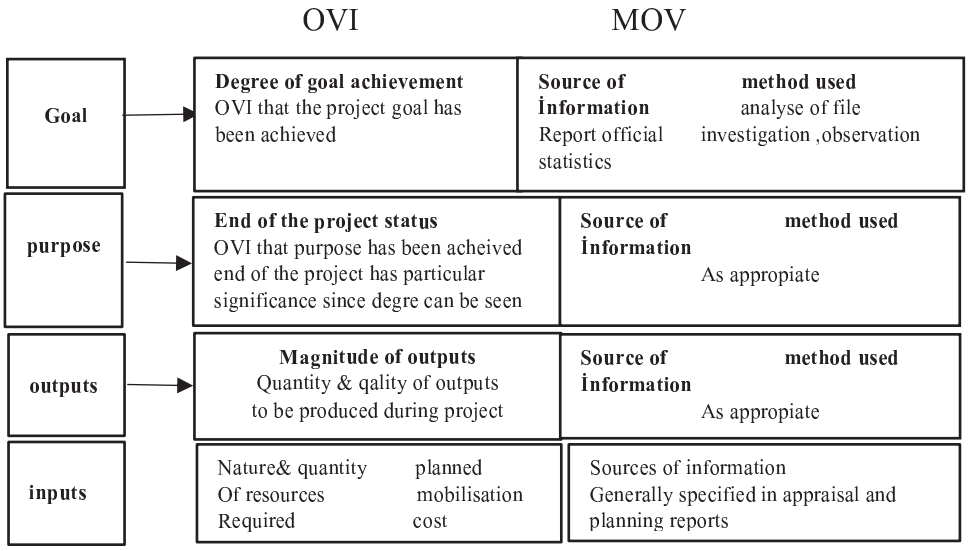


Figure 2.1. Horizontal logic

Source : (Coleman, 1987)

Figure 2.1 presents the matrix of the horizontal logic. It summarizes the different steps of the framework. It identifies the two important components which are the OVI and MOV which help the manager and project team or other evaluators to measure and evaluate the project objectively.

### 2.5.3.3. Evaluation through the establishment of the counterfactual situation

Delarue (2007), about the systemic impact of the agricultural projects on the income of the farmer, recommended a method of impact evaluation that includes the establishment of a situation without a project. She highlights that the impact indicators can vary under the effects of the project, but also there can be external factors which can be independent or influenced by the intervention. She recommends the insulation of the impact indicators to avoid the intervention of factors/conditions that would have occurred even in the absence of the project because of the evolution of other factors. Indeed, it's rejected that the idea of the intervention on the project should be conducted in a static environment and that every evolution observed are attribute to the project. The reconstitution of the situation which would have happened in absence of the project is important to measure the impact. This situation can be translated through a differential between the situation "with" and the situation "without" project.

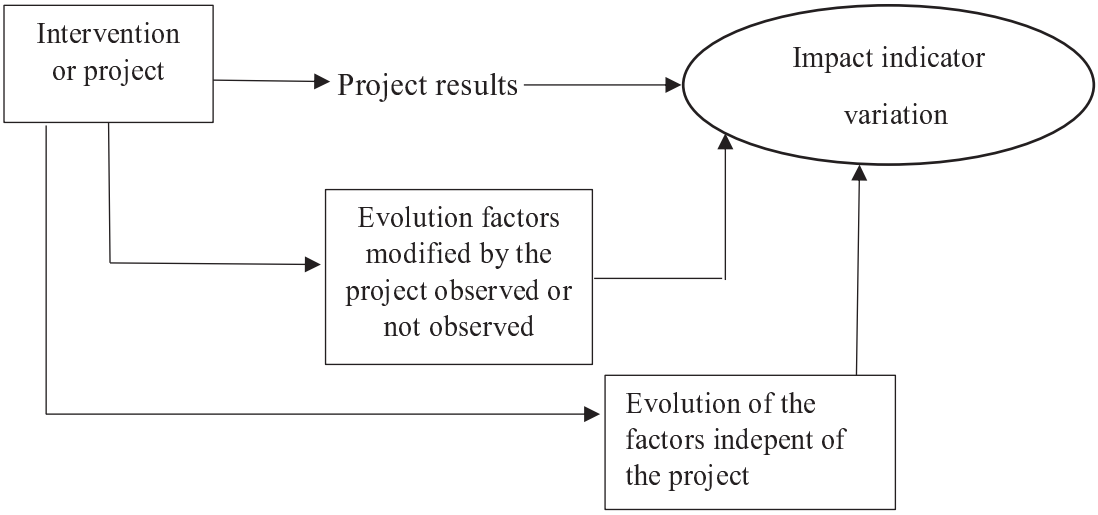


Figure 2.2. Creation of Project impact

Source: Delarue, 2007

Figure 2.2 presents the logic of the analysis method proposed by Delarue to measure the impact of project. It consists to isolate the evolution factors modified by the project, the evolution factors independent from the project in order to get the real impact of the project.

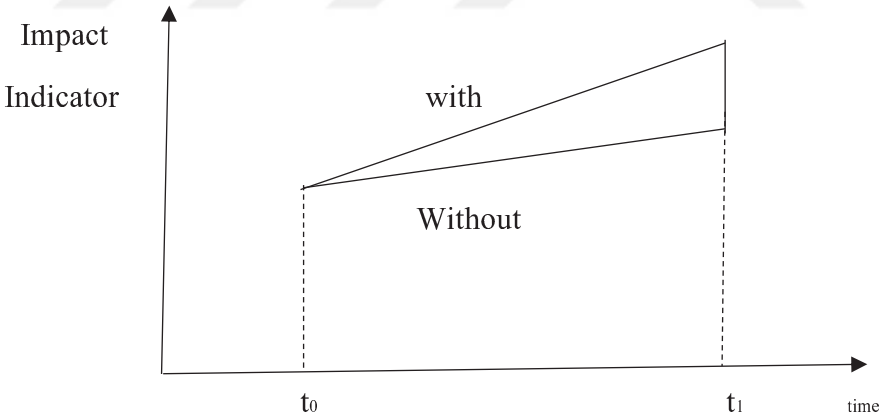


Figure 2.3. Differential of the impact indicator measure

Source: Delarue, 2007

Figure 2.3 presents the differential impact indicator upon the establishment the counterfactual scenario with-without project, between $t_0$ and $t_1$ is what is sought to be measured in order to obtain the impact of the project or the program. This impact represents the area of the triangle in the figure. In the scenario the impact indicator would have increased without the project.

### 2.5.3.4. Previous studies on evolution of impact

Ahmadvand et al., (2009) evaluate the utilization of Social Impact Assessment (SIA) in Iran in term of its policy context and its application in practice. Five cases were studied where SIA was employed in conjunction with Environmental Impact assessments (EIA) for agriculture development projects evaluation. To assess the use of SIA in practice, they analyzed in detail five reports of Agriculture Development Projects (ADPs). These were selected from the SIA studies of ADPs undertaken between 2001 and 2006 in Fars province in the southwest of Iran. Assessment of the quality of the SIAs was undertaken using an evaluation framework originally developed by Glasson et al (1999). This research revealed that there are legal and institutional constraints to the effective functioning of SIA in Iran, and there are deficiencies in the operating guidelines.

In Nigeria, Simoyan & Omokehin (2008) assessed the impact of Fadama II project on income of beneficiary farmers in Kaduna state. Net farm income, double difference method, pared t-statistics and chow test statistical tools were used for data analysis. The findings of the study showed that the net farm income of the project beneficiaries increases from N 302,797 before Fadama II to N 709,493 after Fadama II. There was also an increase in the net farm income of the non-beneficiaries from N 314,702 to N 478,565 during Fadama II project. The double difference method analysis indicated a positive mean income difference value between beneficiaries and non-beneficiaries after Fadama II project at 10% level of significance. Chow test analysis showed a significant change between the coefficients and intercept of the respondents' income implying that Fadama II project contributed positively to the increased income realized by the beneficiaries over that of non-beneficiaries.

In Nigeria, Okpachu et al. (2013) studied the impact of adult education on the agricultural productivity of small scale female maize farmers in Potiskum Local Government Area of Yobe State. The result showed that both groups are young and energetic for farm work. Both groups are also experienced with large household to provide farm labor. The regression analysis showed that age, education, experience and extension contacts were significantly related to output. There was statistical difference between the output and income of participant and non-participants. The study concluded that education positively impacted on the agricultural productivity of small scale female maize farmers in the study area.

In Nigeria, Oduro et al. (2014) investigated how the varying kinds of education affect agricultural productivity and the policy interventions that will facilitate the use of education to increase agricultural productivity and how educational level of farmers in the Municipality of Offinso can be improved. The research design was non-experimental design specifically correlation studies. Non-experimental designs do not involve the manipulation of a situation or circumstance but rather it is used to find the relationship between variables in comparative studies. To explain the effects of the varying types of education on productivity, the mean average output was compared for various level and simple cross tabulations were used to determine the relationships that exists. The major findings in the study were that as educational level increases, output increases with secondary school education having the highest returns on agricultural productivity. Extension service has a greater impact on agricultural productivity than formal education even though coverage is low. The study concluded that education is important to the improvement of agricultural productivity such formal education opens the mind of the farmer to knowledge, non- formal education gives the farmer hands-on training and better methods of farming and informal education keeps the farmer abreast with changing innovations and ideas, and allows farmer to share experience gained.

# 3. DATA AND METHOD

## 3.1. Problem Statement

The agricultural sector is at the heart of the economies of the least developed countries (LDCs) in most of sub Saharan of Africa and many Asian country. It accounts for a large share of gross domestic product (GDP) (ranging from 30 to 60 percent in about two thirds of them), employs a large proportion of the labor force (from 40 percent to as much as 90 percent in most cases), represents a major source of foreign exchange (from 25 percent to as much as 95 percent in three quarters of the countries), supplies the bulk of basic food and provides subsistence and other forms of income to more than half of the LDCs' population (Anonymous, 2001).

Thus, significant progress in promoting economic growth, reducing poverty and enhancing food security cannot be achieved in most of these countries without fully developing the human potential and productive capacity of the agricultural sector and enhancing its contribution to overall economic and social development. A strong and vibrant food and agricultural system, thus forms a primary pillar in the strategy of overall economic growth and development. Agriculture in the LDCs cannot continue to be treated as a residual sector for policy attention and investments (Anonymous, 2001).

Gabon is a typical case where agricultural potential is under developed and neglected. The sector needs a better policy and more investment in order to participate in the development of the national economy at the highest level. Thus, the share of agriculture sector in the GDP was 4%, the country depends on the foreign countries on food security and 60% of the local demand came from the imported food (PRODIAG, 2010).

The valorization of the agriculture sector requires an implementation of coherent agriculture policies which materializes by the practice and application of the existing laws, programs and projects. The problem to be discussed here is about the government of Gabon’s intervention through the PRODIAG project. It is intended to determine for a short term whether the project had contributed to the strengthening of the agriculture sector in the province of Ngounie and particularly in the district of Loustsi-wano and Douya-onoye.

### 3.2. Objectives of the Study

The objective of this study was to assess the effect of the project in the short term on the target group. The data analyzed had been collected at six months before ending the project in order to bring out the possible change registered in the farmer exploitation at short term.

The objective of the project throughout the different activities executed was to improve production system which directly or indirectly would enable an increase in the farmers' income which consequently would lead to a positive change in their social condition. For this cause, two different parameters were selected to measure the short term effect. These parameters were socio-economic and structural characteristic of the farms.

