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# Agriculture based on research as necessary way for sustainable development in Central African Republic

Eric-Désiré Tomoro <sup>1\*</sup>, Yeping Zhu <sup>1</sup>, Weiting Liu <sup>2</sup>

<sup>1</sup> Agricultural Information Institute, Chinese Academy of Agricultural Sciences/Key Laboratory of Agri-information Service Technology, Ministry of Agriculture, 100081 China

<sup>2</sup> Foreign Affairs Office of the Heilongjiang Academy of Agricultural Sciences, 368 Xuefu Road Nangang District Harbin, 150086 China

## Abstract

The farmer in Central African Republic (CAR) had only one concern, which is to feed his family and to meet his basic needs. With the rapid increasing of population and the climate change, this model of artisanal agriculture can no longer meet the population food demand. Therefore, it is necessary to reconsider a new strategy to produce much faster without impact of climate change. We proposed ways and techniques that can help CAR in order to achieve change that address the various challenges. The agriculture based on research is the most effective way for sustainable development in CAR. To make this possible, it is important to use new technology in agriculture in CAR. We presented how the technology is necessary way to provide some concrete solution to the hunger in CAR. As agriculture has an impact on its economy CAR must provide sustainable solutions based on research and appropriate adapted to farmers in CAR, in order to deal with problems of hunger through it in the recent past decades. Some concrete example base one the agriculture sector in recent decades to illustrate our scope.

**Keywords:** Central African Republic, Sustainable agriculture, Food demand

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\* Corresponding author. E-mail address: [etomoro@yahoo.fr](mailto:etomoro@yahoo.fr)

## 1. Introduction

Located between  $2^{\circ} 13'-11^{\circ} 01'N$  and  $14^{\circ} 25'-27^{\circ} 27'E$ , Central African Republic (CAR) covers a land area of about 623,000 km<sup>2</sup> with 80% of arable land only nearly 19% about 536.6 million hectares is used for agriculture the United Nation Environment Program (UNEP) in 2008 (UNEP, 2008). However, it is a very poor country and even unable to feed its entire population with agricultural income it produces. In the period between 1990 and 1992, the number of undernourishment people was 1.5 million almost 50% of the population. And from 2001 to 2003, 1.6 million people go hungry which represent 44% of the population Nation Report on investment, Libya in 2008. According to Food Agriculture Organization (FAO) estimates, the renewable water resources in 2000 are estimated at 144.4 billion m<sup>3</sup>/year, while the total water withdrawal was only 25million m<sup>3</sup>/year. Only one million is used for agriculture (4% of total samples), 20 million for domestic use (80%) and 4 million for the industry (16%) Nation Report on investment, Libya.

Since the independence of CAR on August 13, 1960, the agriculture has been practiced by CAR's farmers for their survival with inefficient traditional techniques and tool (Dumont, 1966). CAR is facing a situation of food shortages since the 90's for many reasons, including a lack of adequate techniques to meet the challenges it faces.

The agriculture in the CAR was and is still based on smallholder food producer using artisanal techniques. With the climate change conditions and the rapid increase of the population, these traditional methods cannot meet the food needs anymore in CAR. Also many smallholders in the country don't know how to deal with the new challenge they face because of the lack of appropriate methods and materials.

New farming techniques based on research must be adopted to prevent this situation from becoming disastrous. To solve this problem, training must begin to employ new methods and research techniques. Why is the transition from artisanal agriculture to modern and sustainable agriculture essential to CAR?

In this paper, agricultural sector as well as strength in CAR was briefly introduced. Then the geographical position and its culture of food habits were first overviewed before explanation of importance of modern and sustainable agriculture. Finally, realistic solutions to not only food problems but also other problems in other sectors, such as gas, electricity of household and forest destruction, were proposed.

## 2. A very rich geocultural space with poor population

CAR is a landlocked country in central Africa, bordered with South- Sudan to the east, Cameroon to the west, Chad to the south and Congo and the Democratic Republic of Congo (DRC) to the north. The natural resources contain diamonds, uranium and gold. Oil and hydropower resources are other important potentials but untapped or at least not in the population interest up to now.

The tropical climate dominates most of the country with a wet season from May to December and a dry season from January to April. The south part bordered with DRC and Republic of Congo, the climate is similar to semi-tropical from *Carnot* to *Berberati* west (Kamalecka et al., 1980). The average annual temperature is

around 26° C. In Bangui, the capital city of CAR, the maximum temperature is around 38°C and minimum 15° C. The average rainfall is between 1000-1600 mm (Xushi and Xin, 2010).

