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Cotton Production And Food Security In Mankono North-central Côte D'ivoire

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Abstract: Arguing that food security is based on the complementarity of cotton and food crops, this study demonstrated synergy between cotton production and the major food crops in Mankono, located in the Central-Northern part of Côte d'Ivoire. However, it revealed the existence of a competition between the two types of culture based on the agricultural calendar and the availability of land. But it has established that in case of competition, farmers still opt for food crops in order to ensure their food needs.

Keyword: Food security, Cotton, Food crops, Côte d'Ivoire.

INTRODUCTION

Unlike all the farmers of the world and of Africa, those of Mankono, located in the Central-Northern part of Côte d'Ivoire,are facing today many challenges. Among these challenges we distinguish deforestation, loss of soil fertility, climate change and food insecurity. In the officials' discourse, the practice of export crops contributes to the abandonment of food crops and the emergence of food insecurity. In fact, farmers generally prefer to export crops which they consider more economically viable and abandon food crops.

This raises the problem of food insecurity in the areas of agricultural production. With cotton, a crop that holds enough time in the agricultural calendar, we expect significant food shortages. However, in our case, the situation is different because large areas of food crops are observed next to the cotton fields. Therefore, we are bound to seek the motivations of the farmers to produce in such a way. Another intention was to know the allocation of food production in terms of consumption and commercialization.
The data of this study have been collected in Mankono which produces 38% of the national cotton production and therefore, is the largest producer area of cotton in Côte d'Ivoire. By this performance, the impact of cotton production on food security has emerged as a result of this investigation.

STUDY AREA AND METHODOLOGY

Area of study

Located in West Africa, Cote d'Ivoire is bordered in the North by Mali and Burkina Faso, in the West by Guinea-Conakry and Liberia, in the East by Ghana and in the South by the Atlantic Ocean. Considering its economic performance, Côte d'Ivoire is one of the leading countries of West Africa sub-region. A the world's first producer of cocoa, the country is ranked fifth in terms of cotton production in Africa.

In fact, Cotton is the largest export crop and the dominant crop in the farming systems of the North of Côte d'Ivoire. The sub-sector of cotton in Côte d'Ivoire is often mentioned as a "success story" given the spectacular rise in the quantity of cotton production and the profile of the crop within the farming system (Ajayi & al, 2009).

Mankono, the area of study is located in the Northern-Central part of Côte d'Ivoire (figure 1).

Figure 1: Area of study in Côte d'Ivoire

The population is estimated to be about 210,000 and most of them live in rural areas. The climate is dry and an average annual rainfall ranges between 1,200 and 1,400 mm,

with one season of rain by year. In Mankono, cotton is the largest export crops and the dominant crop in the farming systems. The area is structured into multiples villages wich grow cotton and food crop.

METHODOLOGY

The quest for literary works was the starting point of this study. It involved consultation of various digital scientific publications on cotton production and food security.

Thereafter, a questionnaire and interview guides have been developed to collect quantitative and qualitative data. The questionnaire was meant for farmers and interview guides to traditional authorities. Before the actual survey, a pilot survey was conducted. This step was the presentation of the study to the administrative, technical and traditional authorities of the area of survey. This stage has been the occasion to identify the topic and the villages chosen for the survey.

The questionnaire survey was conducted in four villages of the department of Mankono. Among them are Hermankono, Soundougouba, Nambidougou and Tchatchatcha. These villages were selected among those whose main activity is cotton production. In the selection of villages, the non-probability sampling method was preferred. Indeed, these villages have allowed us to have the number of the surveyed farmers (table 1).

Table 1: Farmers surveyed in villages of Mankono

Village	Number of farmers surveyed
Hermankono	11
Soundougouba	15
Nambidougou	7
Tchatchatcha	24
Together	***57***

Source: Our surveys from January 2013

Overall, the survey has addressed 73% of farmers who were randomly chosen. For qualitative data collection, interview guides were used. The analysis and data processing were made from stata software.

RESULTS AND DISCUSSION

Synergy between cotton crop and food crop production

In the surveyed villages, the cotton is growing in crop rotation with food crops such as maize, rice and yam. The synergy between the two types of crops is based, first, on the system of cotton extension. This system takes into account the main food crops. The major objective of this system of supervision is to promote food security in the cotton growing areas while practicing cotton.

