STATUS OF
AGRICULTURAL INNOVATIONS, INNOVATION PLATFORMS AND INNOVATIONS INVESTMENT

Togo

PARI Program of Accompanying Research for Agricultural Innovation

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FARA Forum for Agricultural Research in Africa

INSTITUT TOGOLAIS DE RECHERCHE AGRONOMIQUE

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Status of
Agricultural Innovations, Innovation Platforms and Innovations Investment in Togo

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ABBREVIATIONS AND ACRONYMS

ANPAA	National Association of Poultry Occupations in Togo
CIAT	International Centre for Tropical Agriculture
CIRDES	International Agency for Research / Development on Livestock
CORAF	West African Centre for Agricultural Research and Development
CRA-F	Agricultural Research Centre - Forest area
CRA-W	Littoral Agricultural Research Centre
CRA-SH	Agricultural Research Centre - Savannah Wet
CRA-SS	Agricultural Research Centre - Savannah Dryer
DARS	Device Research Support System
ESA	Superior School of Agronomy
ESTBA	Higher School of Biological and Food Techniques
ICAT	Council Institute and Technical Support
IFDC	International Centre for Soil Fertility and Agricultural Development
IITA	International Institute of Tropical Agriculture
ILRI	International Research Institute for Livestock
ITRA	Togolese Agricultural Research Institute
IDDM	Directorate of Agricultural Statistics, Informatics and Documentation
MPD	Plant Protection Directorate
NSCT	New Cotton Company of Togo
QPM	Quality Protein Maize
R & D	Development Research
UEMOA	Economic and Monetary Union of West Africa
UL	University of Lomé
WAAPP	Agricultural Productivity Program in West Afric

STUDY BACKGROUND

Science and technology remains the fulcrum for development over the ages. There is hardly any national development in contemporary history that is not based on consistent efforts from the science and technology sector. The spate of development in agriculture follow suit; the state of efficiency in science and technology generation correlates highly with the development of agriculture. In Africa, agriculture is considered as the sector with the best potential to lead the socioeconomic development of countries on the continent. However, the sector is bedevilled with many constraints that could be categorized as technological, socio-cultural, institutional, infrastructural, and economical. The poor productivity of the enterprise stream in the sector is clearly seen from its contribution to a country's GDP versus the number of active workers engaged in the sector. Africa's agriculture currently engages about 65% of the working population and its average contribution to GDP still stands at 22.9%.

The crave to develop Africa has received good attention in recent years, starting with the political will of the heads of states, under the auspices of the Africa Union Commission, to develop and implement the Comprehensive Africa Agricultural Development Programme (CAADP), the Science Technology and Innovation Strategy (STISA). The Forum for Agricultural Research in Africa (FARA) also came up with a handful of continental initiatives, such as the Sub-Saharan Africa Challenge Programme (SSA CP), *Strengthening Capacity for Agricultural Research and Development in Africa* (*SCARDA*), Dissemination of New Agricultural Technologies in Africa (DONATA) and several others. The different initiatives aim to foster change by addressing specific issues that constitute constraints in the path of progress in Africa agriculture. The notion that African agricultural research system has generated a lot of technologies with great potentials, but which are not realized due to different institutional and organizational constraints—more specifically, the way agricultural research and development systems is organized and operated—is prevalent among stakeholders in the sector. Indeed, this notion appeals to reasoning. However, there is no known cataloguing or documentation of existing technologies and their veracity in delivering broad-based outcomes. The possibility of finding some documentation in annual reports of research institutes, journal articles and thesis in the universities is known, but this will not meet an urgent need.

Thus, the Programme of Accompanying Research for Agricultural Innovation (PARI) commissioned the three studies reported in this volume to provide a compressive

analysis of the state of agricultural technology generation, innovation, and investment in innovations in the last 20 years in selected countries in Africa.
Study 1 is the "situation analysis of agricultural innovations in the country" and provides succinct background on the spate of agricultural innovation in the last 30 years. It provides useable data on the different government, international and private sector agricultural research and development interventions and collates information on commodities of interest and technologies generated over the years. It also conducted an assessment of the different interventions so as to highlight lessons learnt from such interventions, with regard to brilliant successes and failures.

Study 2 concerns a "scoping studies of existing agricultural innovation platforms in the country". It carried out an identification of all the existing Innovation Platforms (IP) in the country, including identification of commodity focus, system configuration, and partnership model. The study provides an innovation summary for each IP for use in the electronic IP monitor platform. It further synthesises the lessons learnt from the agricultural IPs established through different initiatives in the country in the last ten years.

Study 3 was an "Assessment of the national and international investment in agricultural innovation". It is an exhaustive assessment of investments in innovation for agricultural development, food and nutrition security in the country. It collates updated data on investment levels in the past and present, including a projection for the next decade requirement to assure food and nutritional security in the country.
The three studies form the comprehensive collation on the state of agricultural innovation in the 12 countries where the PARI project is being implemented. It is expected that these studies will benefit all stakeholders in Africa's agricultural research and development, including the users of technologies, research stakeholders, extension system actors and, more importantly, the policymakers.

STUDY **01**

Inventory of Agricultural Technological Innovations (1995 to 2015)

INTRODUCTION

Togo has in recent years experienced unprecedented population growth, and economic and socio-political transformation. Agriculture is a key sector of the Togolese economy. The agricultural sector plays an economic and social role in the country because of its immense contribution, such as: the achievement of food security, creation of jobs and income, and availability of goods and services. Agriculture employs over 60% of the active population and contributes about 40% to the gross domestic product (GDP). But it is essentially subsistent and dominated by family farms. Thus, most agricultural activities are organized and implemented by family farms.

Historically, agricultural production in Togo is mainly family based, and this has been a serious production constraints. Production effort has always been through traditional knowledge. In a context of the unprecedented population growth and in the face of increasingly scarce resources, new production systems have emerged with the support of national and international institutions and NGOs. Science, technologies and innovations contribute greatly to fostering productivity, competitiveness and economic development.

Agricultural research generates new technologies to improve productivity and farm incomes; but technology dissemination sometimes experience challenges for the following reasons: (i) the results are always mainly in the form of scientific reports, which are difficult for the end users to understand; (ii) researchers who developed the technologies often do not have the skills to disseminate the information to the prospective users; and (iii) when appropriate technology reaches the intended users, the absence of effective monitoring often jeopardizes their new experience.

In order to bring the technologies developed to the end-users and facilitate their adoption, ITRA designed this baseline document on innovations in Togo. The report focuses on key technologies generated or adapted through development research in Togo. It provides an overview of innovations in crop and animal production, natural resources, food processing, and conservation of agricultural products, among others. In general, it is to make an inventory of technological innovations in their real environment. Specifically, it identified technological innovations introduced on-farm in Togo, highlighting the effects induced by the innovations.

METHODOLOGY

This study was conducted at public bodies performing research and development along the lines of the School of Agronomy (ESA), the Faculty of Science and the School of Biological and Food Techniques (ESTBA) under all of the University of Lomé (UL), the Togolese Agricultural Research Institute (ITRA), the Plant Protection Directorate (DPV) and the Directorate of Agricultural Statistics, Informatics and Documentation (IDDM) and NGOs.

The Participatory Rapid Method (PRM) was used for data collection at the institutes involved in agricultural research and development activities. It was conducted in five (5) steps. Step 1 involved documentation of bibliographic references (secondary data) and interviews with personnel in the documentation activities. The documentation was followed by research on several internet sites, which all helped in the listing of different technologies developed and disseminated on-farm. Step 2 pertained to harmonization meeting to reconcile the data gathered at the first stage; definition of procedure and design of instrument for collecting primary data were also carried out in step 2. Primary data collection was step 3. Issues addressed in the instrument (questionnaire) were: innovation areas, types, and actors; field problem leading to the innovation, coverage area of innovation, beneficiaries, cost of innovation, effects of innovation on households and society. Step 4 concerned data analysis and report writing. The data collected were analysed qualitatively (categorization and triangulation) and quantitatively (descriptive statistics, graphs). The report was then validated in step 5—which involved workshop with stakeholders to validate the draft report.

RESULTS

Agricultural research began in Togo in the 1940s, when the regional branches of several French agricultural research institutes were established. In the aftermath of independence in 1960, most research activities were continued and two additional French research institutes were created: the Institute of Tropical Agronomic Research (IRAT), created in 1961, and the Research Institute of Coffee and Cocoa (IRCC), established in 1967. Togo was then not able to nationalize its research system because of insufficient qualified scientists and limited public resources.

In the late 1980s, the Research and Development (R&D) Agricultural activities in Togo were divided among a dozen institutes under four different ministries, who

lacked coherence in terms of operation and programmes. In 1991, on the recommendations of the World Bank, the Ministry of Rural Development (MDR) and the Ministry of Rural Development (MAR) then merged to form the Ministry of Rural Development, Environment and Tourism (MDRET). The National Directorate of Agricultural Research (DNRA) was also established to take over the planning and coordination of research and development (R&D) activities in agriculture. The National Directorate of Agricultural Research (DNRA) also supervised the Institute of Nutrition and Food Technology (INTA), the National Soil Institute (NSI) and the National Meteorology Directorate (DMA). In addition, all organizations conducting research on crops were combined to form the National Institute of Food Crops (INCV). Those conducting research in livestock were also grouped and placed under the supervision of the National Institute of Zootechnical and Veterinary (INZV) services. From 1994, DNRA also assumed responsibility of IRCC and the Cotton Research Institute and Exotic Textiles (IRCT).

The National Support Project for Agricultural Services (PNASA) of the World Bank has focused on the need to redefine the roles of various research agencies; hence, different entities of DNRA were consolidated to form the Togolese Institute for Agronomic Research (ITRA) in July 1997 on the recommendations of the World Bank. These institutes comprised the National Institute of Staple Crops (INCV), the National Institute of Soils (INS), the National Institute of Nutrition and Food Technology (INTA), the Institute for Research on Cotton and Exotic Textiles (IRCT), the Research Institute of Coffee and Cocoa (IRCC) and the National Institute of Zootechnical and Veterinary (INZV) services. ITRA, under the Ministry of Agriculture, Livestock and Water (MAEH), is responsible for research in agricultural systems, crop and animal production, management of natural resources and food technology, among others. Its mission is to:

i. contribute to the implementation of policy research and study at the service of agricultural development,
ii. produce scientific information in order to sustainably improve the productivity of agricultural systems,
iii. contribute to the sustainable increase in agricultural productivity and production through the development and implementation of research programme and the development of agricultural technology and adapted agri-food,
iv. transfer technologies Scientists generated and acquired other partners (extension workers, farmers, teachers, scientists, etc.),
v. contribute to the training and information science and technology partners.

Its headquarters is located in Lomé and it has centres of agricultural research (ARC) located in each of the four agro-ecological zones of the country, namely the coastline, forest, moist savannas and dry savannas.

Outside of producer organizations and NGOs in agriculture, ITRA and other university departments maintain cooperation with the Western Council of Scientific Networks and African Centre for Agricultural Research and Development (CORAF / WECARD), AfricaRice, the Foundation for Sustainable Food Security in Central West Africa (SADAOC), the Research Network for West and Central African Sorghum (ROCARS), Network for West and Central African Research on Corn (WECAMAN) and a number of international institutions, such as the International Institute of Tropical Agriculture (IITA), the International Institute for Livestock Research Institute (ILRI), the International Centre for Research and Development on Sub-humid Breeding Area (CIRDES), the International Centre for Agricultural Research for Development (CIRAD), and the African Forum for Agricultural Research (FARA).

Togo has six public agencies in agricultural research and development, of which the Togolese Institute for Agronomic Research (ITRA) is the most important. ITRA research focuses on crops, livestock, fisheries, natural resource management and food technology. Apart from its headquarters and stations in Lomé, ITRA operates research centres in the four agro-ecological zones: coastal, forest, moist savannah and dry savanna. DPV and IDDM are two other government agencies that conduct agricultural research activities, albeit at a modest level.

In the education sector, three institutions are involved in agricultural research: ESA, the Faculty of Science, and ESTBA - all within the University of Lomé (UL). The largest of the three is ESA (with 22 researchers) whose activities cover plant virology, biotechnology, management of soil fertility, farm mechanization, postharvest conservation and socioeconomic themes. No non-government organization (NGO) or private company was identified in research and development work. However, the study noted that most private bodies outsource their research activities to ITRA and UL.

Technological Innovations

a. Production plant

Technologies developed in the field of plant production concerned food crops, vegetables and livestock. These technologies affected different aspects of farming techniques and their aim was to improve yields.

b. Varietal selection

Innovations generated in this area are reported in Appendix 1.

Table 2: Cultivation techniques generated by research and development in Togo

Technical	*Speculation*	*Description*	*Year*	*Observation*
PIF	banana tree			This technique provides a quality planting material
Mainly cassava maize ISFM-Zone		Corn for fertilizer and / or Mucuna / cassava / cowpea, maize-fertilizer and / or manure, corn fertilizer and / or fertilities plants (option1); Mucuna-maize-fertilizer crop residues + (option 2); Corn for fertilizer-sweet potato or cassava on previous option Mucuna-maize-fertilizer (option3); Mucuna-maize-fertilizer / - fertilizer -cassava + maize crop residues in rotation (option 4)	2004	
Online seeding and planting hole closed	Cereals, cash crops, root crops, garden crops			
Use of chemical fertilizers for fertilization	main crops			
Nursery and transplanting of irrigated rice with two strands per hole	Rice			
Use of	Cereals cash			

pesticides (herbicides, insecticides and fungicides)	crops, market garden crops and root crops			
Construction of stone bunds	Large culture groups			
Plow following the contour	All speculations			
Using fertilizer plants (Cajanus cajan)	major cereals			
Using vetiver				Fight against erosion
corridor Culture				
Timing of planting dates	Food crops, annuity, gardening, roots and tubers (cassava and yam)			
Cloud seeding	Food crops, annuity, gardening, roots and tubers (cassava and yam			
Contribution periods fertilizer	Food crops, annuity, gardening,			
Dose of fertilizer	Food crops, annuity, gardening,			
Operating fertilizer	All cultures			
Development of processing techniques	Cotton			
Improved production technology of yam setts	Yam			
Technical rapid multiplication	Cassava			

of cassava				

c. Animal production

Table 3: Technologies developed in the area of animal production

Species	*Race*	*Year selection*	*Zootechnical performance*	*Effects*
Sheep	Djallonké sheep	1995 Kolokopé	1. Selecting rams enhancers	1995- 2005: 545 and 3109 selected rams introduced in village farms
			2. Improvement of maternal qualities (prolificacy)	1984 (108%) - 2005 (145%) Annual numerical productivity (150 weaned lambs to 100 ewes against 70 lambs per 100 ewes extensive farming
			3Improved ability butcher	Lamb over medium weight at 1 year (28 kg against 18 kg in the boot) 32 kg for the best lambs; average live weight of 50 kg at the age of 3 years for selected rams
Cattle		1980-1999 Avétonou	1. Selecting bulls	Delivery of 200 heifers and 60 bulls at the National Livestock
			2. Improving the ability butcher	100 bulls from industrial crossbreeding and 140 animals reforms while confused sex were delivered to the slaughter
			3. Animal Traction	50 pairs of steers were shipped to animal traction

The technologies developed in this area are essentially aimed at improving farming conditions by ensuring the health, better nutrition of animals, and improved animal performance through the introduction of effective spawners. In the aquaculture sector, the technologies related to the management of fish ponds, production of fry and fish merchants, as well as their diet.

d. **Natural resources**

The poor soils found in most areas have led to the development of technologies for the management of soil fertility (use of fertilizers, compost, and household waste), as well as the intercropping and agroforestry. ITRA has also conducted tests on the simple furnishing of participatory technical shallows using SMART-IV Project of AfricaRice (see table 1). These technologies were broadcast on-farm by organizing participatory testing, through demonstration units, field days and rural workshops, where fact sheets are distributed and radio broadcasts are done.

Table4: Innovations generated in the field of management and conservation of natural resources in Togo

Innovation	*Speculation*	*Description*	*Institution / Promoters*	*Year of promotion*
Technical simple furnishings shallows	Rice		ITRA, Africa Rice, ICAT NGOs	2012
Improved fallow with legume cover (Mucuna, cajanus pigeon)			ITRA, ICAT, NGOs	
use of mineral and organic fertilizers)	All cultures	Fertilization doses based on identified deficiencies and various types of culture were developed	ITRA, ICAT, NGOs	2004
Streamlining technologies associations of crops and crop rotations	Different types of crops	-For Crop associations were: maize / pigeon peas, corn / cowpea, corn / soya, maize / peanut, corn / cotton, cowpea, sorghum - For rotations, there is generally rotation cereal / legume, the four-year rotation of cotton / corn / millet in the regions of Kara and Savanna, corn / sweet potato rotation in the maritime region	ITRA, ICAT, NGOs	2004
Manufacture of organic			ITRA, ICAT,	2000

fertilizer (compost and manure)			NGOs	
Use of botanical extracts in the conservation of yam tubers	Yam		ITRA, ICAT, NGOs	2008
Mapping culturing technology			ITRA, ICAT, NGOs	
Terrace cultivation technology			ITRA, ICAT, NGOs	

e. Processing and preserving agricultural products

Innovations on the processing and conservation of agricultural products focused on food supplements' production techniques, up to the point of a fizzy drink called 'Dehachampe,' a sparkling palm-wine which was introduced into the market in December 2012.

Table 5: Innovations generated in the field of processing and storage of agricultural products

Innovation	*Description*	*breeder*
Mustard improved néré		ITRA/DL
Manufacture of food supplement based on moringa and cocoa	The food supplement in Moringa is developed to fight child malnutrition. It is a flour rich in minerals, especially iron and zinc. The cocoa food supplement is developed to fight child malnutrition and improve the organoleptic quality of boiled cocoa. It is a flour rich in minerals, especially magnesium, phosphate and calcium.	ITRA/DL
Manufacturing of infant foods (age Nutrimix 1st and 2nd year)	These flours are to counter child malnutrition	ITRA/DL
Precooked corn flour 100%	This is a product of processed maize and is used for the preparation of dough, widely consumed by the population	ITRA/DL
Husked corn flour admixture of different ratio: 90-10%, 70-30%, 50-50%		ITRA/DL
Flour made of maize / cassava	The composite flour is prepared from corn flour and high quality cassava. It answers the needs of a certain section of the population whose consumption of the product satisfies the eating habits	ITRA/ DL
Bread flours from corn and sorghum	The bread flours from corn and sorghum are obtained after the shelling process. These are fine flour, white, odourless and being similar to wheat flour. They are used in the manufacture of pastry and biscuit products.	ITRA/DL
High quality cassava flour (HQCF)	The high quality cassava flour is produced from freshly harvested cassava tubers aged between 10 and 12 months. It is odourless, non-fermented, and	ITRA/DL

	tasteless gluten	
Cassava processing in Gari	Gari is a partially gelatinized cassava flour after roasting. It is characterized by mild taste and fermented sour.	ITRA/DL
Cossettes d'igname	Yam chips are small whole tubers or the slices of tubers precooked and dried to a water content of about 12% to 15%.	ITRA/DL
Preparation of tomato sauce	The tomato sauce is an extract from the tomato fruit. The product is seasoned and spiced. It occupies an important place in the eating habits of Togo.	ITRA/DL
Mango jam	The jam is produced from the pure juice of mango pulp (ripe or green) mixed with sugar.	ITRA/DL
Green mango marmalade / blackberry	Mango marmalade is a product that helps reduce losses and waste of mineral salt sources and valuable vitamins for human harmonious development.	ITRA/DL
Orange syrup	Orange syrup product is from fresh oranges or stabilized concentrated juice with sugar.	ITRA/DL
Production of yam chips		ITRA/DL
Manufacture of local champagne, 'dehachampe', bottled palm-win		ITRA/DL
Local cheese (Wagashi)		ITRA/DL
Foods prepared from sorghum		ITRA/DL
Using PICS bags for storage of cowpea		IITA, ITRA
Use of pesticides for preserving crops		ITRA, ICAT, NGOs

f. Organizational Innovation

Innovations in the field of socioeconomics are references to multi-stakeholders innovation platforms (PIs) products like corn, cheese, guinea fowl, etc. Farmers Field Schools (FFS) and the Participatory Varietal Selection (PVS) approaches are examples.

Impacts of innovation

Table 6. Different innovations and their impacts

Innovation area	*main impacts*
Vegetable production	Increased production and benefits Reduced production costs and increased income
Natural resource management	Improvement of local soil productivity and, hence, agricultural production while allowing the preservation of quality. But in terms of improving soil productivity, innovations have, apart from the use of mineral fertilizers, rather slow and gradual effects and therefore not immediate. Thus, these effects are more appreciated in the medium and long-term than in the short-term
Animal production	Innovations have a range of strategic national interest to reduce medium and long-term chronic deficit in animal protein and ensure food security of the population. Indeed, innovations are promoting the professionalization of producers and the creation of sustainable jobs in rural areas to produce more meat to satisfy the needs of people who need to eat properly for a healthy and productive life
Processing and preservation of agricultural products	Diversification of forms of use of the different cultures, Reduce currency losses in imports; and contributes to the fight against poverty and food insecurity in Togo

CONCLUSION AND RECOMMENDATIONS

It appears from this study that several technologies have been introduced to improve agricultural productivity in Togo. But because not all technologies developed were adopted, agricultural productivity remained low. But this should not discourage the research and development agencies, such as ITRA, as there is some level of progress. Hence, ITRA should continue its research activities to generate knowledge and develop new technologies in the areas of crop and livestock production, natural resource management, food technology and socioeconomic studies. It should, however, look specifically at the conservation of plant genetic resources for food and agriculture, creation and varietal improvement, management of soil fertility, fight against pests, animal genetic selection, improvement of farming systems and animal

health. Some level of emphasis should also be placed on the transfer of proven technologies and training of agricultural stakeholders for better use of technologies. It is important that the gains achieved so far are preserved and enhanced.

STUDY **02**

Inventory and Characterization of Innovation Platforms

INTRODUCTION

As part of the implementation of the Togolese research with Innovative Research Assistance Programme (IRAP), three projects were initiated, including the baseline on innovation platforms. In order to determine the actual number of innovation platforms in Togo, a study was conducted for this purpose. Literature and land surveys identified fifty-five (55) platforms throughout the country: twenty-seven (27) by the International Fertilizer Development Centre (IFDC), twenty-four (24) by the Togolese Agricultural Research Institute and four (4) by the Togolese Confederation of Farmers Organizations (CTOP). Of these, only six (6) to date are functional and are in a state of absolute independence. For all the platforms to develop, the entry point is important and should be well-identified. When potential actors from different links are well-organized and open to innovations, a focused market platform evolves to the state of independence. When the level of organization and openness fails, coupled with a lack of market, the platform barely functions. Today, through the National Agricultural Investment Programme for Food Security (PNIASA), five new platforms (one per region) have been established to revitalize agricultural production as a whole.

Several initiatives have been conducted worldwide to improve the living conditions of people in the rural areas. These initiatives were centred on public health, education, natural resource management or the development of a more sustainable agriculture. Some of the interventions were fairly simple and the expected result was easily achievable. Others, such as the management of natural resources or the development of sustainable production systems are very complex. They can be slow, and usually a lot of actors and processes are associated. Many experiments on research and development are conducted to fight against poverty and promote the development of sustainable agriculture. These efforts mobilize several community organizations, public or private institutions and individuals or group of individuals in the rural and urban areas. All these experiences are not successful, but each carries with it elements of learning for other development actors.

Very often, technologies exist, but they remain largely unknown. This implies that the sharing of knowledge remains low despite several initiatives. The capitalization issue remains a major challenge for the dissemination of experiences. In Togo, the transformation of agriculture into agribusiness and capacity building under the name of Agricultural Enterprise Clusters (platform) was introduced in 2005 by the International Fertilizer Development Centre (IFDC) in its 1000+ project. The

objective of this project was to promote research and development through the capitalization and systematization of practices in the field of sustainable agriculture. From 2010, another concept was born under the name of Innovation Platform (IP). However, when the problem is identified and well thought out, it becomes a beneficial opportunity to the actors. Therefore, the technical partners, the Forum for Agricultural Research in Africa (FARA) and its sub-regional agricultural organizations (BRS), have found it useful to make a full evaluation of the National Agricultural Investment and Food Security Programme (PNIASA) to identify clearly relevant issues that will serve to develop a comprehensive framework for developing human capital necessary for the Comprehensive Africa Agriculture Development Programme (CAADP). It is to carry out an analysis of all the innovation platforms that were created to determine their success factors and failure.

Togo is a small country in West Africa, bordered by Ghana to the west, Benin to the east and Burkina Faso to the north, and covers an area of 56,600 square kilometres. It is located between 6° and 11° North and 0° and 2° East. The country is divided into five regions, with each administrative region further divided into prefectures, townships and villages. The country consists of two large areas of terrain: one formed by a chain of mountains oriented NNE-SSW, which stretches from the Akwapim Hills (Southern Ghana) to Atakora Mountains (Benin), while the other is made up of plains formed by the watersheds of the Oti in the north and Mono in the south. There are three major basins, namely: the Oti basin and its tributaries (26,700 km²), the Mono Basin (21,000 km²) and the coastal basin of Lake Togo (8000 km²).

Two climates prevail in Togo: the sub-equatorial climate and humid tropical climate. The sub-equatorial climate prevails in the southern half of the country and is characterized by two dry seasons (November to March and July to August) and two rainy seasons (March to July and September to October). The northern half is covered by the humid tropical climate, which is characterized by a rainy season (May to October) and a dry season (November to April). The average annual rainfall varies from 800-1500 mm. The natural vegetation consists of dense and open forests, riparian training and also completely degraded or built areas.

Togo belongs to the West African flattened assembly, consisting of primary rocks supporting relatively recent sedimentary strata. This is characterized by a high variability of soils by their nature, geographical distribution and fertility level. A comprehensive description of the soil of Togo jointly by FAO, UNDP and the INS reveals the existence of four major categories:

- Alluvial soils, hydromorphic and vertisols: they cover an area of about 585,000 ha or 10% of the area of Togo.

- Weakly lateritic soils or “bar land”: the “bar land” occupy an area of 700,000 ha or 12% of the area of Togo. They have good physical and structural qualities against chemicals of poor quality.
- The ferruginous tropical soils: these soils cover nearly half of the country (48%) and have a very high variability. Their chemical fertility is often poor, especially phosphate (P_2O_5). Culturing of these soils quite quickly causes a significant regression of their fertility potential due to erosion and leaching of minerals.
- The raw mineral soils and slightly evolved erosion: they cover about 30% of Togo and have no agricultural or pastoral interest.

Togo’s population grew from 2,719,000 in 1981 to over 6,191,155 in 2010, an average annual growth rate of about 2.8%. This population is composed of 48.6% men and 51.4% women. The Maritime region is the most populated, with 42% of the population, as against only 10% for the Central region, which constitutes the least populated region. Togo is an essentially agricultural country and a significant proportion of the population work in the primary sector. However, there is a considerable drop in these population. Indeed, in 1975, 72% of Togo’s population lived in the rural areas, as against only 60% in 2012.

METHODOLOGY

The methodology is based on a participatory process involving the actors identified by the support structures (research institutions, extension services, NGOs). First, a review was carried out in the documentation centres, research institutions, and public and private support services. The different platforms in place at the national level, as well as the structures concerned were listed. Three structures were identified from the literature. This are IFDC-Africa, the Togolese Coordination of Farmer Organizations and Agricultural Producers (CTOP) and the Togolese Institute for Agronomic Research (ITRA). This literature also helped to have an idea about the functionality of these platforms. On this basis, they were divided into two: functional platforms and non-functional ones.

In order to contextualize the secondary information, a survey was thereafter conducted to collect primary data. These data were collected based on an interview guide. The non-functional platforms and functional ones were all surveyed (They were fifty-five (55) in number over the whole country). The points discussed in this guide embrace the platforms in place (functional or not), their strengths and weaknesses, the value added in terms of actors, etc. The collection of information

was done by a qualitative approach, based on focused discussion groups, bringing together the various actors of the platform. At the end of the fieldwork, a report was prepared on the basis of the descriptive analysis of the contents of the interview guide.

RESULTS

The Approach of Integrated Agricultural Research for Development

The Integrated Agricultural Research for Development (IAR4D) is a complex concept proposed by FARA, as an innovation system for the formation of a framework for the transformation of agricultural research in sub-Saharan Africa. Indeed, after independence, various holistic and participatory approaches have been developed, such as the linear approach, triangular village level participatory approach and the farmer field school, placing greater the focus on the knowledge of farmers and their role in the innovation process. Although agricultural research has generated several types of high-potential technologies, the impact of technology on performance, livelihoods and the quality of life of the farmers was not living up to that potential. This situation is explained by the way research is conducted, mainly because it is a unique way without taking into account other essential actors in the production chain. IAR4D fills the gaps in the traditional systems of research and development. It is a concept that incorporates four principles for understanding.

The theme or ‘‘door’’ is a challenge for research and development, identified by one or more players to achieve the desired development impact. It is necessary to unite and work together. The interests and actions of these actors are not restricted to information and technology, but include trade, politics, finance, organization, management, etc., and the links between them.

More than just a process of concerted action, IAR4D is a social learning process, where actors learn from their experience working together. This training covers the same process of interaction between actors, rather than a ‘specific solution challenge’. This learning takes place at the individual, organizational and institutional levels. Current general concepts of sustainable development and multifunctional agriculture highlight the interrelated dimensions of such development. They include economic growth (integrate farmers to markets), conservation of natural resources (soil fertility, biodiversity, reducing carbon dioxide emissions, etc.), integration and social equity (pro-poor development) and food security.

Agricultural innovation is an emergent property of a system of innovation. An effective IAR4D should promote change and enhance learning throughout the innovation process, at all levels of the organizational system: spacial (land, farm, watershed, etc.) economic (product, company, value chain, business location, etc.) and social (individual, group, community, organization, innovation system, etc.). However, beyond these principles, it must be said that the IAR4D requires a set of individual, organizational and institutional capacity to implement these activities. At the individual level, we must strengthen skills in meta-disciplines (systems thinking, knowledge management, strategic planning, learning to learn, write well, use of information and communication technologies, etc.), social skills (communication, teamwork, networking, facilitation, etc) and mental abilities (empathy, self-awareness, self-regulation, self-motivation, etc).

At the organizational level, structures and processes must provide incentives and performance systems that encourage interdisciplinary teamwork, partnership with other stakeholders, promote co-learning and effective knowledge management to promote change. The impact assessment approaches are also needed, but goes beyond economic performance for integrating and encouraging a broader vision of human development. At the institutional or systemic level, we must develop the capacity to allow different actors, individuals and organizations, public and private sectors to find themselves on an equal footing. There is often an institutional vacuum in this direction, although the innovation intermediaries and competitive funding committees are mechanisms that can encourage actors to fill this gap. Finding a good way to manage and finance the inter-institutional space and the necessary intermediaries is vital, as is ensuring their neutrality. It is vital to create a foundation of trust between intermediaries and the different actors, and between the actors themselves.

Therefore, IAR4D is as a set of best practices or actions which put in synergy and provide added value to the existing processes of research and development. It is not considered a special approach to research and development or even as a frame. It is not seen as a process, but rather on the quality of processes. For FARA, development concerns behaviours and abilities, not products and, for this reason, we believe that IAR4D focuses on improving processes and behavioural outcomes such as capacity, rather than technological or political products. Thus, to achieve the results, conceptualization and practice of IAR4D must go beyond the methods or approaches, to include changes in the skills, attitudes and personal attitudes, practices and organizational cultures and forms of interaction of organizations as components of an innovation system. The experiences of the participatory multi-stakeholder process, and comparison with the experience in developed countries have led to the current

emphasis on innovation and innovation systems as ways to rethink agricultural research and development. Innovation thus becomes a tool for operationalization. A definition of the innovation system is that of "networks of organizations or actors," as well as the institutions and policies that influence their behaviour and performance innovation, which bring new products, new processes and new forms of organization to an economic use. The focus is on innovation as an application of knowledge (rather than the knowledge itself), the process (rather than the product), and interactive learning between the actors and the institutional context which influences their behaviour and performance innovation policy. This vision recognizes that innovation institutions, through the habits, practices, rules, laws and policies that regulate the relations and interactions between individuals and groups, influence innovation and should be taken into account to improve innovation and innovation systems. It also recognizes that the introduction of more participatory approaches to research is often ineffective unless the habits, practices and scientific motivations also change.