In 2005 and 2006, the gross agriculture sector counts for 56% of GDP including 35% for cattle of the country (Ndomadji et al., 2003; Vondo, 1998). The main crops are Cassava; banana; maize; coffee; cotton and tobacco. The northwest and central regions represent a watershed for major agricultural crops of cotton and sugarcane. However, weak infrastructure and production support, which remains predominantly extensive, severely limited yields far behind those of neighboring countries. The isolation of the country remains a major handicap and river transport is vital for the economy.

Moreover, the geographical constraints, coupled with large variations (decrease) in international prices of these commodities, have turned in disadvantage of CAR farmers for these crops they could not sell on the market (Mbetid-Bessan, 2002).

Since 2003, there has been a massive return to simple food crops intended for domestic consumption and local levels. The progress of agriculture only benefits large farms; farmers without training still work traditionally, without mechanization. The production is low and quality is poor. Thus, it is remarkable that many orchards were the victims of bacteria and parasites which limit the quality of products.

The food habits of CAR remain focused on the consumption of cassava as a staple food with vegetables, beef and sometimes fish. Rice and other tubers such as potatoes, sweet potatoes, yams and taro are often added to balance with cassava, but their production remains low due to demand, and also to the difficulties of storage and facilities due to bad infrastructure (CARI, 1995).

### **3. Agriculture is a key to sustainable development in CAR**

Being healthy is essential to get strength for work, which means enough food is the basic requirement, and thus production is very important. The philosophy of the People's Republic of China is also to make enough food to meet the demand of its citizens and therefore seek for better development. China is an example of rapid development, which is unprecedented with this philosophy. It has the largest population of the world and had experienced terrible situations as the CAR, but its economy surprised the whole world today. Simply because it quickly realized that it must deal with the belly of its population and the only way to achieve this is to make effort to ensure that its agriculture is able to feed its population.

The appropriate question for CAR is: how other countries such as China do to deal with challenges and succeed to feed its people and assist other nations in the region and even in some countries around the world in such a short period? For example on rice paddy, according to the Food and Agriculture Organization statistics database crop producer ranking, China is at second position 189.81406 trillion tons in 2000 and 197.212010 trillion tons in 2010 and at first position 191.614672 trillion tons in 1990 (FAOSTAT, 2010).

We do believe one of the main issues is to move from the traditional agriculture to modern agriculture based on research using technology transfer. As we are in the 21st century, and then life is based on technology, if CAR doesn't use the new technology in most of the domain yet, but in agriculture it is very

urgent to act. There is a lot of existing technologies using in agriculture, if the country can find the way using international relationships with others countries in term to join strengths together against hunger in the world. For example the cooperation with those countries which already have agricultural technology such as in USA. CAR can at least pay attention and learn from others countries how to implement the new technologies in his system and try to imitate them by using those decision support materials, because CAR is one part of this world. China is one of the great food supplier is the world in the past few decades because China did try to focus on technology transfer in certain domain such as agriculture research.

As we are in 21st century, CAR has to update his agriculture into this century which needs competition and innovation. CAR does have agricultural human resources who have studied in everywhere in the world but doesn't have the research facilities in the country yet. That is why mostly, researchers cannot achieve a research project. CAR is among the last of the planet, simply because it remains a traditional agriculture system with very limited and archaic methods that do not work in this century.

The world saw the pace of research and innovation, while the CAR continues at axes, hoes and machetes when others do with tractors and agricultural machinery, laboratory research and analysis. CAR dares not speak of transformation, since according to the logic; it must produce and then transform result. CAR is aware of the technology needs money, however, that all depends on the financial capacities of the country but seeing how much minerals resources (Diamonds, uranium, timber, gold, oil ) CAR has and it is not understandable that why things are still staying so far behind in this country.

Having the wealth alone is not sufficient to achieve change but we need support from the CAR's government on agriculture management. To look for help from CAR's partners is good but the government has to ask for what farmers' need, not what is available to give them, which mean CAR's government should ask for efficient tools such as tractors and material. And when the CAR's partners assist the country, the government has to manage well and evaluate the result and the impact on the population daily life. For example, instead of continuing to accept donations such as axes, hoes and machetes, CAR can suggest his partner to improve these tools, which need a lot of physical energy without modern tools.