### 3.3. Research Questions

The research questions were listed below:

- Did the project improve the farmer's income?
- Did the project affect the farmer's organization?
- Did the project strengthen the farmer's technical capacities?
- Did the project improve the farmer's production capacity?
- Did the project improve the farmer's access to agriculture inputs?
- Did the project improve the farmer's access to information about agriculture?
- Did the project influence the commercialization system for the farmers?

### 3.4. Research Hypothesis

The different hypotheses have sought to respond to the research questions before data collection and data analysis. The following are the hypothesis which were proposed:

Hypothesis 1 in the short term, the project has a significant effect on the farm's socio-economic characteristics (income, organization, employment, etc.).

Hypothesis 2 in the short term, the project has not significant effect on the structural characteristics of the farm (agricultural information access, input access, technical capacity and commercialization).

### 3.5. Research Area

The data was collected in the Ngounie province located in the South of Gabon (Figure 3.1). The Ngounie province covers an area of 37.750 km² with a population of 101.415 people and a density of 2.7 people per kilometers square. It is the fourth largest province of the country and the province has seven districts. The data was collected in a couple of villages situated in two districts namely Louesti-Wano and Douya-Onoye located in the south and the center of the province respectively (Anonymous, 2016k) The population of the district of Douya-onoye and Louetsi-wano were especially selected based on two characteristics. First, the area where they reside is recognized for its conducive pedagogic and climatic characteristics favorable for the growth of banana and cassava among other crops. The second reason was that the majority of the cassava and banana traders who had taken their business to commercial scale in popular neighborhood provinces come to this area for the purchase of their commodities.

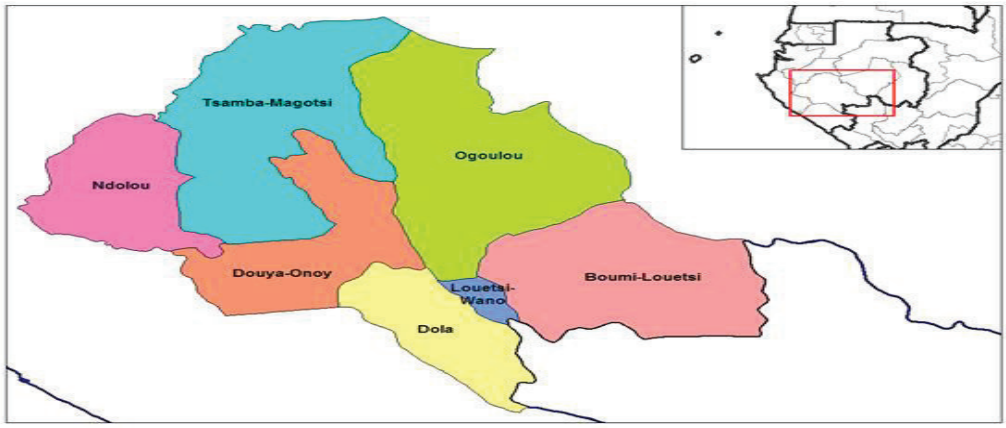


Figure 3.1. Ngounie cartography

### 3.6. Sample Farms

The data analyzed in this paper was collected from the farmers who were beneficiaries of the project. As mentioned previously, the data collected was based on the socio-economic and structural characteristic of the farm. Quantitatively, the PRODIAG

project aimed at including 160 farmers in the province of Ngounie farmers. A sample was selected which would be used as a representative of the whole farmer population from the Ngounie province. Eighty farmers engaged in the PRODIAG program which represents over half of the population were chosen to be part of this research.

The principal population selected to be part of this survey are the recipients of the services offered in the framework of the PRODIAG project. The farmers who were fully engaged in agriculture activities for the first time were included in the population.

### 3.7. Data Collecting Method

To collect the data of this research, an interview method was used. Those interviews were conducted only with the sample farmers. In other words, they were done face to face. The questionnaire was designed as part of the project document. The questions were structured and formulated in a manner that enabled them to cover the objectives of the project on a general scale, at the same time responding to the objectives of the specific components of the document.

### 3.8. Data Analysis Method

In order to analysis the data, several statistical technic including descriptive and comparative statistics were used. Descriptive statistics was for the determination of the frequencies and percentages of categorical variables and means, standard deviation and those scores for continuous variables. The comparative analysis included the analytical tests for comparison. Indeed, the objective of this study is to measure the effects of the project on the farmer situation. The main analytical tests which were used for comparison are the t- test and the chi-square test depending on the nature of the variable. The statistical analysis of the data was carried out by means of the Statistical Package for the Social Science (SPSS version 22).

## 4.THE PLACE OF AGRICULTURE IN GABON ECONOMY AND PRODIAG

### 4.1. Agricultural and Rural Sector

Gabon has an equatorial climate, warm and humid with a vegetation distribution in the form of the neo agro-ecological formation, comprising of forests distributed among the degraded forest, grassland steppes and savannah. Of the 26.8 million hectares of area, 20 million hectares are classified under forests and/or savannah (75% of the area) and the remaining land is classified as agricultural land used for crop cultivation or pastures. However, only 300.000 ha land was used effectively for agriculture and this accounts for less than 5% of the agricultural area and makes for 1.1% of the total area (Ibounde & Haong, 2013).

Table 4.1. Main indicator in Agricultural Sector

| | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| Total population (millions) | 1.5 | 1.6 | 1.6 | 1.6 | 1.7 |
| The share of rural population in the total (%) | 14.7 | 14.3 | 14.0 | 13.6 | 13.3 |
| Population density (people per sq. km ) | 5.9 | 6.0 | 6.2 | 6.3 | 6.5 |
| Annual rural population growth (%) | -0.4 | -0.2 | -0.1 | 0.1 | 0.2 |
| The share of agricultural value added in the GDP (%) | 5.4 | 4.1 | 3.8 | 4.0 | 4.0 |

Source: Anonymous, 2014

Table 4.1 presents the general indicators which are important for following agriculture progress. It can be observed that the rural population had a negative growth up to the year 2011. The rural population represented a small percentage of the general population. Overall, the contribution of agriculture on GDP was minimal when held in comparison with the other sectors of the economy.

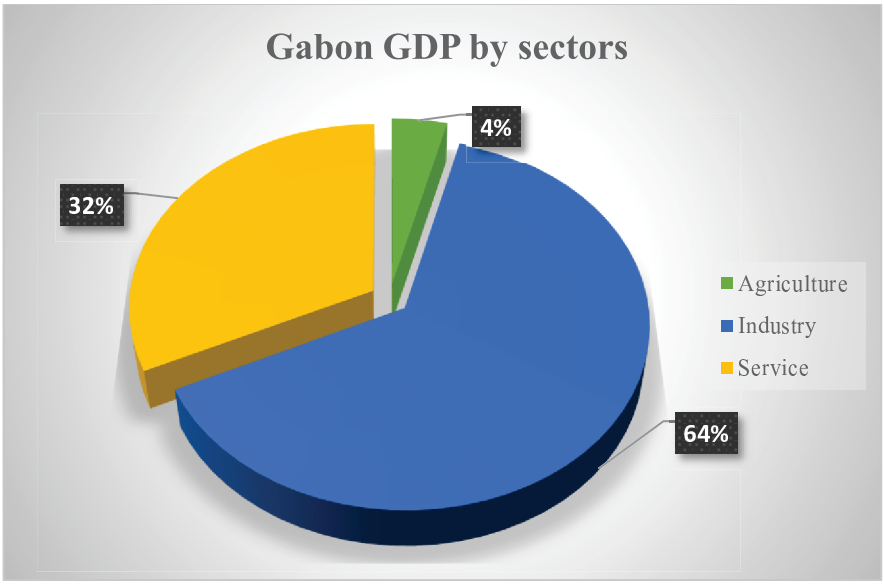


Figure 4.1. Gabon GDP by sectors

Source: Anonymous, 2015a

Figure 4.1 shows the contribution of the different sectors to the GDP of Gabon in 2013. The contribution of agricultural sector in the total GDP was 6%.

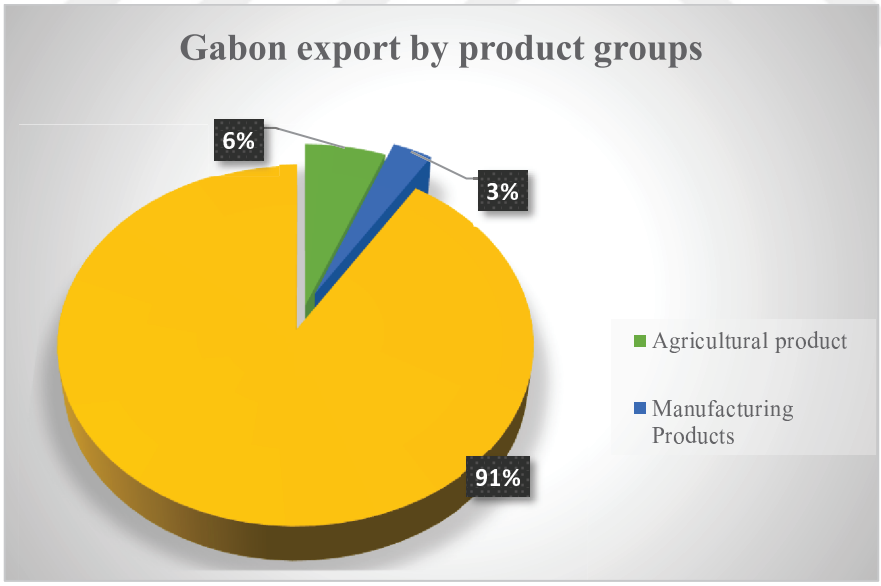


Figure 4.2. Product's exportation percentage

Source: Anonymous, 2015b

Figure 4.2 presents shares of the products' exportation percentage in Gabon. It was seen from the figure that the agriculture products' exportation represented 6% of the country's total exports.

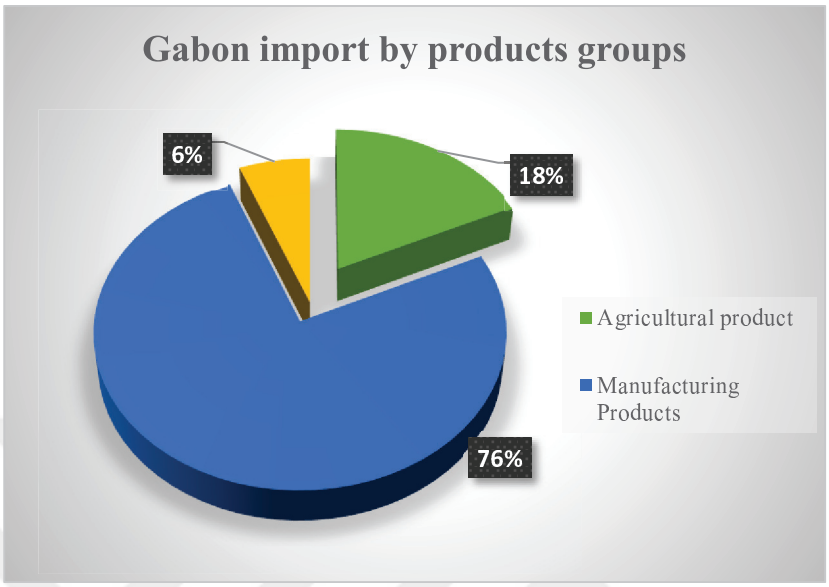


Figure. 4.3. Product's importation percentage

Source: Anonymous, 2015b

Figure 4.3 shows the products' importation into Gabon. It is observable that the importation of agricultural products was in the second place when ranking the products imported by the country from the highest and it represents 18% of total importation.