Inventory of Innovation Platforms in Togo

Several platforms have been implemented by different structures in various areas (Table 1). These areas include food production, animal and food technology production.

Table 1: Innovation platforms installed by different structures

Structure Manager	*Platform*	*Year of installation*	*Zone of intervention*
IFDC	Yellow maize	2006	Maritime
	Rice	2008	Kara, Savanna
	Groundnut	2007	Savanna
	Yam	2008	Kara
	Cowpea	2008	Plateaux
	Pineapple	2008	Maritime
	Soybean	2008	Central, Plateaux
	Ginger	2008	Central
ITRA	GIFS-Maize	2014	Maritime, Kara, Savanna
	QPM[1] Maize	2011	Kara, Savanna
	White Maize	2013	Savanna, Kara, Maritime
	Gardening	2013	Maritime
	Milk	2012	Maritime
	Hen	2013	Kara
	Guinea fowl	2013	Savanna
CTOP	Soybean	2014	Central, Kara, Savanna

	Maize	2014	Central
TOTAL	55		

[1]QPM=Quality protein maize

The portfolio of platforms for IFDC is twenty-seven (27). However, information is only available for 10 platforms. It is these ten IFDC platforms that provide technical and financial support. Twenty-four (24) platforms were listed for ITRA throughout the country. As for CTOP, four were listed.

Platforms on food production

The food production platforms were installed around six speculations, namely: corn, rice, soybeans, peanuts, yam, cowpea and vegetables. Maize is the main staple around which are created different platforms. It is a staple food and cultivated throughout the country. IFDC-Africa established the yellow maize platform in the Maritime region in 2006. ITRA has platforms in all the regions, except in the Central region. Note that ITRA has targeted small-scale areas in the location of its platforms. Thus, in the same region, a platform with the same name may be found in two or three different locations with almost the same actors.

From 2013 to 2014, the Togolese Coordination of Peasant Organizations and Agricultural Producers (CTOP) also invested in the establishment of platforms, in a bid to better organize its producers. It is in this perspective that it has installed a platform around maize in the Central region. Maize platforms are controlled by several players, among other producers, transporters, traders, etc.

Soybean, which was recently introduced in Togo some years back, gradually finds an important place in the eating habits of populations through its by-products. Thus, the platforms around this speculation were introduced in the four regions where it is practiced more (Plateaux, Kara, Central and Savanna). These platforms are to be credited to IFDC and CTOP. This speculation has not been a priority speculation for ITRA. More producer organizations are involved in the operation of these platforms. The platforms installed around rice are located in four regions: Maritime, Plateaux, Kara and Savanna. They were installed by IFDC and ITRA. These platforms are held by organizations of farmers, which are sometimes grouped into unions.

Around peanuts, yams, cowpeas and pineapple, only IFDC could develop platforms around these speculations in the Savanna, Kara, Plateaux and Maritime regions. Vegetable crops play an important role in food security and improved incomes for small producers. The emergence of the IAR4D approach presents an opportunity to address issues of development, and the operationalization of this approach requires

the establishment and operation of innovation platforms. It is in this perspective that the vegetable platform was installed in the Maritime region by ITRA, the only structure to have developed such an approach on gardening. In addition to crop production, other platforms have also been identified in the field of animal production.

Platforms on animal production

ITRA is the only structure involved in animal production platforms. However, very few platforms have been developed. We note only the presence of the hen platform in the Kara region and the guinea fowl platform in the Savanna area. The following are involved in the hen platform: hen breeders, traders, feedstuffs vendors, processors and producers. The market for this platform is not clearly defined and sales activities are done individually. The guinea fowl platform is run by guinea fowl breeders together in a consortium of 26 members and individuals. It has the same characteristic as the hen platform.

Platforms on food technology

In the field of food technology, only one platform was installed. This platform was installed by ITRA. It is a cow milk-processing platform for the production of cheese for the local market. It is run by a woman consortium. Given the failure found in technology dissemination techniques, which rely on a top-down approach, the new IAR4D approach, including the operationalization tool, which is the innovation platform, attracted the attention of the Togolese government. For the revival of agricultural and livestock production in Togo, the Togolese government made the installation of innovation platforms a major concern. Thus, under the influence of policy, the West African Agricultural Productivity Programme (WAAPP) funded the establishment of five platforms (one per region), with ITRA as the prime contractor: tomato platforms (Maritime), small ruminants (Plateaux Region), soybean (Central Region), rice (the Kara region) and guinea fowl (Savanna area). These platforms are currently being installed.

Evaluation of platforms

With regard to platforms that are functional, various advances have been made; and they have indeed improved the productivity of farmers in the country. These platforms have contributed to improving access to inputs, efficient production technologies, provision of a market for the crop products, and creating value added for the benefit of the different links of value chains developed, particularly the small farms. The integration of organic matter, including poultry manure to the producers to triple the productivity of their maize plots (2 tons/ha to 6.2 tons/ha by 2018). The

platforms have enabled some producers to benefit from investment credit of over 19 million by the FECECAV microfinance, and numerous training courses on management and cooperative agricultural enterprises.

The milk platform has enabled stakeholders to benefit from various training and capacity building. In terms of production, the demand for raw material (milk) has increased significantly to reach a capacity of 100 litres daily. Revenue from the sale of cheese helped meet the social, health and educational needs of the women and their husbands. Currently, the market is being extended to the Republic of Benin. The platform has given them easy access to microfinance institutions, who signed purchasing contracts with the stakeholders; indeed, the number of stakeholders is likely to grow in the coming years because of the services they enjoyed already.

Functionality of platforms

As shown in table 2, most of the platforms are non-functional. Various reasons have been given to explain this situation. A prima facie analysis suggests the existence of a group of actors around a speculation. This is explained by the fact that, the entry point, which is the node around which the actors are grafted, is poorly defined. The lack of information on the role that each actor has to play in the proper functioning of the platform is another factor. The lack of openness to new technologies, the lack of funding, the poor organization of actors, lack of trust, breach of contracts of sale, the lack of credibility of the actors at the MFIs (micro-financial institution) and the lack of will of some actors are other causes behind the non-operating platforms. Also, the market is often not organized or non-existent.

The proper functioning of certain platforms are explained by: Entry point is well-identified; Good organization of stakeholders; Existence of a well-targeted market; Contractual sale; Technical and financial support; Respect of sales contracts; Strong market demand. It is noteworthy, however, that these platforms are mostly at the stage of maturity or independence, only desiring support from technical partners.

Table 2: Functional innovation platforms by structure

Organizations	***Number of platforms***			***Starting date of platform***	***Installed by the Platform in 2015 PNIASA***
	Existing	*Functional*	*Non-functional*		
IFDC	27	5	22	2005	0
ITRA	24	1	23	2011	5
CTOP	4	1	3	2015	0
TOTAL	55	7	48		5

CONCLUSION

This study is focused on the situation of innovation platforms installed and functional in Togo. It showed several installed platforms, but a few of which are operational today. Further analysis has identified the factors responsible for their successes and failures. The good organization of stakeholders around well-defined entry points, with sales contracting markets usually allows platforms to work well. However, when the actors are not open to new technologies, not organized and do not receive adequate financial support, especially during the initial phase, they stop functioning.

STUDY **03**

Investments in Innovations for Agricultural Development and Food and Nutrition Security

INTRODUCTION

In Togo's march towards development, a number of policies, reforms, plans and programmes have been developed. Many strategies have also been implemented: the so-called Policyof Major Works from the 1970s to the Accelerated Growth Strategy and Promotion of Employment, 2013-2017(SCAPE), the five-year plans and the Structural Adjustment Program in the 1980s. The Togolese economy has gone through many periods of turbulence and shocks that have permanently weakened it and made it vulnerable. The chronology of economic developments can be divided into three main periods: Origin to 1884: emergence of the country; 1884-1960: the German and French colonization; and 1960 to present: Togo after independence.

The post-independence period is mainly marked by five phases: 1960-1970: Beginning of the conditions of economic growth; 1970-1980: Research in accelerated economic growth; 1980-2000: Blocking growth, structural adjustment and slowing growth; 2000-2010: Recovery and economic restructuring; and 2010 to present: Development and implementation of the Accelerated Growth Strategy and the Employment Promotion, 2013-2017 (SCAPE). Today, to achieve its medium-term policy, as proclaimed in the General Policy Statement and the Millennium Development Goals (MDGs), and to make Togo a country that respects human rights and promotes the rule of law by 15-20 years, the Togolese government has prepared a document entitled "Accelerated Growth Strategy and the Employment Promotion, 2013-2017 (SCAPE)."

The SCAPE is the review of Togo's economic performance in recent years (2008-2012), where GDP growth has been steady, with a moderate level of inflation, a declining debt profike, and an improved budget revenue together with a control of public expenditure. These overall results, generally considered acceptable and encouraging, however, have had only a slight impact on the national incidence of poverty, which went from 61.7% in 2006 to 58.7% in 2011, a decrease of 3 points in 5 years. The high level of unemployment and underemployment, which mainly affect young people and women has made employment and socio-economic integration of the youth a priority of policy makers.

According to the findings of the third national MDG monitoring report approved in April 2010, at the rate of current development indicators, and with sustained efforts, only 7 targets of MDG 6 on "the fight against HIV/AIDS" can be achieved by 2015. The Togole government considers that there are five major challenges to ensure the take-off of the Togolese economy and move towards the actualization of theMDGs.

These challenges are: (i) accelerating economic growth, employment and greater regional and international integration of the Togolese economy; (ii) governance; (iii) reducing inequalities; (iv) demographic; and (v) urban development, regional planning and environmental protection.

Five strategic areas have been identified for the implementation of this strategy. These areas are complementary and interact to achieve the policy direction for accelerated growth, and employment creation. These are: (i) development of high growth potential sectors; (ii) development of economic infrastructure; (iii) development of human capital, social protection and employment; (iv) strengthening governance; (v) promoting participatory development which balanced and sustainable.

In the first strategic focus on the development of high potential growth sectors, agriculture is placed in a prime position to realize this objective, with the commercial channels, services (crafts and tourism), mining and manufacturing industries through: increased agricultural productivity (improved food and nutrition security); increased industrial productivity; increased productivity of services. But towards increased agricultural productivity and improved food and nutritional security, there are constraints to the fulfillment of this objective. Among these challenges, there is that of research in agricultural productivity, as the government aims for the next 5 years to generate a craze for research, by putting the means for more efficient research into value added varities in selected promising sectors. These new varieties will also help to achieve substantial savings on the annual fertilizer subsidy, and adapted to the adverse effects of climate change facing the country.

The national agricultural development policy is to ensure an agricultural growth rate of at least 4% (baseline scenario) and more than 6% (accelerated growth scenario), so as to achieve by 2017, cereal production levels of 1 million to 2 million tonnes. To finance this strategy, the ambition of the government is to devote at least 10% of the state budget to agriculture. The general objective of this study is to analyze the impact of national investments and technological innovations for agricultural development and food and nutrition security in Togo during the last twenty years. The specific objectives of this study are to:

1. To analyze the effect of national and international investments in the development of technological innovations in agriculture in Togo in the last twenty (20) years;
2. Determine the impact of technological innovations from national and international investments on the profitability of agricultural production in Togo in the last twenty (20) years;

3. Measuring the impact of technological innovations from national and international investment on the contribution of agriculture to GDP in Togo in the last twenty (20) years;
4. Determine the impact of technological innovations from national and international investment on the contribution of agriculture to foreign exchange reserves in Togo in the last twenty (20) years;
5. Analyze the impact of technological innovations from national and international investments on food security in Togo in the last twenty (20) years;
6. Measure the impact of technological innovations from national and international investments in nutrition security in Togo in the last twenty (20) years.

Trends in Agricultural Development in Togo

An examination of the study objectives and the review of the methodology outlined in the terms of references are to the understanding of a number of quantitative indicators over a long period (1990-2012). These indicators are related to: crop production; animal production; gross domestic product; investments in agriculture; technological innovations related to the different productions. The major trends of these indicators are the subject of the first element of the report.

a. Evolution of maize production

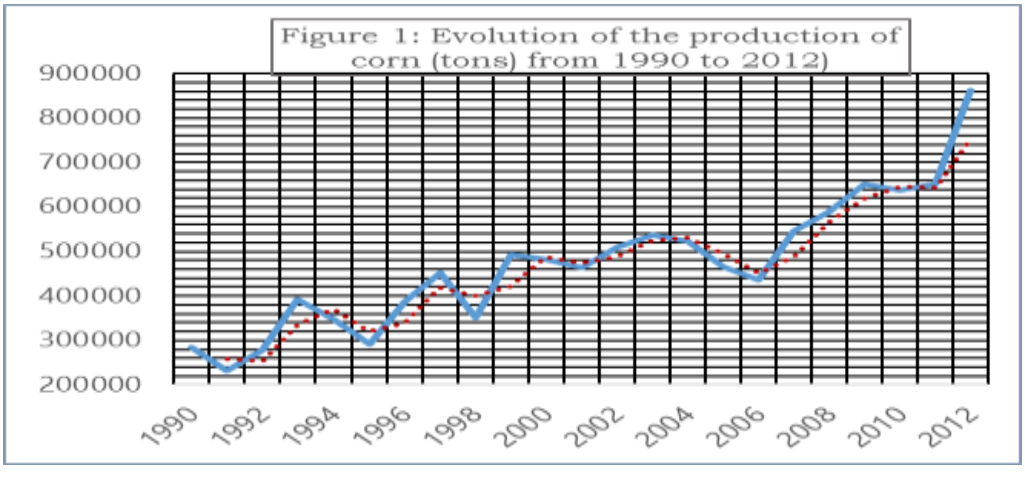
Maize is the staple food of the country and the West African sub-region. The analysis of corn demand in the regional market shows that it is expected to grow rapidly, particularly in countries with a very high consumption such as Nigeria. Thus, the existence of well-established circuits would enable Togo to position itself as a regular exporter of corn in the sub-region.

Table 1. Production of digital synthesis (proma), area (supma) and yield (renma) of corn (1990 – 2012)

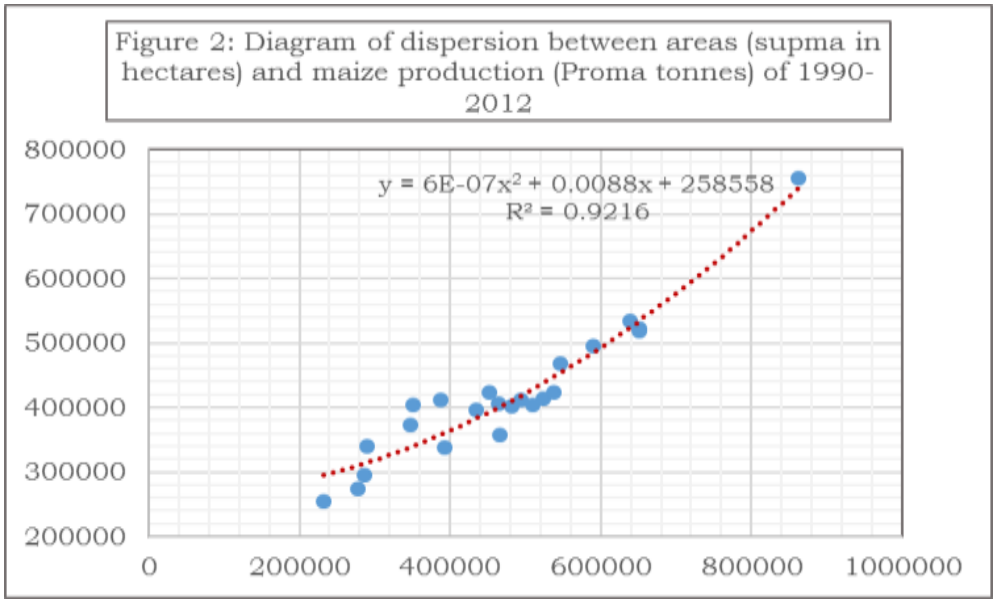
Variable	*Average*	*Median*	*Minimum*	*Maximum*
Proma	472535,0	466540,0	231400,0	862257,0
Supma	418368,0	405780,0	255400,0	754739,0
Renma	1,11545	1,15986	0,855306	1,30847
Variable	Standard deviation	C.V.	Asymmetry	Ex.flattener
Proma	147918,0	0,313031	0,556436	0,355725
Supma	104069,0	0,248751	1,31284	2,95804
Renma	0,142801	0,128021	-0,530327	-1,07276
Variable	Perc. 5%	Perc. 95%	IQinterval	missing Obs.

Proma	240730,0	820153,0	195565,	0
Supma	259160,0	710706,0	111601,	0
Renma	0,857709	1,30134	0,279970	0

The ambition of the government is to increase the production of maize 710,690 tons to 1,294,686 tons by 2022, a relative growth 7% per year. The graph of corn production (figure 1) indicates the saw teeth (a bullish trend). With a minimal production of 231,400.0 tons (1991) and a maximum production of 862,257.0 tons (2012), the average annual rate of production is estimated at 4.41%. The cubic function type: Proma and logarithmic equation, *Log (Proma) = a+bt* accurately portrays the displayed trend (blue). Changes in red dots is that of a smooth moving average period of 2 years. Outside the average characteristics of production, table 1 shows the standard deviation and coefficients of variation of the variables concerned. The production coefficient of variation for the period is 31.3%, and information about a relatively low variability in corn production from one year to another.



It is important to note that between 1990 and 2012, corn production doubled once in 2008, after 18 years. Figure 2 shows the obvious dependency between maize production and acreage. However, what is less obvious in figure 2 is the nature of adoption, which is a parabola of order 2. The intensity of this relationship which, by the coefficient of determination (R^2), shows that the change in output is about 92% greater than that of the areas under the conditions on the type of regression. Nevertheless, one can express the concern over the extreme point that satisfies the geometric conditions to be considered as atypical or aberrant.



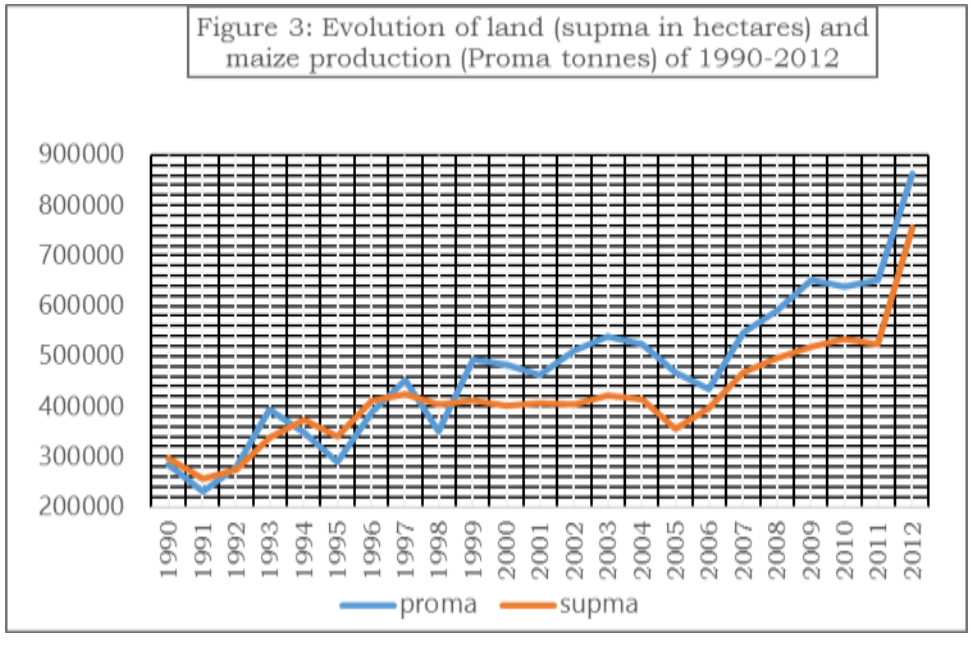


Figure 3 sets in the same Cartesian system of the two trend lines: that of production and that of areas. Note that the two patterns are alike. From 1990 to 1998, we see that the overall yields was less than 1 and that from 1999 there was a reversal. Recall that when production is greater than the surface area, the yield is greater than 1. This

leads us to hypothesize an event thatallegedly occurredin 1998 andthat would bethe cause ofthis reversal.

Togo's agricultural policy for the coming years places particular emphasis on the passion for research on agricultural productivity in general, and the selection of the best performing varieties and generating more added value in the sectors.We also know that one of the major constraints to improved vegetable crop production remains the availability of improved seed varieties adapted to different agro-ecological zones.It is undoubtedly in the follow-up to this recommendation in 2011 that the authorities in charge of agriculture, with the support of the FAO, developed a national catalogof plant species andvarieties grown in Togo.

This catalogue of plant species grown in the country were classified into three groups: 1) grains: corn, rice, sorghum, millet and fonio; 2) legumes: cowpeas, groundnuts, soybean and bambara beans; 3) roots andtubers: cassava, yam, potato, taro and sweet potato. It should be notedthat the vegetable crops, annuity and fruits were notlisted in the catalog.
The varieties of interest used in this study are those of cereals, tubers and cotton. The table below summarizes the maize varieties.

Table 2. Maize varieties introduced from 1980 to 2012

AB 11	**1985**	**DRA /ITRA**	**Toutes Regions**
AMEN	1992	INCV/ITRA	Toutes regions
IKENNE 9449-SR	1980	CYMMIT/IITA	Toutes regions
ACR97 TZL COMP 1 W	1999	IITA	Toutes regions
TZEE W POP STR QPM	2000	IITA	Toutes regions
OBATANPA	1997	Crop Research Institute (Ghana)	Toutes regions
SOTUBAKA	2004	Institut d'économie rurale Mali	Toutes regions
PIRSABACK (EV 8430-SR)	1980	CYMMIT	Kara central
POZA RICA 8443 SR	1981	CYMMYT	Toutes regions
TZL Comp 1 W	1999	IITA	Toutes regions
TZEE W1	1980	IITA	Kara savannas
TZESR X Gua 314	1980	IITA	Kara savannas

EV99 QPM	2004	Crop Research Institute (Ghana)	Toutes regions

From 1980-2004, thirteen (13) varieties were introduced in maize production. It is noted that the four species introduced in 1980 (PIRSABACK, TZEE W1, TZESR X Gua 314 et IKENNE) had an average yield of about 2t/ha and limited coverage area (Kara Region, Central Region and Savannah Region). From 1981 to 1985, two varieties (POZA RICA 8443, SR et le AB 11) with higher yields and a full covered area were added. From 1990 to 2004, a series of seven varieties (AMEN, OBATANPA, ACR97 TZL COMP 1 W, TZL Comp 1 W, TZEE W POP STR QPM, SOTUBAKA, EV99 QPM) which are generally more efficient (five of them have average yields of 4t/ha to 6t/ha), and whose growing area covers all regions of the country were introduced.

Table 3: Maize varieties and their main characteristics

Variety	*Main characteristics*
AB 11	Synthetic in nature, variety was created in 1985 by DRA and ITRA, but ITRA is the maintainer of the species. The male-flowering seedlings cycle is 50-55 days, while the sowing-maturity cycle (50%) is 95-105 days for a potential yield of 5 t/ha. It can be grown throughout the national territory. It has good resistance to lodging and tolerates resistance streak
AMEN	Amen variety of genetic nature was created in 1992 by INCV/ITRA. ITRA is the maintainer of the species. The male-flowering seedlings cycle is 45-50days, while the seedlings round-maturity (50%) is 90-100days for a potential yield of 4t/ha. It can be grown throughout the national territory. The variety has good resistance to lodging, drought and striga resistance and tolerates streak.
IKENNE	Introduced in 1980 by CIMMYT/IITA, the variety (species composite) is cultivable in all regions of the country. The male sowing-flowering cycle is 50-55days, while its cycle sowing-maturity (50%) is 100-105 days for a potential yield of 5t/ha. It is cultivable throughout the country. The variety has a good resistance to lodging and tolerant resistance to streaking.
ACR97 TZL COMP- 1 W	Introduced in1999. The the maize variety is a composite of its genetic nature, with IITA as the breeder and ITRA as the maintainer. The male sowing-flowering cycle is 55-60days and its mature seedling-cycle (50%) ranges from 100 to110 days. It has a potential yield of 6 t/ ha.It has a good resistance to lodging and streak-resistant.
TZEE W	Composite genetic nature, the variety of corn is a composite of its

POP STR QPM	genetic nature, with IITA as the breeder and ITRA as the maintainer. It was introduced in 2000. Its sowing-flowering cycle is between 40 and 45 days and the sowing-maturity cycle (50%) is 80-85 days. Its potential yield is 3.5 t / ha. It has good resistance to lodging, is resistant to striga and tolerates resistance streak.
OBATANPA	Composite of its genetic nature, with Cereal Research Institute of Ghana (CRI) as its breeder and ITRA as the maintainer. It was introduced in 1997. Its cultivation area covers all regions of the country. It has an average resistance to lodging and tolerates resistance streak. It has potential yield of 6t/ ha.
SOTUBAKA	Composite of its genetic nature. This variety was created in 2004 by the Institute of Rural Economy of Mali, while ITRA is the maintainer. Two cycles are defined as follows: • Cycle male seedling-flowering: 55 - 60 days • Planting maturity-cycle (50%): 100 - 110 days It has a potential yield of 6 t/ha. In terms of cultivation area, it covers all regions of the country. In terms of resistance, it has good resistance to lodging and tolerant resistance streak.
PIRSABACK (EV8430-SR)	From a cycle of 115-120 days and streak resistant to breakage and good performance stability CIMMYT introduced the variety in 1981. The average and maximum yields are 4tha and 6 t/ha. It is grown in all regions of the country.
TZL Comp 1 W	It has an average yield of 3.5t/ha and maximum yield of 6t/ha. The variety has a 110-115days cycle and was introduced in 1999. It has good stability performance and is resistant to streak and to lodging. Its cultivation area covers all regions of the country.
TZEE W1	Cultivated in the regions of Kara and Savana, with a cycle of 85 to 90 days, and an average yield of 2t/ha and a maximum yeild of 4t/ha. The variety was introduced in 1980. It is resistant to streak and has good yield stability. IITA is the plant breeder.
TZESR X Gua 314	Also cultivated in the regions ofKara and Savana. It was introduced in 1980. It has a cycle of 85 to90 days, with an average yield of2t/ ha and a maximum yield of 4t/ha. It is resistant to corrugation and has a good stability performance. IITA is its breeder.
EV99 QPM	It has an average yield of 2.5 t / ha and a maximum yield of 4t / ha. The variety was introduced in 2004 by the Crop Research Institute of Ghana. It has a relatively short cycle from 75 to 85 days, it is resistant to maize streak, stores well and is grown in all regions of the country.

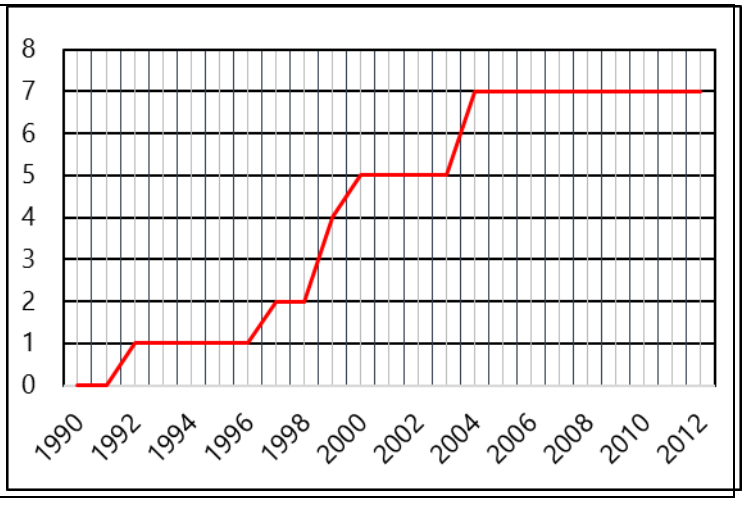
Table 4. Maize varieties used in Togo in 1980-2004

Denomination	*year*	*Region**	*RPotent*	*Cycle***
PIRSABACK (EV 8430-SR)	1980	KC	2,5	80-90
TZEE W1	1980	KS	2	85-90
TZESR X Gua 314	1980	KS	2	85-90
POZA RICA 8443 SR	1981	TR	4	115-120
AB 11	1985	TR	5	95-105
IKENNE 9449-SR	1980	TR	5	100-105
AMEN	1992	TR	4	90-100
OBATANPA	1997	TR	6	95-105
ACR97 TZL COMP 1 W	1999	TR	6	100-110
TZL Comp 1 W	1999	TR	3,5	110-115
TZEE W POP STR QPM	2000	TR	3,5	80-85
SOTUBAKA	2004	TR	6	100-110
EV99 QPM	2004	TR	2,5	75-85

It was noted that during 1990 and 1991, there was no variety in use. From 1992-1996, only one variety was in use. From 1997-1998, there were two varieties use; in 1999, there were four varieties; from 2000 to 2003, five species were in use, while from 200 to 2012, seven varieties of corn were grown in Togo.

Table 5. Number of varieties (ordinate) of period corn (years abscissa)

Periods	varieties
1990-1991	Any
1992-1996	One
1997-1998	Two
1999	Four
2000-2003	Five
2004-2012	Seven



b. Evolution of millet and sorghum production, 1990-2012

Millet and sorghum are mainly grown in the northern parts of the country. They are used for the preparation of pasta and drinks, in addition to traditional local consumption. About 114,615 tonnes of surghum was produced in 1990, and rose to

286,967tonnes in 2012. As to the production of millet, about 57,907 tonnes were produced in 1990, and dropped to 29,339tonnes in 2012. At this rate the disappearance of this crop seems imminent. The catalogue cereals contains only two varieties of sorghum: Sorvato1and Sorvato 28. No varieties were reported for millet.

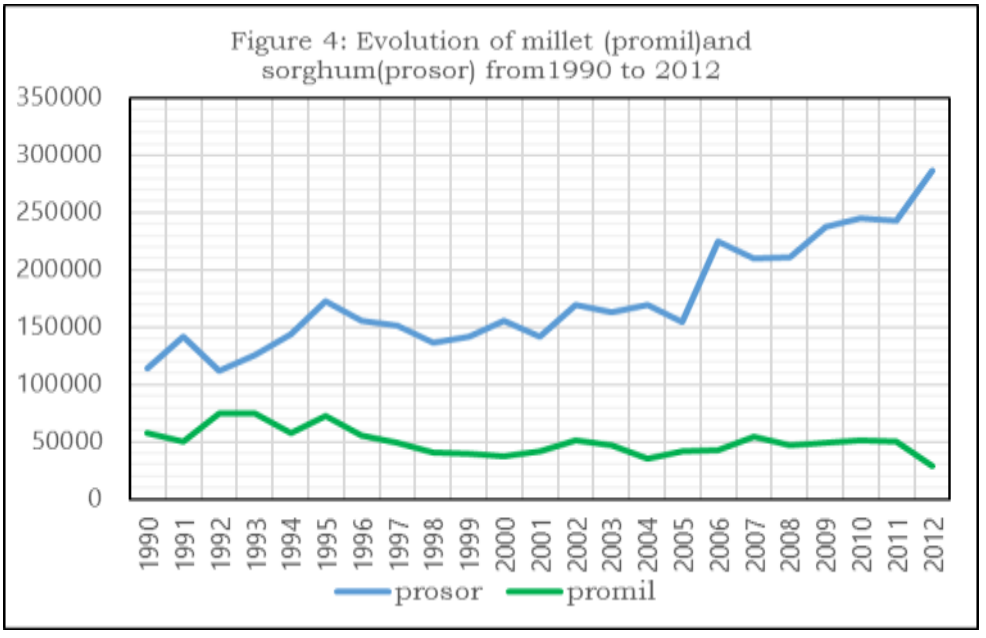


Table 6. Sorghum varieties and their characteristics

Varieties	*Characteristics*
SORVATO 1	This variety was introduced in 1993 by INCV/ITRA and maintained by ITRA. It has a cycle-seed maturity of 105-110 days and a potential yield of 6t/ha. This variety has good lodging resistance, its grains keep well, but is cultivated in the savanna region only.
SORVATO 28	Created by INVC/ITRA in 1994. It has a seedling-maturity cycle of 105-110days and a potential yield of4 t/ ha. Like the Sorvato1, it is cultivable in the savanna region only. It has a good resistance to lodging and midge, and is sensitive to mold.

c. Tubers

The two main tuber crops are cassava and yam. The total cassava production in 2012 amounted to 38,946 tonnes. Yam is produced primarily in the central regions (45,71%), the trays (26,18%) and Kara (20.84%). While an evolving sawtooth (figure 5), the trends of these cultures is rather linear and are rising. It was noted that between 1990 and 2003, the trendlines have a rhythm indicating an interlaced alternating evolutions of the two products. But from 2003, cassava production has

taken precedence over that of yams. During the period under review (1990-2012), yam production has doubled (to 2010), while that of cassava has evolved at a slower pace.