#### **4. Situation and problems in agriculture of CAR**

CAR's farm which had structured around the extended family, but now it is gradually losing the character and begins to show a correspondence between the entity and the nuclear family. This phenomenon is the result of segmentation that occurs commonly within the extended family to questions of ownership of factors of production and control of production and income. Accordingly, CAR encounters very small farm sizes 0.5 to 1.5 hectare with less than 3 farm assets using means working very rudimentary (PRASAC-CIRAD, p.317).

These farms are heavily dominated by practices that do not allow homeless to better promote such investment in labor. They are characterized by very low income level to allow an expansion of these farms. Unfortunately, these types of systems are most prevalent in CAR. Farmers in CAR don't combine crops production and livestock together. Farms integrating both agriculture and livestock are very few and are confined in the border areas of Chad and south, north-east Cameroon. The bystander effect in these areas

where animal traction is located can probably explain the observed situation in this part of CAR. According to FAOSTAT (Table1) the production of Yams is 435000MT; cassava is 678958 MT and maize is about 150000MT. These data represent the top production in CAR in 2010.

**Table1.** the CAR production in 2010. Source faostat: the top production

Commodity	Production (MT)
Yams	435000
Cassava	678958
Groundnuts	140000
Bananas	126000
Maize	150000
Rice	39000

CAR had some opportunities in past two decades to increase his crop production but it didn't take that chance. Because government in CAR must understand first of all that CAR's partners' give modern materials such as tractor to the farmers not to political leaders, their family and friends as it is the case in CAR.

Those tractors and machineries never arrived to right person who it belongs to. So CAR's partners have to make sure each time that they make decision to help farmers with new materials. That is very important because it is not sure that the material can be used in right way that they expect. We think that it is very important to evaluate the impact of using new technique and machinery every year on the field only on report is not enough but to measure the impact on population's improvement daily life, otherwise CAR cannot exit from the lack of food range and the population's suffer and poverty are not close to the end.

Now CAR faces the energy and infrastructure's problems. Only in the capital city can have electricity available 24hours a day, so farmers in the border of the capital city cannot sell out their product because they can't keep long some products which can get bad, there is not adequate storage facilities. Also mobile phone is one of the convenient ways to order products from firms, but the cell phone's batteries dead and it not easy to have batteries full charged that is handicap to farmers.

## 5. A new base for agriculture in CAR

Yet the initiatives to promote animal traction launched in the 60s objectives were to:

- Promote the integration of agriculture and livestock;
- Increase the size of operation and possibly diversify the choice of products possibly;
- Reduce the drudgery by using the plow and other machinery from tillage (harrow, hoe weeding, lifters and body scorers peanut);

- Unload youth and women from the drudgery of transport by the use of the cart;
- Promote the transfer of manure and soil on the parcels of park of culture and therefore achieve lower costs of acquiring fertilizers; offer the opportunity to increase revenues from the operation.

The extension of these technologies remains limited because of low farm incomes. It is more difficult by the absence of a credit system which can acquire the tools and the coupling of tension and the possibility to access the necessary man power for grubbing plots newly cleared. This helps to maintain the pattern of crop rotation, which reduces the area cultivated by farmers, increases the need for labor for crop maintenance and thereby reduce yields, not to mention bursts of families caused by the need to control the factors of production, products and income.

## 6. What prospects for agriculture research in CAR?

Given the problems of agricultural development in CAR as we have presented, it begs the question of what should be done to exploit rationally the agricultural area, improve the performance of farms, and increase - sustainable agricultural income significantly.

Beyond issues related to the economic environment of agricultural activities, for which answers must be found politically, three main areas of research can be retained for future action.

### 6.1. Improved performance of farms

Food politics are moving quickly. Food is increasingly understood as a sector with great potential for national and regional economic development, if only supply chains linking farmers to customers can include local processors and merchants (Friedmann, 2007). To develop models of farm development those reflect the types of operation and based on their objectives, their strategies and traceability of the products.

Setup the conditions for development of farms: transition to more advanced stage of development by promoting the development of animal traction, based on rural credit and improving the quality of technical supervision.