### 4.1.1 The previous and new agriculture policy

From the 1970s to the 1980s, the Gabonese government invested in the agricultural sector (4.5% of the state budget) adopting a proactive and productive strategy based on three main axes such as agro-industries and cash crops (coffee, cocoa, palm oil, sugar cane, rubber), Operations Zonal Integrated - OZI (concentration of resources and actions in the production areas to form the poles of agricultural modernization) and broadcast operations (agricultural extension and supervision of farmers to improve agricultural production). However, this strategy failed to boost agricultural production mainly because of the associated high cost of labor and was abandoned in the mid-1990 (Pourtier, 1990).

The state has very little investment in family agriculture and that little support directed towards subsistence systems has even declined gradually due to the weakness of human and social capital, an unfavorable economic environment (low road development, marketing problems and strong competition from foreign products), low-intensive production and processing systems, access to socio-economic services issues and deficiency in rural development strategies.

The Gabonese government has not created a sufficiently attractive institutional environment to help small producers. Agricultural diversification and the creation of a restructured and incentive institutional and economic environment are the current national priorities of agricultural development by focusing firstly on areas with high potential. Since 2009, the Ministry of Agriculture, Livestock and Rural Development has led a new agricultural policy called Agricultural Policy for Food Safety and Growth (PASAC). This policy focusses on three points which are national program of food safety to support rural agriculture, support program for intensive production in order to support growth and agricultural machinery and infrastructure rehabilitation program to valorize existing assets. All these programs have the objectives to increase contribution of the agriculture sector on the GDP to improve farmers' technical level through access to new agriculture inputs and information, to increase significantly increase the local agriculture production and to reinforce the actor capacities (extension, research…).

### 4.1.2. Food safety

In terms of food availability, Gabon covers its needs by relying massively on imports of about 60% of the country's food needs. This situation is related with an increase in the demand of the urban centers and the inability of the local production to meet this demand. In general terms, the basic needs for domestic consumption are roughly covered by the local production for example plantain, cassava, taro, yam and fish products, but even these products are part of the imports. For other products, the coverage rate is low for fruits, meat, vegetables, as well as rice and wheat, hence the importation is inevitable.

Table 4.1. Foreign trade of agricultural products (million US $)

| | Ave. 04-08 | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| Agricultural exports | 39.28 | 50.98 | 27.21 | 48.96 |
| Agricultural imports | 310.37 | 423.87 | 436.63 | 456.51 |
| Net agricultural trade | -271.09 | -372.89 | -409.42 | -407.56 |

Source: Anonymous, 2014

Table 4.1 shows the agriculture products Gabon's. It can be seen that net agricultural foreign trade of Gabon was negative. The country spend more money for import than export revenue for agricultural products because the national production had not been able to satisfy the country's demand.

### 4.1.3. Land use

Land use and its policies are complex in nowadays. As a national policy, all land belongs to the state albeit in communal areas, there is a remarkable persistence of traditional rights concerning land ownership. In the case where these two ownership policies come into conflicts, the modern legislation superimposes the traditional rights in line with the increasing monetization of the present economy. In principle, all the lands that have not been registered belong to the State (Act 14/63 of 8 May 1963) representing virtually all farmland. In practice, the traditional land tenure system, land belongs to clans, never to individuals alone. The clan affiliation is the only one which gives permission of the clearing of the forests in its territory. Whoever clears the land, first eventually becomes the owner. As long as he belongs to the clan inhabiting that territory. Any arising issues, complications or misunderstandings are directed to the leaders of the clan, the chief or whoever the hierarchy stipulates. (Republic of Gabon, 2013)

Table 4.2. Arable land and land under permanent cultivation of crops

| | 1999 | 2004 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| Agricultural land (% of land area) | 20.03 | 20.03 | 20.03 | 20.03 | 20.03 | 20.03 |
| Arable land (% of land area) | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 | 1.26 |
| Arable land (hectares per person) | 0.27 | 0.24 | 0.21 | 0.21 | 0.20 | 0.20 |
| Permanent cropland (% of land area) | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |

Source: Anonymous, 2014

Table 4.2 presents division of agriculture land. It is observed that the percentage of arable land is small, just 1.26 per cent of the total agriculture land and remained stable from 1999 up to 2012. The permanent cropland percentage is too small and invariable from 1999 up to 2012. The agricultural land of Gabon is under exploited or unexploited if it explains the situation better.

### 4.1.4. Vegetal production

Agriculture is a marginalized sector in Gabon. Despite significant potential, agricultural production had declined continuously and the share of the sector in the economy had declined from 15% to less than 5% in today. However, it remains the sixth provider of employment in the modern private sector. Its contribution to wealth creation remains marginal (about 4%). It was emphasized the fact that Gabon remains dependent on imports for food security for about 60% of food requirements. Some factors such as the absence of a coherent strategy, a lack of a formalized action plan and a non-realistic political situation in the country are responsible for the weakness of public investments in the agricultural sector in recent years.

The Gabonese agriculture has not been able to adapt to the growing urban demand and changes in consumption pattern. Accelerated urbanization (nearly 70% of the population and 40% in Libreville), high incomes and changing food habits related to this urbanization (growth of the share of cereals, fruits and vegetables, meat, dairy) resulted in a considerable increase in imports (Government of Gabon, 2005). This agricultural failure is mainly due to the incapacity of rural areas to meet the demand despite their agro-ecological potential favorable to the production of a variety of crops.

This positive factor could have been negated by the factors such as the isolation of production areas, the lack of labor and poor road infrastructure in some regions.

The main obstacles to the intensification of Gabonese agriculture can be listed as fragile soils, lower technical level of producers, the insufficient number of young people active in rural areas, the high cost of production factors, the low productivity of crops, the poor road network, inadequate rural roads and lack of infrastructure, the weakness of the support programs offered by the government and non-governmental institutions resulting in a difficulty for farmers in accessing the necessary material and abstract objects, the lack of organization at the commercial level, the weakness of public and private investment and the lack of appropriate fiscal policy, insufficient savings and the difficulties of access to bank credit in rural area (Government of Gabon, 2005). All of these factors cause a significant problem of competitiveness of local production compared to the same products imported from the sub-region.

Table 4.3. Main crop production in 2011

| | Area Harvested (Ha) | Yield (Hg/Ha) | Production (1000 tons) |
|---|---|---|---|
| Cassava | 60 000 | 52 500 | 315 |
| Sugar cane | 4 800 | 583 333 | 280 |
| Maize | 27 000 | 16 667 | 45 |
| Groundnuts, with shell | 23 000 | 10 435 | 24 |
| Soybeans | 4 500 | 8 889 | 4 |
| Sweet potatoes | 1 900 | 19 474 | 4 |
| Rice, paddy | 620 | 27 419 | 2 |
| Pulses, nes | 315 | 12 698 | 0 |

Source: Anonynous, 2014

Table 4.3 presents the harvested area, yield and production for main crops grown in Gabon for 2013 year. Cassava, maize, groundnuts and sugar cane were the largest grown crops with the highest productions. Cassava is a food consumed approximately in all family households. The important sugar production is linked to the national sugar company. As for maize, it is consumed in the households, but it also used as an animal feed. Most other productions remain rather low.

Table 4.4. Inputs

| | Ave. 00-08 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|
| Fertilizer consumption (kg/ha) | 7.24 | 10.52 | 12.02 | 12.5 | 12.5 |
| Land area equipped for irrigation (% ) | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

Source: Anonymous, 2014

Table 4.4 shows the consumption of fertilizer and the percentage of land with irrigation systems. The data shows that fertilizer use was very low. Land under irrigation represented 0.1% of arable land and this was also insignificant. In fact, most farmers practice traditional agriculture.

### 4.1.5. Animal production

Animal products are important in the Gabonese diet. This is a very poorly developed sub-sector, it deserves more attention in the context of intensification. Traditional farming remains predominant. The main constraints in the sector were the low production capacity of family farmers, the high prices of food and other inputs, strong competition from imported products at low prices, difficult access to bank credit (conditions for granting credit inadequate to small producers, high transaction costs, high interest rates), the lack of extension programs and the weak supervision of breeders because of a lack of strategies and financial, material, public and private support services and low level organization on the part of producers (Government of Gabon, 2005). .

In sub-urban and large savannah areas of the country, there is a high potential for poultry farming, pig farming and village boviculture. Their development should be based on the improvement of farming technics combined with farming, processing and conditioning of products, and improving access to agricultural advice, credit, inputs and markets (Republic of Gabon, 2013).

### 4.2. Priority Action for Agriculture Investment

#### 4.2.1. Sustainable management of agricultural land

In this domain, the project aimed at reaching 120 000 ha of cultivated land sustainably by 2015, divided on traditional food crops, cash crops and industrial crops. To achieve this objective, the main line of actions are identified as below (Republic of Gabon, 2013):

- Mobilization and management of water through technical development of lowlands and irrigation/drainage low-cost and sustainable development of managed agricultural land,
- Stabilization of rain-fed agriculture by sustainable soil fertility management, protection against erosion and land security and,
- Promotion of modern family farms practicing intensive polyculture (food crops, vegetable gardening, and fruit farming) and combining agriculture, livestock and fisheries.

#### 4.2.2. Improving access to local and national markets for agricultural products

On this agenda, national strategies were designed to primarily open up areas of production, improve product competitiveness so that they can withstand the pressure of imports from the sub-region and to develop the marketing systems in general. To this effect, possible lines of intervention were:

- Opening up the main production areas through better identification of priority needs, rehabilitating agricultural and rural roads,
- The development of product processing (agricultural, livestock, fisheries, etc.) by improving the processing capacity, quality and diversity of products (improved technologies, access to equipment),
- Improving the marketing of agricultural products and product conservation by the construction of storage in rural area,
- Improving access and the diffusion of economic and social information through the establishment of an information exchange system and to coordinate the supply and demand from a network community information centers and rural radio stations (Republic of Gabon, 2013).

### 4.2.3. Research Gabon's food self-sufficiency

The national strategy targeted to reduce the country's dependence on imports to meet its food requirements by increasing and diversifying agricultural production. To achieve this, the priority areas where interventions would be made were identified as follows:

- Intensification of food crop production (tubers, cereals, bananas, plantains, peanuts, etc.) and vegetable by the use of quality plant material, highly efficient small tools and intensive farming practice inputs.
- The development and intensification of small livestock (pigs, poultry, small and big ruminants) sub-urban in particular, and the village fish farming through the use of effective brood stock and quality food prepared primarily from local products whilst effecting a regular health control (Republic of Gabon, 2013).

### 4.2.4. Reinforcing productive capacities in sub-urban and rural surroundings

For the goal of reinforcing productive capacities in sub-urban and rural surroundings, the national strategies aimed at offering equal opportunities to everyone to access support services, development of human capital and strengthening the role of farmers' organizations. To achieve this goal, the identified main lines of intervention were:

- Support the creation of private input supply services (seeds and good quality seedlings, plant protection and veterinary products, animal feed) and development of micro-finance structures,
- Strengthening the technical and management capacities of rural producers and their organizations (training available on request and depending on the needs of producers),
- Promoting agricultural development and agricultural research on improving the traditional systems of production, processing and marketing of products with more emphasis on the primary needs of producers (Republic of Gabon, 2013).