Figure 5: Evolution of yam and cassava production from1990 to 2012 (in tonnes)

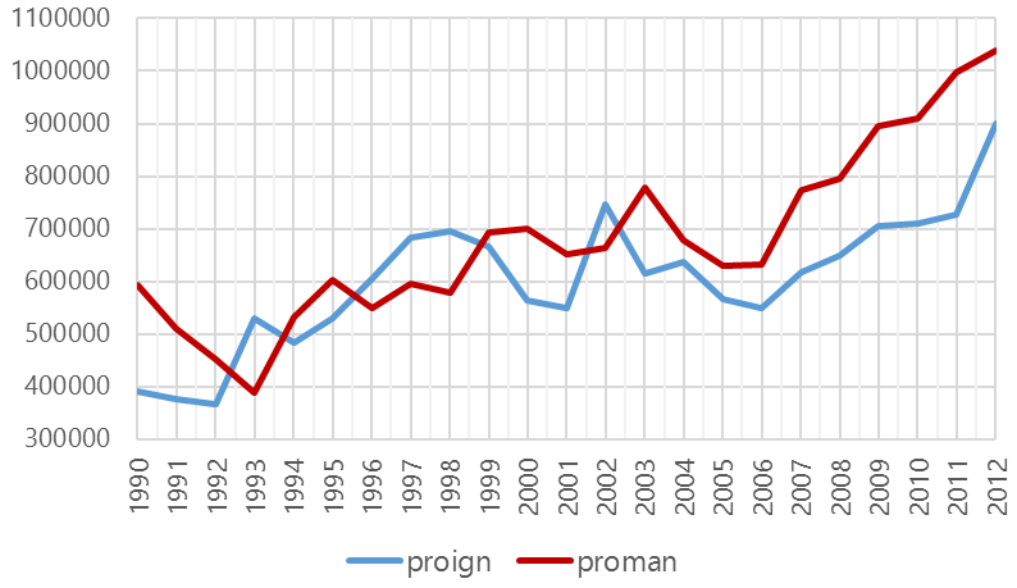


Table 7. Available cassava and yam varieties

	Breeder	***Maintainer***	***Year***
Cassava			
GBAZEKOUTE	INPT (ITRA)	ITRA	1989
TMS 96/409	ITTA	ITRA	1998
TMS 92/0326	IITA	ITRA	1994
TMS 95/0166	IITA	ITRA	1998
Yam			
LABOCO		ITRA	
KRATSI		ITRA	
HE-ABALOU	IITA	ITRA	
KOUKOU	IITA	ITRA	
TDR 89/02665	IITA	ITRA	1999
TDR 747	IITA	ITRA	1996
MONIA		ITRA	
FLORIDO		ITRA	1985

Improved yam varieties were introduced between 1989 and 1998, with yields ranging from 40 to 55 tonnes per hectare. The INPT and IITA are their breeders, while ITRA is the maintainer. They are highly resistant to disease and are cultivated in all regions of the country. They have a ring-planting maturity of 12months. These species have a starch content of between10 and 15%. The yam varieties are of different origins: West Africa (Laboco, He-Abalo, Koukou and Monia); Ghana (Kratsi); Ibadan, Nigeria (747 TDR, TDR89/02665; Puerto Rico, via Ivory Coast (Florido).
The Laboco variety is cultivated in the locality of Bassar, and has a remarkable reputation for both good fufu and yam fries commonly called Koliko. As for Kratsi, it is especially good for fufu and is produced in the Plateaux region, particularly in the prefecture of Ogou. For most varieties of yams, years of introduction are not reported. Foreign varieties (Nigeria and Puerto Rico) have introduction dates.

d. Leguminous plants

Leguminous plants are the third group of food in Togo. Legumes because of their ability to fix atmospheric nitrogen readable formviathe symbiosisthey realizewithRhizobium bacteria, do not require nitrogen fertilization in pure culture. Groundnut is one of the main leguminous crops in Togo. It is cultivated in all regions of the country. Data on groundnuts show a variationin production, but with an upward trend. Groundnut production increased from 25,972tonnes in 2000 to 45,003 tonnes in 2012.It is cultivated more in the northern parts of the country. The regions of Savanes and Kara account for three quartersof the national production of groundnuts.
The evolution trend of the area shows a phase of strong variation between 1990 and 1996 when it reached a record high of 110,112 ha. But from 1997, the area planted fell sharply, with very little variation from one year to another. Regarding performance, it presents a strong variation from one year to another, but with an upward trend. Cowpea is produced throughout the whole of the country. Its production during the period 1990-2012 shows very little variation. It still should be noted that this production has a rising trend. It increased from 19,630 tonnes in 1990 to 41,769 tonnes in 2000. But it peaked in 1994 at 76,110 tonnes, representing a growth of over 300% from the figures of 1990. In terms of area, it has the same appearance as the production, with little variation from one year to another with an upward trend. However, the yield remains low and barely reached 1 t/ ha.

Soybean cultivation is an emerging activity in Togo, and whose production volume grows year by year. Part of the amount produced is processed locally for the production of mustard, flour, cheese, milk, meat, skewer, soap, oil, etc. In recent years, export of the seeds to Benin developed. It is now present all over northern

Togo. Bambara groundnut is one of the minor crops in Togo. It is cultivated in the Savanna area. In 2010, its production was estimated at 4,171 tonnes. Bambara groundnut, beans and groundnuts are the crops that benefit the least from research.

There is very little diversity in terms of cultivated peanut varieties in Togo. It is of very little research interest. Its cultivation is entirely the traditional type, on small plots mainly for home consumption. Two main varieties were listed: TS32-1 and RMP12. The varieties were introduced in the 1970s from Burkina Faso and Senegal. The catalogue of varieties identified three cowpea varieties cultivated in Togo, namely: VITOCO, TVX1850-01^{E} and VITA-5. The cultivated soybean varieties available to producers are: TGX1910-14F and TGX14482.

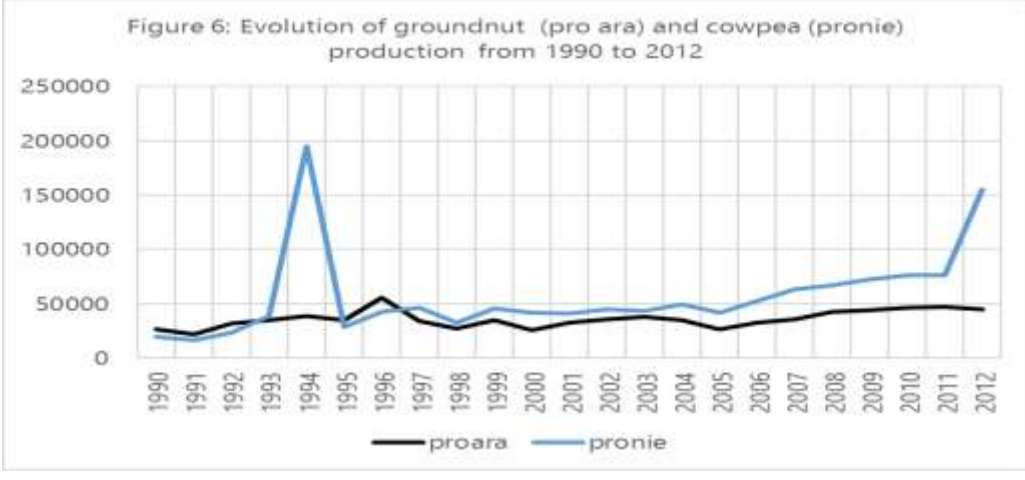


Table 8. Varieties of leguminous plants in Togo

Variety	*Characteristics*
Groundnuts	
TS 31-1	This is one of the groundnut varieties grown in Togo. It was introduced in 1970 from Burkina Faso and maintained by ITRA. It has good drought resistance and yields an oil content of 51% of the dry seed. It has a maturity of 90semi-cycle days and a potential yield of3 t/ ha.It is cultivated in all regions of Togo
RMP 12	This is the second groundnut variety grown in Togo. Coming from Senegal, this variety is maintained by ITRA. It was introduced in 1970. It is a variety grown throughout the territory, with a potential yield of 3t/ha for a semi-mature cycle of 120 days. Oil content: 40% by weight of the dryseed
Soybean	
TGX 1910-14	This soybean variety was introduced by IITA in 2003 and

F	maintained by ITRA. It is grown in all the regions of Togo. It gives a potential yield of 4 t/ ha for a semi-maturity cycle of 90-100days.
TGX 1448 2E	Obtained by IATA and maintained by ITRA. This soybean variety has a potential yield of 4t/ha, and was introduced in 2003. It is grown in all regions of Togo and has a semi-maturitycycle of 90-100days.
Cowpea	
VITA 5	It was introduced by Nigeria in 1970 and maintained by IITA. This cowpea variety gives a potential yield of 2t / ha. Its semi-maturity cycle is 75-80days and is cultivated in all regions of Togo.
VITOCO	IITA is both the breeder and maintainer of this cowpea variety. It was introduced in 1970. It is grown in all regions of Togo, and has a potential yield of 2 t/ ha, with a cycle of 80-85days.
TVX 1850-01^{E}	Obtained by IITA and maintained by ITRA. This variety of cowpea was introduced in 1970, with apotential yield of2 t/ ha. It has a semi-cycle maturity of70-80 days and is cultivated in all regions of Togo.

NOTE: THE CATALOGUE OF VARIETIES EXLUDED BAMBARA BEANS USED IN TOGO.

e. Animal Production

Livestock is mainly characterized by a traditional family syste, with a low mastery of technical innovations. There is a mixed crop-livestock system. In recent decades, the diets of people are increasingly rich in animal protein. The national production is insufficient. The Togolese state has recourse to substantial imports. Local production performed by breeders covers a very small proportion of needs.According to available statistics, the coverage varies between 15 and 26% of consumption. The contribution of livestock to the agricultural GDP increased from 20% in 1995 to 25% in 2000, and dropped to 18%in 2007. These mainly involve final consumption products (meat, eggs and milk). The livestock in Togo is composed mainly of goats, cattle, sheep and poultry.

Livestock barnyard villagers or family farming is a complementto agriculture.This is speculationthat dominateslivestock productionin rural households. The national census of agriculture in 2012 gave an average of 30 animals per farm, as against 5 goats/exploitation, 2.2sheep/exploitation, pigs1.9/0.8operation andcattle/exploitation. Moreover poultry farming occupies almost 15% of female householders, while other crops occupy less than 14% of women. The villager's livestock products, with the exception of guinea fowls in the savanna area, are sold to ensure timely health

spending for the family members, or school fees for children, or for cultural events/rituals.

Poultry

The avian species exploited in Togo include chickens, guinea fowl, ducks, turkeys, quail, pigeons and ostriches. Indeed, family poultry is dominated by chicken farming, with about 71% of the effective monitoring of guinea fowl and pigeons, which represent 20% and 8%, respectively. All the species are exploited in different systems in all regions of Togo, with the exception of a few ostrich farms which are reported in the Central region and in the Kara region.

Poultry production is mainly carried out in rural areas by small-scale family farms, with local poultry strains and sometimes crossbreeds. There is, however, a modern commercial poultry, especially in the outskirts of large cities. The mixed crop-livestock system plays an important role in raising poultry.Indeed, the results of the National Agricultural Census in 1996 of the regional distribution of guinea fowls in Togo are shown in table 21. The table shows that the Savannah region alone had 53.5% of the total number of guinea fowls in the country. The share of the Savanna region in the national work force is shrinking. Indeed, the last agricultural census in 2012 showed that the Savanna region holds 47% of the total number of guinea fowls (table 9).

Table 9. Breakdown of staff guinea fowls in different regions of Togo

Region	***Staff 1996****	***Staff 2012*****
Savanes	637 800	789 295
Kara	213 393	295 965
Centrale	95 755	234 309
Plateaux	167 294	296 164
Maritime	77 876	65 968
Total	1 192 118	1 681 701

Source: * Lombo and Dao (2009), ** DSID, RNA (2012)

During the last 50-60 years, the livestock sector has experienced great revolutions in industrialization. This revolution was most pronounced in the poultry sector. Indeed, the production of poultry meat and eggs is increasingly industrialized. Despite these advances, poultry production continues to face great challenges in the developing countries, with regards to breeding, production and good practices. In Togo (and the West African sub-region), there is very little documentation on the various sectors of the poultry industry. Training and support structures of actors in the sector are

inadequate or nonexistent. Moreover, the motivation of the actors to get trained or go in search of information is very low. Finally, the absence of standards and/or regulations governing the poultry sector further strengthens the difficulties of the Togolese poultry industry. All these shortcomings characterize the poultry sector in Togo, and have adverse consequences on the level of production and productivity of poultry.

Goats

The ruminant production systems are of the extensive traditional type, focused on the exploitation of natural pastures, fallow land and surface water for watering the animals. Goats constitute 56.45% of the national small ruminant livestock and dominate the south of the country.According to FAO statistics, the number of heads of goats dropped from 2.043 million in 1990 to 813,000 in 1995. However, the number has increased to 1.915 million heads of goats in 2010 (table10). The animals are guarded by children of the family, are attached to the post to pasture during the season for food crops, are allowed to roam freely around the village. Waste from the family kitchen and crop processing are regularly fed to the animals.The breeding of goats is practiced by 51.40% of farm households.

The NGO, Borne Fonden, initiated the Terminal Base Goats for Milk Production in Cinkassé, Kante and Kamboli. The micro programme - 7th EDF Production also sponsors some goats Djallonké goats for the benefit of youth groups. An experimental core of 400 Djallonke goats are on display in the Kolokopé station.

Table 10: Five-year evolution in the number of ruminants in1990-2010 (in thousand of heads)

YEARS	1990	1995	2000	2005	2010
Goat	2043	813	1200	1700	1915
ovine animals	1252	501	1064	1500	1699
Cattle	243	202	275	300	309

Ovine animals

Sheep constitute 43.54% of the herd of small ruminants in the country and dominate the north. Raising sheep is basically traditional. The changes in the number of sheep is similar to that of goats (table 10).

Raising ovine animals is practiced by 80% of farm households. About 95% of farms are of the traditional type, characterized by a summary level of human intervention and very low use of inputs. The power supply is based on the natural pasture and fallow, plus the crop processing byproducts. In the north, the animals are guarded by

children of the family, are attached to the post to pasture during the season for food crops, are allowed to roam freely around the village. Production costs are negligible, if not nil.

Since the 1980s, Togo has developed an improved model of breeding sheep: Djallonké 50 or 110 animals. On the basis of a rational management of livestock, improved housing and the supply of inputs (veterinary medicine, food supplements and mineral salts), the herd performance is well beyond that of traditional breeding. The improved breeding of 17,359 sheep, initiated by development projects and NGOs, whose micro programme led to the establishment of 110 associative farms or groups, housing more than 5,000 sheep. In parallel, Togo has a research station in Kolokopé which houses a core selection of over 2000 Djallonké of ovine animals.

Cattle

Cattle farming is practiced by 6.2% of farm households. About 97% of herds belong to farmers. This is the least important in terms of actual stock. Cattle breeding is essentially of the traditional extensive type. The intensive system is underdeveloped and represents less than 2% of the herd. In 1995, the number of cattle increased from 202,000 to 309,000 in 2010 (table 10). The animals are reared in collective herds entrusted to the Fulani. This is a traditional extensive farming system with low input. Animal feed is based on the exploitation of natural pastures, fallow land and surface water. Production costs, which include costs of caretaking, veterinary care, food and mineral supplements are very low. Over a third of the herds have no bulls. Accordingly, the national herd performance is very modest. In the recent years, the creation of private cattle farms by a few wealthy officials and merchants have been noted.

Pigs

Pig farming is practiced by 10% of farm households. The breeding system is predominantly the traditional family-style. The number of breeding sows average is 3.2 - mothers. The pigs roam free in the village to seek for food, in addition to breceiving the dregs of the local drink made from sorghum. They are confined or tied to a picket in the Savanna region in the food crops season. There are improved farming systems (piggery improved, control of reproduction, health monitoring and food distribution) under the control of development projects and NGOs, and some high-level farms in Adjakpa, Bassar and Sotouboua. Béna pig farming is the modern model met in the country.

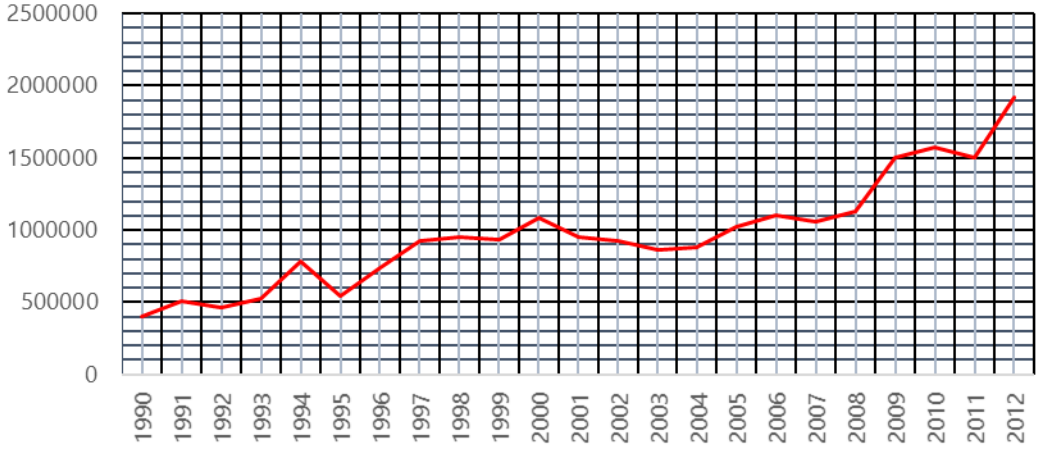
Gross domestic product

The gross domestic product (GDP) is one of the most widely used economic indicators in the practice of national accounting and economic analysis. Principal

economic indicators measure economic output achieved within a given country. The GDP quantifies for a given period, the total value of the "wealth generation" conducted by economic agents (households, businesses, governments) residing within the national territory. It therefore reflects the internal economy of a country and its variation from one period to the other. It differs from the gross national income (GNI), which adds net inflows to GDP factor income from abroad (factor income from the rest of the world decreases factor income paid to the rest of the world).

In practice, the determination of GDP is done using three approaches: demand, production and income. The concept of GDP has always been controversial, because it recognizes the production of certain so-called "negative" activities. The most cited cases are advertising and marketing. In developing countries, production in the so-called informal sector activities are not recorded, as well as the positive activities, both non-market and non-administrative, like art or altruistic activities (eg. the creation of a free software) or volunteer activities or the daily domestic production provided within the family.

Figure 7: Gross Domestic Product (GDP),1990 to 2012



Additionally, defenders of the environment and sustainable development are critical of the gross domestic product as a measure of "wealth generation" ; because, although.economic output partly consumes natural capital, GDP does not take into account the effects of this consumption. And that is why the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) works to define and promote an indicator that takes into account the effects on the environment. The production approach of GDP determination has this indicator by sector: agriculture, industry, trade, etc. Agricultural GDP is one of the key variables

of this research. During the period 1990-2012, GDP in Togo has more than quadrupled, from $404 billion to nearly1919 billion CFA francs (See Annex for data file).

GDP per capita

The GDP per capita is the value of GDP divided by the number of inhabitants of a country. It is more effective than GDP to measure the development of a country. However, it is only an average, therefore it does not account for inequalities of income and wealth within a population. In general, a country is considered to be developed when its GDP per capita is above $20,000 (about 10 million CFA francs). Per capita GDP measures the standard of living and approximately that of purchasing power, because the impact of changes in the general level of prices is not taken into account dynamically.

Like the GDP, GDP per capita is not to be confused with the per capita income. Per capita GDP is a good indicator of economic productivity, but it imperfectly accounts for the level of welfare of the population or the degree of success of a developing country. This indicator does not show the distribution of income between the inhabitants of a country. Derived from the GDP, it does not reflect the damage caused to the environment and natural resources by the production process, and does not include unpaid work which can be done within households or communities, or the underground/informal economy. GDP per capita is not constructed as an indicator of the quality of life (The latter is far more subjective and difficult to measure, although some indicators such as the Human Development Index (HDI) could be used) .

In Togo, GDP per capita has doubled once in the time period 1990-2012. The GDP per capitan of Togo was 117,000 CFA francs in 1990 and 296,358 CFA francs in 2012, representing less than 3% of per capita GDP required for Togo to be among the developed countries of th world. These values also show that the daily per capita GDP is about 800 CFA francs, which is less than $2.

The nominal GDP and Real GDP

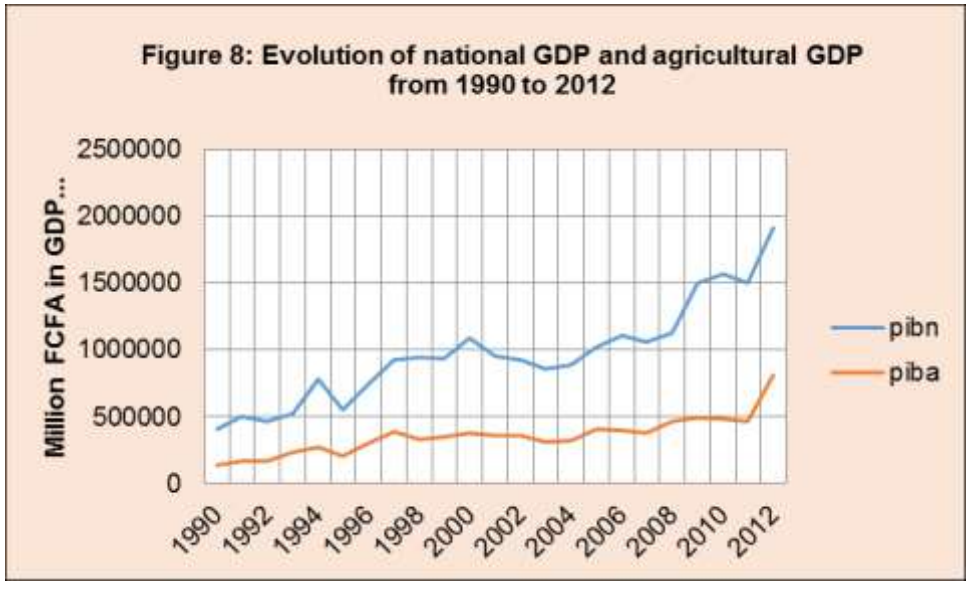
Real GDP or volume is the value of GDP that does not take into account price changes (that is inflation). Real GDP has the advantage of showing the variations in the rise and fall of the volume (quantity) of production of goods and services. This is the value used when measuring GDP growth. Indeed, one cannot know just by looking at the nominal GDP (in value) if the rise in the value of the indicator is due increase in prices, production or a combination of different factors. When calculating

the volume of GDP, three approaches that allowed for the calculation of the nominal GDP (demand, output and income) are not equivalent. The demand approach is preferred. The volume of the quantities which fall within the definition of GDP by the production approach, however, are defined so that the volume of GDP calculated by this approach coincides with the volume obtained by using a demand-driven approach. The volume of value added is defined as the difference between the volume of production and volume of inputs. The volume of taxes and subsidies is defined as the volume of taxed products, while the corresponding price is the price of the product multiplied by the rate of tax or subsidy.

THE INCOME APPROACH IS NOT USED BECAUSE IT DOES NOT TAKE INTO ACCOUNT CHANGES IN THE PRODUCTIVITY OF FACTORS OF PRODUCTION. LET $P_{I,T}$ BE THE PRICE OF A GOOD I DURING A PERIOD T AND $Q_{I,T}$ IS THE QUANTITY DEMANDED OF THAT GOOD I IN PERIOD T (FINAL DEMAND, INVESTMENT AND NET EXPORTS); THEN: NOMINAL $GDP_{,T} = \Sigma_I P_{IT} Q_{I,T}$. REAL GDP IS CONSTITUTED BY THE VALUE OF GOODS I REQUESTED DURING THE PERIOD T MEASURED AT CONSTANT PRICES (BASE YEAR DENOTED AS T0), I.E., REAL $GDP_{,T} = \Sigma_I P_{I,T0} Q_{I,T}$. THE MANUAL OF NATIONAL ACCOUNTS FOR 2008 RECOMMENDS UPDATING THE BASE YEAR EVERY YEAR. THE VOLUME OF GDP IS CALCULATED BASED ON THE ANNUAL GROWTH RATE APPLIED TO THE VOLUME OF THE PREVIOUS YEAR. THERE IS A TALK OF CHAINED INDEX. THE GDP DEFLATOR IS THE RATIO BETWEEN THE NOMINAL AND REAL GDP.

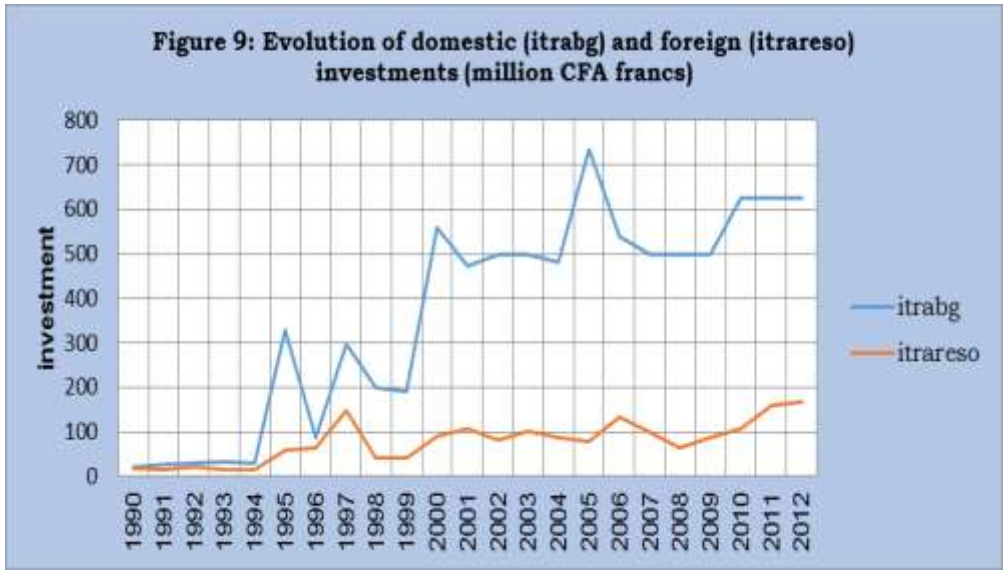
Agricultural GDP

Agricultural GDP is the gross domestic product from agriculture – the sum of value added to the various sectors of agriculture. As indicated in the figures and tables, the agricultural GDP shows a trend reminiscent of the national GDP. In 2012, the GDP of the agricultural sector reached 807.9billion CFA francs as against 136.6billion CFA francs in 1990, to an annual average of 354.6 billionCFA francs. Judging by the increase in both indicators in 2012 compared to 1990s, the GDP was multiplied by 4.75, while the agricultural GDP by 5.91. Both indicators have doubled twice each.



National and foreign investment in agriculture

For sustainable development in the agricultural sector, activities should be financed through domestic investment and foreign investment. The main sources of investment are the state budget, different development partners and donors. Over the period of the study, the budget allocated by the state to agriculture is about 2.6% of the national budget. The budget for ITRA from the state is about 6.5% of the agricultural budget.



The foreign investments granted by the various partners and donors to ITRA are about 78million CFA francs per year. It is from these funds that the institute finances the development and technological innovations in crop varieties. The trends examined above present the evolution of the main indicators and the key variables of the study. The trends from 1990 to 2012 have been graphical and numerical summarized. Variables representing technological innovations were built on thirty varieties of maize, sorghum, rice, cassava and yam. The trends of the evolution of national and international investments were also analyzed.

Analysis of national and international investments in the development of technological innovations

The issue of the impact of investments on agricultural development and food security, especially in countries where the agricultural weight determines the national product, related to technological innovations. In this study, these technological innovations are understood as the varieties introduced in crops to improve production and yield. Intuitively speaking, we know that there is a dependency between technological innovations and agricultural investments. But what is less known is the provision of empirical scientific evidence to confirm the presence or absence of this dependence in farming practices. Where investments are used effectively and managed inappropriately, the dependency relationship could not be demonstrated.

Investments in ITRA's activities are of two types: national and international/foreign. Domestic investments are made by the national budget allocated by the state to ITRA and are expressed in million CFA francs (Itrabg). International or foreign investments are allocated by the various partners and donor agencies to ITRA and are also expressed in million CFA francs (Itrareso).

Table 11: Some characteristics of digital variables

	Budget / Investment 1990-2012 (million FCFA)			
	National	*Agriculture*	*ITRA*	*foreign*
Minimum	75984,240	429,710	21,000	14,900
Maximum	656204,138	50585,189	735,000	169,158
AVERAGE	211214,732	5627,544	365,765	78,339
Variation (CV en%)	73,1	196,8	64,7	59,7

A partial synthesis of the different types of investments revealed that during the period selected (1990-2012): the budget allocated to agriculture reported to the national budget is equal to 2.7%; the budget for ITRA related to the agriculture sector budget is equal to 6.5%; the budget for ITRA reported to the national budget is 0.2% The two variables on investments are quantitative variables.

Technological innovations consist of new crop varieties and are dichotomic variables, i.e., variables that take only two encoded values 0 (no) and 1 (presence). The table below summarizes the 33 varieties unevenly distributed between corn, rice, sorghum, cassava, yams and cotton.

Table 12: List of technological innovations for selected crops

Maize	*Rice*	*Sorghum*	*Cassava*	*Yam*	*Cotton*
1. Amen	10. Tgr2003	19. Sorv1	21. Tms96	26. Tdr95	32. Stam129
2. Arc97	11. Tgr405	20. Sorv28	22. Tms92	27. Tdr98	33. Stam279
3. Tzeew	12. Nerica14		23. Tms95	28. Tdr747	
4. Obatan	13. Was161		24. Manvita	29. Tdr89	
5. Sotuba	14. Nerica7		25. Mantol	30. Miniset	
6. Tzlco	15. Nerica8			31. Consign	
7. Ev99	16. Nerica11				
8. Farm	17. Amsobf				
9. Famprc	18. Ppu				

Processing and analysis of investments and innovations

Innovation is a function of investment and is a dependent variable. The investments that explain the presence or absence of innovations are explanatory variables. Linking each of the two quantitative variables with each technological innovation (crop varieties) is supported by an obvious dependency relationship. It is understandable, therefore, that to achieve the first objective of this study, it was necessary to apply more than sixty logistic regressions, since there are two explanatory variable and 33 varieties. In statistics, the study of the dependence of a dichotomous variable explained and quantitative explanatory variable is done using the method of logistic regression.