As CAR has only few Commercial Banks, it is important to joint farmer's strength by being in NGO's because there is nowhere to borrow enough money as long term credit to farmers to have big investment. So the only farmer's hope is to look forward to the support from the government. The government must take into account the promotion of firms in term of materials and the selling out or stock in good condition the products after production.

### 6.2. Integration of livestock in agriculture

- Develop models of transition from manual cultivation to animal traction which take more account of agrarian realities;
- Develop management models suitable for the farmers;

- Identify, analyze and understand the social practices that inhibit progress and individual success of farmers in different socio-cultural groups.

### 6.3. Towards a new approach for supporting producers

The management of family farms aboard now seems to be an interesting path to follow. In this perspective, it will:

- Reconsidering the extension method by integrating the management board as a basic tool for dialogue with technical and economic operators, using the scientific knowledge available, but above all by emphasis more on research;
- Promote dialogue with producers to identify their needs and expectations, to adjust the advice and financial support to provide them with loans or modern material work;
- Training of farmers in the management of their production and help them to implement to knowledge to the field, create an opportunity for them to have international exchange experiences with others farmers. In partnership with national agricultural development as the Central African Agricultural Development Agency (CADA) and the Central African Agricultural Research Institute (CARI), CAR farmers must be trained to make farming as a profession, because since so far is considered as agriculture of subsistence no as a business.

## 7. What efforts have done and what need to be improved?

Yet the government has initiated some priorities addressed to agriculture ministry department such as PAPA AV project CARI, 1996. Which were the support to small livestock breeding and cotton farm in *ouaka mbomou* and *basekotto*. More focus on research is something to encourage, and build laboratories for agriculture research need more scientists and materials so more money to invest.

Making decision to start some big projects such as build laboratories of research is important and the implementation of this kind of project needs time and more money. Now the focus should be on how to keep the laboratories working and how to evaluate the impact of the research on the population daily life.

We believe that if the government is really supporting the sustainable agriculture, CAR is going to see the real effect on every sector and even on security in the north part of the country because the population will have enough food to eat for everyone. And the main problem of security in CAR comes from hunger. Some few people can eat and enjoy, the huge number of the population cannot meet their needs in term food in daily life.

## 8. Inspiration to car agriculture development from china's and other countries modern agriculture

China already has faced hunger problem and struggled to solve it over last 3 decades, then they tried focusing on agro-research and finally succeed. CAR is facing difficulties that some people have faced before and it has

been solved according the situation and their own reality. So CAR doesn't need to innovate on the solution of these problems, but just to modify according to his own facts.

China's population is the biggest in the world but Chinese farmers only can feed this huge population and also can supply to abroad some food to support the world market need. The government finds his way to motivate farmers to produce more for the market. And award those who succeed by increasing their allowances. Each year every farmer has the objectives to meet and the government encourages researchers to create or ameliorate crops quality to increase the production yield.

The reasons for optimism regarding the potential of Civil Society Organizations (CSOs) to influence food systems have to do with the general political and social climate in Canada and the increasing urgency of responding to global environmental crises through sustainable agriculture, distribution, and consumption strategies (Koc et al., 2008). A powerful national sense of community persists. Despite the prevalence of a neo-liberal free market ideology in the public sphere, many of the more egalitarian traditions that flourished from the 1940s through the 1970s have endured. Support for Canada's universal and publicly funded medical system is unchallengeable, even by the extreme right. The same is true for basic standards of public education, public health, and public recreational facilities. Socially and environmentally, progressive and social democratic political parties fare well and often win elections in several areas where working people, farmers, and fishers form the majority, as has frequently been the case in Québec, Ontario, Manitoba, Saskatchewan, and British Columbia (Koc et al., 2008).

This indicates a favorable circumstance for CSOs, which best issues that are publicly perceived as socially, economically, nutritionally, and environmentally healthy.

## 9. Reasons of rapid development of agriculture in China and problems

For example in China every year, all universities and researcher all over China has to looking for the projects of sustainable development. In the 1990s, China's grain problem attracted worldwide attention, from politicians and scholars of developed and developing countries, inside China and abroad. The astonishing question "*Who Will Feed China?*" became well known following the publication of a book with that title by Lester R.,S.Z. Gu and Y. J. Zhang, 2002. In agriculture, researchers are getting more research projects because of the challenges are increasing every year. For example the cities are getting more space and infrastructures using more and more agriculture spaces so researchers are more oriented on greenhouses in big cities which mean need more investment and more research. The government subsidy in agriculture is increasing considerably this past decade and also the crop production is increasing. As Huang et al. (2000) reported in their working paper that "the food self-sufficiency is a main goal of China's Agricultural reforms". The Chinese government pointed out the governmental objectives for the economic growth and agricultural sustainability 2000 as shown in Table2.