### 4.3. Incentives and Measures in the Agricultural Profession in Gabon

#### 4.3.1. Government subvention support

To encourage people to become farmers, several measures have been taken by the Gabonese government. Thus, financial aid is allocated and tax exemptions are granted.

- Support the prime installation given to farmers. The priority of the premium is granted to young people aged 18 to 40 and women.
- Prime support for the processing and marketing of agricultural products is given to farmers whose activities aim at boosting the various industrial operations.
- Prime support for training is given to farmers or to any other operator who are involved in the training and the furthering of knowledge and professional skills of other individuals in the sector (Anonymous, 2013a).
- Prime support for agro ecology is given to farmers who employ sound management techniques of natural resources and environmental protection, conserve the national agricultural heritage, landscape and mainstream characteristics according to national goals (Anonnymous, 2013a).

#### 4.3.2. Tax exemption

To encourage people to get involved in agriculture activities and to empower the few existing agriculture professionals who already practice some agricultural activities, the government has removed some tax burden including: Exemption from the patent, value added tax (VAT), custom duties, tax exempt and land tax. Exemption from the patent is allowed to farmers for sales transactions on all kind of products from their farms, agricultural unions and marketing cooperatives which have no storefront. VAT exemption is applied on products from agricultural activities of farming, fishing, capital goods for agricultural, livestock processing, fertilizers, feeds, pesticides and animal health products. Exemption from customs duties is applied on agricultural inputs whose list is determined by the ministerial order. Tax exempt is offered to the cooperatives and civil organizations involved in the production, processing, storage and marketing of agricultural products. Also, companies dealing with the export of agricultural products, livestock and processing can benefit from the tax exempt status

during the first three years of their activity. Exemption from land tax is applied to rural land used for purposes of agricultural and livestock activities (Anonymous, 2013a).

## 4.4. Project Development and Agriculture Investment Program in Gabon (PRODIAG)

### 4.4.1. General objective

The general objective of the project was to contribute to the strengthening of food safety in urban centers and to reduce poverty in the rural areas through the promotion of entrepreneurship in agriculture, effective and respectful of the environment (PRODIAG, 2015).

### 4.4.2. Specific objectives

The project had two specific objectives which were to provide for an improvement in production and the commercialization of agricultural products in order to improve the income of rural producers and to reorganize the agricultural profession into a form where it would have an impact on the agriculture sector development.

### 4.4.3. Strategic approach

To achieve these objectives, a strategic approach was adopted which took into consideration the agricultural sector's weaknesses and strengths. The efforts of the project were aimed at creating a favorable environment for the development of existing agricultural enterprises. It was meant to provide to the beneficiaries of the project access to the information, training, the land, material, advice and technical support.

### 4.4.4. Target group and intervention area

To be a beneficiary of the project, a person had to be a Gabonese citizen, age between twenty and sixty years old and a willingness to become an agricultural producers. The project was implemented throughout the national territory in areas which had agricultural potential.

### 4.4.5. Priorities in the agriculture sector

Based on pre-performed analysis, specific fields in the agriculture sector were selected to get primary attention according to the national investment program at short term (PNIMT) and PRODIAG adhered to the principles of the (PNIMT) by primarily focusing on bananas, cassava, vegetable gardening, livestock (poultry and pork) and agricultural products processing (particularly cassava). (Republic of Gabon, 2013)

### 4.4.6. Sources of financing and duration of the project

The project was financed by the Gabonese government and the French Agency for Development (AFD). The Gabonese government contribution represented a 20% of the project's total budget which is approximately 2.623 billion FCFA (4 million euro), and the remaining 80% of the budget which is around 10.495 billion FCFA (16 million euro) was a contribution by the AFD. The duration of PRODIAG was five years. It started in September 2011 and ended in June 2016 (PRODIAG, 2010).

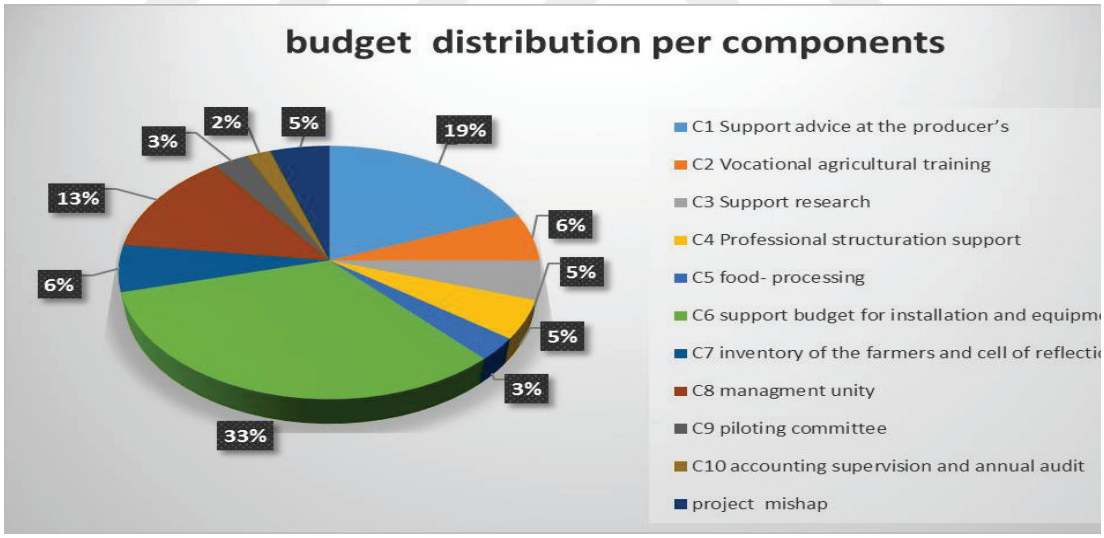


Figure 4.4. Budget distribution per component

Source: Anonymous, 2014f

Figure 4.4 presents the percentages of the budget distribution in the whole project. For classification purposes, the components marked C1 up to C5 were for the work on the ground such as training and research, whereas those marked C6 to C10 were the administration and general logistics expenses of the project. It can be observed that

among the components of the budget which accounts for the expenses directly impacting the work on the ground, the one having the biggest share (19%) is the support advice to the producer. However, on overall consideration, the component with the biggest share in the budget was for installation and equipment which served to support farmers in the project

### 4.4.7. Support advice at the producer's component

The principal objective of this component was to support the producer during the course of the project. Breaking down the objective of this component, it comes to materials support for the producers, advice support for the producers and advice for exploitation management. (Anonymous, 2014a)

Table 4.5. PRODIAG numerical targets

| | Installed farmers | Independent farmers | Total |
|---|---|---|---|
| Food crop | 719 | 132 | 851 |
| Gardening vegetable | 131 | 9 | 140 |
| Livestock production | 24 | 6 | 30 |
| Livestock breeding | 1 | 0 | 1 |
| Food processing | 32 | 8 | 40 |
| banana multiplication | 30 | 0 | 30 |
| Feed mill | 2 | 0 | 2 |
| Total | 939 | 155 | 1095 |
| Percentage (%) | 85.5 | 14.5 | 100 |

Source: PRODIAG, 2010

Table 4.5 presents the number of farmers the project created and supported. The food crop and vegetable gardening were the most important fields in terms of the number of farmers taking parts in the events.

In practice, this aspect was to provide technical and material support according to the needs of a particular producer that is to say modern producers who need to either improve or diversify their production. Regarding the traditional producers or people who desired to engage in the agriculture sector with the aid of the project's support, they were installed in agricultural perimeters made by the project. They were then provided with agricultural material kit, fertilizers and continuous technical support. Different from this group, another class of farmers who had farms and had some sort of significant development and perceivable skills but were still in need of support to

diversify and/or to intensify their production. The project called this type of farmers as independent farmers. Mainly, the farmers had to improve their exploitation and the PRODIAG gave them support. The project was designed to be able to identify this type of farmers and provided them with technical and/or material support (Anonymous, 2014a).

Table 4.6 presents the amount of fertilizer use per hectare by the farmer in banana and cassava production. The number of bags per hectare given to the farmer for banana and cassava production was the same.

Table 4.6. Fertilizer kit per hectare

| Fertilizer | Cassava kg/ha | Banana kg/ha | Bag Number |
|---|---|---|---|
| Dolomite | 200 | 200 | 4 |
| Superphosphate | 200 | 160 | 4 |
| Potassium chloride | 100 | 64 | 2 |
| Urea | 100 | 80 | 2 |

Source : PRODIAG, 2010

Table 4.7 presents the number and type of agricultural tools offered to the farmers. The farmers were offered only one agricultural tool to each farmer under the program.

Table 4.7. Agricultural tools offered to the installed farmers

| Agricultural tools | Number per farmer |
|---|---|
| Wheelbarrow | 1 |
| Machete | 1 |
| Hoe | 1 |
| Sprayer | 1 |
| Protection suit | 1 |
| Pell | 1 |
| Total | 6 |

Source: PRODIAG, 2010

### 4.4.8. Vocational agricultural training component

The objective of this component was to offer agricultural vocational training not only to the producers, but also to every person who needs vocational training about agricultural activities. To achieve these objectives, this particular element of the project had activities to elaborate the training modules and extend it to the producers and other people interested in the training sessions which varied according to their demand (Anonymous, 2014b).

The modules were composed of two phases such as the theorical phase and the practical phase. The practical phase helped people to apply the knowledge they have acquired. The different modules implemented were vegetable gardening, food crop, livestock (poultry and pork), cassava processing, exploitation management and producer's exploitation.

Table 4.8. Presentation of training situation at 31/10/2015

| Training type | Prevision of the project | Realization 31/10/2015 | Percentage (%) |
|---|---|---|---|
| Food crop | 870 | 1369 | 157 |
| Vegetable gardening | 285 | 341 | 120 |
| Laying hen | 180 | 71 | 39 |
| Pork | 140 | 26 | 19 |
| Producer organizing | 150 | 0 | 0 |
| Farm management | 750 | 197 | 26 |
| Cassava process | 480 | 270 | 56 |
| Arboriculture | 250 | 0 | 0 |
| Ovine | 70 | 0 | 0 |
| Total | 3175 | 2274 | 71.6 |

Source: PRODIAG, 2015

This table presents the type of training, project prevision and the training realized up to 31/10/2015. It was apparent that for crop production and vegetable gardening, the realization rate was higher than the project prevision. The modules of training in the field of vegetable gardening and crop food were composed of four parts as soil preparation and fertilization, sowing and planting, phytosanitary protection and plant maintenance and harvesting. However, the livestock modules were composed generally of five parts as material and sanitary norms knowing, livestock followed, feeding and prophylaxis. The exploitation management module was focused on the

management of the input and output. It thought the producers how to articulate the basic financial documents which are basic yet essential for satisfactory management.

### 4.4.9. Support research component

This element of the project had the objective of continuing the research-development works on the technic of culture over the cover vegetal method in order to restore or improve soil fertility and also aimed at investigating other alternatives for solving problems related with shifting agriculture (Anonymous, 2014c). The different activities performed to achieve the objective were to introduce new plant varieties in the research dispositive and at the producers and to develop easy channels for the diffusion of information concerning solutions to the producers' common challenges. This part of the project is in part related to the advice support component. For an easy spread and access of information, the program used the producer associations and organizations.