Logistic regression is a statistical method for the study of conditions that adjusts the data when the dependent variable is a dichotomous variable and the explanatory variables is a quantitative variable. The reputation of this method is well known in

the humanities, and general and health sciences, where the variable to predict is to say, the dependent variable is defined as the presence or the absence of a disease. By its analytic form, logistic regression is defined as follows: Ln (y/1-y) = A + ΣBjXij, where: Y is the dependent variable and X is the explanatory variable (quantitative). In our case, the dependent variable is represented by technological innovations embodied by the introduction of new varieties of crops. Xij represents the explanatory variables. In our case, we use the variables related to domestic and international investments. A and Bj are regression coefficients that must be determined statistically. This equation corresponds to the natural log of the probability of being part of a group divided by the probability of not being part of the group. There are three types of logistic regression: direct logistic regression, the sequential logistic regression and explanatory logistic model. Direct logistic regression is used when no specific assumption is made about the order or the importance of the explanatory variables. In the process of performing a stepwise regression, indicates the entry order of the variables in the model. And as the name suggests, the explanatory logistic regression aims to confirm or refute the hypotheses and it is that which corresponds to our case. The estimation of the logistic function parameters was made using the SPSS software. The standard programme to perform this task is:

```
LOGISTIC REGRESSION VAR=group
/METHOD=ENTER sexe age
/METHOD=FSTEP (COND) at_anxd at_ppen at_patt at_cdel at_inte at_ext
/CONTRAST (sexe) =Indicator
/CRITERIA PIN (.05) POUT (.10) ITERATE (20) CUT (.5)
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Results interpretation

This verification of the model is done using a table of results called "Model Summary", which contains the test, Nagelkerke R^2, as the variance explained by the model. The variables included in the model are identified, those variables where the Wald test is statistically significant. This is followed by analysis of the odds ratios calculated in the Exp (B) cells. Note that the odds ratios are the number of times of a group membership when the value of the explanatory variable increases by 1. Here, more specifically, odds ratio greater than 1 indicates increased chances of belonging to the period of introduction of technology. The technical and methodological details of this model are presented in the technical offer that is a document attached to this report. The investment data were collected at the Budget Directorate of the Ministry of Economy and Finance. As for the technological innovations, they were collected at the Coordination Device Support for System Research (DARS-ITRA), where the names of the varieties and the year of introduction were identified. This was used in

creating the data file for the dichotomous variables representing the technical innovations.

As the study is done with a temporal statistical series, we identify the year of introduction of the variety. The years before the introduction of the variable is set at 0, while for all other years after the introduction, it is set at 1. The analysis was carried with the XLSTAT software.The results were transferred into a microsoft word file as shown below.

Table 13: Characteristics of binary logistic modelsbetween domestic (Itrabg) and international (Itrareso) investments and technological innovations

Order No.	variable explained	explanatory variable	2Log Likelihood	R^2Cox & Snel	R-Deux Nagelkerk	Test Hosmer	0	1	A	B	Wald A	Wald B	P-Value A	P-Value B	Exp(A)	Exp(B)
Maize																
01	Ac297	Itrabg	8,396	0,622	0,843	0,761	9	14	0,016	-5,042	5,953	4,358	0,015	0,037	1,016	0,006
02	Ac297	Itrareso	20,517	0,360	0,488	0,564	9	14	0,042	-2,475	5,879	3,975	0,015	0,048	1,043	0,084
03	Obata	Itrabg	8,809	0,571	0,807	0,792	7	16	0,015	-3,105	5,335	4,024	0,021	0,045	1,015	0,045
04	Obata	Itrareso	11,064	0,578	0,733	0,962	7	16	0,078	-3,789	6,052	4,410	0,014	0,035	1,052	0,023
05	Sotub	Itrareso	23,118	0,284	0,384	0,679	14	9	0,032	-3,099	4,935	5,347	0,026	0,021	1,032	0,045
06	Tzlco	Itrabg	8,396	0,622	0,843	0,761	9	14	0,016	-5,042	5,953	4,358	0,015	0,037	1,016	0,006

07	Tzlco	Itrareso	20,517	0,360	0,488	0,564	9	14	0,042	-2,475	5,879	3,915	0,015	0,048	1,043	0,084
08	Tzee	Itrareso	18,388	0,434	0,582	0,420	10	13	0,051	-3,454	6,164	4,815	0,013	0,028	1,053	0,033
09	Ev99q	Itrareso	23,118	0,284	0,384	0,679	14	9	0,032	-3,099	4,935	5,347	0,026	0,021	1,032	0 ?045
10	Fampr	Itrareso	19,064	0,196	0,302	0,593	18	5	0,028	-3,891	3,705	5,787	0,054	0,016	1,029	0,020
Rice																
01	Nérical1	Itrareso	23,118	0,284	0,384	0,679	14	9	0,032	-3,099	4,935	5,347	0,026	0,021	1,032	0,045
02	Was161	Itrareso	14,181	0,265	0,439	0,711	19	4	0,040	-5,590	4,313	5,840	0,038	0,018	1,041	0,040
03	Nerica7	Itrabg	8,809	0,571	0,807	0,792	7	16	0,015	-3,105	5,335	4,024	0,021	0,045	1,015	0,045
04	Nerica7	Itrareso	11,464	0,518	0,733	0,962	7	16	0,078	-3,789	6,052	4,410	0,014	0,036	1,082	0,023

05	Nerica8	Itrabg	19,122	0,328	0,464	0,271	16	7	0,010	-5,168	3,680	3,904	0,055	0,048	1,010	0,006
06	Nerica8	Itrareso	20,079	0,300	0,423	0,855	16	7	0,036	-4,017	4,928	6,035	0,026	0,014	1,036	0,018

Table 13: Characteristics of binary logistic models between domestic investment (Itrabg) and international (Itrareso) and technological innovations (*continued)*

Order No.	variable explained	explanatory variable	2LogLikelihood	R^2Cox & Snel	R-Deux Nagelkerke	Test Hosmer Lemeshow	0	1	A	B	Wald A	Wald B	P-Value A	P-Value B	Exp(A)	Exp(B)
07	Nerica11	Itrabg	19,122	0,328	0,454	0,271	16	7	0,010	-5,168	3,680	3,904	0,055	0,048	1,010	0,006
08	Nerica11	Itrareso	20,079	0,300	0,423	0,855	16	7	0,036	-4,017	4,928	6,035	0,026	0,014	1,036	0,018
Cassava																
01	Tms96	Itrabg	10,76	0,56	0 ,77	0,30	8	15	0,01	-	6,94	4,58	0,00	0,03	1,01	0,036

			1	1	4	5			3	3,312	5	7	8	2	3	
02	Tms96	Itrareso	21,685	0,295	0,407	0,626	8	15	0,035	-1,791	5,171	2,682	0,023	0,101	1,036	0,167
03	Tms95	Itrabg	10,761	0,561	0,774	0,305	8	15	0,013	-3,312	6,945	4,945	0,008	0,032	1,013	0,036
04	Tms95	Itrareso	21,685	0,295	0,407	0,626	8	15	0,035	-1,791	5,171	2,682	0,023	0,101	1,036	0,167
05	Manvita	Itrabg	19,122	0,328	0,464	0,271	16	7	0,010	-5,169	3,680	3,904	0,055	0,048	1,010	0,006
06	Manvita	Itrareso	20,079	0,300	0,423	0,855	16	7	0,036	-4,017	4,928	6,035	0,026	0,014	1,036	0,018
07	Mantol	Itrareso	14,181	0,265	0,439	0,711	19	4	0,040	-5,59	4,313	5,840	0,038	0,010	1,041	0,004
Yam																
01	Tdr95	Itrareso	18,388	0,434	0,582	0,420	10	13	0,05	-3,454	6,164	4,815	0,013	0,028	1,053	0,032
02	Tdr98	Itrareso	22,481	0,324	0,425	0,499	13	10	0,036	-3,16	5,318	5,228	0,021	0,022	1,036	0,042

										4						
03	Tdr747	Itrabg	8,809	0,571	0,807	0,792	7	16	0,015	-3,105	5,335	4,024	0,021	0,045	1,015	0,045
04	Tdr747	Itraresо	11,464	0,518	0,733	0,962	7	16	0,078	-3,789	6,052	4,410	0,014	0,036	1,082	0,023
05	Tdr89	Itrabg	8,396	0,622	0,843	0,761	9	14	0,016	-5,042	5,953	4,358	0,015	0,037	1,016	0,006
06	Tdr89	Itraresо	20,517	0,360	0,488	0,564	9	14	0,042	-2,475	5,879	3,915	0,015	0,048	1,043	0,084
07	Miniset	Itraresо	22,126	0,281	0,388	0,835	15	8	0,032	-3,415	4,857	5,691	0,028	0,017	1,033	0,033
08	Consigne	Itraresо	19,064	0,196	0,302	0,593	15	8	0,028	-3,891	3,705	5,787	0,054	0,016	1,029	0,020

Table 14 shows the variable treatment outcomes using the binary logistic regression method (explained with a dichotomous variable). Note that the odds ratios are the number of times of a group membership when the value of the explanatory variable increases by 1. Here, more specifically, odds ratio greater than 1 indicates increased chances of belonging to the period of introduction of technology, while an odds ratio less than 1 decreases the probability of belonging to this period.

Tableau 14: Responses on national innovation techniques and investments

Culture	*Varieties*	*Itrabg*	*Itrareso*	*Ordrer N°*
Maize	Ac297	Yes	Yes	1
	Obata	Yes	Yes	2
	Sotub	No	Yes	3
	Tzl	Yes	Yes	4
	Tzee	No	Yes	5
	Ev99	No	Yes	6
Rice	Nerical14	No	Yes	7
	Was161	No	Yes	8
	Nerica7	Yes	Yes	9
	Nerica8	Yes	Yes	10
	Nerica11	Yes	Yes	11
Cassava	Tms96	Yes	Yes	12
	Tms95	Yes	Yes	13
	Manvita	Yes	Yes	14
	Mantol	No	Yes	15
Yam	Tdr95	No	Yes	16
	Tdr98	No	Yes	17
	Tdr747	Yes	Yes	18
	Tdr89	Yes	Yes	19
	Miniset	No	Yes	20
	Consign	No	Yes	21

The examination and analysis of the logistic regression models were used to confirm or deny the presence of dependency between the sources of investment (domestic/foreign/Itrabg /Itrareso) and the types of technologies/varieties. Out of the 33 technological innovations, the processing and analysis of data shows that: 11

technological innovations have a confirmed statistically dependent relation with foreign investments; 11 technological innovations have a confirmed statisticallydependent relationwith domestic and foreign investment. The analysis could not confirm the presence of a statistically significant relationship between investment and the following 10 technological innovations:

- Amen, Fam, Fampr for maize;
- Tgr203, Tgr405, Amsobf, Ppu for rice;
- -Sor21,Sorv28 for sorghum;
  Tms92 for cassava.

For all practical purposes, without repeating the description of these 'unconfirmed' innovations, we considered it appropriate to indicate the dates (years) of their introduction (table 15)

Table 15: The yearof introduction of innovations unconfirmed

Amen	*Fam*	*Fampr*	*Tgr203*	*Tgr405*	*Amsobf*	*Ppu*	*Sorv21*	*Sorv28*	*Tms92*
1992	2008	2008	1995	1995	2011	2012	1993	1994	1994

As indicated in table 15, the years of introduction of the varieties "unconfirmed" show no particularity. However, it should be noted that for rice, the Amsobf innovation and Ppu were introduced in 2011 and 2012, respectively, and have probably not yet had time to produce their true effect, regardless of their funding source. After the definition, identification and brief description of the essential variables, to meet specific objective 1 of the study, the use of binary logistic regression was used to estimate statistical functions linking each innovation, the type of investment in agricultural activities and ITRA. These results showed that the 33 technological innovations related to the cultures of corn, sorghum, rice, cassava and yam, only 22 have a statistical dependent relationship confirmed with the type of investment. For the other 10 varieties, the method has not confirmed the relationship.

ANALYSIS OF TECHNOLOGIES AND YIELDS

Table 16 shows the results of treatment of data on the impact of technological innovations on the yields of agricultural products. It should be stressed that all cultures are not represented in this table. Indeed, for these crops, innovations that were introduced on-farm are earlier than the period considered in this study, or in terms of their characteristics after statistical processing. Twenty-two (22)

technologies have been the subjectof treatment. They cover crops such as maize, rice, sorghum, cassava and yams.

Table 16: Analysis results of the impact of technological innovations from national and international investments on yields of agricultural products

Technology	R^2a	A	b	ta	Tb	Pa	Pb
MAIZE							
Amen	0,118	0,936	0,197	9,865	1,984	<0,0001	0,061
Acr97	0,709	0,967	0,243	37,694	7,395	<0,0001	<0,0001
Tzeew	0,598	0,990	0,221	34,593	5,807	<0,0001	<0,0001
Obatan	0,468	0,967	0,213	24,565	4,508	<0,0001	<0,0001
Sotuba	0,245	1,056	0,151	31,855	2,854	<0,0001	0,010
Tzl	0,709	0,967	0,033	37,694	7,395	<0,0001	<0,0001
Ev99	0,245	1,056	0,151	31,85	2,854	<0,0001	0,041
Farma	0,074	1,090	0,116	33,672	1,664	<0,0001	0,111
Famprc	0,074	1,090	0,116	33,672	1,664	<0,0001	0,111
RICE							
Tgr203	0,343	1,368	0,743	7,359	3,537	<0,0001	0,002
Tgr405	0,343	1,368	0,743	7,359	3,537	<0,0001	0,002
Nerical14	0,212	1,750	0,512	14,371	2,628	<0,0001	0,016
Was161	0,047	1,881	0,397	16,365	1,442	<0,0001	0,164
Nerica7	0,625	1,342	0,874	11,299	6,135	<0,0001	<0,0001
Nerica8	0,143	1,809	0,465	15,227	2,160	<0,0001	0,043
Nerica11	0,143	1,809	0,465	15,227	2,160	<0,000	0,043

						1	
CASSAVA							
Tms96	0,172	6,618	-0,719	26,911	-2,361	<0,000 1	0,028
Tms92	0,480	7,305	-1,400	26,500	-4,6&5	<0,000 1	0,000
Tsm95	0,172	6,618	-0,719	26,911	-2,361	<0,000 1	0,028
Mantol	0,007	6,227	-0,452	35,638	-1,078	<0,000 1	0,293
YAM							
Tdr747	0,351	9,124	1,187	33,140	3,595	<0,000 1	0,002
Tdr89	0,195	9,418	0,872	34,814	2,515	<0,000 1	0,020

From this table, for the cultivation of maize, nine (9) of the introduced technologies were on-farm technologies. Two of these technologies area vailable from the foodtechnology.

The technologies derived from corn

Maize, the main staple food of the country and is the most extended culture in Togo. Once grown mainly in regions of Plateaux and Maritime, maize cultivation gradually spread over to the entire national territory. New technologies have been analyzing the annual yield of corn.

Analysis of the table shows that for the "Amen" variety, the coefficient of determination, adjusted R2 is 0.118. This means that 11.8% of the Amen variety accounted for the corn yield. The average return before the introduction of the variety was 0.936 t / ha. This value is statistically significant after the introduction of the variety. The annual increase in yield is 0.197 t/ha. But this coefficient is not statistically significant. Therefore, this technology does not have a significant impact on the yield of corn. This situation can be explained by the fact that the Amen variety, obtained by the National Institute of Food Crops (current ITRA) in 1992, has not been maintained by the producers. ITRA, who bears the responsibility for the production of this variety, ceased the production of the Amen variety for technical reasons. In the analyses of dependency relationships between technology and investment, the Amen variety was one of the varieties for which the statistical dependence could not be confirmed.

The relationship between yield and the variety ACR 97 TEL COMP 1 W gives an adjusted determination coefficient of 0.709. This means that 70.9% of the variety accounted for the corn yield. The average yield was estimated at 0.967 t / ha before the introduction of this variety. This value is highly significant. The introduction of the variety increased yield by an average of 0.234 t/ha. This value also remains statistically significant. The introduction of this technology resulted in a 26% grain. Indeed, the producers for several years, face the permanent presence of striga, a weed that invades the cornfields and thereby reduces production. So, to solve this problem, this variety was introduced because of its good resistance to striga. Also, it gives a potential yield of 6 t / ha. What keeps view of increasing the level of the average annual yield of maize?

There is an adjustedd etermination coefficientof 0.598 for the variety WTZEPOPSTRQPM. This variety accounts for 59.8% of maize yield. Prior to its introduction at farm level, the yield was estimated at 0.99t/ha, a highly significant value.The dissemination of this on-farm technology results in an increasing in yield of 0.221t/ha annually. Statistical tests show that this value is significant. The impact of this technology on corn yield is positive and provides a 22% profit. This is one of the varieties introduced in order to fight against striga.

There is a positive dependency betweencorn yield and the Obatanpa variety. Indeed, the adjusted coefficient of determination gives a value of 0.468, indicating that 46.8% of corn yield is explained by this innovation. Before this variety, the yield was estimated at 0.967t/ha. Statistical tests show the significance of this value. With the diffusion of technology, performance has seen an average annual increase of 0.213t/ha. In view of the profitability associated with this value, the latter is statistically significant. This variety was introduced in 1997 from northern Ghana in order to address the problem of nutritional deficiency observed in children. It offers a 22% gain in performance.

The adjusted coefficient of determination is equal to 0.245, for the relationship between yield and Sotubaka technology. This explains 24.5% of corn yield. The average yield registered before the introduction of this variety was estimated at 1,056 t/ha. This value has a statistical significance. The spread of this variety has increased the yield by 0.151t/ha. This situation can be explained by the fact that Sotubaka is a yellow corn variety, more suitable for animal consumption (poultry). It is used to enhance the color of egg yolk. In some communities in the prefecture, such as Aklakou Lakes, there are varieties not consummed for reasons of tradition. For others, texture paste does not present a good appearance.

Another technology that positively affected maize yield is the variety TZL Comp 1 W. This technology accounts for 70.9% of maize yield (adjusted R2 = 0.709). The average yield before introduction was estimated at 0.967 t/ha. Corn yield has experienced an annual growth of 0,033 t / ha after its extension. This results in a gain of 25%.

The adjusted coefficient of determination between performance and EV99 QPM technology is 0.245. The innovation accounts for 24.5% of maize yield. Before his on-farm distribution, the average yield was 1.056 t/ha. Unfortunately, the growth generated by its extension can not be statistically validated (P-value greater than 0.05). The EV99 QPM technology is one of the varieties of high protein corn. It is a variety that has not been widely adopted by producers and is more prevalent in agricultural research systems in the field. The technology for making precooked corn flour did not positively impact maize yields. Statistical tests confirmed this. Indeed, it was a technology for improving the nutritional quality of children. Thus, its impact was felt in nutrition security—but it is practised only in the Savannah area. At this scale, it is obvious that it would not lead to significant expansion.

Technologies on rice cultivation

Rice is a food crop that conquered the Togolese food habits over time. Once considered a luxury commodity, it very quickly entered the eating habits of all social strata. It is grown in three ecologies: rainfed, irrigated and low background. The above table clearly shows that three technologies have a dependency relationship with the rice yield. These varieties Tgr203, Tgr405 and Nerica7. This dependency relationship does not exist with other technologies.

Table 16 shows that the adjusted coefficient of determination is 0.343. This means that the Tgr203 and Tgr405 technologies account for 34.3% of the yield of rice. Before the popularization of this technology, the average yield was estimated at 1,368 t/ha. This value is statistically significant. The extension of these on-farm technologies has resulted in increase in the yield of rice by 0.743 t / ha. These technologies introduced have contributed to a gain of 54% on the yield of rice. The Nerica7 provides an increase of 0.875 t/ha annually on rice yields. This allows a gain of 65%. Nericavarieties: Nerica8 and11 have the same characteristics. Prior totheir introduction, the annual average yield was estimated at 1,809t/ha for the two varieties.They have contributed further to the increase in average yield by 0.465t/ha. However, the contribution of these two varieties to rice yield is not significant. Nericel14 and WAS161-B-9-2 do not contribute meaningfully to rice yield. Table 16

shows the lack of dependency betweent the varieties: Nerical14 and Was161 and the evolution of performance.

Technologies on cassava cultivation

Cassava is cultivated in all the economic regions of the country because of its adaptability, and minimal requirements in terms of temperature, water and soil. It is one of the most cultivated crops by the Togolese people. Formerly cultivated only in the Maritime and Plateaux regions, it has over time gradually been extended to the Central and Kara regions. Of the six technologies of cassava that were reecorded, none has a significant and positive impact on the change in cassava yield. This is explained by the fact that the local varieties are the most cultured (the most common are: Fétonéghodji, Kataoli, Yovovi, Kalaba).

Technologies on yam cultivation

Yam is the second most cultivated tuber crop in Togo. The Central region alone provided nearly 50% of the national production. It is celebrated in some communities (prefecture of Bassar and Ogou) as a traditional feast. One of its by-products of processing, "fufu", is popular in Togo (and in the West African sub-region). Six technologies have been recorded over the period of the study and were the subject of analysis. From table 16, the Tdr747 variety has a significant effect on performance. Long before its extension, the average annual yield was estimated at 9,124t/ ha, with an adjusted determination coefficient of 0.351. Its on-farm distribution has resulted in increase in yield by 1.187 t/ha per year. This has helped to boost the efficiency by 13%. The relationship between yield and the Tdr89 variety gives an adjusted determination coefficient of 0.195. This means that the technology acounted for 19.5% of yield. Before the introduction of the variety, the annual average yield was estimated at 9.418 t/ha. After the diffusion of technology, there was an average increase of 0.872 t/ha. It should nevertheless be specified that domestic production was represented mostly by old or varietal groups such as local varieties and Labako Kratsi, which exhibit outstanding reputations for both good fufu and yam fries (commonly called Koliko).

Effect of technological innovations from national and international investments on the contribution of agriculture to GDP

Agriculture contributes significantly to the national GDP. Its contribution in 2010 was estimated at over 38%, including 28% for food production. This is the main provider of employment in Togo (more than 60%) according to the last national agricultural census in 2012. This contribution was made possible thanks to technologies introduced at the farm level in order to boost production. These

technologies have been seen in different food crops, and their impact on agricultural GDP was measured using the appropriate software. To address this, the agricultural gross domestic product (PIBA in millions of CFA francs) was selected as the dependent variable, with crop varieties as the explanatory variable. In determining the national wealth of the country, the agricultural GDP plays a key role. It is therefore pertinent to assess the impact of agricultural innovations on this indicator. Data on agricultural GDP was collected from the World Bank and ITRA. The dependent variable (dichotomous) was created. These variables are the same as described above.

Table 17: Effect of technological innovations fromnational and international investments on the contribution ofagriculture to GDP

Technology	R^2a	A	b	Ta	tb	Pa	Pb
MAIZE							
Amen	0,168	150959	223051	1,653	2,333	0,113	0,030
acr97	0,378	244458	180972	6,567	3,793	0,0001	0,001
Tzeew	0,373	254591	176966	7,176	3,750	0,0001	0,001
Obatan	0,443	211311	205999	5,289	4,300	0,0001	0,001
Sotuba	0,400	282023	185513	9,618	3,958	0,0001	0,001
ev99	0,400	282023	185513	9,618	3,958	0,0001	0,001
Farma	0,485	302569	239411	12,627	4,658	0,0001	0,000
Famprc	0,485	302569	239411	12,627	4,658	0,0001	0,000
SORGHUM							
sorv1	0,277	155611	228854	2,238	3,069	0,039	0,006
sorv28	0,325	174494	21041	3,00	3,407	0,007	0,003
RICE							
tgr203	0,342	194276	204877	3,782	3,528	0,001	0,002
tgr405	0,342	194276	204877	3,782	3,528	0,001	0,002
nerical14	0,400	282023	185513	9,618	3958	0,0001	0,001
was161	0,449	310856	251616	12,888	4,350	0,0001	0,000
nerica7	0,443	211311	205999	5,289	4,300	0,0001	0,000
nerica8	0,442	291963	205856	11,041	4,295	0,001	0,000
nerica11	0,442	291963	205856	11,041	4,295	0,0001	0,000
Amsobf	0,462	334010	473918	15,085	4,463	0,0001	0,000
Ppu	0,361	327914	307059	13,273	3,665	0,001	0,001
CASSAVA							
tms96	0,379	233512	185691	5,920	3,802	0,0001	0,001
tms92	0,325	174494	218041	3,00	3,407	0,007	0,003

tsm95	0,379	233512	185691	5,920	3,802	0,0001	0,001
Manvita	0,442	291963	205856	11,041	4,295	0,0001	0,000
Mantol	0,449	310856	251616	12,888	4,350	0,0001	0,000
YAM							
tdr95	0,373	254591	176966	7,176	3,750	0,0001	0,001
tdr98	0,347	280045	171510	81823	3,563	0,0001	0,002
tdr747	0,443	211311	205999	5,289	4,300	0,0001	0,000
tdr89	0,378	244458	180972	6,567	3,793	0,0001	0,001
Miniset	0,455	284576	201360	10,537	4,397	0,0001	0,000
Consign	0,485	302569	239411	12,627	4,658	0,0001	0,000
COTTON							
stam129	0,455	284576	201360	10,537	4,397	0,0001	0,000
stam279	0,342	194276	204877	3,782	3,528	0,001	0,002

Technologies on maize

Almost all the technologies on corn have a significant effect on agricultural GDP. Indeed, in recent years, Togo has recorded surpluses in terms of corn, to the point where this speculation is becoming a cash crop. This increased availability has allowed, for example, the National Agency for Food Security in Togo (ANSAT) to deliver 32,000 tonnes of maize in 2012 to deficit countries in the sub-region such as Niger, Burkina Faso, Mali and Liberia. The Amen variety has a significant effect on agricultural GDP, in terms of statistical tests of significance, including p-values. Its introduction resulted in a gain of 47% on the agricultural GDP

The relationship between performance and ACR97 variety provides an adjusted coefficient of determination of 0.378, indicating that 37.8% of the yield of corn is explained by this variety. Prior to its introduction, the agricultural GDP was estimated at 244billion CFA francs (P-value less than 5%). Following the introduction of the variety, the agricultural GDP grew by an average of 180 billion CFA francs (statistical tests arevalid). Regarding the relationship between the TZEEw variety and performance trends, table 18 shows that the variety accounts for 37.3% of performance trends. Whether before or after its introduction, the parameters considered are statistically significant. As the results show, all other maize technologies have a significant and positive effect on the agricultural GDP. However,

it should be noted that, Obatanpa accounts for 97% of the agricultural GDP, or 97%, Famprc Farma accounts for 79% of the agricultural GDP, while ACR97 accounts for 74% of the agricultural GDP. The TZEEW variety accounts for 70% of the agricultural GDP, while the EV99 and Sotubaka varieties account for 66% of thee agricultural GDP.

Technologies on sorghum

This study confirms a positive relationship between performance and the Sorvato1 and Sorvato28 varieties. There is a statistically significant dependency relationship between these variables.The Sorvato1 variety shows a strong contribution to the agricultural GDP (47%), compared to Sorvato28 (12%).

Technologies on rice

Nine technologies have been identified and have been the subject of analysis. The review attests that all the technologies significantly and positively contributed to the agricultural GDP. The NERICA varieties offer a significant contribution to the agricultural GDP (Nerica 7 (97%), Nerica 8 and 11 (71%), while the Was161 technology contributes 81%). The new rice fertilization procedure, through the deep placement of urea, is not a technology to be overlooked as to its contribution to the agricultural GDP. It provides a gain of 94%. The development of lowlands (Amsobf) that allow utilization of wetlands for rice production contributes 42%. The Tgr203 and Tgr405 varieties contributed the least (5% each).

Technologies on cassava

The four technologies have a significant and positive effect on the agricultural GDP. The probabilities associated with each technology (p-values), following their introduction, are less than 5%. The TMS92 variety is the most effective in terms of wealth generation, with a gain of 125%. It is followed by the Mantol variety (81%).TMS96TMS95varietiesandare in third placewith a share of80%and finallyMantolvarietywith a contribution of71%.

Technologies on yam

Just like most technologies, those related to yam also display a positive and statistically significant impact on the production of agricultural wealth. The TdR747 variety contributes most to the agricultural GDP (97%). The technique of conservation of yam (Consign) technology is an important capital can it contributes about 79% to the agricultural GDP. The TdR89 variety contributes about 74% to the agricultural GDP, while the technique of quick fragmentation contributes about 71%.

For their part, the TdR95 and TdR98 varieties contributed 70% and 61%, respectively.

Technologies on cotton

Cotton is a major cash crop in Togo. It contributes significantly to the foreign exchange reserves. Although it struggled up to the dissolution of SOTOCO, a company that was in charge of all cotton-related activities, and its replacement by "Nouvelle société cotonnière du Togo", it contributed 0.7 PBI% in agriculture in 2010. Analysis of technologies from cotton have this trend in terms of contribution: Stam 279 (105%) and Stam 129 (71%).

Impact of technological innovations from national and international investments on the contribution of agriculture to foreign exchange reserves