**Table2.** The objectives met at 2000 (Source: FAO annex 3: Agriculture policy and Food security in China)

Commodity	Production(MT)
Grain	490-500
Cotton	4.5
Oil crop	25
Meats	58
Sugar crop	110
Aquatic product	32

These targets cannot be met without some strategies such as:

- Increasing the rate of regeneration of renewable resources, Regulating the exploitation of non-renewable resources,
- Providing input and output price incentives to increase the multiple cropping indexes.

But these strategies using to meet the targets are not without consequences especially in term of using amount of fertilizer. Former wants to meet these targets, so they also increase the amount of fertilizer they put in soil to increase yield. Doing that way brings environmental consequences such as bad quality of products; soil and water pollution.

## 10. Suggestions on agriculture development of CAR

CAR has always stuck to principle that agriculture is the foundation of the national economy, so CAR must give top priority to agriculture in national economic development. For example in Republic of Togo in West Africa, people already understand the necessity of moving from the artisanal agriculture to the modern agriculture based on research. They suggest that soil fertility management is indeed a major issue in this region and made decision based on the ideas of specialized scientists within the international institute, was that agriculture needed to be intensified in order to improve production; it was assumed that an increase in production would benefit farmers and reduce poverty and the focus on technology development rather than on rural development, which would have included development of infrastructure and markets. Such decisions can have major effects in on operationalizing project objectives. Problems, solutions and criteria for activities that were listed during the initial donor meeting had to be grounded in the demands of country partners in order to fit the specific context. The international institute therefore organized a meeting in-country with potential stakeholders, including the governmental research and extension organizations, the agricultural policy analysis organizations, and a NGO working on credit, to present the outcomes of the donor workshop and discuss the way forward. For example in Cameroon, Collective action involving group training

in production and storage facilities, negotiation abilities and group marketing, and aiming to improve smallholder benefits in the value chain have been used to improve market access and bargaining power of producers (Takoutsing et al., 2012). The decision to base the Project in the Central Region of Togo was based on the need to improve the rural credit scheme, which was the initial topic proposed by Suzanne et al. (2007).

## **11. Conclusion**

CAR can be sure that after decades of attempts to try and insistence in the old methods and techniques in the agricultural sector. According to all facts cited above, we believe that the only way left is to adopt a modern agriculture based on research to develop sustainable agriculture in CAR. Putting the agriculture sector into governmental high priorities assessments are not enough to change things, but CAR really needs to act quickly to avoid the hunger disaster in the coming decades. As it is well known that the hunger troubles are terrible, and also development and sustainable agriculture are linked with modernity in this 21<sup>st</sup> century. CAR is one needs modern way for his agriculture because this is one of the main economic sectors can promote the economic development of CAR. That is why it is urgent to professionalize the agriculture sector. To do so requires: training farmers and offer the better environment for an industrial agro-business. Not more time to waste, act quickly and efficiently with good decisions making tool to change the situation. Manage the agriculture and livestock as one sector, because they are liked and cannot be separated. Work with other scientists and CAR's partners in development together because as the hunger is the world concern. Work on the implementation in any research because ultimate goal of research is the implementation of solutions to the problems of farmers and ranchers. Researchers also need more communication with the producers to better understand their problems and needs, in order to transfer them into effective research protocols and implementation on the field. And finally, promote NGO's to help farmers putting their knowledge and work together, because together they can do better.

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## Abbreviations

CADA: Central African Agricultural Development Agency

CAR: Central African Republic

CARI: Central African Agronomic Research Institute

CIRAD: Agricultural Research for Development

CSO: Civil Society Organization

DRC: Democratic Republic of Congo

GDP: Gross Domestic Product

FAOSTAT: Food Agriculture Organization Statistics

PAPAAV: Project to support Agricultural Production and Village self-promotion

PRASAC: Pole Regional Applied Research of Agricultural Systems in Central Africa

UNEP: United Nation Environment Program

NGO: Non-Governmental Organization

WFP: World Food Program

MT: Million Ton