Table 4.9. Extending varietal crops

| Varietal crop | Types | Characteristics |
|---|---|---|
| Cassava ITA | Improved | Precocious and more productive |
| Cassava manbikini | Local | Mosaic virus resistance |
| Cassava diaki | Local | Mosaic virus resistance |
| Banana big ebanga | Improved | More productive |
| Banana French | Improved | More productive |

Source: PRODIAG, 2010

Table 4.9 presents the different varieties of cassava and banana extend during the project. There was an improved and local variety with the different characteristics.

### 4.4.10. Professional support structure component

During the project, this component had the objective to conduct studies, to collect and analyze data in order to know the environment where the intervention was being implemented, measured and at the same time followed the progress using different markers (production system, agricultural, etc.) (Anonymous, 2014d).

The aims of this component were (i) to create a Market Information System (MIS), (ii) to create the Economic Tracking System (STE) and to determine the target study areas on the important agriculture pathways. The MIS activity is characterized

by the collection of information regarding trends in the rise and fall of prices of agricultural products. The data is collected, analyzed and interpreted then spread to the different producers to help improve their production. The STE was created through the collection, analysis and interpretation of the farmers' results at the end of the season in order to have an overview of the technical and economic turnover. This indicator would help to measure the farmers' efficiency. The results would be shared with the producers at workshops. In order to determine the target study areas on the important agriculture pathways, diagnostic studies on the exploitation system and agricultural pathways were done in order to identify the target domains where the farmers need support (Anonymous, 2014d).

This assessment procedure covered the whole chain of production from the initial production stage to the selling of the products in order to help the farmer become more professional with the support structure component of this project.

Table 4.10. Support structure indicators results

| Indicator | Project prevision (Quantity) | Realization on 31/10 /2015 (%) | |
|---|---|---|---|
| Number of price bulletin produces | 840 | 1234 | 157 |
| Number of price bulletin spread | 2800 | 5564 | 199 |
| Number of MIS' synthesis report | 5 | 4 | 80 |
| Number of diagnostic study | 26 | 14 | 54 |
| Number of group work | 100 | 31 | 31 |

Source: PRODIAG 2015

Table 4.10 presents the project's prevision for this component and different indicators for farmer professional structure. It was seen that some indicator at 10/2015 is higher than the project prevision.

### 4.4.11. Food-processing support component

The objective of this component was to review agricultural production by strengthening the processing segment of the production chain. This component aimed at supporting the production unit concerned with processing activities, creating and

helping them develop their activities. The main agricultural product was cassava. It was transformed into different forms (Anonymous, 2014e).

The objectives of this component were achieved by the transformation process of the agriculture products to reduce work hardship, improve product quality, productivity and income, offering training to the management of the processing unit as outlined by the vocational training component and installing processing plants in the identified areas of cassava production. The cassava processing units would be completely financed by the project.

Table 4.11. Cassava process unity material

| Material type | Quantity |
|---|---|
| Building | 1 |
| Machinery | 1 |
| Diesel oil | 200 liters |
| Cleaning products | 1 package |
| Pot | 1 |
| Bucket | 2 |
| Blouse | 1 |
| Working gloves | 2 |

Source: PRODIAG 2015

Table 4.11 presents on the different material provided by the project for the cassava processing each unit.

### 4.4.12. Numerical targets of the project in the Ngounie province

Table 4.12 presents the number of farmers targeted by the project to install at the beginning of the program and the ones it actually managed to install. The highest success was realized in the vegetable gardening category where the project achieved a 100% installation mark in line with its pre-determined objectives.

Table 4.12. Numerical targets of the project in Ngounie

| | Numerical targets | Exploitation installed at 31/10/15 | Percentage % |
|---|---|---|---|
| Vegetable gardening | 15 | 15 | 100.00 |
| Food crops | 150 | 109 | 72.66 |
| Livestock | 2 | 2 | 100.00 |
| Cassava process | 5 | 3 | 80.00 |

Source: PRODIAG,2015

# 5. RESEARCH FINDINGS

This chapter presents the survey results conducted with the farmers. The research findings gave us the ability to make conclusions concerning the effect at short term of the project on the target group in Ngounie province.

## 5.1. Socio-economic Characteristics of the Farm

In the agricultural project, the analysis of the socio-economic characteristic is necessary. Indeed, the farmers live in society where the socio-demographic and economic characteristics can influence their decisions on the farming activity.

### 5.1.1. Age of the farm owner

Regarding the age of the farm owners, it ranges from 24 to 62 years. In fact, the project is only open to people aged 22 - 60 years old. The average age of participants is 48 years old, with a minimum age of 24 and a maximum age of 62 years old.

### 5.1.2. Gender of the farm owner

The equality between the different genders in agriculture is important, as male and female have the same capacity to contribute to the development of agriculture sector. They must have the same chance to access the land, inputs and financial support in the agriculture sector. According to the Food and Agriculture Organization of the United Nations (FAO) report on women in agriculture, agriculture underperforms because half of all women farmers lack equal access to the resources and opportunities they need to be more productive (Anonymous, 2009). It is necessary that there should be an equality between men and women.

Table 5.1. Gender of farmers

| Gender of farmer | Frequencies | Percentage |
|---|---|---|
| Female | 35 | 43.8 |
| Male | 45 | 56.2 |
| Total | 80 | 100.0 |

Table 5.1 presents the farmers' gender frequency. The data observed shows the ratio of male respondents was 56%, the remaining (43.8%) was female. In Africa, the males are generally the farm owners and make tillage activities, whereas the females do the rest of the remaining farm work and assure 90% of the foodstuff production for rural poor population (Anonymous, 2000a).

### 5.1.3. The main profession of the farm owners

Table 5.2 presents the main professions of the farm owners. While 53.8% of the respondents were full time farmers, 26% of them were unemployed. These two categories mentioned above represent 80.1% of the sample. The remaining farmers were temporary employee (6.3%), pensioner (5%), artisan (3.8%), the state employee (2.5%) and permanent workers (1.3%), respectively. About half of the respondents did part-time farming to diversify their income and to feed their families with some of the crops. In fact, in Africa most of the household in rural areas use farming as a source of income that's why the major population are farmer. The households depend directly or indirectly on agriculture (Diao et al., 2007). However, 5% and 1.3% of the respondents were retired and students, respectively.

Table 5.2. Main profession of the farm owners

| Main profession | Frequencies | Percentage |
|---|---|---|
| Unemployment | 21 | 26.3 |
| Farmer | 43 | 53.8 |
| Temporary employee | 5 | 6.3 |
| Retired person | 4 | 5.0 |
| Artisan | 3 | 3.8 |
| Government official | 2 | 2.5 |
| Permanent worker | 1 | 1.3 |
| Other (student) | 1 | 1.3 |
| Total | 80 | 100.0 |

### 5.1.4. Education level of the farm owner

Education is a learning and development process of the intellectual faculties, moral and physical. Education is considered as an important element of the person's development in the different fields where they exercise an activity. Education level of farmers is important to constitute a social asset in the development and management of the agricultural production. Table 5.3 presents on the education levels of the farmers. We observed generally that the education levels of the respondents were quite low. In fact, while 12.5% of the farmers were illiterate, the majority of respondents graduated from elementary school (35%), secondary school (37.5%) or literate (8.8%). Despite that the ratio of high school or vocational school graduates among the respondents constituted of only 6.3%.

Table 5.3. Education level of farmers

| Education Level | Frequencies | Percentage |
|---|---|---|
| Illiterate | 10 | 12.5 |
| Literate | 7 | 8.8 |
| Elementary school | 28 | 35.0 |
| Secondary school | 30 | 37.5 |
| High school | 1 | 1.3 |
| Vocational school | 4 | 5.0 |
| Total | 80 | 100.0 |

The education level of the farmer is important as it has an influence on the farmer's productivity. A study was conducted in the municipality of Offinso in Ghana its main objective was to measure the effect of education level on the productivity of the farmer. The major finding of the study was that as the educational level increases, so is the output increases with the farmer who has secondary school education level, and the highest returns on agricultural productivity (Oduro-Ofori Eric and al., 2014). However, a study implemented in fourteen villages in Ethiopia where cereals are produced using traditional oxen-plough technology reveals the positive and significant returns to additional years of formal schooling in terms of increased output of cereal crop (Weir, 1999).

### 5.1.5 Population and unemployment status in the farm

Table 5.4 shows changes in the farm population with the age of 15-64 between the previous and during the research time. There was not a statistically significant differences on the population size by means of the project application. But it is important to note that 20.9% of males and 14.1% of females had never engaged in agricultural activity before the project. They started the farming profession with the project. Farming activities were generally conducted by a couple composed of a male and a female or are conducted by single men or women but in most cases it is women. Furthermore, the ratio of women in the farms was higher than that of men before and during the PRODIAG project. Women were the pillars of African agriculture, they represent 52% of the total population in the agricultural farm and they were responsible for about 50% of agricultural work on farms in sub-Saharan Africa (Bongiwe, 2015).

Table 5.4. Population by gender in the farms (with the age of 15-64 years old)

| Person | Before the project | | | | During the project | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | Freq | % | Freq | % | Freq | % | Freq | % |
| 0 | 14 | 20.9 | 11 | 14.1 | - | - | - | - |
| 1 | 49 | 73.1 | 55 | 70.5 | 57 | 93.4 | 58 | 81.7 |
| 2 | 2 | 3.0 | 7 | 9.0 | 2 | 3.4 | 7 | 9.9 |
| 3 | 1 | 1.5 | 3 | 3.8 | 1 | 1.6 | 4 | 5.6 |
| 4 | 1 | 1.5 | 2 | 2.6 | 1 | 1.6 | 2 | 2.8 |
| Total | 67 | 100 | 78 | 100. | 61 | 100 | 71 | 100 |

P= 0.743

### 5.1.6. Migration from the farm during the project

Table 5.5 presents the migration rate has been recorded during the project. Departure of farmers from the farm to other sectors during this period was very low (1.3%). Indeed, it should be noted that active people in rural areas were generally old age. In Gabon, the rural population represents 13% of the total population and it is noteworthy to mention that most of the rural population has more than fifty years of age.

Table 5.5. Migration

| | Frequencies | Percentage |
|---|---|---|
| Migration | 1 | 1.2 |
| No migration | 79 | 98.8 |
| Total | 80 | 100.0 |

### 5.1.7. Social security status of the farm owner

The social security status of farmers before and during the project were given Table 5.6. The majority of farmers (92.5%) had health insurance. Indeed, in Gabon there is a health insurance system established by the state called the National Health Insurance and Social Guarantee (CANMGS). This insurance coverage is mandatory for all Gabonese and free of charge for all people living in rural areas, because they are considered economically disadvantaged.

Table 5.6. Social security of the farmers

| Insurance coverage | Before the project | | During the project | |
|---|---|---|---|---|
| | Frequencies | Percentage | Frequencies | Percentage |
| Insured | 6 | 7.5 | 6 | 7.5 |
| Uninsured | 74 | 92.5 | 74 | 92.5 |
| Total | 80 | 100.0 | 80 | 100.0 |

### 5.1.8. Hired labor

Table 5.7 presents the labor used by farmers and also the duration of the period in which it was used in days. The above indicators are observed before and during the project. For both variables the change registered is significant. A positive change is observed in the averages of the indicators in both periods. The average of the hired labor number used is increased from 2.3 before the project to 3.6 people during the project, an increase of 1.3 people. Regarding the hired labor time in days, the average increased between the two periods, going from 3.06 to 5.75, an increase of 2.31.This positive change of average can be explained by the expansion of areas and the improvements made in the technical methods used of doing the work.