Togo's foreign exchange reserves from the agricultural sector come mainly from cash crops: coffee cocoa and cotton. Coffee and cocoa technologies predate the period of analysis for this study. Thus, the impact on the foreign exchange reserves was measured from the cotton technologies. The analysis results are shown in table 19 below. Calculating the gain remains the same as before.

Table 18: Results of impact of technological innovations from national and international investments on thecontribution of agriculture to foreign exchange reserves

Variable	R^2 a	a	B	ta	tb	Pa	Pb
COTTON							
stam129	0,355	11044	45258	1,534	3,546	0,141	0,002
stam279	0,040	7113,31	23723	0,468	1,371	0,645	0,186

The determination coefficients (R 2a = 0.355, R 2a = 0.040) reflect a positive and significant correlation between the adoption of new varieties (STAM129, STAM279) and the foreign exchange reserves of the country. In fact, 35.35% of the variation of the foreign exchange reserves can be explained by the adoption of the variety STAM 129A. Only 4% of the variation in foreign exchange reserves can be explained by the adoption of the STAM279A variety. Statistically, the adoption of the variety STAM 279A has no significant effect on the mobilization of external funds (Pb = 0,186 well above 0.05). Analysis of the results reveals that the adoption of the cotton variety STAM129A allowed the foreign exchange reserves to increase by 4 billion CFA francs. The cotton sector, despite having experienced difficulties leading to the replacement of the" Société Togolaise du Cotton (SOTOCO)" by the "Nouvelle

Société Cotonnière du Togo (NSCT)", the sector retains its position as the leading contributor to the foreign exchange reserves, before coffee and cocoa.

Agricultural investment and food and nutrition security

Since the World Food Summit held in Rome in1996, the concept of food security has been the subject of an international consensus. It was during this summit that the definition of the concept of food security was adopted by the Committee on World Food Security: "Food security exists when all people at all times have the physical, social and economic opportunity to provide sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.
Food security has four dimensions or pillars:

1. Access : When a person has sufficient purchasing power to buy food;
2. 2)Availability: When a person has enough food, whether from domestic production, stocks, imports or aid;
3. :Quality : Nutritional, health and socio-cultural beneits of food;
4. Stability : Access capabilities, purchasing power, availability and quality of food and diets are stable.

The concept of food securityis linked to food insecurity. Food insecurity is a situation in which there are individuals who do not have guaranteed access to healthy and nutritious food in sufficient quantities to allow for normal growth and development, and an active and healthy life. It can be due to a shortage of food, the lack of purchasing power, distribution problems or poor utilization of food at the household level. Food insecurity is one of the main causes of an altered nutritional status, as well as health problems, poor sanitation and inadequate practices for care and feeding. It may be chronic, seasonal or transitory. From a pragmatic point of view, FAO, the UN body responsible for data collection in the field of agriculture, developed in the FAOSTAT software: a thirty quantifiable indicators on food security: Disponibility, Adequacy of dietary energy resources (%); Average value of food production (SI per person); Share of cereals, roots and tubers in food energy intake (%) (3 year average); Mean protein supply of vegetable origin (g / person / day) (3 year average); Average animal protein supply (g / person / day) (3 year average); Access; Percentage paved road on the entire road network (%); Road density (per 100 sq km of total land area); Rail network density (per 100 sq km of total land area); National food price index (Index); GDP per capita (PPA international $ constant 2011); Number of undernourished people (millions) (3-year average); Prevalence of undernourishment (%) (Average over 3 years); Share of food expenditure among the poor (%); Scale of the food deficit (kcal / person / day) (Average over 3 years); Prevalence of food insufficiency (3-year average); Stability; Dependency ratio in respect of cereal imports (%) (average over 3 years); Percentage

of arable land equipped for irrigation (%) (Average over 3 years); Value of food imports to total merchandise imports (%); Political stability and absence of violence / terrorism (index); Instability of food prices at national level; and Variability of food production per capita (by SI constant person 2004-2006), among others.

The indicators are unevenly distributed according to the size. The availability has 5 indicators, the access dimension is described by 10 indicators; stabilitycomprises 6 variables. After defining the concept of food security and reviewed the indicators it contains, it becomes entirely clear that the analysis of the impact of technological innovations on each of the 30 variables is impossible to perform by statistical methods because most of the variables listed are not fully informed or are misinformed (unreliable data).

Moreover, nutritional status is the physiological state of an individual, resulting from interactions between inputs and nutrient needs, and the ability of the body to digest, absorb and assimilate these nutrients. Nutrition security is the set of provisions which contribute to put an individual or household in a balanced and sustainable nutritional status. More specifically, it is a situation in which all members of households have guaranteed access to enough nutritious food and at the same time, a healthy environment and to health services and care to ensure their own healthy living.

Nutrition security is distinct from food security in that it considers the care practices, health and hygiene in addition to the adequacy of diets. Thus, nutrition security defines the appropriate quantity and combination of inputs such as food, nutrition and health services, as well as the time required by the manager at any time to ensure an active and healthy lifestyle for all. Food security is a necessary but not a sufficient condition to ensure nutrition security. Among the nutrition indicators, the daily calorie consumption per capita measured in calories per capita per day, is the best known, the most used and especially the most populated. In this section, the analysis will focus on the dependency relationships between domestic and foreign investment, the daily calorie consumption per capita and agricultural GDP.

Impact of investments in agricultural innovations on nutrition security

The Togolese people consume local and imported products, from which the energy required for growth and maintenance of the body is obtained. However, a difference is observed in terms of supply of these energy sources in relation to the composition, quantity and quality of the diet. The table below shows the results of the analysis of variance of agricultural innovations and the daily intake of calories per person.

Table 19: Measuring the impact of technological innovations from national and international investments on nutrition security

Technology	R^2a	a	b	ta	tb	Pa	Pb
MAIZE							
Amen	0.093	2010.5	169.85	22.012	1.773	0.0001	1.773
acr97	0.604	2039.22	212.701	71.717	5.75	0.0001	0.0001
TZEEw	0.606	2050.2	210.3	76.168	5.77	0.0001	0.0001
Obatanpa	0.613	2010.857	225.943	63.031	5.848	0.0001	0.0001
Sotuba	0.626	2084.571	220.929	94.017	6.009	0.0001	0.0001
Farma	0.392	2124.389	222.861	85.243	3.813	0.0001	0.0001
Famprc	0.392	2124.389	222.861	85.243	3.813	0.0001	0.0001
SORGHUM							
sorv1	0.3	1972.33	222.982	30.118	3.164	0.0001	0.005
sorv28	0.46	1969	239.444	39.529	4.348	0.0001	0.000
RICE							
tgr203	0.528	1983.6	234.635	47.631	4.953	0.0001	0.0001
tgr405	0.528	1983.6	234.635	47.631	4.953	0.0001	0.0001
nerical14	0.626	2084.571	220.929	94.017	6.009	0.0001	0.0001
was161	0.297	2134.632	222.035	81.859	3.144	0.0001	0.005
nerica7	0.613	2010.857	225.943	63.031	5.848	0.0001	0.0001
nerica8	0.537	2104.25	222.417	91.223	5.035	0.0001	0.0001
nerica11	0.537	2104.25	222.417	91.223	5.035	0.0001	0.0001
CASSAVA							
tms96	0.584	2028.75	213.964	65.591	5.518	0.0001	0.0001
tms92	0.46	1969	239.44	39.529	4.348	0.0001	0.0001
tsm95	0.584	2028.75	213.964	65.519	5.518	0.0001	0.0001

Manvita	0.537	2104.25	222.417	91.223	5.035	0.0001	0.0001
Mantol	0.297	2134.63	222.035	81.859	3.144	0.0001	0.005
YAM							
tdr95	0.606	2050.2	210.3	76.168	5.77	0.0001	0.0001
tdr98	0.637	2075.769	217.897	91.561	6.147	0.0001	0.0001
tdr747	0.613	2010.857	225.943	63.031	5.848	0.0001	0.0001
tdr89	0.604	2039.22	212.701	71.717	5.75	0.0001	0.0001
Consign	0.392	2124.38	222.86	85.243	3.813	0.0001	0.001

Technologies on maize

From table 20, all the introduced corn technologies positively and significantly impacted nutrition security, with the exception of Amen variety (P-value greater than 5%). The most important cereal in the human diet are rice, wheat and corn. Corn, in particular, consists essentially of starch, lipid and protein. However, the protein is often unbalanced. This is led to the development of the Acr97 variety. Other varieties like TZEEW and Obatanpa are varieties which contain lysine and tryptophan, two amino acids essential for human growth. They are qualified in the context of high protein maize (quality protein maize - QPM). These varieties not only help solve the problem of low productivity, but also help to improve the nutritional status of the population, especially children. They are most cultivated in northern Togo, where malnutrition and poverty rates are high.

Technologies on sorghum

Examination of the results show that both sorghum varieties significantly and positively affect nutritional security. They offer gains of11 and 12% for Sorvato1 and Sorvato28, respectively.

Technologies on rice

The results show that all innovations from rice have a significant positive impact on nutrition security, with the exception of the Ppu variety (P-value greaterthan 5%). There is a new rice fertilization technology that involves the displacement of urea. Its impact would be more sensitive to performance. There is no dependency relationship between technology and Ppu daily calorie consumption. Note that other species provide up to 10 to 12% of the amount of calories consumed by one person.

Technologies on cassava and yam

The same pattern occurs for both tubers. This means that innovations enable any person who consumes cassava or yam to benefit from a heat input of 10 to 12%. An important point to note is that the use of botanical extracts in the conservation of yam tubers (Consign) is a technology that keeps the organoleptic quality of yam during storage. It displays a calorie gain of 10%.

Food crops such as corn, rice, cassava and yam provide significant amounts of calories. The recent evaluation of food security based on the results of the analysis of consumption expenditure data from the Survey of Households BudgetConsumption in 2006 reveals that one in three (30%) people in Togo was undernourished, and that about one in six(16%) people were in a situation of critical food poverty. At the sub-regional level, it occurred mainly in low-income households with more than five persons, and in those residing in rural areas, especially in the Central and Savannah regions, were a large proportion of food deprivation, occurs (approaching or exceeding 40%).

The diet of an average Togolese was composed mainly of cereals, roots and tubers, pulses, oils and vegetable derivatives, representing more than 70% of dietary energy. Eating foods rich in protein (meat, fish, milk, dairy products and eggs) was marginal and did not represent more than 5% of total energy consumption. In nutritional terms, this meant that the protein, lipid and carbohydrate intake of an average Togolese was 12%, 16% and 72%, respectively, of the dietwas inthe standards recommendedby FAOand WHOfor protein, to lower limit standards for fat and higher in carbohydrates. For the energy consumption of a person suffering from hunger to be equal to the minimum energy requirement of 1742 kilocalories required for a Togolese to maintain a healthy life corresponding to a low level of physical activity, we had an energy surcharge of 301 kilocalories.

To complete the investment analysis on food and nutrition security, we conducted an impact assessment using multiple regression, where the daily consumption of calories per day is the food security representative/nutritional explained variable and investments (domestic and foreign) and agricultural GDP are the explanatory variables. The results of the analysis of the simple regression between daily calorie consumption per capita (Calo) and domestic investment (itrabg) on one hand and the daily calorie consumption per capita foreign investment, on the other, allow:

- To confirm the presence of a relatively strong dependency relationship between daily calorie consumption per capita and domestic investments

- To state that under the assumption of a linear relationship between two variables, calorie consumption per capita is explained almost 68% of domestic investments;
- Say, under the same conditions, that the increase in domestic investment of one million CFA francs increases the calorie consumption per day per person by 0.481 units.
- Confirm the presence of a significantly strong dependency relationship between daily calorie consumption and foreign investments
- To say, assuming a linear relationship between two variables that explain foreign investment to nearly 53% of daily calorie intake;
- Establish that an increase in foreign investment of one million CFA francs will be an increase in incidence of 2,318 calories per person per day.

Table 20: Results of simple linear regression between daily calorie consumption (calo), domestic investment (itrabg) and foreign investment (itrareso)

	No-standardized coefficients		standardized coefficients	t	Sig.
	A	Standard error	Bêta		
(Constante)	1994,772	30,084		66,306	0,000
Itrabg	0,481	0,071	0,833	6,742	0,000
R^2a=0,679	F=45,4				
(Constante)	1992,894	40,091		49,709	0,000
Itrareso	2,318	0,469	0,741	4,941	0,000
R^2a=0,527	F=24,4				

The impact of foreign resources on the daily calorie consumption per person is five times higher than the impact of national investment. In a multivariate approach, the daily calorie intake was considered as a function of the total investment and the agricultural GDP. Statistically valid and fully multiple regression information that the variation of total investments of the agricultural GDP and 82% to determine the daily calorie consumption per capita.AndUnder the conditions of a multiple dependent relationship between two variables, the impact of investment on consumption of calories (0,179) is far superiorto that of agricultural GDP (0.001).

Table 21: Results of multiple linear regression between daily calorie consumption (calo), total investment (Bgtot) and agricultural GDP					
	No-standardized coefficients		standardized coefficients	t	Sig.
	A	Standard error	Bêta		
(Constante)	1825,099	47,059		38,783	0,000
Bgtot	0,179	0,078	0,357	2,290	0,034
Piba	0,001	0,000	0,603	3,865	0,001
R^2 a=0,823 F de Fisher-Snedecor =49,7					

Conclusion and recommendations

As in anyscientific research, in this study, the objectives imposed the nature and quantity of data to use. This study is an impact study, which required the development of a data file of nearly 80 variables, about the period from 1990 to 2012. Much of these variables are quantitative variables for which collection was organized and conducted by a team of three research assistants. Before data collection, technical tenders which detail the methodology to achieve the objectives set, was crafted. After the stages of editing and processing of data, the analysis and report writing followed. The analysis was carried out using several softwares: SPSS, XLSTAT, SYSTAT and Excel. The report consists of 7 parts. The first was a presentation of the general trends of the key variables of the study.

The other parts were designed to address the specific objectives of the study, by making use of various statistical tests confirming the existenc edependency relationships from which their impacts were calculated. The main limitation of this study is the use of a relatively small number of observations. But as the models examined were rarely multivariate in nature, 22 observations could guarantee the validity of the different statistical tests.

There is the need for comprehensive statistics, reliable and timely information on various aspects of technological innovation; hence, it is important to investigate innovations, and introduce them into agricultural activities. But it is also important to assess, record and maintain all the costs and investments related to these innovations. Any analysis of innovations incomplete and misinformed agronomic variables can help to develop policies and make recommendations for improving sector performance. The ITRAand the officials of the ministry in charge of agriculture are advised to create better conditions for the collection, processing, archiving, updating and dissemination of data on agricultural activities of the institute.

The analysis of the first objective of the study shows that the dependency relationship between innovation and foreign investment is denser than the relationship between innovations and domestic investment. For example, the presented results indicate that the impact of foreign exchange reserves on the daily calorie consumption per person is five times higher than the impact of national investments on the same variable. It is logical to ask the question for the reasons behind this situation.One reason would be the mode of governance, management and control of investments available to the institute. It would, therefore, be desirable to take measures and steps to improveidoinesthis mode. And since investments from international cooperation seem to lead to better results, the lesson can be learned.

In practice, the search for technological innovation to find the most improved varieties appear not to be a priority. The timing of the introduction of new varieties does not seem to attest that the research is well organized and supported. The recommendation would be to invest more in physical, financial and human efforts to boost the enthusiasm of researchers in order to increase the quality and quantity of the varieties of food crops, and sustainably increase agricultural productivity. According to the data at our disposal, the share of agriculture in the national budget is far from the1 0% standard suggested by the international agricultural community.

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APPENDICES

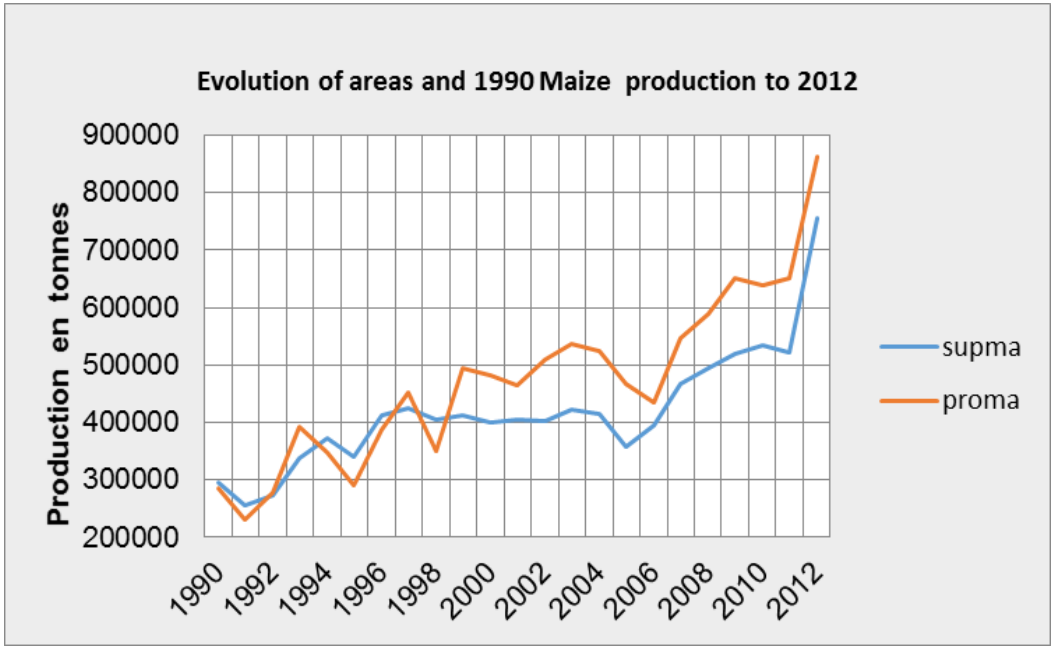
Appendix 1: The numerical and graphical summary of quantitative study variables

This document is a working document on the impact of investments on agricultural development and food security in Togo. Generally, in all scientific research, the various syntheses are the early stages, where it carries out the digital synthesis (quantitative variables), graphics and paintings by synthesis (categorical variables).
The study refers to a significant number of quantitative variables. And most of these variables are directly or indirectly related to the key variables defined in the objectives of the terms of reference. One can not speak of agricultural GDP reminiscent of the national GDP, and a graphic synthesis of the two variables would indicate not only the individual evolution of each of these variables, but also the dependency relationship between them. And if one chooses to synthesize by a graphic like the bivariate scatterplot, it has almost all the elements for a complete dependency analysis between these two variables.

These characteristics as indicated by their name give a general idea of the variables of interest. Then, to get an idea about the degree of variability, we calculated the characteristics of variation or dispersion (standard deviations, the average absolute deviations, median absolute deviations, coefficients of variation, etc). We recall that in the practice of statistical analysis, it is strongly recommended to rather deal with more or less homogeneous data for outliers (also called outsiders), because they are sources of a number of statistics related to the inconvenience disruption of dependency relationships.
The shape characteristics in terms of skewness and kurtosis coefficients guide the researcher on the nature of the distribution (normal distribution symmetric, asymmetric, etc).

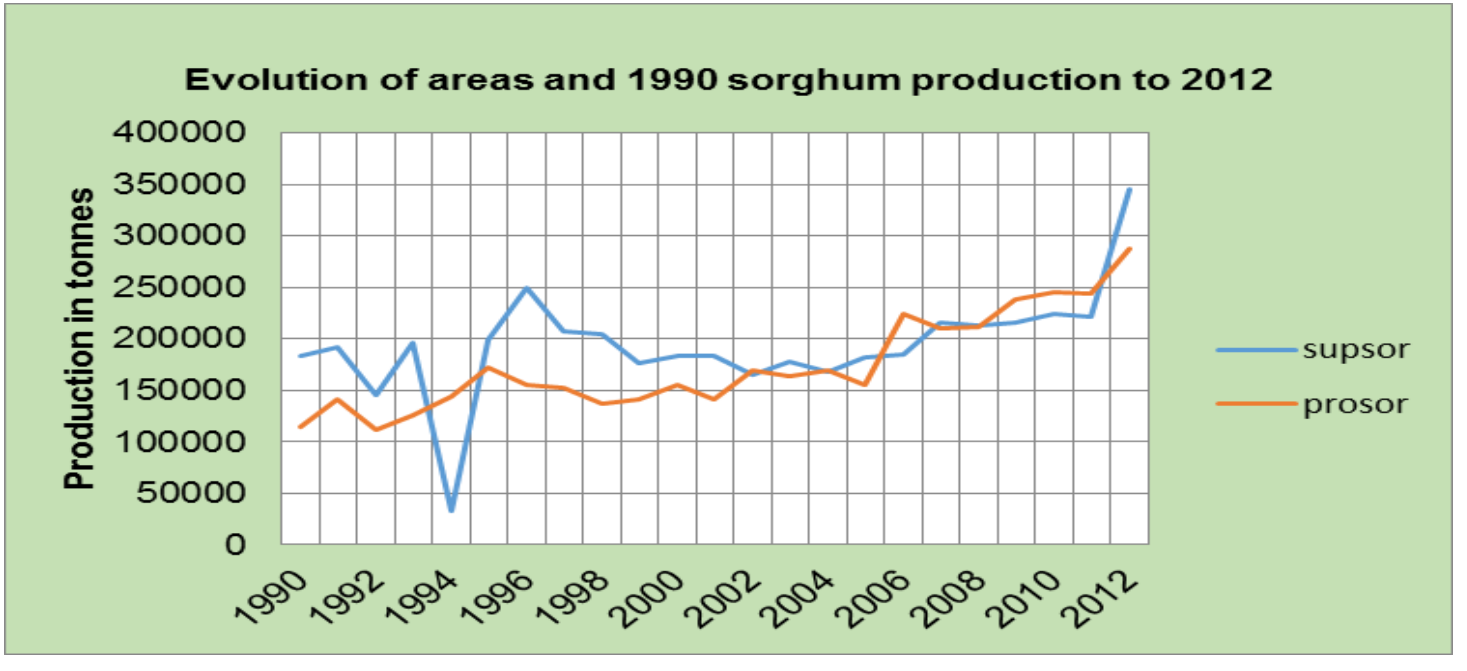
MAIZE	Supma	Rdtma	Proma	Prima
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	255400,000	0,855	231400,000	30,412
1er quartile	356555,000	0,965	350485,000	38,662
Médiane	405780,000	1,160	466540,000	54,616
3ème quartile	468156,000	1,245	546050,000	75,091
Maximum	754739,000	1,308	862257,000	110,648
Etendue	499339,000	0,453	630857,000	80,236
Somme	9622474,470	25,655	10868303,693	1346,540
Moyenne	418368,455	1,115	472534,943	58,545
Moyenne géométrique	407251,336	1,106	450504,389	54,745
Moyenne harmonique	396913,176	1,097	428464,065	51,334
Aplatissement (Pearson)	2,451	-1,237	0,070	-0,686
Asymétrie (Pearson)	1,228	-0,496	0,521	0,653
Aplatissement	4,033	-1,034	0,761	-0,278
Asymétrie	1,406	-0,568	0,596	0,748
CV (écart-type/moyenne)	0,249	0,128	0,313	0,382
Variance d'échantillon	10359544273,793	0,020	20928472679,841	477,875
Variance estimée	10830432649,874	0,020	21879766892,561	499,597
Ecart-type d'échantillon	101781,846	0,140	144666,764	21,860

Ecart-type estimé	104069,365	0,143	147918,109	22,352
Ecart absolu moyen	68977,985	0,121	112047,245	17,946
Ecart absolu médian	49225,000	0,096	79510,000	17,915
Ecart-type de la moyenne	21699,963	0,030	30843,058	4,661
Borne inf. IC de la moyenne	373365,487	1,054	408570,356	48,880
Borne sup. IC de la moyenne	463371,423	1,177	536499,530	68,211



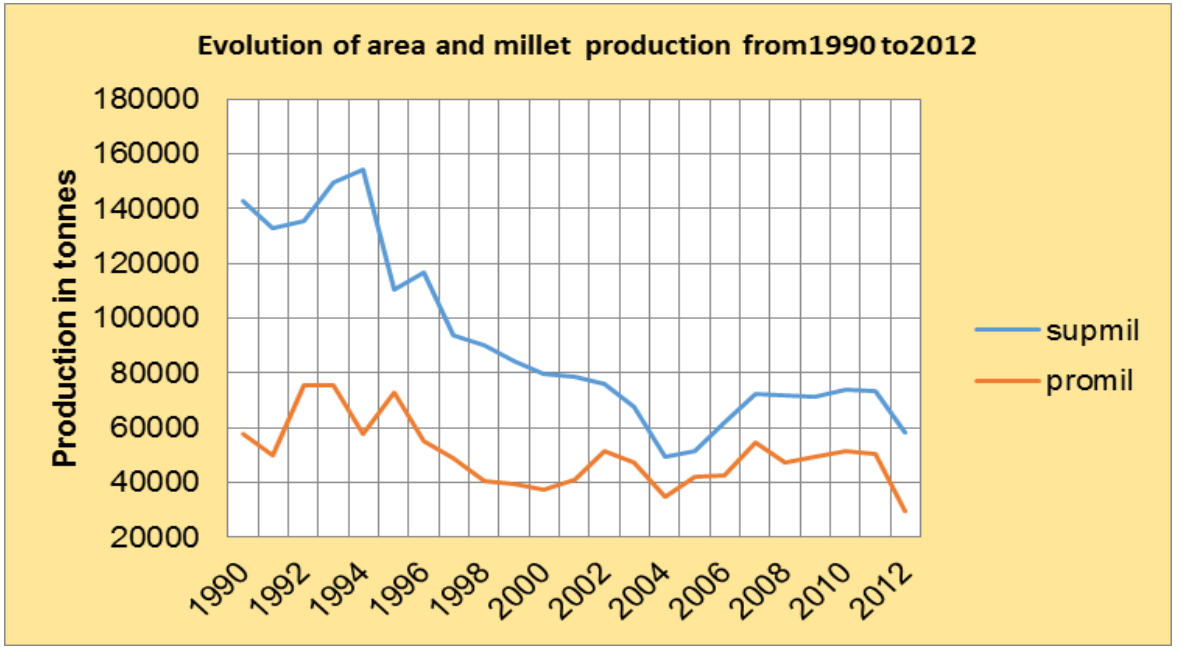
SORGHUM	Supsor	Rdtsor	Prosor	Prisor
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	32560,284	0,623	112319,000	33,352
1er quartile	177677,000	0,738	141658,000	58,591
Médiane	191600,000	0,851	155853,000	66,923
3ème quartile	215368,000	1,026	211258,000	71,960
Maximum	345111,000	4,420	286967,000	138,011
Etendue	312550,716	3,797	174648,000	104,659
Somme	4461637,804	23,640	4009440,754	1602,605
Moyenne	193984,252	1,028	174323,511	69,678
Moyenne géométrique	183272,417	0,921	168763,025	66,361
Moyenne harmonique	160651,043	0,872	163735,528	63,188
Aplatissement (Pearson)	4,069	14,418	-0,563	1,366
Asymétrie (Pearson)	-0,210	3,856	0,753	1,043
Aplatissement	6,256	20,476	-0,109	2,542
Asymétrie	-0,240	4,416	0,862	1,194
CV (écart-type/moyenne)	0,270	0,738	0,270	0,330
Variance d'échantillon	2618986185,031	0,550	2114628891,708	504,876
Variance estimée	2738031011,623	0,575	2210748386,785	527,825
Ecart-type d'échantillon	51176,031	0,742	45985,094	22,469
Ecart-type estimé	52326,198	0,758	47018,596	22,974

Ecart absolu moyen	30903,108	0,330	38129,233	15,503
Ecart absolu médian	15209,000	0,140	16472,000	5,391
Ecart-type de la moyenne	10910,767	0,158	9804,055	4,791
Borne inf. IC de la moyenne	171356,707	0,700	153991,145	59,744
Borne sup. IC de la moyenne	216611,797	1,356	194655,877	79,613



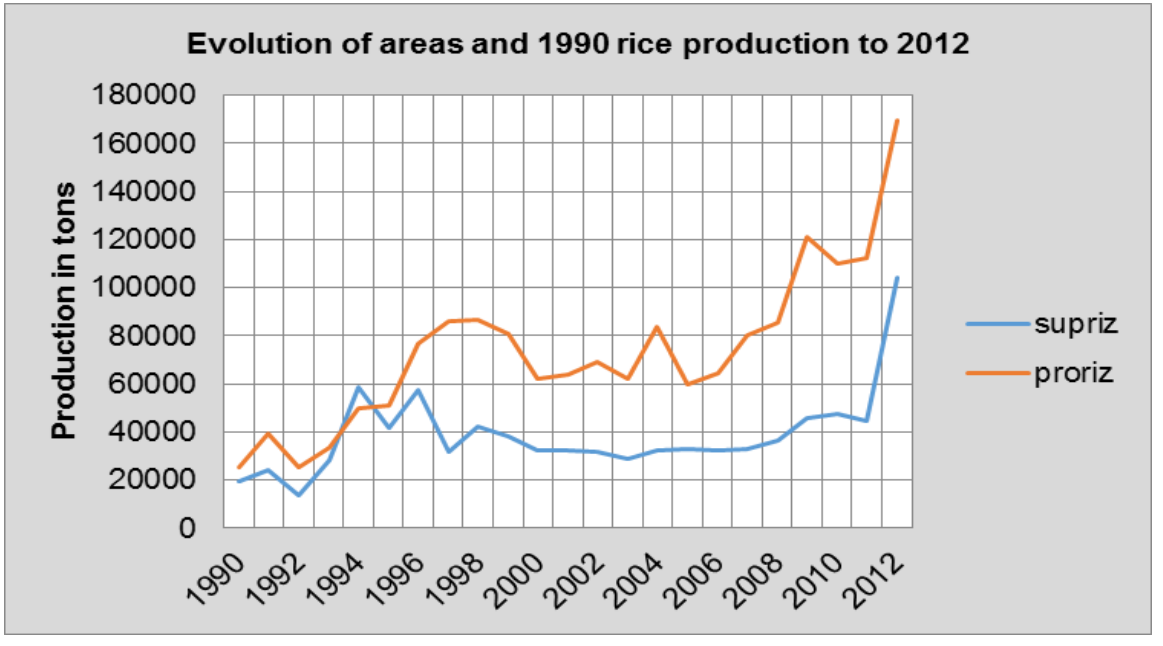
MILLET	Supmil	Rdtmil	Promil	Primil
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	49362,000	0,375	29339,000	25,511
1er quartile	71467,968	0,470	41248,000	52,111
Médiane	78580,000	0,556	49146,000	64,908
3ème quartile	116696,000	0,688	55137,000	83,776
Maximum	154300,000	0,821	75240,000	110,948
Etendue	104938,000	0,446	45901,000	85,437
Somme	2095955,968	13,351	1151602,000	1547,580
Moyenne	91128,520	0,580	50069,652	67,286
Moyenne géométrique	86139,321	0,566	48754,222	63,643
Moyenne harmonique	81723,157	0,551	47492,083	59,598
Aplatissement (Pearson)	-0,969	-1,388	-0,165	-0,745
Asymétrie (Pearson)	0,679	-0,015	0,660	0,115
Aplatissement	-0,666	-1,243	0,439	-0,359
Asymétrie	0,778	-0,017	0,755	0,132
CV (écart-type/moyenne)	0,354	0,225	0,240	0,322
Variance d'échantillon	994523663,218	0,016	138435211,009	448,581
Variance estimée	1039729284,273	0,017	144727720,601	468,971
Ecart-type d'échantillon	31536,069	0,128	11765,849	21,180
Ecart-type estimé	32244,833	0,130	12030,283	21,656

Ecart absolu moyen	26640,160	0,117	8788,911	17,118
Ecart absolu médian	14960,000	0,123	6987,000	13,341
Ecart-type de la moyenne	6723,513	0,027	2508,488	4,516
Borne inf. IC de la moyenne	77184,809	0,524	44867,367	57,921
Borne sup. IC de la moyenne	105072,232	0,637	55271,937	76,651



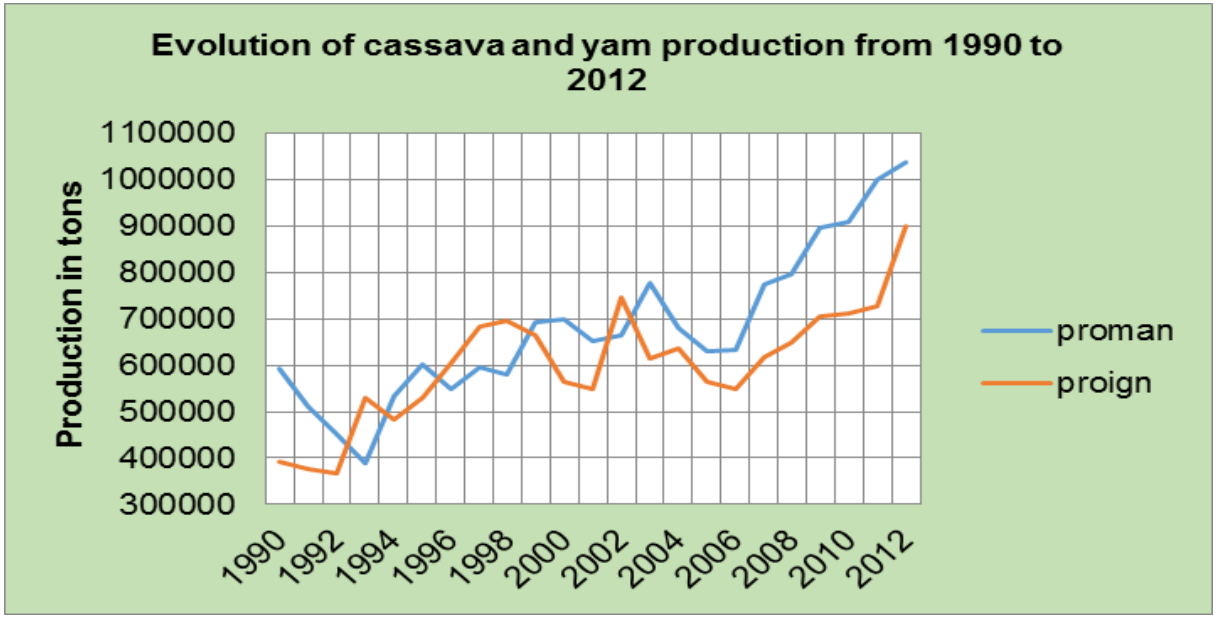
RICE	Supriz	Rdtriz	Proriz	Pririz
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	13650,000	0,855	25149,000	45,114
1er quartile	31957,000	1,627	51226,000	58,836
Médiane	32605,000	2,000	69243,000	68,829
3ème quartile	44713,000	2,344	86211,000	78,249
Maximum	104043,000	2,698	169272,000	102,154
Etendue	90393,000	1,842	144123,000	57,039
Somme	888938,772	44,855	1699753,599	1625,584
Moyenne	38649,512	1,950	73902,330	70,678
Moyenne géométrique	35674,213	1,876	66908,548	68,712
Moyenne harmonique	33073,107	1,790	59725,437	66,825
Aplatissement (Pearson)	5,323	-0,917	0,907	-1,015
Asymétrie (Pearson)	2,047	-0,389	0,858	0,419
Aplatissement	7,979	-0,595	1,911	-0,730
Asymétrie	2,344	-0,445	0,982	0,480
CV (écart-type/moyenne)	0,460	0,263	0,448	0,245
Variance d'échantillon	302855889,216	0,252	1047131925,295	285,745
Variance estimée	316622065,999	0,263	1094728830,990	298,734
Ecart-type d'échantillon	17402,755	0,502	32359,418	16,904
Ecart-type estimé	17793,877	0,513	33086,687	17,284

Ecart absolu moyen	11562,842	0,410	24369,475	13,631
Ecart absolu médian	5534,000	0,372	16968,000	9,420
Ecart-type de la moyenne	3710,280	0,107	6899,051	3,604
Borne inf. IC de la moyenne	30954,862	1,728	59594,574	63,203
Borne sup. IC de la moyenne	46344,161	2,172	88210,087	78,152



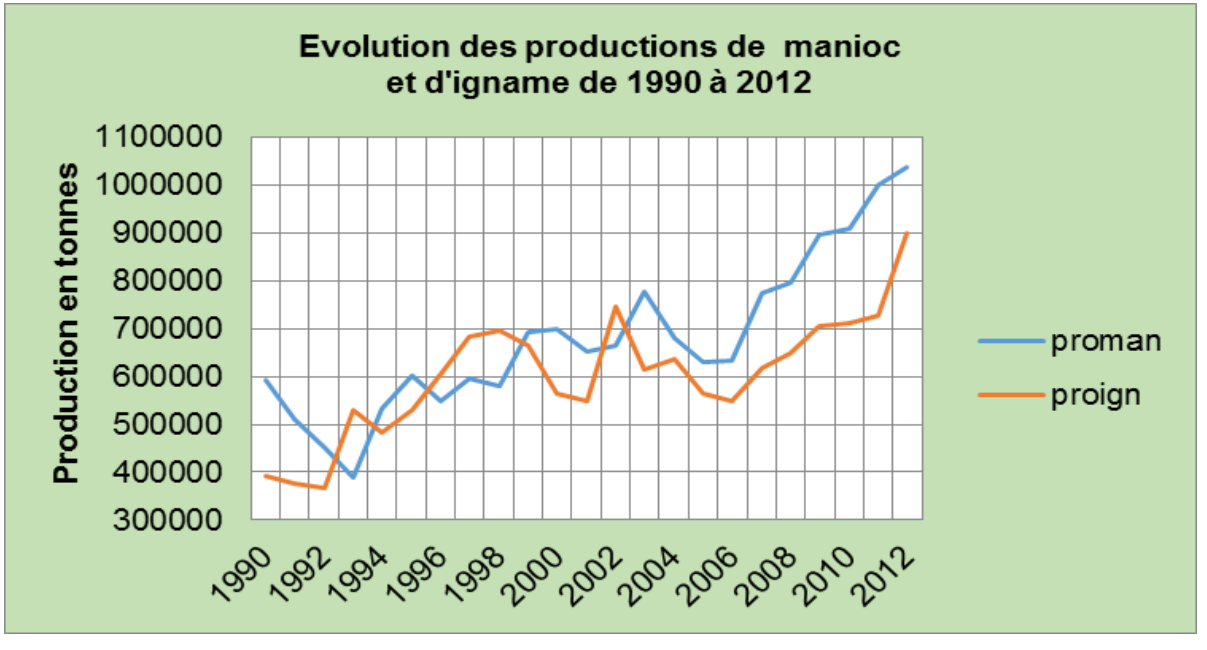
CASSAVA	Supman	Rdtman	Proman	Priman
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	56800,000	4,130	389448,000	15,192
1er quartile	95574,000	5,857	579381,000	20,148
Médiane	109947,000	6,059	651530,000	27,036
3ème quartile	131425,000	6,560	778864,000	36,974
Maximum	251589,000	7,787	1038946,433	58,156
Etendue	194789,000	3,658	649498,433	42,963
Somme	2621544,790	141,420	15642337,054	676,741
Moyenne	113980,208	6,149	680101,611	29,424
Moyenne géométrique	108400,454	6,101	661392,007	27,552
Moyenne harmonique	103301,862	6,051	643126,206	25,983
Aplatissement (Pearson)	3,887	1,058	-0,462	-0,146
Asymétrie (Pearson)	1,576	-0,089	0,517	0,973
Aplatissement	6,005	2,118	0,030	0,464
Asymétrie	1,805	-0,102	0,592	1,115
CV (écart-type/moyenne)	0,347	0,124	0,243	0,393
Variance d'échantillon	1495318352,883	0,559	26206494231,593	127,865
Variance estimée	1563287368,923	0,584	27397698514,847	133,677
Ecart-type d'échantillon	38669,346	0,748	161884,200	11,308
Ecart-type estimé	39538,429	0,764	165522,502	11,562

Ecart absolu moyen	26093,435	0,506	127223,874	8,834
Ecart absolu médian	15793,000	0,202	103214,000	6,888
Ecart-type de la moyenne	8244,332	0,159	34513,827	2,411
Borne inf. IC de la moyenne	96882,509	5,818	608524,314	24,424
Borne sup. IC de la moyenne	131077,907	6,479	751678,908	34,423



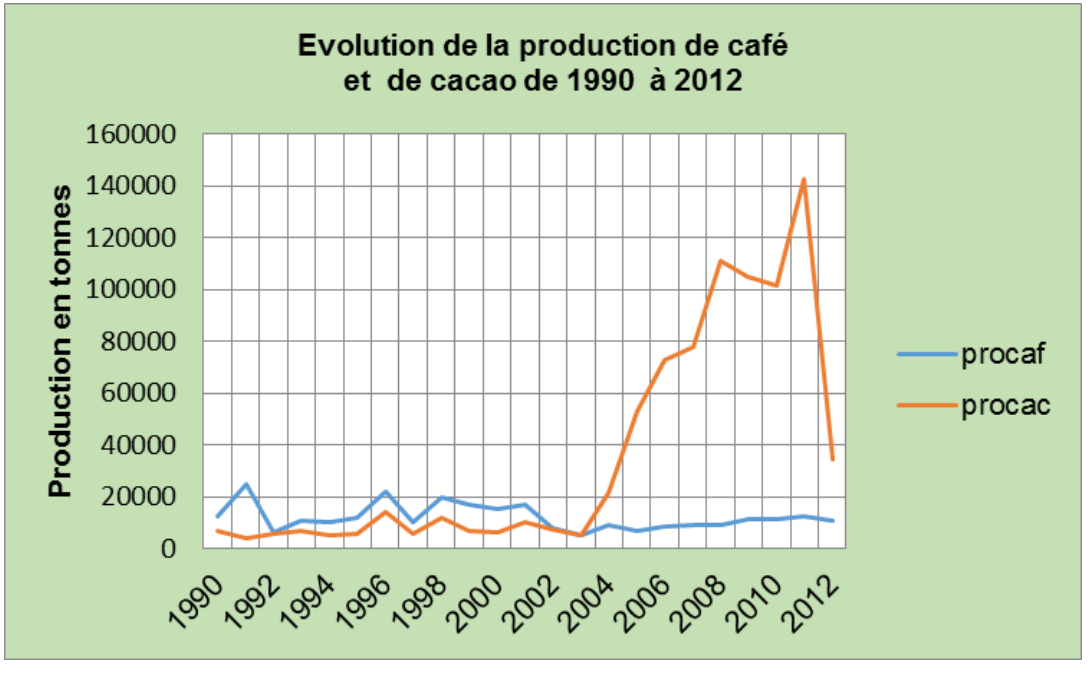
YAM	Supign	Rdtign	Proign	Priign
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	41700,000	8,326	367997,000	28,942
1er quartile	51300,000	9,028	530502,000	40,241
Médiane	60941,000	10,183	614960,000	50,042
3ème quartile	69334,000	10,829	696145,000	67,876
Maximum	103475,000	11,147	900832,000	114,351
Etendue	61775,000	2,821	532835,000	85,409
Somme	1396692,500	228,830	13865181,397	1377,224
Moyenne	60725,761	9,949	602833,974	59,879
Moyenne géométrique	59472,390	9,909	589289,458	55,795
Moyenne harmonique	58311,777	9,867	574806,578	52,359
Aplatissement (Pearson)	2,267	-1,331	-0,165	-0,296
Asymétrie (Pearson)	1,164	-0,379	-0,031	0,952
Aplatissement	3,780	-1,164	0,438	0,258
Asymétrie	1,333	-0,434	-0,035	1,090
CV (écart-type/moyenne)	0,218	0,091	0,210	0,406
Variance d'échantillon	167985782,606	0,783	15376716297,515	566,591
Variance estimée	175621499,997	0,818	16075657947,402	592,345
Ecart-type d'échantillon	12960,933	0,885	124002,888	23,803
Ecart-type estimé	13252,226	0,904	126789,818	24,338

Ecart absolu moyen	9639,336	0,750	97386,151	18,879
Ecart absolu médian	9043,000	0,740	81185,000	12,415
Ecart-type de la moyenne	2763,280	0,189	26437,505	5,075
Borne inf. IC de la moyenne	54995,069	9,558	548005,945	49,355
Borne sup. IC de la moyenne	66456,453	10,340	657662,003	70,404



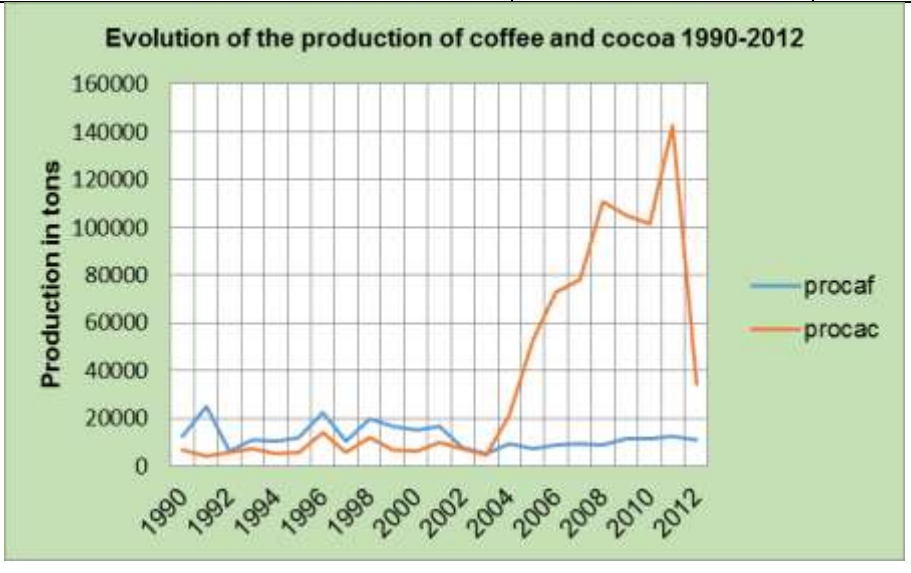
COFFEE	Supcaf	Rdtcaf	Procaf	Pricaf
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	20000,000	0,158	5500,000	95,456
1er quartile	29500,000	0,262	9143,000	145,526
Médiane	34000,000	0,307	11000,000	241,989
3ème quartile	46018,000	0,390	15200,000	336,601
Maximum	57930,000	0,655	24900,000	410,739
Etendue	37930,000	0,498	19400,000	315,283
Somme	857612,000	7,769	283566,000	5508,652
Moyenne	37287,478	0,338	12328,957	239,507
Moyenne géométrique	35752,881	0,321	11472,331	220,511
Moyenne harmonique	34241,724	0,306	10714,913	201,590
Aplatissement (Pearson)	-1,170	0,981	0,113	-1,272
Asymétrie (Pearson)	0,282	1,211	0,966	0,199
Aplatissement	-0,943	2,013	0,820	-1,083
Asymétrie	0,323	1,386	1,106	0,228