Table 5.7. Number of worker and time days working

| | Before the project | | During the project | |
|---|---|---|---|---|
| | Means | Standard dev | Means | Standard dev |
| Hired labor (number)*** | 2.30 | 2.30 | 3.60 | 2.92 |
| Hired labor (day)*** | 3.06 | 4.34 | 5.75 | 5.48 |

* indicates that there was a statistically significant difference between before the project and during the project at 1% level

### 5.1.9. Hired labor employment in the farm

The farms employed more hired labor during the project. Thus, while 62.5% of the farms hired labor before the project, this ratio increased 76.2% during the project. There was a statistically significant difference about the ratio of hired labor between the pre-project and during the project. While the ratio of hired labor for the activities of planting and planning increased during the project, the ratio of hired labor use in the weeding decreased. We can explain all of these changes as being related to the extensions which were done to the field area for most of the farms hence the need for more planting and weeding labor arises.

Table 5.8. Hired labor employment

| | Before the project | | During the project | |
|---|---|---|---|---|
| Labor use | Frequency | % | Frequency | % |
| Weeding | 34 | 42.5 | 16 | 20.0 |
| Weeding & planting | 13 | 16.3 | 32 | 40.0 |
| Planting | 2 | 2.5 | 12 | 15.0 |
| Planning | 1 | 1.2 | 1 | 1.2 |
| Not hired labor | 30 | 37.5 | 19 | 23.8 |
| Total | 80 | 100.0 | 80 | 100.0 |

### 5.1.10. Income status of the farm

In Africa, almost all of the households in the rural areas get a major part of all their income from agricultural activities. In developing countries, three quarters of the poor population live in rural area and depend mainly on agriculture and related activities for their livelihood (Anonymous, 2003). In the 21$^{st}$ century, agriculture continues to be a fundamental instrument for sustainable development and poverty reduction. In

developing countries, 2.1 billion poor people live on less than 2 dollars a day and depend mostly on agriculture for their livelihood (World Bank, 2008). Therefore, an increase in the agriculture income of the farmers consequently improves the general livelihood of the rural population.

Income levels of the farms were given in Table 5.9. During the project, while there had been a decrease of 18.4% in the non-agricultural income of the farms (from 384810 to 314000 FCFA), the agricultural income and total income of the farms increased about 3 times (from 913750 to 2862212 FCFA) and 2.4 times (from 1298560 to 3176212 FCFA), respectively. There were statistical difference about income levels between the pre-project and during the project at the significant levels of 5 and 1%, respectively. Indeed, the variation can be explained by different factors. Thus, the farmers spent more time in their agricultural activities and they reduced the time spending to non-agricultural activities. However, almost all of the farms increased their external input uses such as fertilizer and pesticide treatment in the production process. Also using the new technology and technique by the farms caused an important increase their productions and incomes.

Table 5.9. Income status of the farms (in FCFA)

| | Before the project | | During the project | |
|---|---|---|---|---|
| | Means | Std. dev. | Means | Std. dev. |
| Agriculture income*** | 913750 | 944122.89 | 2862212 | 1847464.32 |
| Non-agriculture income** | 384810 | 804453.72 | 314000 | 786455.92 |
| Total income | 1298560 | 1749562.5 | 3176212 | 394562.5 |

** and *** indicate that there was a statistical significant difference at the levels of 5 and 1%, respectively.

### 5.1.11. Organization status of the farms

Table 5.10 shows the agricultural organization levels of the farmers. There were mainly two different organizations as cooperatives and associations in Gabon. There exist fundamental differences between cooperatives and associations. Thus, cooperatives are entities officially recognized by the Gabonese authorities governed by the laws and statutes of the Gabonese Republic. Agricultural cooperatives were given several benefits such as exemption from taxation. On the other hand,

associations are just a group of individuals with a common goal, area of interest and an internal organization not recognized by public authorities.

Table 5.10. Organization status of the farms

| Organization type | Before the project | | During the project | |
|---|---|---|---|---|
| | Frequencies | Percentage | Frequencies | Percentage |
| Cooperative*** | 8 | 10 | 6 | 7.5 |
| Association*** | 5 | 6.3 | 27 | 33.8 |
| No organization*** | 67 | 83.8 | 47 | 58.8 |
| Total | 80 | 100 | 80 | 100 |

*** indicate that there was a statistical significant difference at the levels of 1%.

Before the project, only 16.3% of the farms were organized as cooperative or association. This ratio increased to 41.2% during the project. While there had been a decrease the member of cooperatives (from 6.3 to 7.5%), the members of association increased from 6.3 to 33.8%. Although more than half of the survey population still do not adhere to one of the two types of organization. During the project, 58.8% of the farms were not organized under an agricultural organization. This may be explained by the administrative and bureaucratic difficulties faced by farmers whom majority have a fairly low level of education. There had been statistically significant difference the organization levels of the farms during the project.

### 5.1.12. Benefits from the services of farmer organizations.

The 5.11 presents the services taken from the organizations by the member farmers. Indeed, the organizations fulfill some programs to provide labor force to their member farms who have financial difficulties to hire labor. Before the project, while the ratio of the farmers who benefited from common work was 12.5%, this dramatically increased to 41.3% during the project. The change in benefiting the services of farm organization was found statistically significant. During the project, the farmer who needed more labor and became adherent to one of the organizations to get workforce. However, the member of these organizations could also get training from other organizations like FAO.

Table 5.11. Benefiting from the services of agricultural organizations

| | Before the project | | During the project | |
|---|---|---|---|---|
| benefits | Frequencies | Percentage | Frequencies | Percentage |
| Common work | 10 | 12.5 | 33 | 41.2 |
| No benefit | 70 | 87.5 | 47 | 58.8 |
| Total | 80 | 100 | 80 | 100 |

*** indicate that there was a statistical significant difference at the levels of 1%.

## 5.2. Structural Characteristics of the Farms

### 5.2.1. Land asset of the farms

Table 5.12 presents the average land ownership of the farmers before the project and during the project. Under the project, the farmers were given a land which differs from 0.5 to 3 ha if the farmer has the capacity to exploit the land. While the average tillable land was 0.55 ha, this land increased to 1.02 ha in the farms during the project. There had been s statistically significant difference on the land asset during the project.

Table 5.12. Land asset of the farms (hectare)

| | Means | Standard dev |
|---|---|---|
| Land asset before project | 0.55 | 0.550 |
| Land asset during the project*** | 1.02 | 0.656 |

*** indicate that there was a statistical significant difference at the levels of 1%.

### 5.2.2. Crops species cultivated by the farms

Crops grown by the farms before and after the project were given in Table 5.13. While there were increases in the ratios of farms grown amaranth, lettuce, eggplant and paper, there were decreases in the ratios of the farms grown banana and cassava. This decrease can be explained by the fact that many farmers specialized in a single crop either cassava or bananas and, the new techniques and operations such as fertilization, pesticide treatment bring additional heavy workload to the farms. There was statistically significant differences about the percentage of crops grown by the farmers during the project.

Table 5.13. Crops grown by the farms

| Crop species | Pre-project | | During the project*** | |
|---|---|---|---|---|
| | Frequencies | Percentage | Frequencies | Percentage |
| Cassava | 63 | 78.8 | 61 | 76.3 |
| Banana | 30 | 37.5 | 18 | 22.5 |
| Amaranth | 5 | 6.3 | 11 | 13.8 |
| Tomato | 2 | 2.5 | 2 | 2.5 |
| Lettuce | 3 | 3.8 | 9 | 11.3 |
| Eggplant | 1 | 1.3 | 4 | 5.0 |
| Peppers | 3 | 3.8 | 7 | 8.8 |

*** indicates that there was a statistical significant difference at the levels of 1%.

### 5.2.3 Crops sown area

Sown area of the crops were given in the Table 5.14. There had been important increase in the sown area of cassava, those increases were very little for other crops. The population in the area were used to cultivate cassava and therefore they give more space and importance to this crop. Also, in the market, cassava can be sold easily than others. On the other hand, there had been a decrease in the area of tomato of the farms between these two periods. The differences between the sown area of cassava, banana and amaranth were statistically significant.

Table 5.14. Crops sown area (hectare)

| | Before the project | | During the project | |
|---|---|---|---|---|
| Sown area | Means | Standard dev | Means | Standard dev |
| Cassava *** | 0.32 | 0.26 | 0.83 | 0.68 |
| Banana * | 0.17 | 0.26 | 0.21 | 0.45 |
| Amaranth * | 0.002 | 0.01 | 0.007 | 0.02 |
| Tomato | 0.003 | 0.020 | 0.001 | 0.01 |
| Lettuce | 0.001 | 0.01 | 0.005 | 0.023 |
| Eggplant | 0.0004 | 0.003 | 0.001 | 0.01 |
| Peppers | 0.003 | 0.022 | 0.005 | 0.03 |

* and *** indicate that there were statistical significant difference at the levels of 10% and 1%, respectively.

### 5.2.4. Crop production of the farms

Table 5.15 shows the crop production quantities. In several products, the production was stated as zero in both periods. Cassava and banana productions recorded important changes between these two periods. Thus, during the project period, while average cassava production quantity of the farms increased about 2.6 times (from 7.2 tons to 18.5 tons), banana production increased about 1.5 times (from 2.8 tons to 4.3 tons).

Table 5.15. Crops' production in the farms

| | Before the project | | During the project | |
|---|---|---|---|---|
| Crops | Means | Standard dev | Means | Standard dev |
| Cassava **** | 7.20 | 11.13 | 18.50 | 14.36 |
| Banana *** | 2,.0 | 4.86 | 4.3 | 9.15 |
| Amaranth | 0.0 | 0.0 | 0.0 | 0.0 |
| Tomato | 0.0 | 0.0 | 0.0 | 0.0 |
| Lettuce | 0.0 | 0.0 | 0.0 | 0.0 |
| Eggplant | 0.0 | 0.0 | 0.0 | 0.0 |
| Pepper | 0.0 | 0.0 | 0.0 | 0.0 |

*** indicate a statistical significant difference at the level of 1%.

### 5.2.5. Crop sale points of the farms

Crops sale points were given in Table 5.16. In both periods, all producers sold their entire production to traders. In fact, some traders have established an agricultural product collection system. These few product collection networks arrange themselves in order to define the prices of goods that are often not the real reflection of the market. They buy a kilogram cheap and resell it at a price often double or triple in the urban areas. In fact, this is the cause of the lack of a formal network market system to value rural agricultural products.

Table 5.16. Crops sale points of the farms

| Crops | Before the project | | During the project | |
|---|---|---|---|---|
| | Frequencies | Percentage | Frequencies | Percentage |
| | wholesaler | wholesaler | Wholesaler | wholesaler |
| Cassava | 63 | 100 | 61 | 100 |
| Banana | 29 | 100 | 18 | 100 |
| Amaranth | 5 | 100 | 11 | 100 |
| Tomato | 2 | 100 | 2 | 100 |
| Lettuce | 3 | 100 | 9 | 100 |
| Eggplant | 1 | 100 | 4 | 100 |
| Peppers | 3 | 100 | 7 | 100 |

### 5.2.6. Crop sale prices of the farms

Table 5.17 shows the average change in crop prices in FCFA per kilogram (FCFA/ kg) during the project. There had been an increase in only cassava and lettuce prices. During the project period, while cassava prices increased from 177 to 180 FCFA/kg, lettuce prices rise from 88 to 2000 FCFA/kg. But, these changes were not found statistically significant. On the other hand, the prices of the other crops did not changed during the project period. In general the average price does not vary much but remain stable because the agricultural marketing system in the rural areas and suburban areas remains under-developed.

Table 5.17. Sale prices of the crops in the farms (FCFA/kg)

| Crops | Before the project | | During the project | |
|---|---|---|---|---|
| | Means | Standard dev | Means | Standard dev |
| Cassava | 177 | 22 | 180 | 0 |
| Banana | 160 | 0 | 160 | 0 |
| Amaranth | 560 | 0 | 560 | 0 |
| Tomato | 1000 | 0 | 1000 | 0 |
| Lettuce | 833 | 408 | 2000 | 3000 |
| Eggplant | 500 | 0 | 500 | 0 |
| Peppers | 2000 | 0 | 2000 | 0 |

### 5.2.7. Agriculture information sources of the farmers

The agriculture information is very important for the farmer. In agricultural production process, farmers need to have necessary information about input and output market trends and the different risks (health, climate, fertilizer, etc.) to help them to make the best decisions in the production process. That is why, the information sources of the farmers market must be constant, reliable and up to date.

Information sources of the farmers were given in Table 5.18. The farmers could use different information sources. Before the project, the farmers used the Ministry of Agriculture (42.5%), other farmers (37.5%), television (13.8%) and any others (10%) as the main information sources. Whereas, during the project, they used PRODIAG as the main information source and importance of other farmers, the ministry and TV were decreased. There was statistically significant differences about information sources of the farms between these two periods. Kughur et al. (2015) found that the majority of the respondents (75.5%) received agricultural information through friends or relatives (farmer to farmer) information in Gwer-East local government area of Benue State, Nigeria.

Table 5.18. Information sources of the farmers

| | Before the project | | During the project*** | |
|---|---|---|---|---|
| Information sources | Frequencies | Percentage | Frequencies | Percentage |
| Farmers | 30 | 37.5 | 7 | 8.8 |
| Ministry | 34 | 42.5 | 26 | 32.5 |
| PRODIAG | - | - | 80 | 100.0 |
| TV | 11 | 13.8 | 7 | 8.8 |
| Any information | 8 | 10.0 | - | - |

*** indicate a statistical significant difference at the level of 1%.

### 5.2.8. Farmers' input providers

Table 5.19 shows the different input suppliers and farm equipment before and during the project. About 89% of the farmers did not use fertilizer and pesticides before the project. Furthermore, 85% of the plant material and 86.3% of agricultural equipment were provided internally from their farms. And 10% of farmers using inputs

(pesticides, fertilizers) were the small market gardeners living in the sub-urban area. Indeed, agriculture in rural areas of Gabon is predominantly a traditional itinerant. When we look at the difference in the suppliers of inputs for agricultural equipment during the project, we found that the leading supplier was the PRODIAG project for all inputs needs, including equipment. It is important to note that the PRODIAG project offered all inputs free of charge to the farmers. There was statistically significant differences about input suppliers between two time periods of the project. Salami, et al., (2010) found that improved access to input and readily available output market are key preconditions for the transformation of the agricultural sector from subsistence to commercial production. The average fertilizer use per hectare for arable crops were estimated to be 30 kg in Kenya, 14 kg in Ethiopia, 5 kg in Tanzania and 1 kg in Uganda. Those amounts were far less than the world average of 100 kg (Smaling et al., 2006; Ariga et al., 2006).

Table 5.19. Inputs providers

| | Before the project | | | | | | During the project | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Providers | Fertilizer& pesticide | | Seed | | Agriculture equipment | | Fertilizer& pesticide | | Seed | | Agriculture equipment | |
| | Freq | % | Freq | % | Freq | % | Freq | % | Freq | % | Freq | % |
| The farm | 8 | 10.0 | 68 | 85.0 | 69 | 86.3 | - | - | - | - | - | - |
| Ministry | 1 | 1.3 | 1 | 1.3 | 0 | 0.0 | - | - | - | - | - | - |
| PRODIAG | - | - | - | - | - | - | 80 | 100.0 | 80 | 100.0 | 80 | 100.0 |
| No input | 71 | 88.8 | 11 | 13.8 | 11 | 13.8 | - | - | - | - | - | - |
| Total | 80 | 80.0 | 80 | 80.0 | 80 | 80.0 | 80 | 100.0 | 80 | 100.0 | 80 | 100.0 |

*** indicate a statistical significant difference at the level of 1%.

### 5.2.9. Participation in the extension programs

Farmers' participation into the extension programs were given in Table 5.20. The percentage of participation in the various training modules was high for most modules except some of them. The participation levels of the farmers were very high for the extension programs on tillage, fertilization, planting/sowing and plant protection. Those participation ratios decreased in the marketing, crop processing and sustainable environment management. The agricultural processing component was not open to all farmers in the project. Only farmers who reside in the support areas of the cassava

processing plants were beneficiaries. Regarding the organization of producers, there was some reluctance on the part of the farmers which is misleading. Though this was part of the module of the plan for the project, it was never really put into effect and somehow represents the failures or deficiencies of the program.

Table 5.20. Farmers' participation into the extension programs

| Extension | Frequencies | Percentage |
|---|---|---|
| Tillage | 79 | 98..8 |
| Fertilization | 78 | 97.5 |
| Planting/sowing | 79 | 98.8 |
| Plant protection | 79 | 98.8 |
| Marketing | 52 | 65.0 |
| Crop processing | 28 | 35.0 |
| Sustainable environment management | 15 | 18.8 |

### 5.2.10. Impact level of the training extension activities

If any help is given to the farmers in order to improve their farming, they need to access new agricultural techniques and methods. The professional agricultural training is important to help the farmer become more effective and efficient. Vocational training allows to the farmers to acquire knowledge, skills and attitudes about the new agricultural practices and technologies. Evaluations made on the target group regarding whether the program has been beneficial or not reflects the quality and impact of training.

The impacts of extension activities were given in Table 5.21 with the lowest impact. The modules of producer organizations, management of the environment and agricultural processing were stated as their impacts were the lowest. The producer organization module is not valued in the research area. The processing of agricultural products module was a module that only implemented in the areas receiving cassava processing workshop. In other words, this training was not open to all beneficiaries of the project. The environmental management module of the project was characterized in two forms. The first form was the rational use of fertilizers, herbicides and pesticides. The module of protection and management of environment were integrated in the fertilization and plant protection modules. This is hardly discernable by farmers who have a fairly low level of education for most cases. The second form of

management and environmental protection is the use of cover crops to protect the soil aeration, soil fertilization and sedentary farmers.

Table 5.21. Impact level of training

| | Percentage | | | | | Sum | Grade |
|---|---|---|---|---|---|---|---|
| Extension impact | Very low | Low | Medium | High | Very high | | |
| Fertilization | 1,3 | - | 11,4 | 32,9 | 54,4 | 347 | 1 |
| Planting/sowing | 1,3 | - | 11,4 | 34,2 | 53,2 | 346 | 2 |
| Plant protection | 1,3 | - | 11,4 | 34,2 | 53,2 | 346 | 2 |
| Tillage | 1,3 | - | 11,4 | 35,4 | 51,9 | 345 | 4 |
| Marketing | 2 | - | 8 | 28 | 62 | 224 | 5 |
| Product process | 7,2 | 21,4 | 50 | 21,4 | - | 80 | 6 |
| Sustainable environmental | - | 60 | 33,3 | - | 6,3 | 38 | 7 |

### 5.2.11. Most beneficial components of the project to the farmers

Table 5.22 presents the levels of benefit provided by each project component to the farmers. Support advices to the farmers and vocational agricultural training were stated as the most beneficial components during the project. The two components that had the most important roles in the project are those with direct contact with the farmer, the first one supporting the farmers during the agriculture production process and the second one teaching them before the starting of production process and during the process. Other important components of the project were stated as food processing support, professional structure support and accompanied research, respectively.

Table 5.22. The most beneficial components

| Components | Very low | Low | Medium | High | Very high | Sum | Grade |
|---|---|---|---|---|---|---|---|
| 1.Support advices to the producers | - | - | - | - | 100.0 | 400 | 1 |
| 2.Vocational agricultural training | - | - | 6.3 | 7.5 | 86.3 | 384 | 2 |
| 5.Food-processing support | 52.5 | 5.0 | 42.5 | - | - | 125 | 3 |
| 3.Professional structure support | 88.8 | 10.0 | 1.3 | - | - | 90 | 4 |
| 4.Accompanied research | 92.5 | 7.5 | | - | - | 86 | 5 |

**5.2.12. The farmers' problems**

In the agriculture production cycle, the farmer face with several problems and identifying those problems is very important. The most important thing is to identify the most common problems among farmers about their operations. As far as hindering production is concerned suitable solutions can be generated to increase output and can serve for future references.

The main problems of the farmers in their daily activities were presented in Table 5.23. The most important three problems were stated as financing the labor force and getting agricultural equipment (1 and 2). Indeed, the rural population in Gabon is small and represents 13% of the total population which causes labor shortage in the rural area. The labor shortage situation is the origin of the high cost of the labor force which is a primary problem for almost all the farmers. In Gabon, there were mainly two types of production area as the savannah and forest areas (secondary forest). In the savannah areas, the necessary equipment consists of tractors with hitch, and small maintenance equipment, such as machete, hoe, harrow and wheelbarrow (farm equipment 1). For secondary forest areas, the necessary equipment (farm equipment 2) consists of chainsaw slaughter, tiller and small farm equipment (machete, hoe, harrow, wheelbarrow, etc.). The lack of the agriculture equipment provider in the province is a major problem to get agriculture equipment. The farmers who are in better financial

situation often make some request to providers in bigger cities to supply them from time to time.

Table 5.23. Farmer's problems

| Problems | Percentage | | | Sum | Grade |
|---|---|---|---|---|---|
| | Medium | High | Very high | | |
| Rental labor financing | 1.7 | 5.0 | 93.5 | 295 | 1 |
| Agriculture equipment1 | - | 2.2 | 97.8 | 229 | 2 |
| Agriculture equipment2 | 2.8 | 8.3 | 88.9 | 175 | 3 |
| Seed supply | - | - | 100.0 | 55 | 4 |
| Greenhouse production | - | - | 100.0 | 55 | 4 |
| Capital financing | - | - | 100.0 | 10 | 6 |

# 6. CONCLUSIONS

PRODIAG had been implemented for the purpose of reinforcing local agricultural production, bringing down poverty in the rural areas and making a sustainable use of the environment. The evaluation of the project impacts on the farms in the Ngounie province revealed that overall implementation of the project had a positive effect on the farms. There were several important aspects which were improved which in turn contributed to the amelioration of the agriculture production as a whole. However, there were other factors which did not see any significant positive changes during the project.

During the course of the project, the farmers benefited from an increase of access to agricultural theoretical and practical training which reinforced their technical capacity. On evaluation, the access to agricultural information and inputs registered a statistically significant change due to the effect of the project. During the project, many producers joined, adhered and became part of different professional organizations and associations which was not the case before the implementation of the project. Consequently, the farmers became beneficiaries of services offered by different organizations and this was one of other parameters which saw a positive and significant change. Also a significant improvement in food crop production registered a significant change. The income of the farmers increased better though following up further. It is noticeable that the agricultural income significantly increased, while the non-agriculture income decreased.