CV (écart-type/moyenne)	0,293	0,349	0,405	0,397
Variance d'échantillon	114071415,467	0,013	23902983,172	8642,203
Variance estimée	119256479,806	0,014	24989482,407	9035,031
Ecart-type d'échantillon	10680,422	0,115	4889,068	92,963

Ecart-type estimé	10920,462	0,118	4998,948	95,053
Ecart absolu moyen	9230,412	0,087	3745,074	78,157
Ecart absolu médian	7000,000	0,057	1857,000	94,612
Ecart-type de la moyenne	2277,074	0,025	1042,353	19,820
Borne inf. IC de la moyenne	32565,117	0,287	10167,249	198,403
Borne sup. IC de la moyenne	42009,840	0,389	14490,664	280,611



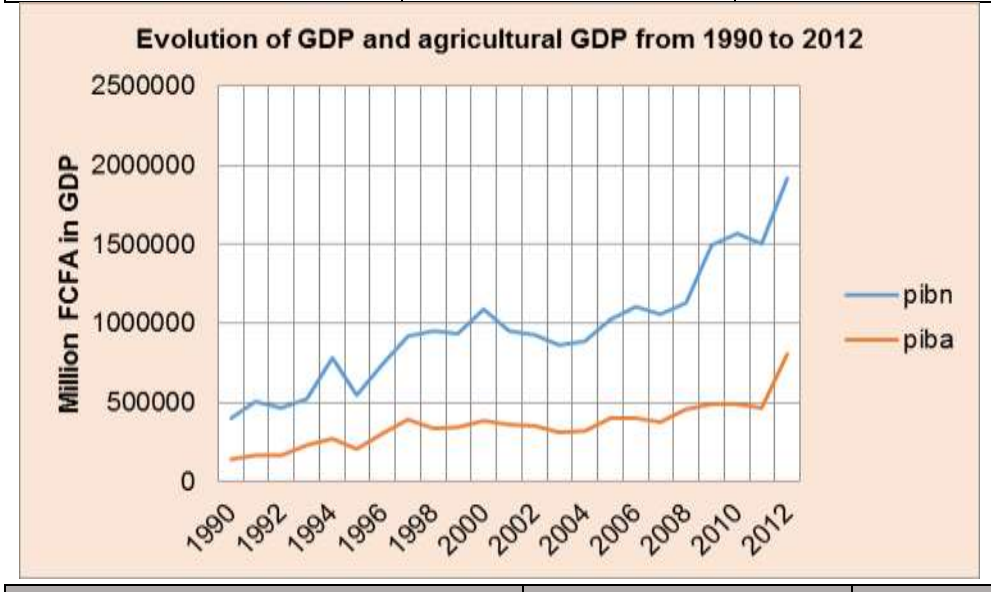
COCOA	Supcac	Rdtcac	Procac	Pricac
Nbr. de valeurs utilisées	23	23	23	23
Nbr. de valeurs ignorées	0	0	0	0
Nbr. de val. min.	1	1	1	1
% de val. min.	4,348	4,348	4,348	4,348
Minimum	15000,000	0,146	4100,000	147,105
1er quartile	21400,000	0,262	6000,000	239,511
Médiane	30000,000	0,417	10200,000	300,009
3ème quartile	108160,000	0,708	73000,000	428,381
Maximum	146000,000	1,096	142500,000	754,419
Etendue	131000,000	0,950	138400,000	607,314
Somme	1324715,000	10,910	824414,000	8324,904
Moyenne	57596,304	0,474	35844,087	361,952
Moyenne géométrique	41921,172	0,411	17237,483	321,779
Moyenne harmonique	32545,088	0,356	10235,030	290,905
Aplatissement (Pearson)	-1,272	-0,735	-0,299	-0,411
Asymétrie (Pearson)	0,745	0,585	1,101	1,055
Aplatissement	-1,083	-0,345	0,254	0,100
Asymétrie	0,854	0,669	1,261	1,208
CV (écart-type/moyenne)	0,826	0,535	1,207	0,536
Variance d'échantillon	2162805348,560	0,062	1789894934,427	35964,895
Variance estimée	2261114682,585	0,065	1871253795,083	37599,663
Ecart-type d'échantillon	46505,971	0,248	42307,150	189,644
Ecart-type estimé	47551,180	0,254	43257,991	193,906

Ecart absolu moyen	42526,049	0,219	35920,991	152,346
Ecart absolu médian	9931,000	0,203	4700,000	60,497
Ecart-type de la moyenne	9915,106	0,053	9019,915	40,432
Borne inf. IC de la moyenne	37033,632	0,365	17137,929	278,101
Borne sup. IC de la moy	78158,976	0,584	54550,245	445,804



	Pibn	Piba	Pibh	Valexp
Nbr. values used	23	23	23	22
Nbr. Of ignored values	0	0	0	1
Nbr. val. min.	1	1	1	1
%Val. Min.	4,348	4,348	4,348	4,545
Minimum	404040,945	136565,840	85578,563	4459,811
1st quartile	738681,709	273404,445	152551,994	7468,279
Median	937094,079	354644,326	195086,885	12105,883
3rdquartile	1105912,582	402759,905	205318,646	20575,434
Maximum	1919071,504	807929,103	296358,460	137282,498
Scope	1515030,559	671363,264	210779,898	132822,687
Sum	22287903,026	8156153,275	4335348,090	559796,677
Average	969039,262	354615,360	188493,395	25445,304
geometric mean	898876,224	328859,781	180907,754	14674,946
harmonic mean	829619,568	302777,194	172462,025	10825,266
Flattening(Pearson))	-0,088	2,270	-0,516	3,072
Asymmetry(Pearson)	0,628	1,084	-0,089	2,026
Flattening	0,544	3,784	-0,044	4,988
Asymmetry	0,719	1,241	-0,101	2,334
CV(standard deviation/ mean)	0,392	0,399	0,275	1,365
Sample variance	137921427779,173	19188076869,405	2573990843,609	1151112086,198
Estimated variance	144190583587,318	20060262181,651	2690990427,409	1205926947,446
Standard deviation of sample	371377,743	138521,034	50734,513	33928,043
Estimated standard deviation	379724,352	141634,255	51874,757	34726,459

Mean absolute deviation	275475,024	97019,003	38148,992	23869,469
Median absolute deviation	168818,503	53262,188	24437,293	4904,227
Standard deviation of the mean	79178,001	29532,784	10816,635	7403,706
Lower bound. The average IC	804834,139	293368,115	166061,068	10048,454
Boundarysup. ICMoy	1133244,385	415862,605	210925,722	40842,153



	Bgnat	**Bgagri**	**Itrabg**	**Itrareso**
Nbr. values used	23	23	23	23
Nbr. ofignoredvalues	0	0	0	0
Nbr. val. min.	1	1	1	1
%Val. min.	4,348	4,348	4,348	4,348

Minimum	75984,240	429,710	21,000	14,900
1st quartile	111907,500	1785,121	87,900	39,990
Median	155433,378	1951,718	480,000	80,400
3rdquartile	247409,996	2900,000	540,000	107,753
Maximum	656204,138	50585,189	735,000	169,158
Scope	580219,898	50155,479	714,000	154,258
Sum	4857938,845	129433,522	8412,603	1801,792
Average	211214,732	5627,544	365,765	78,339
geometric mean	174713,293	2682,825	230,925	61,595
harmonic mean	151004,102	1935,695	99,496	44,183
Flattening(Pearson)	1,630	9,171	-1,489	-0,998
Asymmetry(Pearson)	1,631	3,099	-0,307	0,243
Flattening	2,904	13,266	-1,382	-0,707
Asymmetry	1,868	3,549	-0,352	0,278
CV(standard deviation/ mean)	0,731	1,968	0,647	0,597
Sample variance	22820604261,766	117380909,697	53520,740	2092,457
Estimatedvariance	23857904455,483	122716405,593	55953,501	2187,569
Standard deviation of sample	151064,901	10834,247	231,345	45,743
Estimated standard deviation	154460,042	11077,744	236,545	46,771
Mean absolute deviation	109612,533	6230,216	209,483	37,428
Medianabsolute deviation	61797,054	307,174	145,000	27,650
Standard deviation of the mean	32207,145	2309,869	49,323	9,753
Lower bound. The average	144421,202	837,169	263,476	58,113
Bornesup. The averageIC	278008,263	10417,920	468,055	98,564

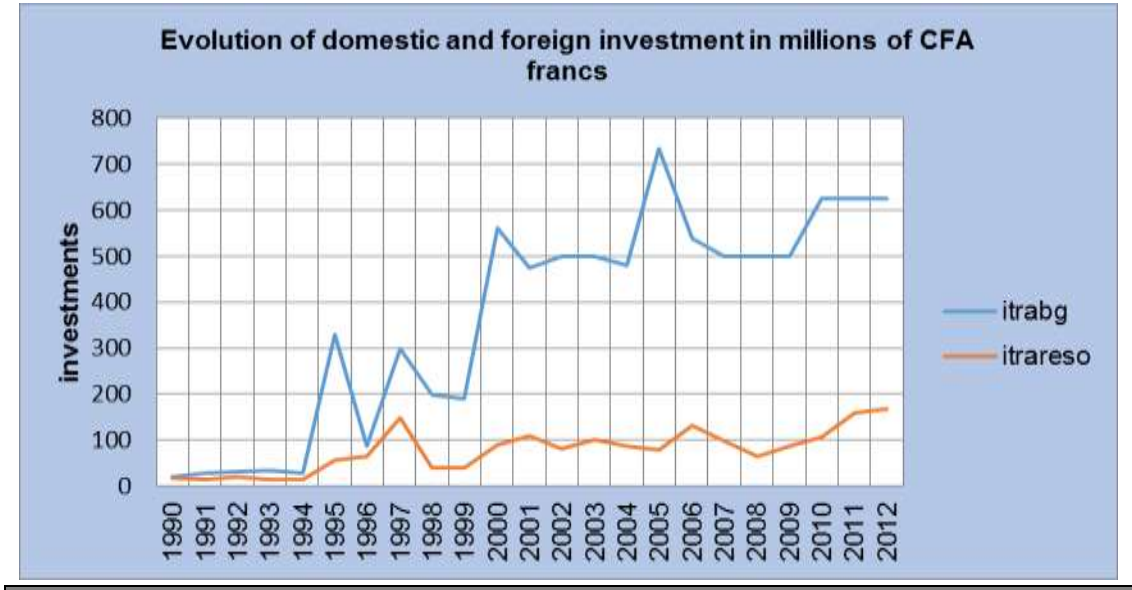


Table:The variables used inthe study	
SUPMA	superficie de maïs en ha
RDTMA	rendement de maïs en t/ha
PROMA	production de maïs en tonne
PRIMA	prix au producteur du maïs en FCFA/kg
AMEN	variété de maïs amen
ACR97	variété de maïs acr
TZEEW	variété de maïs tzeew
OBATAN	variété de maïs obatanpa
SOTUBA	variété de maïs sotubaka

EV99	variété de maïs ev
QPM	technique de mini fragmentation d'igname
FARMA	Farine de maïs précuit 100% alimentation des enfants
FAMPRC	Farine de maïs précuit a différents pourcentage pour alimentation des enfants
SUPSOR	superficie de sorgho en ha
RDTSOR	rendement de sorgho en t/ha
PROSOR	production de sorgho en tonne
PRISOR	prix au producteur du sorgho en FCFA /kg
SORV1	variété de sorgho sorvato 1
SORV28	variété de sorgho sorvato 28
SUPMIL	superficie de mil en ha
RDTMIL	rendement de mil en t/ha
PROMIL	production de mil en tonne
PRIMIL	prix du mil sur le marché de consommation en F CFA/kg
SUPRIZ	superficie de riz en ha
RDTRIZ	rendement de riz en t/ha
PRORIZ	production de riz paddy en t/ha
PRIRIZ	prix au producteur du riz paddy en F CFA /kg
TGR203	variété de riz tgr203
TGR405	variété de riz tgr405
NERICAL14	variété de riz nerical14
WAS161	variété de riz was161
NERICA7	variété de riz nerica7

NERICA8	variété de riz nerica8
NERICA11	variété de riz nerica11
AMSOBF	aménagement simple des bas-fonds
PPU	placement profond de l'urée sous le riz
SUPMAN	superficie manioc en ha
RDTMAN	rendement manioc en t/ha
PROMAN	production de manioc en tonne
PRIMAN	prix au producteur du manioc en F CFA/kg
TMS96	variété de manioc tms96
TMS92	variété de manioc tms92
TSM95	variété de manioc tsm95
MANVITA	Nouvelles variétés de manioc à chair jaune riches en vitamine A
MANTOL	Développement de variétés de Manioc tolérantes et ou résistantes à la mosaïque africaine du manioc
SUPIGN	superficie d'igname en ha
RDTIGN	rendement d'igname en t/ha
PROIGN	production d'igname en tonne
PRIIGN	prix au producteur de l'igname en F CFA /kg
TDR95	variété d'igname tdr95
TDR98	variété d'igname tdr98
TDR747	variété d'igname tdr747
TDR89	variété d'igname tdr89
MINISET	technique de mini fragmentation d'igname
CONSIGN	Utilisation des extraits botaniques dans la conservation des tubercules d’igname
SUPARA	superficie d'arachide en ha

RDTARA	rendement d'arachide en t/ha
PROARA	production d'arachide en tonne
PRIARA	prix au producteur e l'arachide en F CFA /kg
SUPHAR	superficie du haricot en ha
RDTHAR	rendement du haricot en t/ha
PROHAR	production du haricot en t/ha
PRIHAR	prix du haricot sur le marché de consommation en F CFA /kg
SUPCAF	superficie de café en ha
RDTCAF	rendement de café en t/ha
PROCAF	production de café en tonne
PRICAF	prix du café sur le marché en F CFA /kg
SUPCAC	superficie de cacao en ha
RDTCAC	rendement de cacao en t/ha
PROCAC	production de cacao en tonne
PRICAC	prix du cacao sur le marché en F CFA /kg
EFFVOL	effectif de volaille
EFFCAP	effectif de caprin
EFFOVI	effectif d'ovin
EFFBOV	effectif de bovin
PIBN	produit intérieur brut en million F CFA
PIBA	produit intérieur brut agricole en million F CFA
PIBH	produit intérieur brut par habitant en F CFA par habitant
BGNAT	budget national en million F CFA
BGAGRI	budget de l'agriculture en million F CFA

ITRABG	budget national alloué à l'Itra en million F CFA
ITRARESO	budget extérieur alloué à l'Itra en million F CFA
CAL	Ampleur du déficit alimentaire en kcal/personne/jour
VALEXP	Valeur des exportations agricoles exprimées comme la contribution de l'agriculture aux devises extérieures en million de F CFA
SAL	Variabilité de la disponibilité alimentaire kcal/personne/jour exprimé comme sécurité alimentaire

APPENDIX 2:TERMS OF REFERENCE

Context

Agricultural research, and development and transfer of technological innovations were perceived for decades as essential tools for the development of agrarian economies. Agriculture, which is the main activity and the main provider of sustainable livelihoods, is facing a major challenge, this is how to ensure food security of people in developing countries by 2025 (Adegbola et al, 2008), while reconciling social development to economic growth all in strict compliance with environmental standards. Indeed, the West African population grew from 70 to 318 million inhabitants between 1950 and 2010, and should be doubled between 2011 and 2050, to reach 650 million people. Most African countries face various difficulties resulting from the combination of monetary poverty, the importance of food items in the household budget, a very high import dependence for food, to supply of fossil energy, weak agricultural performance and institutional capacities (UNECA, 2009). It challenges beam exposed to high risks of food insecurity.

In Togo, agriculture contributes on the average 38% to the GDP (38%). Agriculture in Togo is, however, facing several difficulties hampering productivity and improving living conditions of its key players. Among other constraints, continual degradation and decline in soil fertility, institutional gaps in technical and financial management of farms, market access difficulties and climate variability. The producers for this purpose develop several so-called endogenous 'adjustment of measures' to improve their yields. These initiatives are local and personal decadesreinforced byexternal contributionsin particular fromthe entitiesof the National Systemof Researchand Extension.

Based on consistent diagnoses, several initiatives were relayed from the technical, technological and organizational innovation, to provide knowledge and practical solutions to improve the performance of family farming systems. The implementation and transfer of these innovations require a synergy of actions between several strategic actors, the components of SNRV (National System of Research and Extension), NGOs (Non-Governmental Organization), the producers and the users of reearch results. The operation of these platforms is provided by national and international investments and technical support. The Forum for Agricultural Research in Africa (FARA), a technical body of the Commission of the African Union on issues relating to agricultural science, technology and innovation, coordinates and promotes innovations in agriculture in Africa, and the concept of Integrated

Agricultural Research for Development (IAR4D). In order to generalize the adoption of innovations in agricultural value chains in twelve (12) countries in Africa, FARA in partnership with the government of the Federal Republic of Germany, is implementing in these countries the Program Accompanying Research with Innovation (PARI).

In this perspective, one of the main programme activities is the prior sale of an inventory. This activity aims to analyze existing demand for agricultural technological innovations, supply and financing of innovations already available, innovation platforms and development research approach that accompany the development of innovations, to make choices sound innovative, approaches and financing that guarantee to achieve the desired results. It is in this context that the impact study of national and international investments on innovations for agricultural development and food security in Togo was initiated.

2 Understanding of the study

As part of the initiative, "A world without hunger" or "One World - No Hunger", the Forum for Agricultural Research in Africa (FARA), in partnership with the German government, through the Center for Agricultural Development (ZEF), University of Bonn, runs the Accompaniment Program of Research with Innovation (IRAP). Within twelve (12) countries involved in this initiative, this programme aims to provide producers and actors of strategic agricultural value chains capable of effective technological innovations to inject real momentum to the production and disposal of agricultural products.

In the life cycle of the project, there is provided a baseline assessment which is nothing but an updated diagnosis over 20 years of processes, actors, approaches and investments for the implementation and transfer of agricultural innovations to users. This is a necessary prerequisite to avoid duplication, analyze strengths and weaknesses in the investment climate for the development of innovations in value chains and build on relevant guidance. To do so, three (3) additional studies were initiated in each country involved in the initiative, and it includes: (i) an inventory of existing innovations and functional materials onpromising agricultural innovations in the country; (ii) the overall assessment of existing innovation platforms; (iii) the impact of investments on agricultural development and food security.

In this dynamic, to carry out a study on the impact of national and international investments on innovations for agricultural development and food security in Togo involves analyzing the situation after all significant and lasting changes, positive or negative, hav been provided or are unexpected in the life and environment of people

and groups for which a direct or indirect causal link can be established with the innovations. For this purpose, the main tasks of the research team concern the capitalization and assessment of learning about the types and investment process and substantial innovations. Following this study, the research results should be sufficientto provide updated data on levels of investment in the past and present, including a projection on the achievements of food and nutrition security. Several publications are also expected. All the specific objectives are to achieve the following results: the achievements of the past 20 years in Togo, beneficiaries of innovations, innovation platforms, epigraphs set by the first two studies are documented and capitalized, institutions, investment types and processes for the development of agricultural innovations in the last 20 years in Togo, the strengths and specific constraints in the investment climate for the development of innovations in agriculture, the added value of investments in the implementation of innovations on some economic and social indicators. Specific recommendations were made for the proper orientation of investments and effective strategies for the development and transfer of innovations.

3- Study Objectives

The general objective of this study is to analyze the impact of national and foreign investments on technological innovations for agricultural development and food and nutrition security in Togo in the last twenty (20) years. Specifically, this will involve:

1- analyzing the effect of national and international investments on the development of technological innovations in agriculture in Togo in the last twenty (20) years;

2 analyzing the impact of technological innovations from national and international investments on the profitability of agricultural production in Togo in the last twenty (20) years;

3- analyzing the impact of technological innovations from national and international investment on the contribution of agriculture to GDP Togo in the last (20) years;

4. analyzing the impact of technological innovations from national and international investment on the contribution of agriculture to the foreign exchange reserves in Togo in the last twenty (20) years;

5- analyzing the impact of technological innovations from national and international investments on food security in Togo in the last twenty (20) years;

6- analyzing the impact of technological innovations from national and international investments on nutrition security in Togo in the last twenty (20) years.

4-Methodology

4-1- Methods and data collection tools

This study will be based primarily on secondary data. They will be collected at the Ministry of Agriculture, Livestock and Water (MAEH), the Regional Directorates of Agriculture, Livestock and Water (DRAEH), Council of Technical Support Institute (ICAT) and the National Agricultural Research Institute of Togo (ITRA), the Agricultural Research Centers (ARC), the United Nations Fund for Agriculture (FAO), libraries of universities in Benin, the Ministry of Health and its decentralized institutions, etc. Data collection will be conducted at reading gridbase anda listof statistical data neededfor the successof the study.

4-2- Agricultural development indicators and food and nutrition security

We can measure the agricultural development of a country by the system's ability to ensure food security in the country, to contribute to wealth creation and exports, and profitability of agricultural production activities. Thus, food security indicators are also agricultural development indicators.

The contribution of agriculture to the creation of wealth is measured by its contribution to the Gross Domestic Product (GDP). PAPIBi, the agriculture percentage contribution to the national GDP, will be collected for the last 20 years.

The contribution of agriculture to exports will be measured by the number of exported agricultural products and the percentage contribution of these products to the foreign exchange reserves of the country. Let NPAEXPi be the number of agricultural products exported during the year i and PADEi the percentage contribution of agriculture to foreign currency during the year i. NPAEXPi and PADEi will be collected for the last 20 years.

Regarding the profitability of agricultural activities, the average net margin per hectar (MN); the productivity of family labour (PML) and the average productivity of investment (IRR) economic and financial options will be targeted indicators. Either MNi; PMLi; TRIEi and TRIFi MN respectively PML, TRI economical option and IRR financial option in agricultural production year i. These indicators will be collected to the extent possible for the last 20 years. Otherwise, they will be collected for each product or each region.

The food security of a country can be measured by the proportion of essential agricultural products for which the country is autossufisant and

foodautossuffisancerates relative toeach agriculturalstaple product. Let PPAAi be the proportion of essential agricultural products for which the country isautossufisantinyear and TAAij is the food self-sufficiency rate for agricultural staple product j during year i. PPAAi and TAAij will be collected for twenty (20) years. The nutritional security of a country can be measured by the rate of malnourished children, the rate of malnourished adults and the rate of malnourished elderly. Temibei, Tamii and TVM is the rate of malnourished children, adults and elderly during the year i. These indicators will be collected for the last twenty (20) years.

4-3-Parameters that can influence agricultural development, food and nutrition security indicators

If agricultural development, food and nutrition security indicators are measured at the macro level (all across Togo), the parameters which may influence these indicators are national and international investments through technological innovation, which generate domestic agricultural policies (subsidy of inputs, setting up inputs; creation of agricultural credit, etc.). But at the meso level (region), the characteristics of each area (accessibility, agro-climatic conditions, socio-community infrastructures, socio-cultural characteristics, etc.) also intervene. Thus, in the data collection, agricultural development and food and nutrition security indicators happen to be measured at the macro or meso level.. Suitable parameters will also be measured. Indicators of investment are the research/extension and agricultural development projects implemented.

4-4- Methods and data analysis tools

Descriptive statistics (frequencies, means and standard deviations), average comparison tests, the independence tests and econometric regressions are the preferred methods of analysis in this study. As second data will be used, descriptive statistics : average comparison tests, ans the independence tests area the analytical methods mostly used in this study.If data allow, econometric models will be made. In case econometric models would be possible with the available data, the counterfactual method will be used to measure actual changes due to national and international investments. In this context, the average effect of investments (ATE) will be evaluated. The change in the value of agricultural development and food security indicators can be modeled as follows:

$$Y_{1k} = Y_{0k}.e^{(\alpha_k + \mu_k.D_{pk} + \gamma_k.\Delta X_k)} \quad (1)$$

où :

Y_{1k} represents the value of an agricultural development or food security or nutritional security indicator k after a national and international investment in agricultural technology innovations

Y_{0k} represents the value of the same indicator before national or international investment in agricultural technology innovations

; α_i the indicator growth rates before investing. It is the rate of growth of the indicator after the initiative.It represents the average effect of the investment on the indicator.

D_{pk} , the binary variable for investment

($D_p = 1$ for participants and 0 if not),

X_k , the set of characteristics that can influence the indicator in question,

Δ_k , the difference operator between, before and after the investment;

e , the exponential operator.

An empirical specification for the estimation of the model can be obtained by applying the natural logarithmto the equation (1), which gives:

$$\Delta \ln(Y_k) = \alpha_k + \mu_k . D_{pk} + \gamma_k . \Delta X_k \qquad (2)$$

With $\Delta \ln(Y_k) = (\ln Y_{1k} - \ln Y_{0k})$

This specification assumes that the impact does not vary from one area to another. To account for this heterogeneity, interactions between the variable investment:

D_p and characteristics X_k of the area will be introduced in equation (2)

$$\Delta \ln(Y_k) = \alpha_k + \mu_k . D_{pk} + \gamma_k . \Delta X_k + \beta_k . D_{pk} \Delta X_k \qquad (3)$$

The average effect of the investment (ATE) can then be obtained using the formula:

$$E(ATE / D_{pk} = 1) = E(\mu_k + \beta_k / D_{pk} = 1) \qquad (4)$$

Equation (3) will be estimated using the method of instrumental variables.

APPENDIX 3: TECHNICAL OFFER

Context

Covering an area of 56,600 km, Togo is located in West Africa and bordered to the south by the Gulf of Guinea, to the north by Burkina Faso, west by Ghana and to the east by the Republic of Benin. The three neighbouring countries, like Togo, are members of the Economic Community of West States (ECOWAS) and the African Union (AU). Togo and its neighbours to the east and north are also members of the West African Economic and Monetary Union (UEMOA). The route mostly used for terrestrial communication between Togo and its immediate neighbours is the road that runs along the Gulf of Guinea and which crosses the Accra in Ghana, Togo and Benin in Lomé by Cotonou. One can also join Burkina Faso by land via the National No. 1 leading to the Border Cinkassé. In the East, immediately after the Republic of Benin, is one of the economic giants of Africa, the Federal Republic of Nigeria, which has a decisive influence on the imports of Togo and labour migration-border work.

The first level of administration in Togo are the 5 regions: Maritime, Plateaux, Centrale, Kara and Savannah. For obvious analytical reasons, in some cases, Lomé is extracted from the Maritime region to form a sixth region. The second level consists of 36 prefectures and 5 boroughs of the city of Lomé considered alongside the prefectures.The third level consists of 386cantons. The areas of different levels are unevenly distributed throughout the national territory. The best known example is that of the two prefectures in the Kara region (Bassar and Dankpen) whose total area is equal to the area of the Maritime region.

Togo has a population of 6,191,155(51.4% women) according to the final results of the fourth General Census of Population and Housing in 2010(RGPH4). This population is distributed among 1,298,153 households. According to the estimates by the World Bank, the number of inhabitants for the years 2012 and 2013 are equal to 6,642,928 and 6,817,000, respectively. The 2012 population density is 119inhabitants/km².The proportion of people under 15 years in 2012 is 41.9%, reflecting the youth of the population. Also the proportion of people under 25 years was 60%. The potentially active segment of the population (15-64 years) is 54%. Life expectancy at birth for 2012 is equal to 56 years. The urbanization rate for the same year is 38.5%.

The demographic situation of the country is essentially characterized by high levels of total fertility rate (4.1 children per woman), population growth (2.84%) and the

inequality in the pulation density between the coastal regions and other regions.Approximately1/10of the total area of the coastal region is home to 42.0% of the total population. In less than 30 years (1981-2010), the population hass doubled. From 1981 to 2010, the rural population fell from 74.8% to 62.3%, while the population in the urban centers has increased (25.2% as against 37.7%).

Recall that the demographic evolution of the country is in the image of that of the West African sub-region. Indeed, the West African population grew from 70 to 318 million between 1950 and 2010, and should be doubled between 2011 and 2050, to reach 650 million people.

Such demographic and socio-economic context is not without impact on the education, health, employment, agriculture (producer livelihoods) and migrationof the population.
In 2050, it will house, feed, clothe, educate the 650millionWest Africans,which will pose and record, among other things, the problems of food production and security.
Agricultural research and the development and transfer of technological innovations were perceived for decades as essential tools for the development of agrarian economies. Now that agriculture is the main activity and the main provider of sustainable livelihoods, it is facing a major challenge, this is how to ensure food security of people in developing countries by 2025 (Adegbola et al, 2008), while reconciling social development to economic growth, all in strict compliance with environmental standards. In most African countries, income poverty, the importance of food items in the household budget, the strong foreign import dependence supply and weak agricultural performance and institutional capacities (UNECA, 2009) are challenges that affect the fragile food security situation.

In Togo, the agricultural sector contributes 38% of the GDP. Agriculture in Togo is however facing several difficulties hampering productivity and improving living conditions of its key players. Among other constraints, the continual degradation and decline in soil fertility, institutional gaps in the technical and financial management of farms, market access difficulties and climate variability. The producers, for this purpose, have develop several so-called endogenous adjustment of measures to improve their yields.These initiatives are local and personaldecadesreinforced byexternal contributionsin particular fromthe entitiesof the National Systemof Researchand Extension.

Based on consistent diagnoses, several initiatives were developed to provide knowledge and practical solutions to improve the performance of family farming systems. The implementation and transfer of these innovations require a synergy of

actions between several strategic actors, SNRV (National System of Research and Extension), NGOs (Non-Governmental Organization), the producers and users of the research results. The operation of these platforms is provided by national and international investments and technical support. The Forum for Agricultural Research in Africa (FARA), a technical body of the Commission of the African Union on issues relating to agricultural science, technology and innovation, coordinates and promotes innovations in Africa, and the concept of Integrated Agricultural Research for Development (IAR4D). In order to generalize the adoption of innovations in agricultural value chains in twelve (12) countries in Africa, FARA, in partnership with the government of the Federal Republic of Germany is implementing in these countries, the Program Accompanying Research with Innovation (PARI).

In this perspective, one of the main programme activities is the prior sale of an inventory. This activity aims at analyzing existing demand for agricultural technological innovation, supply and financing innovations already available, innovation platforms and development research approach that accompany the development of innovations, to make choices about sensible innovations, approaches and financing that guarantee the achievement of expected results. It is in this context that the impact study of national and international investments on innovations for agricultural development and food security in Togo was initiated.

Understanding/justificationof the study

The African Forum for Agricultural Research (FARA) is the umbrella organization for agricultural research and development in Africa. It aims to create large-scale improvements in agricultural productivity, competitiveness and markets by supporting African sub regional organizations in capacity building of regional stakeholders of agricultural innovation. In close collaboration with the NEPAD Coordination Unit and the Commission of the African Union (AUC/NEPAD), it contributed to the implementation of Pillar IV of the Detailed Programme for the Development of African Agriculture (CAADP), focused on the generation, dissemination and adoption of agricultural innovations. However, huge gaps were recorded in many African countries, in terms of human capacity to implement agricultural programmes on the generation, dissemination and adoption of technologies. FARA and its sub-regional agricultural organizations (BRS) constituent (ASARECA, CORAF/WECARD and CCARDESA) and key continental partners including Planning and Coordinating Agency of NEPAD (NPCA), decided to undertake a comprehensive assessment of PNIASA to clearly identify the relevant issues that will inform the development of a comprehensive framework for developing human capital necessary for the implementation of CAADP. Knowing that human capital plays a key role in promoting change and technology diffusion,

the future growth in the agricultural sector in Africa will be supported by increased worker productivity.
In the field of agricultural research, the development and transfer of technological innovations were perceived for decades as essential tools for the development of agrarian economies. However, agriculture, which is the main activity and the main provider of sustainable livelihoods, is facing a major challenge, this is how to ensure food security of people in developing countries by 2025 (Adegbola et al, 2008), while reconciling social development to economic growth in compliance with environmental standards.

Indeed, the West African population grew from 70 to 318 million between 1950 and 2010, and should be doubled between 2011 and 2050, to reach 650 million people. Most African countries face various difficulties resulting from the combination of monetary poverty, the importance of food items in the household budget, a very high import dependence for food supply, fossil energy, weak agricultural performance and institutional capacities (UNECA, 2009). It is exposed to high risks of food insecurity.

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Objective of the study

The context and the presentation of the challenges, and the possible solution to the problems raised appears the following objectives.

a) General Objective

The general objective of this study is to analyze the impact of national and foreign investments on technological innovations for agricultural development and foodand nutrition security in Togo in the last twenty (20) years.

b) Specific objectives

Six (6) Specific objectives are the subject of this research.

1-To analyze the effect of national and international investments in the development of technological innovations in agriculture in Togo in the last twenty (20) years;

2- Determine the impact of technological innovations from national and international investments on the profitability of agricultural production in Togo in the last twenty (20) years;

3- Measuring the impact of technological innovations from national and international investments on the contribution of agriculture to GDP in Togo in the last twenty (20) years;

4. Determine the impact of technological innovations from national and international investments on the contribution of agriculture to foreign exchange reserves in Togo in the last twenty (20) years;

5. Analyze the impact of technological innovations from national and international investments on food security in Togo in the last twenty (20) years;

6. Measure the impact of technological innovations from national and international investments on nutrition security in Togo in the last twenty (20) years.

Methodology

The importance and complexity of the problem requires a methodology based on: i) clearly defined concepts, ii) available, reliable and complete data (in terms of time coverage), iii) appropriate methods of analysis adapted and relatively easy to implement.

Fundamentals and basic concepts of the study

The development of the methodology of this study strongly reflects the objectives listed above. The unfolding of this methodology depends on the aspects covered in the theme. By listing the objectives of this research, these aspects refer to ideas and concepts that must be identified, clearly defined and put into dependency relationship to allow to impact assessments as required by most of the objectives.

- Domestic Investment (INN) and Foreign Investments (INE);
- Technological Innovations for Agricultural Development (ITD);
- Technological Innovations from National and International Investments (ITI)
- Food Security (SAL) and Nutritional Security (SNU);
- Development of Technological Innovations in Agriculture (ITA);
- Profitability of Agricultural Production (RPA);
- Gross Domestic Product (GDP);
-Contribution of Agriculture in GDP (CAP);
-Contribution of Agriculture to External Currency (CAD).

The Gross Domestic Product (GDP)

The gross domestic product (GDP) is one of the most important economic indicators used in the practice of national accounting and economic analysis.

It is a principal economic indicator measuring economic output achieved within a given country, and quantifies for a given period the total value of the "wealth generation" conducted by economic agents (households, companies, governments) residing within the national territory. GDP therefore reflects the internal economy of a country and its variation from one period to the other is measured by the rate of economic growth. It differs from the gross national income (GNI), which adds net inflows to GDP factor income from abroad (factor income from the rest of the world decreases factor income paid to the rest of the world). In practice, the determination of GDP is done using three approaches: demand, production and income.

In the developing countries, production in much of the so-called informal sector activities are not recorded, as well as the positive activities, both non-market and non-administrative, like art or altruistic activities (eg. the creation of a free software) or volunteer activities or the daily domestic production provided within the family.

Moreover, defenders of the environment and sustainable development are critical of the gross domestic product as a measure of "wealth generation"; because, although economic output partly consumes natural capital, GDP does not take into account the effects of this consumption. And that is why the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) works to define and promote an indicator that takes into account the effects on the environment.

GDP per capita

The GDP per capita is the value of GDP divided by the number of inhabitants of a country. It is more effective than GDP to measure the development of a country. However, it is only an average so it does not account for inequalities of income and wealth within a population. In general, a country is considered "developed" when its GDP per capita is above $20,000.

GDP per capita measures the standard of living and, approximately, that of purchasing power, because the impact of changes in the general level of prices is not taken into account dynamically. This indicator is not to be confused with the per capita income. It is a good indicator of economic productivity, but it imperfectly accounts for the level of welfare of the population or the degree of success of a development country. It does not show the distribution of income between the inhabitants of a country. Derived from the GDP, it does not reflect the damage caused to the environment and natural resources by the production process, and does not include unpaid work which can be done within households or communities or the informal economy. GDP per capita is not constructed as an indicator of the quality of life (the latter is far more subjective and is difficult to measure, although some indicators such as the Human DevelopmentIndex (HDI) could be used).

The Nominal GDP and the Real GDP

Real (volume) GDP is the GDP value that does not take into account changes in prices, that is inflation. Real GDP has the advantage of showing the variations in the rise and the fall in the volume (quantity) of production of goods and services. This is the value used when measuring GDP growth. Indeed, one can not know just by looking at nominal GDP (in value), if the rise of the indicator is as a result of a rise in prices or an increase in production, or in what proportions these changes combine. When calculating the volume of GDP, three approaches usedd to calculate the nominal GDP (demand, output and income) are not equivalent. The demand approach is preferred. The volumes of the quantities which fall within the definition of GDP by the production approach, however, are defined so that the volume of GDP calculated by this approach coincides with the volume obtained by using a demand-driven

approach. The volume of value added is defined as the difference between the volume of production and volume of inputs. The volume of taxes and subsidies is defined as the volume of taxed products, while the corresponding price is the price of the product multiplied by the rate of tax or subsidy. The income approach is not used because it does not take into account changes in the productivity of factors of production. Let Pi,t be the price of a good i during a period t in period t and Qi,t is the quantity demanded of that good i in period t (final demand, investment and net exports), then: nominal GDPt = Σ i Pi t Qi,t. Real GDP is constituted by the value of goods i requested during the period t measured at constant prices (base year denoted t0), ie: real GDPt = ΣiPit0Qi,t. The manual of national accounts for 2008 recommends updating the base year every year. The volume of GDP is calculated based on the annual growth rate applied to the volume of the previous year. There is a talk of chained index. The GDP deflator is the ratio between the nominal and real GDP.

Investments Interiors

An investment is an important driver for growth, both for developed and developing countries. There are two types of investment: domestic investments that are derived from the mobilization of domestic internal funds and foreign investments coming from foreign countries. In Africa, domestic investments have increased in the last twenty years. Yet, despite the steady growth and official development assistance (ODA), most of the continent's countries still face enormous gaps between their investment needs and national resources available to them.

Domestic and foreign investment

Direct investment abroad and foreign direct investment (FDI), also called international direct investment (IDI) by the OECD, are international movements of capital to create, develop or maintain a foreign subsidiary or exercise control, or significant influence over the management of a foreign company. The FDI is a driving force in the multi-nationalization of enterprises and cover both the creation of subsidiaries abroad and cross-border mergers, and acquisitions or other financial relations, including loans and intercompany loans. Two fundamental reasons motivate FDI:

- Cost reduction: remote operation of expensive natural resources or the need to use a cheaper workforce;

-The conquest of new markets difficult to penetrate by exports alone.

If the FDI effect is generally considered positive on the growth of host countries, notably through induced technology transfer, it is discussed, based on international trade, employment in countries investors on working conditions and the environment. Measured by the statistics of the balance of payments, FDI has experienced strong growth since the mid-1980s and decisively contributed to the globalization of economies. IDE is also one of the main indicators of economic attractiveness of the country.

Foreign direct investment can be of great help to bridge the gaps between the investment needs and national resources available in developing countries. Unfortunately, Africa captures only a very small proportion of global IED**?** (2 flows (2.8%), which, moreover, does that converge towards a handful of countries that are, in large measure, intended extractive industries. This is what explains the greater dependence of Africa on exports of commodities and the high vulnerability of countries to external demand and fluctuations in commodity prices due to speculation.

It seems, according to a recent research that nothing to date that indicates that foreign direct investment in Africa is involved in the diversification of the economy through backward and forward linkages. Moreover, it does not seem entirely justified to think that simply attracting FDI would pave the way for technology transfer, link with national businesses and create opportunities to diversify into more dynamic activities. The facts show that the contribution of FDI to development is generally more important in host countries that already had a dynamic national sector and well-developed companies. As a result, voices are growing to recommend that the policy on FDI is a component of a broader and more integrated development strategy, which is essential to raise growth, create jobs, build productive capacity and promote the dynamism and vitality of the domestic private sector.

Hunger

Hunger is one of the keywords of this study. It is a word that is used as a synonym for “chronic malnutrition".

Food Safety

Situation in which everyone has, at all times, the physical access, social and economic access to sufficient, safe and nutritious food to meet the food needs and preference for healthy active lives.From this definition, it is possible to identify the following four dimensions of food security: food availability, economic access to food supplies, food use and stability over time.

Food insecurity

Food insecurity is a situation in which there are individuals who do not have guaranteed access to healthy and nutritious food in sufficient quantity to allow for normal growth, development, and an active and healthy life. It can be due to a shortage of food, the lack of purchasing power, distribution problems or poor utilization of food at the household level. Food insecurity is one of the main causes of an altered nutritional status, as well as health problems, poor sanitation and inadequate practices for care and feeding. It may be chronic, seasonal or transitory.

Nutrition security

Nutritional status is the physiological state of an individual, resulting from interactions between inputs and nutrient needs, and the ability of the body to digest, absorb and assimilate these nutrients. Nutrition security is the set of provisions which contribute to put an individual or household in a balanced and sustainable nutritional status. More specifically, it is a situation in which all members of households have guaranteed access to enough nutritious food and, at the same time, a healthy environment, health services and care to ensure their own healthy and active living. Nutrition security is distinct from food security in that it considers the care practices, health and hygiene, in addition to the adequacy of diets.

Thus, nutrition security defines appropriate quantity and combination of inputs such as food, nutrition and health services, as well as the time required by the manager at any time to ensure an active and healthy lifestyle for all. Food security is a necessary, but not sufficient condition to ensure nutrition security.

The data andits collection: the data file

In relation to the defined objectives, 10 variables were involved in the analysis that can help achieve these goals. These variables were therefore defined after the analysis of the objectives. The study will cover a period of 24 years, from 1990-2014.

The main data sources are the National Statistics and Demographic Studies (INSED), Institute, the Department of Statistics and Informatics of the Ministry of Agriculture, Livestock and Water Resources (MAEH), documentation centers of the Institute for Agronomic Research (ITRA), the Council of the Institute and Technical Support (ICAT) and the library of the School of Agronomy of the University of Lomé.

The data collected are secondary data that is data that already exist, which were copied, photocopied or typed directly into the data file. At the end of the period, a data file of 24 lines representing the years and consisted of 10 columns of variables

was obtained. At the intersection of the rows and columns are the variable values (for quantitative variables) or codes of the terms.
For reasons related to the quality of the analysis of the data file, the team also collected data on the main agricultural products (cereals, tubers, export crops, livestock and fisheries) during the study period.

Table: Features of variable in the data file

N°	Full name of the variable and unit of measure	Short name	Variable
01	National investments	INN	Quantitative
02	Foreign investment	INE	Quantitative
03	Technological innovations toagricultural development	ITD	Mute/dichotomous
04	Food safety	SAL	Quantitative
05	Nutrition security	SNU	Quantitative
06	Development of technological innovations in agriculture	ITA	Mute/dichotomous
07	Profitability of agricultural production	RPA	Quantitative
08	Gross domestic product	PIB	Quantitative
09	Domestic product per capita	PIH	Quantitative
09	Contribution of agriculture to GDP	CAP	Quantitative
10	Contribution of agriculture to external currencies	CAD	Quantitative

With regards to the collection of data related to technological innovations implemented, following discussions on the terms of reference, the researchers considered it necessary to make a complete inventory of these innovations from 1990 till the present day, taking care to indicate their name, theirdomain/application sector (cereals, tubers, livestock, fisheries, etc.), their cost, date/year of implementation and coverage.

Analytical methods

As mentioned above, to achieve the objectives, impact assessment is the approach that is needed. In statistical language, it will involve analyzing the dependencies between these variables to confirm the presence or absence of these relationships on the one hand and, on the other, to measure the intensity and the level of these interdependencies.

Table 2. *The methods of analysis of data based on the variable type*

	Quantitative	**Qualitative**	**Mixture**
Quantitative	Scatterplots	Analysis of variance	Covariance analysis
	Digital Synthesis		
	Correlation Analysis		
	Simple Regression		
	Multiple Regression		
Qualitative	Discriminant Analysis	Generalized linear model	Generalized linear model
	Logistic regression		

This study summarizes the methods and types of variables used in this study. By adapting thediagram belowto oursituation, we canidentify the mostrelevant statisticalmethods to achievethe goals set bythe terms of reference.**which diagram?**

Table 3. Purposeprocessingmethods

	explained variable	**explanatory variable**	**Treatment Methods**
Objective1	dichotomous	Quantitative	Logistic regression
Objective2	Quantitative	Qualitative/ dichotomous	Analysis of variance
Objective3	Quantitative	Qualitative/ dichotomous	Analysis of variance
Objective4	Quantitative	Qualitative/ dichotomous	Analysis of variance
Objective5	Quantitative	Qualitative/ dichotomous	Analysis of variance
Objective6	Quantitative	Qualitative/ dichotomous	Analysis of variance

As we can see, the first specific objective will involve the method of logistic regression, while the other specific objectives will involve the use the reference method for the impact assessment: the method of analysis of variance (ANOVA).

Logistic regression

Regression is one of the dependency study statistical methods. It allows to one connect between a variable (dependent variable) and other variables (explanatory variables). By issuing the assumption of a linear relationship between the dependent variable and the three explanatory variables, for example, the regression model takes the following form:

$$Y = b0 + b1x1 + b2x2 + b3x3 \ldots bkxk + e$$

Under these conditions, the two types of variables (the dependent and the independent variables) are all quantitative variables.
But when the dependent variable is a dichotomous variable (variable whose terms are yes or no, present or absent), and the explanatory variables are quantitative variables, the dependency relationship takes the form of a logistic function in the following form:

$$Ln [p / (1-p)] = b0 + b1x1 + b2x2 + b3x3 \ldots bkxk + e$$

When the relationship has only one explanatory variable, the logistic regression takes the following form:

$$Ln [p / (1-p)] = b0 + b1x1 + e$$

In this formula, p is the probability that the variable Y takes the value X, bo and b1 are coefficients to be determined, and x1 is the amount of national and international investments.

For the first specific objective of this study, logistic regression connects technological innovations for agricultural development (dependent variable) and national and international investments (you can choose either domestic investments or international investments, or both). If you choose both, the previous model will be slightly modified and takes the following form:

$$Ln [p / (1-p)] = b0 + b1x1 + b2x2 + e$$

Where: x1 represents domestic investments and x2 international investments. The interpretation and analysis of coefficients b0, b1 and b2 are used to tell whether or not investments have fostered technological innovations.

The analysis of variance

In the analysis of dependencies, a quantitative dependent variable explained by a qualitative explanatory variable is used for most of the impact assessments of this study. Take the case of specific objective 2, where it is necessary to determine the impact of technological innovations from national and international investments on the profitability of agricultural production in Togo in the last twenty (20) years. The dependent variable is the profitability of agricultural production, which is a quantitative variable, while technology from national and international investments is the explanatory variable.

A heuristic solution to the problem would be to divide the data on profitability into two: the returns that correspond to the years of implementation of innovations on the one hand and, on the other hand, years without technological innovations. After calculating the average profitability for each group of years. The two averages may be different or equal. When the average of years 1 group (say, for example, from 1990 to 2004 – years without innovation) is less than the average of the years 2 group (2005-2014 - years of implementation of innovations), we could conclude that technological innovations have had a positive effect on the profitability of agricultural production. Although tainted with common sense, this finding may be due to chance and distort the real situation. To remedy this situation, the analysis of variance (ANOVA) is used.

1 factor ANOVA

The analysis of variance for one factor enables a univariate analysis of variance on a quantitative variable explained by a simple criterion variable (qualitative explanatory variable). Analysis of variance is used to test the hypothesis of equality of means. This technique is an extension of two-sample t test.

To determine that differences exist is certainly not enough for deciding the presence or absence of an impact. It must go through a test to determine the statistical significance of the differences between these averages. For this, there are two types of tests to compare means: the a priori contrasts and post hoc tests. Contrasts are tests set before the experiment, and post hoc tests are performed after the experiment. One can also test trends across modalities. *Example*: Doughnuts absorb fat in various amounts when they are cooked. An experiment was conducted for the use of three types of fat: peanut oil, corn oil, and lard. The peanut oil and corn oil are unsaturated fats, while lard is a saturated fat. To determining whether the amount of fat absorbed depends on the type of fat, you can create an a priori contrast to determine whether the degree of fat absorption differs for saturated and unsaturated fats.

Anova one-factor model

Mathematically, the model of one-way ANOVA can be presented as follows: yij observations (i = 1 . . . I, j = 1 . . . ni) of the dependent variable y is a linear function. An explanatory variable (α factor) are thought to be derived from the model below
The observations yij, (i = 1 . . . I, j = 1 . . . ni) are assumed to form the model:

$$Yij=\mu+ \alpha_i + \varepsilon_{ij} \begin{Bmatrix} i = 1.....I \\ j = 1....n_j \end{Bmatrix}$$

(C_1) $E\lfloor \varepsilon_{ij} \rfloor = 0$

(C_2) $\text{cov}(\varepsilon_{ij}, \varepsilon_{i'j'}) = 0$

(C_3) $\text{var}(\varepsilon_{ij}) = \sigma^2$

Multi-factor ANOVA

When wanting to determine the impact of various factors (variables), including the effects of combinations of variables (interaction), multi-factor analysis of variance is used.

The outcome of the analysis of variance (ANOVA) always takes the form of an array whose elements are:

- sources of variability;
- sums of squares (SS);
- degrees of freedom (df);
- mean square (MS);
- the ratio F = MS (effect) / MS (error);
- the probability p of exceeding the ratio F.

For each group, the number of cases, mean, standard deviation, standard error of the mean, minimum, maximum, and 95% confidence interval for the mean were obtained. Levene's test for homogeneity of variance, analysis of variance table and equality tests averages for each dependent variable a priori contrasts to that specified by the user and range tests and post hoc multiple comparisons: Bonferroni , Sidak, Tukey test, Hochberg GT2, Gabriel, Dunnett, Ryan-F Einot-Gabriel-Welsch (REGW F) interval test, Ryan-Einot-Gabriel-Welsch (REGW Q) range test, T2 Tamhane, Dunnett's T3, Games-Howell test, C Dunnett test of Duncan, Student-Newman-Keuls (SNK), B Tukey, Waller-Duncan, Scheffé and Fisher's least significant difference.

Software used

For data collection and the development of graphs, spreadsheet (Microsoft Excel) was used. The working documents (minutes of meetings, reports, forms, publications and other documents) were developed using the Microsoft Word. The statistical analyses were carried out using the SPSS.

Plan andchronogramof the study

The study duration is 1 month (30 days), from 26 September to 26 October 2015. The chronology of activities is shown in the table below.

Table 4 : Chronology of the study activities

Activities	Time
Information working session and startof the study	26 September 2015
Session preparation of the technical offer	28 September 2015
Literature search	26 Sept - 07 Oct.
Finalization of the technical offer	30 September 2015
Meeting on the progress of data collection	03 October 2015
Finalization of the data collection and formatting	05-07 October 2015
Development of the plan of the study report	09 October 2015
Data verification	10 October 2015
Data processing	11-15 October 2015
Writing of the report	16-23 October 2015
Review and provisional version	24-26 October 2015

The staff and the job description

The study was conducted by a team consisting of Mr. Alpha Todjé, an agronomist, scientific coordinator of the support device to the system searches (C/SDARS), whose function is to:

- Coordinate all activities
- Prepare of the technical offer of the study
- Verify the data;
- Format the data file;
- Process the data;
- Analyze the data;
- Draft the report of the study;
- Ensure the availability of resources (material and financial) to members of the team.

Me Kokou Baninganti, a statistics professor, who will contribute to:

- The preparation of the technical offer of the study
- Verification of the data;
- The formatting of the data file;
- The processing of data;
- Analysis of the data;
- The drafting of the study report

The data collection agents: Four in number and are responsible for the collection of data from:

- The Directorate-General Budget
- The World Bank representative in Togo
- The Togolese Institute for Agronomic Research

Their mission has a duration of two months and shall run from October to November.

APPENDIX 4: Varieties developed through research and development activities in Togo

Speculation	*Variety*	*Year established or introduced*	*Obtaining / Patent*	*Agronomic Characteristics*	*Technological and organoleptic characteristics*	*Effects*
Maize	Ikenne 9449 SR	1980	CIMMYT/IITA	Potential return: 5t / ha Sowing-maturity cycle: 100-105 days Resistant to lodging, tolerant streak	Milling pretty easy	- Variety grown in all regions of the country. -Increased Production -Good closing spars protect the ears against bird and improves producer's income