Despite improvements in several aspects of farming, the beneficiaries of the project constantly faced some issues during the production process. Whilst the main problems faced by food crop producers were access to equipment, hiring of new labor force, and capital funding. The main challenges for the gardening vegetable producers were access to seeds and green house production facilities. Despite the positive short term effects registered by the project on farmers in Ngounie province, it is necessary to raise some questions regarding the sustainability and/or perpetuity of these farming development projects because many factor of production such as inputs, information, field planning were completely dependent on the project. But, we know that PRODIAG is an activity limited in time and space. The question is, will the farmers of Ngounie province be able to maintain the benefits registered and received during the PRODIAG project?

After our observations during the survey and our analysis of the situation, we may suggest some recommendations to policy makers of Gabon agriculture sector, managers of projects and anybody interested in agriculture in Gabon who can access this paper.

- Access to agriculture information:

To increase the farmers' access to agricultural information, we advise that the government and agricultural partners to help the regional directorate of agriculture to reinforce their logistic capacities so that they can stay in touch with the farmers and be able to inform and teach them. Likewise introduce special programs on local and regional TV channels and radios to broadcast the agricultural information about input, market situation, pest, and so on.

- Access to inputs:

The absence at the selling point of the agricultural inputs such as fertilizer, pesticide, spray and seeds constitute a weakness for the development of agriculture in the Ngounie province. To find a solution to this problem the government must encourage the agriculture companies which provide agricultural inputs in the country to open a local branch of the company in each province of the country by offering them incentives, such as taxes reduction or credit. Furthermore, the partnership between the provider and agricultural organizations can be developed. The agricultural organizations with the support of the government and/or NGOs could build warehouses for the storage of the inputs. Then with the support of their partnership with the provider, the farmers will be able to bring in the inputs they need.

- Constant access to the agricultural training:

In the objective of constantly reinforcing the technical capacity of the farmers, we recommend to use the method of training to the trainers. This method is characterized by the identification of an eligible individual from a group, association or organization of farmers or from the village, then this individual will participate continuously in different training programs organized by NGOs, the professional agricultural schools and government institutes. The ultimate goal is to equip this particular individual with the tools necessary to share the knowledge he /she acquired during the training with other farmers.

- Agriculture product commercialization:

To increase their income, it is necessary for the farmers to be able to access the markets which give their products an increased value. We have to support the farmer and farmer organizations to acquire the means of transportation and put them in a position where they can transport their products to the markets place which have more value and demand. But also, develop a system of storage and conservation for the farmer' products when their products are facing a decrease in price on the market so that they can wait for the moment where price will peak again. The government in association with different partners can develop an agro-industry for some important products like cassava to diversify the market where the farmer can sell his/her product.

- Micro finance:

Regarding the finance, the farmers encounter many problems such as financing to hire new labor force and difficulty in purchasing agricultural materials. It will be essential that the government, the various funding institutions and the banks could develop a suitable agricultural micro-financing system which gives the farmers access to funding and put them in a position to be able to finance their different needs in order to have an effective agricultural production. Indeed, the funding support coming from the government is not enough to sustain a successful and prosperous agricultural sector in Gabon. Overall, Gabon must establish a policy which improve the productivity of the farmer throughout the country and help them become more professional.

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## APPENDIXE

**APP A: Table A.0.1.** Questıonary of impacts of agricultural development project (PRODIAG) on agricultural farms in Gabon: a case study in Ntoum Estuaire

***Survey No:*** ***Name and Surname of Farmer:*** ***Date: …./……/2015***
***Province:*** ***District:*** ***Village:***

**A) SOCIO-ECONOMIC CHRACTERISTICS OF THE FARMS**

**A1. Age of the farm owner**: *……. Years*

**A2. Gender of the farm owner**: *0. Female 1. Male*

**A3. Education level of the farm owner**:

*0. Illiterate 1. Literate 2. Elementary school 3. Secondary school 4. High school*
*5. Vocational school 6. Bachelor degree 7. Master degree 8. Doctorate degree*

**A4. The main profession of the farm owner**

*0. Unemployed 1. Farmer 2. Temporary employee 3. Permanent worker 4. Artisan*
*5. Government official 6. Retired person 7. Other (……..)*

**A5. Population and unemployment status in the farms**

| *Age group (year)* | *Pre-Project Population* | | | | *Current Population* | | | |
|---|---|---|---|---|---|---|---|---|
| | *Female* | *Male* | *Total* | *Unemployed* | *Female* | *Male* | *Total* | *Unemployed* |
| *0-14* | | | | | | | | |
| *15-64* | | | | | | | | |
| *65-+* | | | | | | | | |
| *Total* | | | | | | | | |

**A6. Has there been any migration from the farms during the project period?** ***(If there has not been, please answer A8th Question)***

0. No 1. Yes (…… person)

**A7. What was the reason for migration from the farm?**

*1. Look for or find a work 2. Education 3. Health problem 4. Marriage*
*5. Security 6. Other (……..)*

**A8. Social security status of the farm owner** ***(if the answer is Yes, please write the kind of securityin the bracket)***

| *Pre-Project Situation* | | *Pre-Project Situation* | |
|---|---|---|---|
| *0. No* | *1. Yes (……..)* | *0. No* | *1. Yes (……..)* |

**A9. Rental labor status**

| | *Pre-Project Situation* | | | *Pre-Project Situation* | | |
|---|---|---|---|---|---|---|
| | *Number* | *Employment* | *Time (day)* | *Number* | *Employment* | *Time (day)* |
| *Employed workers* | | | | | | |

**+A10. Income status of the farm (FCFA in year)**

| *Source of Income* | *Pre-Project Situation* | *Pre-Project Situation* |
|---|---|---|
| *Agriculture* | | |
| *Non-agriculture* | | |
| *Total* | | |

**+A11. Organizing status of the farmers and benefiting from the services of the farm organizations**

*Please write type of farmer organization in the first column before copying your questionnaire*

**B) STURUCTURAL CHARACTERISTICS OF THE FARMS**

**+B1. Land assets and ownership status (decar or hectare)**

| | *Pre-Project Situation* | *Current Situation* |
|---|---|---|
| *Property (own) land* | | |
| *Partner-held land* | | |
| *Rental land* | | |
| *Giving land partner* | | |
| *Land leased* | | |
| *Total land* | | |

**B2. How many parcels are agricultural land of the farm?** ……..

**B3. How many people have the title of the agricultural land belongs to the farm?**

……. *People*

**+B4. Plant production and marketing status**

| *Product* | *Pre-Project Situation* | | | | | *Current Situation* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Crops species* | *Sown area (da/ha)* | *Production (kg/ton)* | *Sale price (FCFA/kg)* | *Sale point** | *Crops species* | *Sown area (da/ha)* | *Production (kg/ton)* | *Sale price (FCFA/kg)* | *Sale point** |
| | | | | | | | | | | |
| *Cassava* | | | | | | | | | | |
| *Banana* | | | | | | | | | | |
| *Eggplant* | | | | | | | | | | |
| *Papper* | | | | | | | | | | |
| *Corn* | | | | | | | | | | |
| *Peanuts* | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| *Other(....)* | | | | | | | | | | |

** Please state where product was marketed such as trader, artisan, processing firm, exporter, etc.*

**+B5. Animal production and marketing status**

| *Product* | *Pre-Project Situation* | | | | | *Current Situation* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Animal species* | *Animal number* | *Production (kg/ton)* | *Sale price (FCFA/kg)* | *Sale point** | *Animal species* | *Animal number* | *Production (kg/ton)* | *Sale price (FCFA/kg)* | *Sale point** |
| *Pork* | | | | | | | | | | |
| *Hen (egg)* | | | | | | | | | | |
| *Other* | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

** Please state this column where product was marketed such as trader, artisan, processing firm, exporter, etc.*

**+B6. Information sources of the farmers**

| | *Pre-Project Situation* | *Current Situation* |
|---|---|---|
| *Other farmers* | | |
| *Farmer organizations* | | |
| *The Ministry of Agriculture* | | |
| *PRODIAC* | | |
| *TV* | | |
| *Radio* | | |
| *Newspaper* | | |
| *Book* | | |
| *Other (……)* | | |

**+B7. Participating into extention and training activities of the PRODIAC program and its impacts**

| | *Participation (if Yes, write √ )* | *Impact level of extension and training activities (if Yes, write √ )* | | | | | *Please, order your information need from the highest to the lowest* |
|---|---|---|---|---|---|---|---|
| | | *1. Very low* | *2. Low* | *3. Medium* | *4. High* | *5. Very high* | |
| *Tillage* | | | | | | | |
| *Fertilization* | | | | | | | |
| *Irrigation* | | | | | | | |
| *Animal breeding* | | | | | | | |
| *Animal feeding* | | | | | | | |
| *Pests and diseases control* | | | | | | | |
| *Crops or product processing* | | | | | | | |
| *Storage* | | | | | | | |
| *Organizing farmers* | | | | | | | |
| *Marketing* | | | | | | | |
| *Sutainable environmental management of the farms* | | | | | | | |

**+B8. Where have the farms provided agricultural inputs from?**

| | *Pre-Project Situation* | *Current Situation* |
|---|---|---|
| *Fertilizer* | | |
| *Pesticides* | | |
| *Herbicides* | | |
| *Diesel* | | |
| *Seeds* | | |
| *Seedlings* | | |

*1. The farm 2. Cooperative 3. Farmer Union 4. PRODIAC 5. Ministry of Agriculture*

*6. Other (……)*

**+B9. Which component of the project did you benefit more from?**

| | *1.Very low* | *2.Low* | *3.Medium* | *4.High* | *5. Very high* |
|---|---|---|---|---|---|
| *1.Supporting board farm management* | | | | | |
| *2. Technical and vocational training the farmers* | | | | | |
| *3. Research and development* | | | | | |
| *4. Organizing and consulting farmers* | | | | | |
| *5. Processing agricultural products* | | | | | |

**B10. Importance of the farm problems**

| | *1.Very low* | *2.Low* | *3.Medium* | *4.High* | *5. Very high* |
|---|---|---|---|---|---|
| * | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

** Please state this column the problems of the farms*

## CURRICULUM VİTEA (C.V)

**Mr N'KOUAH YALI tanguy**
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**Professional experience**

**2010 Gabonese Institute of Support for Development (IGAD) (trainee) Libreville**

- Monograph of the institute
- Monitoring of the agricultural situation in dry season in Owendo agricultural perimeter

**2011 Directorate General of cocoa coffee Banks (CAISTAB) (trainee) Franceville**

- Comparative study of the effect of organic and mineral fertilizers on coffee plants in garden center ( bachelor's degree thesis topic)
- Monitoring and maintenance of the garden center ( added activity)

**2012 - 2013 Institute of Gabonese Development Support (IGAD) (employment) Libreville / Port-gentil**

- Agent department advisory support to producers
- Producers followed and advice on agricultural perimeter ( activity)

**Education and Qualification**

**2015 Ondokuz Mayıs University**

- MSc Student

**2011 National Institute Superior of Agronomy and Biotechnology (INSAB)**

- Bachelor's Degree in agronomy (crop production speciality)

**2008 D Eugene Marcel Amogho**

- High school diploma

**2005 Secondary College Study George Mabignath**

- Secondary school undergraduate

**Skill**

- Language: French, English, Turkish.
- Good keyword skill familiarity with Word, SPSS &Excel