	Obatanpa	1997	CRI du Ghana	Potential return: 6t / ha Sowing-maturity cycle: 95- 105 days Average resistance to lodging, tolerant streak	easy milling Lysine and Tryptophan-rich	-Variety grown in all regions of the country. -Improved nutritional quality. - Increasing production
	ACR 97 TZL Comp 1W	1999	IITA	Potential return: 6t / ha Sowing-maturity cycle: 100 - 110 days Good lodging resistance and streak resistant to striga	Milling pretty easy	Variety grown in all regions of the country. Improvement of production in areas infested by striga. Increased production in areas of striga infestation

	SOTUBAKA	2004	Institut d'Economie Rurale du Mali	Potential return: 6t / ha Sowing-maturity cycle: 100- 110 days Good lodging resistance, tolerant streak	Milling pretty easy	Variety grown in all regions of the country; Enhances the yellow colour of the egg; Improving the nutritional quality of vitamin A
	TZEE W pop STR QPM	2000	IITA	Potential return: 3.5t / ha Sowing-maturity cycle: 80- 85 days striga resistant and tolerant streak	Easy milling, rich in lysine and tryptophan	Variety grown in all regions of the country. Responds well in case of delay on the season because of his extra-early maturity. Can adapt to climate change
Rice	IR 841	1973	IRRI	Potential return: 6t / ha Cycle: 115-120 days Good lodging resistance, Tolerant to blast; Ecology: and Irrigated Lowland	Milling yield: 65-68%	Variety grown in all regions of the country Cooking: sticky Aroma: fragrant
	NERICA L-14	2004	ADRAO/AfricaRice	Potential return: 8t / ha Sowing-maturity cycle: 115-125 days; Resistant to drought, to lodging and to blast' Ecology: Lowland / Irrigated	Milling yield: 62-64%	Variety grown in all regions of the country Cooking: tack Aroma: lightly perfumed
	NERICA 8	2006	ADRAO/AfricaRice	Potential return: 5t / ha Sowing-maturity cycle: 85-90	Milling yields: 68-70%	Variety grown in all regions of the country Cooking: tack

				days; Resistant to drought, to lodging and to blast; Ecology: storm		Aroma: Low
	NERICA 11	2006	ADRAO/AfricaRice	Potential return: 7t / ha Sowing-maturity cycle: 85-90 days; Resistant to lodging, drought tolerant and blast; Ecology: storm	Milling yields: 65-68%	Variety grown in all regions of the country Cooking: tack Aroma: non-aromatic
	NERICA 7	1997	ADRAO/AfricaRice	Potential return: 5t / ha Sowing-maturity cycle: 95-100 days; Resistant to lodging and to pylacura-liose,, drought tolerant Ecology: rainfed	Milling yields: 63-65%	Variety grown in all regions of the country Cooking: tack Aroma: non-aromatic
Sorghum	SORVATO 1	1993	INCV/ITRA	Potential return: 6t / ha Cycle: 105-110 days		Variety grown in the savannah region Sensitive to moulds
Groundnut	RMP 12	1970	ISRA	Potential return: 3t / ha Sowing-maturity cycle: 120 days	Husking performance: 72% .	Resistant to rosette, susceptible to rust; Oil content: 40% by weight of the dry seed
	TS32-1		IRHO			Variety grown in the savannah region and Kara
Soybean	TGX 1910-14F	2003	IITA	Potential return: 4t / ha Sowing-maturity cycle: 90-100		Cultivated in all regions Non dehiscent

				days		pods
	TGX 1448-2E		IITA			
Cowpea	VITOCO	1970	IITA	Potential return: 2t / ha Sowing-maturity cycle: 80-85 days	fast cooking	Cultivated in all regions Sensitive to photoperiod Susceptible to beetles
	VITA 5	1970	University of Ifê (Nigeria)	Potential return: 2t / ha Sowing-maturity cycle: 75-80 days,	slow cooking	Cultivated in all regions Not susceptible to photoperiod sensitive bruchids
Cassava	GBAZEKOUTE	1989	INPT/ITRA	Potential return: 40 t / ha Plantation-maturity Cycle: 12 months	sweet variety; Good ability to fufu Starches rates: 13-16%; Hydrogen cyanide content: <100mg / kg wet weight	Strong disease resistance, suitable for intercropping
	TMS 96/409	1998	IITA	Potential return: 50 t / ha Plantation-maturity Cycle: 12 months; Strong disease resistance, suitable for intercropping	sweet variety Average skills fufu, Starches rates: 12-14%' Hydrocyanic acid content: <100mg / kg wet weight	Strong disease resistance, suitable for intercropping
	TMS	1994	IITA	Potential return:	sweet	Strong disease

	92/0326			50 t / ha Plantation-maturity Cycle: 12 months Strong disease resistance, suitable for intercropping	variety Poor skills fufu, Starches rates: 12-15%; Hydrocyanic acid content: <100mg / kg wet weight	resistance, suitable for intercropping
	TMS 95/0166	1998	IITA	Potential return: 55t / ha Plantation-maturity Cycle: 12 months; Strong disease resistance, little suited to intercropping	sweet variety Poor skills fufu, Starches rates: 10-11%; Hydrocyanic acid content: <100mg / kg wet weight	Strong disease resistance, suitable for intercropping
	LAGOS	-	Origin : NIGERIA	Early variety, suitable for intercropping; Resistant to diseases and pests	Good skills fufu, gari and chips	Strong disease resistance, suitable for intercropping
	TMS 30 572		IITA	Resistant to diseases and pests, high efficiency	Good skills gari and chips	Zone of kpalimé
yam	TDr 747	1996	IITA (Ibadan)	Potential return: 25t / ha Plantation-maturity cycle: 6-7 months; Strong resistance to viral diseases Average	Good ability to fufu and frying Good taste	

				resistance to drought		
	FLORIDO	1985	Origin : Porto Rico via Ivory Coast	Potential return: 25t / ha Plantation-maturity Cycle: 10 months; Average resistance to drought, resistant to anthracnose	Good taste Fufu and low suitability for frying	
Cotton	STAM 129A	2005	ITRA	110 days to mature field performance 2-3 tonnes per ha	high ginning outturn (44.8%) low fibre brightness	Cottonseed gain for the producer and fibre cotton to the spinner
	STAM 279A	1995	ITRA	Maturity 120 days, return to the field 2-3 tonnes per ha	Good ginning outturn (43.5%); Good brightness of the fibre and long fibre	Cottonseed gain for the producer and fibre cotton to the spinner
Coffee	107	1980	IRCC	Station Yield: 3660 kg / ha clone plastic Good drought resistance early maturation Station Yield: 2970 kg / ha Staggered late maturation	Medium Technology Features	
	126	1980	IRCC	Station Yield: 3660 kg / ha clone plastic Good drought resistance early maturation Station Yield: 2970 kg / ha	Good technological characteristics	

				Staggered late maturation		
	149	1980	IRCC	Station Yield: 2860 kg / ha Grouped staggered maturation	Good technological characteristics	
	181	1980	IRCC	Station Yield: 2780 kg / ha Early staggered maturation Giant caules (stem) hard (difficult to harvest)	Medium technology features	
	182	1980	IRCC	Station Yield: 2500 kg / ha Regular and average production		
	197	1980	IRCC	Station Yield: 4420 kg / ha Clone suitable for all areas Early-maturing group planting	Medium Technology Features	
	200	1980	IRCC	Station Yield: 2470 kg / ha	Good technological characteristics	
	211		IRCC	Station Yield: 3280 kg / ha	poor technological features	
	375	1980	IRCC	Station Yield: 2600 kg / ha Good response to coppicing		
	461	1980	IRCC	Station Yield: 2350 kg / ha	poor technological features	
Cocoa	C25 x C75	1988	IRCC	Yield: 1312 kg / ha; CMV	Good quality	

				infection percentage: 47%	size	
	C75 x C25	1988	IRCC	Yield: 1376 kg / ha; Infection CSSV percentage: 65%	Good quality size	
	UPA413 x C1	1988	IRCC	Yield: 1473 kg / ha CSSV infection percentage: 53%	Good quality size	
	C14 x C75	1988	IRCC	Yield: 1780 kg / ha CSSV infection percentage: 58%	Good quality size	
	C75 x C14	1988	IRCC	Yield: 2090 kg / ha cm CSSV infection percentage: 47%	Good quality size	
	UPA603 x C409	1988	IRCC	Yield: 2200 kg / ha CSSV infection percentage: 26%	Good quality size	
Pepper	PP 0207-7532	2010	AVRDC	Yield: 10.86 t / ha		Strong disease resistance, suitable for all regions of Togo, pungent flavor and easy drying.
	PP 9955-15	2010	AVRDC	Medium Yield: 11.12 t / ha		
	ICPN 19-4	2010	AVRDC	Medium Yield: 17,12 t/ha		
	ICPN 19-3	2010	AVRDC	Medium Yield: 10,12 t/ha		
	ICPN 19-2	2010	AVRDC	Medium Yield: 10,63 t/ha		

APPENDIX 5

Country	**TOGO**
IP Name	Soybean
Entry Point	Soybean export opportunity in a situation of low production
Location **GPS Coordinate:** **IP webpage:**	Anié Région des plateaux - --
Participating villages	All the villages that produce soybeans in the three economic regions (Maritime, trays and Central) of TOGO
Date IP establishment	2008
Number of years activities on the ground	7
Facilitators Contact: **Name** **Mobile** **Skype ID** **Others**	 ADODO (IFDC) 00228 90201817 XXXXX YAOVI Abla (00228) 90 08 55 54 ;ALPHA Todjé (00228) 93 02 18 66
Partners	
Farmers	Individual and farmer organizations in targetted villages, represented at IP management committee level Union des Agriculteurs de la région des plateaux (UARP), Cooperative "HEZOU" And Individual members. - A high level of Cooperative organization
Private sector	* AGRINOVA (wholesaler buyer) started the contract system with individual producers and cooperative but disappeared after two years because of financial malfeasance in favour of l'Union des Agriculteurs de la

	Region des Plateaux (UAR/P) (whole buyers (grossiste), *AGRIKOM * Poultry * The producer groups and individual producers Soy * Some producer groups Soy certified seed, * Soy Processing Cooperative "HEZOU" * Sales companies of phytosanitary products, factories, fertilizer public trader, society input blinds * Project manager (IFDC)
Policy makers	Ministry of Agriculture
Researchers	Togolese Agricultural Research Institute (ITRA)
Extension	Institute Council and Technical Support (ICAT) and non-governmental organizations
Micro financing institutions	Popular Bank(BPEC); ex Togolese Bank of development(ex BTD); Banque Régionale de Solidarité; MFIS (MICROFINANCIAL INSTITUTION)locales
Others **Total number of stakeholders**	Carriers, Radio, the feed producers, etc ... The platform includes 22 producer organizations with 391 members
Opportunities addressed	Control of Soybean production technique by producers. Training on the concept of developing a business plan. Mastering bundling; Control of the management of cooperatives, training on seed production technique, etc.
Achievements to date	* Producers are able to make a difference between the best varieties of soyabean. * Increased soybean production * Every year the whole of IP soy product is sold. * The farmers' organizationss registered with legal documents. * Integrated soybean production practices (good quality treated seed with fungicide, planting methods with

	planting, weed management, efficient use of poultry fertilizer) are evaluated with farmers, * Introduction of processing units, etc.
Challenges remaining	* Develop soybean processing units to increase production products derived from soybeans, * Selection of high yielding varieties, competitive and adapted to climate change. * Limited capacity of inputs dealers to satisfy farmers' demands, misunderstanding of issues between traders and producers.
Sustainability issues	*So with this project, it is necessary to re-strategize by looking for a new market with new contracts (The wholesale buyer ran away with all the money) * Install processing plants, increase soybean production capacity for the plant to be available all year round. * Supporting producers technically to raise their production capacity (Research & Development) * Organize producers to a contracting system * Strengthen the spirit of trust between players and between partners, etc.
Phase in IP process	Early Phase 1 • The members of the Soy Platform have seen an improvement in their living conditions. • Women, members of the platform that process the products derived from soya get a better income. • Expansion of the market, to make the new products available to the consumers. • The platform is at a level of maturity.

A-) characteristics of some functional platforms

Country	**TOGO**
IP Name	Maïs Jaune (Yellow Maze) value chain
Entry Point	Loss of color of egg yolk
Location **GPS Coordinate:** **IP webpage:**	Tsévié (Région Maritime) XXXXX XXXXX

Participating villages	The villages of producers unions
Date IP establishment	Official set-up in November 2006
Number of years activities on the ground	9 years
Facilitators Contact **Name** **Mobile** **SkypeID** **Others**	 ALPHA Todjé Coordinateur du PLATEFORME Maïs 00228 93 02 18 66 XXXXX GBETCHI (00228 90122047)
Partners	Regional Union of Cereal Producers Organizations of Maritime Region (UROPC/M)
Farmers	* Cooperative of Poultry Ffarmers in the Maritime Region (COOPAREM) * Individual poultry farmers National Association of Poultry Producers of Togo (ANPAT) * Carriers Organization * Organization of feed producers, Seed Producer Group Certified, etc
Private sector	* Company Sales of Phytosanitary Products (SPROCA) * Basic seed producers (ITRA)
Policy makers	Ministry of Agriculture * Central d'Approvisionement et de Gestion des Intrants Agricoles (CAGIA)
Researchers	Institut Togolais de Recherche Agronomique (ITRA)
Extension	Institut du Conseil et d'Appui technique (ICAT)

Micro financing institutions	Banque Régionale de Solidarité (BRS) Banque Populaire d'Epargne et de Crédits (BPEC)
Others **Total number of stakeholders**	MFIS (micro-finance institutions): FUCEC, WAGES et FECECAV An umbrella unions of 121 producer organizations with 2145 producer members
Opportunities addressed	* Market and Technology always available)
Achievements to date	* All agricultural production of yellow maize is removed by the poultry farmers (Every time the whole product (yellow maize) is bought by poultry farmers). * Better ouality of egg yolk.
Challenges remaining	* Creating a climate of confidence between the poultry farmers, yellow corn producers and Agricultural Bank, through an insurance covering actors in the rural areas.
Sustainability issues	* Agricultural insurance is essential for the creation of a climate of trust between the different actors. * Administration of training in the field of insurance to prepare in advance the actors in the rural areas.
Phase in IP process	Early Phase 1 The yellow corn platforms is at the independent phase

Country	TOGO
IP Name	Milk value chain
Entry Point	Inadequate local cheese (wagashi) in the market
Location **GPS Coordinate:** **IP webpage:**	Akoumapé XXXXXX XXXXXX
Participating villages	Akoumape and Surrounding Villages inhabited by Peul
Date IP establishment	Official set-up in 2011
Number of years activities on the ground	About 4 years
Facilitators Contact **Name** **Mobile** **SkypeID** **Others**	 NYAKU Afua 00228) 91772627 XXXXXX Transporter
Partners	
Farmers	* Groups of Transformative Women's Village, Akoumapé. * Cattle breeder individual groups (individual cattle rearers and women transformation factory organization) Carrier cheese (cheese)
Private sector	
Policy makers	Ministry of Agriculture, Livestock and Water
Researchers	Institut togolais de recherches Agronomique (ITRA)

Extension	Institut du Conseil et d'Appui technique (ICAT)
Micro financing institutions	MFIS (micro-finance institution)
Others **Total number of stakeholders**	WXXXX Members
Opportunities addressed	*Higher demand *Proper and hygienic techniques for food processing *Quality product
Achievements to date	* The whole product (cheese) is soled every time. * The offer is below demand (The women organization can't even meet the demand).
Challenges remaining	* Since 2011, production has not changed, hence the need to increase production by adopting modern methods of production
Sustainability issues	* They need materials to improve and to increase their capacity of production, as a result more employment opportunities will be created). * Improve the quality of breeding cattle
Phase in IP process	Early phase 1 Milk platform is already at a level of independence. They are no longer under supervision.

Country	TOGO
IP Name	Yam value chain
Entry Point	Showcasing a variety of yams called 'Laboko'
Location **GPS Coordinate:** **IP webpage:**	Bassar XXXXXX XXXXXX
Participating villages	All villages in the prefecture of Bassar
Date IP establishment	Official set-up in 2008
Number of years activities on the ground	About 7 years
Facilitators Contact **Name** **Mobile** **SkypeID** **Others**	 ADODO de l'IFDC (00228) 90201817 XXXXXX ALPHA Todjé (00228) 93021866
Partners	
Farmers	*COOP-CA BINOKPAAB (coopérative des Producteurs d'Igname de BASSAR), 65 groups Yam Producers of 1,500 members, including 150 (10%) of women in 2011. *Carriers, * The shoppers * Consumers * Transformers. * Input suppliers
Private sector	* ONGs : ACM, et PADES
Policy makers	Ministry of Agriculture, Livestock and Water

Researchers	Institut togolais de rechercher Agronomique (ITRA)
Extension	Institut du Conseil et d'Appui technique (ICAT)
Micro financing institutions	MFIS (micro-finance institution): FUCEC, WAGES et FECECAV
Others **Total number of stakeholders**	WXXXX 65 groups of yam producers of 1,500 members, including 150 (10%) women
Opportunities addressed	* Inability to meet the total needs of members * Organizational deficiency
Achievements to date	*The whole product is always sold * The organization cannot even meet the demand.
Challenges remaining	* Absence of a resource mobilization strategy * Lack of product development strategy * Organizational deficiency
Sustainability issues	* Increase production capacity through modern production methods (use of new varieties, make available certified seed varieties).
Phase in IP process	Early Phase 1 * The platform is at its initial phase. * It requires revitalization with proper guidance.

B-) Characteristics of some non-functional platforms

Country	**TOGO**
IP Name	Peanut value chain
Entry Point	Raw material failure to run full time the processing unit.
Location **GPS Coordinate:** **IP webpage:**	Tamonga XXXXXX XXXXXX
Participating villages	All Villages of District of Nangbeni
Date IP establishment	2008
Number of years activities on the ground	7
Facilitators Contact **Name** **Mobile** **SkypeID** **Others**	 ADODO de l'IFDC (00228) 90201817 XXXXXX *YATOMBO de l'ONG RAFIA 00228 90020468/27708456 *Madame DOUTI Kiyésoa
Partners	
Farmers	* UNICAP Tamango is a union of 33 cooperatives, consisting of 665 members, including 512 women from the Central peasant self-promotion (CAP) *, * The shopping * Consumers * Processors .
	* SPROCA, NGOs, research institutions, Research, Support and

Private sector	Training for Self-Development Initiatives (RAFIA) and business support services,
Policy makers	* Ministry of Agriculture, Livestock and Water
Researchers	*Institut togolais de rechercher Agronomique (ITRA)
Extension	*Institut du Conseil et d'Appui technique (ICAT)
Micro financing institutions	*IMF: UCMEC/S (Union des Caisses et Mutuelles d'Epargne et Crédit de la région de la savane.
Others **Total number of stakeholders**	YATOMBO de l'ONG RAFIA 00228 90020468/27708456
Opportunities addressed	* Inability to meet the total needs of the processing unit. * Organizational deficiency
Achievements to date	* Every time the whole product is sold. *The organization cannot even meet the demand.
Challenges remaining	* Lack of a resource mobilization strategy * Organizational deficiency
Sustainability issues	* Increase production capacity
Phase in IP process	Early Phase 1 The peanut platform is already at an initial level. It requires revitalization with proper guidance.

Country	**TOGO**
IP Name	White corn (Obatanpa) value chain
Entry Point	Dissémination des nouvelles technologies.
Location **GPS Coordinate:** **IP webpage:**	Bafilo XXXXXX XXXXXX
Participating villages	All Villages district of Bafilo
Date IP establishment	2011
Number of years activities on the ground	About 4 years
Facilitators Contact **Name** **Mobile** **SkypeID** **Others**	 KOUSSA Dissirama de l'ITRA (00228) 90296457 XXXXXX *ADABE de l'ITRA 00228 90941385 *Ali Egbataou (00228) 90346626
Partners	
Farmers	* Consumers * The transformative
Private sector	* Assoli Radio Suppliers of Inputs
Policy makers	* Ministry of Agriculture, Livestock and Water
Researchers	*Institut togolais de recherche Agronomique (ITRA)
Extension	*Institut du Conseil et d'Appui technique (ICAT)
Micro financing institutions	*IMF: COOPEC Bafilo
Others	-

Total number of stakeholders	"Assonou Kifani" Corn Producers has 15 members
Opportunities addressed	* Inability or willingness to come together * Organizational deficiency
Achievements to date	-
Challenges remaining	-
Sustainability issues	-
Phase in IP process	Early phase 1 The white corn platform is at the null step. This is evidenced in the poor sales of the white corn variety and the lack of the will to persevere among the actors.

Appendix 6: Data File

YEAR	supma	rdtma	proma	prima	amen	acr97	Tzeew	obatan	sotuba	tzl	ev99	qpm	farma	famprc	supsor
1990	295700	0.965	285448	51	0	0	0	0	0	0	0	0	0	0	183900
1991	255400	0.906	231400	56	0	0	0	0	0	0	0	0	0	0	191600
1992	274200	1.014	278052	75	1	0	0	0	0	0	0	0	0	0	144800
1993	338900	1.160	393076	41	1	0	0	0	0	0	0	0	0	0	196050
1994	373579	0.931	347645	30	1	0	0	0	0	0	0	0	0	0	32560
1995	339565	0.855	290432	52	1	0	0	0	0	0	0	0	0	0	199181
1996	412118	0.940	387562	60	1	0	0	0	0	0	0	0	0	0	248839
1997	423534	1.068	452160	62	1	0	0	1	0	0	0	0	0	0	206809
1998	404101	0.867	350485	47	1	0	0	1	0	0	0	0	0	0	203899
1999	412018	1.198	493570	37	1	1	0	1	0	1	0	0	0	0	176663
2000	401053	1.202	482056	33	1	1	1	1	0	1	0	0	0	0	183149
2001	405780	1.143	463931	35	1	1	1	1	0	1	0	0	0	0	183669
2002	403228	1.265	510084	39	1	1	1	1	0	1	0	0	0	0	164679
2003	422644	1.273	537956	35	1	1	1	1	0	1	0	0	0	0	177677
2004	414354	1.264	523650	45	1	1	1	1	1	1	1	0	0	0	167638
2005	356555	1.308	466540	81	1	1	1	1	1	1	1	0	0	0	181884
2006	395729	1.100	435145	58	1	1	1	1	1	1	1	0	0	0	184206
2007	468156	1.166	546050	55	1	1	1	1	1	1	1	0	0	0	215368
2008	494963	1.192	590106	111	1	1	1	1	1	1	1	1	1	1	213007
2009	518955	1.256	651738	95	1	1	1	1	1	1	1	1	1	1	216436
2010	534573	1.194	638129	75	1	1	1	1	1	1	1	1	1	1	223596
2011	522630	1.245	650831	90	1	1	1	1	1	1	1	1	1	1	220917

2012	754739	1.142	862257	86	1	1	1	1	1	1	1	1	1	1	345111

YEAR	rdtsor	prosor	prisor	sorv1	sorv28	supmil	rdtmil	promil	primil	supriz	rdtriz	proriz	pririz	tgr203
1990	0.623	114615	67	0	0	142600	0.406	57907	64	19200	1.31	25149	69	0
1991	0.738	141368	65	0	0	133000	0.375	49820	72	24155	1.63	39328	77	0
1992	0.776	112319	95	0	0	135300	0.556	75239	89	13650	1.85	25265	96	0
1993	0.644	126299	62	1	0	149600	0.503	75240	59	28200	1.20	33769	63	0
1994	4.420	143929	33	1	1	154300	0.375	57823	26	58553	0.86	50088	49	0
1995	0.865	172325	67	1	1	110354	0.658	72613	65	41916	1.22	51226	63	1
1996	0.626	155853	85	1	1	116696	0.472	55137	81	57442	1.33	76515	78	1
1997	0.734	151755	68	1	1	93540	0.521	48749	69	31957	2.70	86211	65	1
1998	0.670	136558	67	1	1	89928	0.453	40694	66	42397	2.04	86663	69	1
1999	0.802	141658	65	1	1	84589	0.465	39337	54	38139	2.13	81061	60	1
2000	0.848	155401	38	1	1	79580	0.470	37372	33	32413	1.92	62307	45	1
2001	0.772	141722	49	1	1	78580	0.525	41248	43	32110	1.98	63694	50	1
2002	1.026	168983	59	1	1	76169	0.679	51726	52	32014	2.16	69243	51	1
2003	0.919	163272	42	1	1	67681	0.696	47136	45	28614	2.17	62048	52	1
2004	1.013	169784	58	1	1	49362	0.709	35018	52	32276	2.60	83857	59	1
2005	0.851	154849	101	1	1	51358	0.821	42159	84	32605	1.84	60013	70	1
2006	1.219	224623	63	1	1	61748	0.687	42413	59	32228	2.00	64449	68	1
2007	0.976	210297	64	1	1	72481	0.751	54457	61	32717	2.46	80419	69	1
2008	0.992	211258	138	1	1	72048	0.658	47402	111	36492	2.34	85540	102	1
2009	1.098	237665	103	1	1	71467.97	0.688	49146	95	45702	2.65	121295	93	1

2010	1.094	244674	71	1	1	73777	0.695	51265	75	47403	2.32	110109	78	1
2011	1.101	243267	72	1	1	73356	0.687	50362	91	44713	2.51	112233	100	1
2012	0.832	286967	71	1	1	58441	0.502	29339	101	104043	1.63	169272	97	1

YEAR	tgr405	nerical14	was161	nerica7	nerica8	nerica11	Amsobf	ppu	supman	rdtman	proman	priman	tms96	tms92	tsm95
1990	0	0	0	0	0	0	0	0	77100	7.69	592867	24	0	0	0
1991	0	0	0	0	0	0	0	0	65560	7.79	510528	27	0	0	0
1992	0	0	0	0	0	0	0	0	65650	6.89	452093	30	0	0	0
1993	0	0	0	0	0	0	0	0	56800	6.86	389448	29	0	0	0
1994	0	0	0	0	0	0	0	0	90403	5.88	531526	15	0	1	0
1995	1	0	0	0	0	0	0	0	101780	5.92	602212	20	0	1	0
1996	1	0	0	0	0	0	0	0	96350	5.69	548316	20	0	1	0
1997	1	0	0	1	0	0	0	0	95574	6.23	595792	25	0	1	0
1998	1	0	0	1	0	0	0	0	95616	6.06	579381	30	1	1	1
1999	1	0	0	1	0	0	0	0	114534	6.06	693998	22	1	1	1
2000	1	0	0	1	0	0	0	0	123941	5.65	700697	18	1	1	1
2001	1	0	0	1	0	0	0	0	109014	5.98	651530	20	1	1	1
2002	1	0	0	1	0	0	0	0	131907	5.03	663557	20	1	1	1
2003	1	0	0	1	0	0	0	0	115811	6.73	778864	20	1	1	1
2004	1	1	0	1	0	0	0	0	115938	5.86	679082	23	1	1	1
2005	1	1	0	1	0	0	0	0	109947	5.72	629166	28	1	1	1
2006	1	1	0	1	1	1	0	0	103894	6.09	632850	29	1	1	1
2007	1	1	0	1	1	1	0	0	125740	6.15	773162	37	1	1	1
2008	1	1	0	1	1	1	0	0	131425	6.05	795372	41	1	1	1

2009	1	1	1	1	1	1	0	0	143427	6.24	895655	51	1	1	1
2010	1	1	1	1	1	1	0	0	147336	6.17	908755	44	1	1	1
2011	1	1	1	1	1	1	0	1	152209	6.56	998540	47	1	1	1
2012	1	1	1	1	1	1	1	1	251589	4.13	1038946	58	1	1	1

YEAR	manvita	mantol	supign	rdtign	proign	priign	tdr95	tdr98	tdr747	tdr89	miniset	consign	supara	rdtara	proara	priara
1990	0	0	43300	9.05	391853	50	0	0	0	0	0	0	56900	0.47	26485	96
1991	0	0	41700	9.03	376478	64	0	0	0	0	0	0	39694	0.55	21843	116
1992	0	0	44200	8.33	367997	68	0	0	0	0	0	0	41081	0.78	32066	125
1993	0	0	51300	10.34	530412	61	0	0	0	0	0	0	73483	0.47	34682	119
1994	0	0	49305	9.82	484023	29	0	0	0	0	0	0	101969	0.38	38574	63
1995	0	0	61805	8.58	530502	38	0	0	0	0	0	0	71650	0.49	35088	82
1996	0	0	69334	8.72	604731	50	0	0	0	0	0	0	110112	0.50	55420	80
1997	0	0	62170	10.99	683039	49	0	0	1	0	0	0	58398	0.59	34236	84
1998	0	0	70227	9.91	696145	48	0	0	1	0	0	0	60919	0.45	27158	96
1999	0	0	60941	10.92	665632	40	0	0	1	1	0	0	61749	0.57	35375	95
2000	0	0	51220	11.00	563285	36	1	0	1	1	0	0	53894	0.48	25972	77
2001	0	0	53948	10.18	549071	38	1	0	1	1	0	0	58841	0.56	33023	74
2002	0	0	66919	11.15	745954	40	1	0	1	1	0	0	51730	0.69	35682	75
2003	0	0	69984	8.79	614960	45	1	1	1	1	0	0	63313	0.60	38244	81
2004	0	0	58761	10.83	636304	48	1	1	1	1	0	0	59286	0.59	34870	88
2005	0	0	51358	11.01	565483	58	1	1	1	1	1	0	54093	0.50	26919	110
2006	1	0	53608	10.25	549295	52	1	1	1	1	1	0	57572	0.56	32413	117
2007	1	0	58431	10.58	618212	64	1	1	1	1	1	0	57882	0.62	35952	118

2008	1	0	62775	10.33	648328	80	1	1	1	1	1	1	67357	0.63	42647	164
2009	1	1	69178	10.18	704414	95	1	1	1	1	1	1	67691	0.66	44528	129
2010	1	1	71528	9.93	710482	99	1	1	1	1	1	1	69621	0.67	46496	121
2011	1	1	71226	10.22	727749	114	1	1	1	1	1	1	68785	0.69	47369	159
2012	1	1	103475	8.71	900832	111	1	1	1	1	1	1	65421	0.69	45003	202

YEAR	supnie	rdtnie	pronie	prinie	supcaf	rdtcaf	procaf	pricaf	supcac	rdtcac	procac	pricac	stam129	stam279
1990	114500	0.17	19630	119	21000	0.610	12800	269	34000	0.200	6814	237	0	0
1991	88200	0.19	17001	134	38000	0.655	24900	169	28000	0.146	4100	241	0	0
1992	97700	0.24	23766	145	40000	0.158	6300	190	30000	0.200	6000	257	0	0
1993	180100	0.21	38557	129	38001	0.289	11000	135	32000	0.225	7200	216	0	0
1994	85848	2.27	195062	77	45000	0.236	10600	172	21000	0.262	5500	147	0	0
1995	129110	0.22	28994	91	48200	0.251	12080	355	21400	0.280	6000	300	0	1
1996	173081	0.25	42644	161	45203	0.496	22400	399	20069	0.708	14200	240	0	1
1997	169065	0.28	46683	108	46018	0.230	10600	345	15000	0.387	5800	229	0	1
1998	150394	0.22	32738	119	52488	0.381	20000	337	28000	0.436	12200	246	0	1
1999	135371	0.34	45391	111	50472	0.337	17000	318	21400	0.327	7000	253	0	1
2000	144310	0.29	41769	71	57930	0.262	15200	134	27767	0.238	6600	147	0	1
2001	147496	0.28	41336	78	55000	0.307	16900	95	24259	0.420	10200	302	0	1
2002	169825	0.26	44671	76	26000	0.304	7900	120	18000	0.417	7500	334	0	1
2003	145566	0.30	43633	89	20000	0.275	5500	121	19000	0.268	5100	284	0	1
2004	159002	0.31	49419	92	30000	0.310	9300	146	35000	0.620	21700	307	0	1
2005	144275	0.29	41960	113	28000	0.257	7200	258	80000	0.663	53000	330	1	1
2006	142510	0.37	52809	97	34000	0.262	8900	258	104000	0.702	73000	330	1	1

2007	178707	0.35	62942	101	33600	0.277	9300	411	108160	0.721	78000	428	1	1
2008	191165	0.35	67325	159	29500	0.310	9143	340	146000	0.760	111000	572	1	1
2009	203747.5	0.36	72366.93	137	30000	0.390	11700	242	138160	0.760	105000	754	1	1
2010	210617	0.36	76189.86	151	30200	0.381	11500	231	133500	0.760	101500	719	1	1
2011	207172	0.37	76465	206	32000	0.391	12500	242	130000	1.096	142500	754	1	1
2012	379711.5	0.41	155419.2	204	27000	0.402	10843	224	110000	0.314	34500	696	1	1

YEAR	pibn	piba	pibh	Valexp	bgnat	bgagri	itrabg	itrareso	calo
1990	404040.9	136566	117077	8983	92490	2667	21	18	2091
1991	504125	165353	116294	5647	92700	2900	28	15	1930
1992	467181	164915	112468	7468	93636	430	31	21	1896
1993	524133.9	231143	85579	4460	75984	1645	34	16	1959
1994	783393.8	273404	130495	9009	79250	1480	30	15	2042
1995	546068.4	206414	152552	13407	149594	1623	330	58	2046
1996	738681.7	301382	170650	12703	111908	2741	88	64	2112
1997	921613.9	388921	194141	22607	126020	3322	298	149	2154
1998	948642.5	332025	202485	14150	140958	3272	199	40	2123
1999	937094.1	345788	204395	20575	144075	2145	190	40	2149
2000	1087188	381603	189031	11508	155419	1806	560	91	2171
2001	950750.9	358433	195087	6880	155433	1749	474	108	2155
2002	928388.3	354644	199867	6935	165146	1991	500	80	2157
2003	859595.3	307735	184120	6769	158980	1952	500	102	2199
2004	884877.1	320325	188508	14573	189774	1785	480	86	2246
2005	1022233	402760	200006	12908	187523	1835	735	79	2238

2006	1105913	397023	200941	57597	247410	1870	540	133	2282
2007	1055345	377814	205319	68851	246601	1872	500	99	2289
2008	1130260	460016	234034	9088	265174	1834	500	66	2319
2009	1498719	493079	240126	137282	275185	1985	500	87	2348
2010	1570523	486862	245896	100615	499726	50585	625	108	2356
2011	1500062	462019	269920	7781	548748	13618	625	159	2366
2012	1919072	807929	296358		656204	24327	625	169	