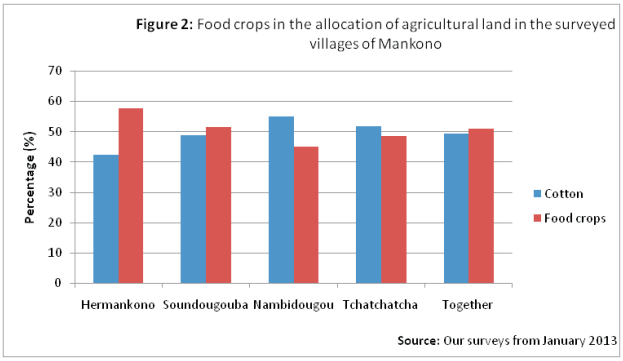
Then, surveys have shown that almost all the farmers use agricultural inputs of the cotton to produce food. Furthermore, in agricultural areas, food crops receive fertilizer residue left by the cotton. This supports the productivity of food crops. In this regard, Raymond & Fok (1995), studying the relationship between the development of cotton crops and food security in West Africa and Central countries, have revealed that the expansion of cotton in these areas had a very positive effect on the productivity of food crops. Indeed, the promotion of animal traction initially for cotton and food crops subsequently played a key role in this complementary relationship between cotton and food security. According to Raymond & Fok (1995), even though the manpower and the lands allocated to local commodity chains declined, the increase in productivity has helped to sustain food production.

Finally, the distribution of cultivated area is one expression of the synergy that exists between cotton production and the main food crops in the villages (table 2).

Table 2: Size (in hectares), comparison of the surfaces (in hectares) occupied by cotton and food crops in the surveyed villages of Mankono

		Hermankono	Soundougouba	Nambidougou	Tchatchatcha	***Together***
Cotton	Size	54	82	32.5	133	*301.5*
	Percentage	42.3	48.6	55.0	51.6	*49.2*
Maize	Size	35	44.25	11	62	*152.25*
	Percentage	27.4	26.3	18.6	24.0	*24.8*
Rice	Size	33	34.5	13.5	53	*134*
	Percentage	25.9	20.5	22.9	20.6	*21.8*
Yam	Size	5.5	7.75	2	9.5	*24.75*
	Percentage	4.4	4.6	3.5	3.8	*4.2*
Total	*Size*	*127.5*	*168.5*	*59*	*257.5*	*612.5*
	Percentage	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Our surveys from January 2013



Generally, we notice a slight domination (50.8%) of food crops in the allocation of agricultural land. This significant domination is observed in several villages, including Hermankono (57.7%) and Soundougouba (51.4%). A Nambidougou (55%) and Tchatchatcha (51.6%), cotton acreage takes precedence over those of food crops (figure 2). Whatever the dominant culture, farmers are able to ensure food security and cotton production is not a major obstacle. On the contrary, it is a source of development of major food crops such as maize, rice and yam.

The example of Mankono is a particular case. In fact, Ibrahim & al. (2009) in their study conducted in the North-Central Nigeria revealed that 58.9% of households suffer from food insecurity due to the allocation of land resources between export crops and food crops. What is more, this study has recommended that households should increase their production regarding cassava, yams and maize.

The results of our investigations have revealed that the average size of a cotton field per farmer as a whole is estimated to 5.28 hectares (table 3).

Table 3: Average size per farmer and crop in the surveyed villages of Mankono

	Hermankono	Soundougouba	Nambidougou	Tchatchatcha	***Together***
Cotton	4.9	5.46	4.64	5.54	*5.28*
Maize	3.18	2.95	1.57	2.58	*2,67*
Rice	3	2.3	1.92	2.2	*2.35*
Yam	0.5	0.51	0.28	0.39	*0.43*
Total	*11.59*	*11.23*	*8.42*	*10.72*	*10.74*

Source: Our surveys from January 2013

It was found that the average size of a cotton field per farmer is substantially the same in all villages. After cotton comes maize (2.67 hectares), rice (2.35 hectares) and finally yam (0.43 hectare). Based on these data, it appears that farmers have large farms of food crops that allow them to meet their food needs. The average size per farmer, when you consider all the crops is estimated at 10.74 hectares. This average changes significantly from one village to another. Example we have: Hermankono (11.59 hectares), Soundougouba (11.23 hectares), Tchatchatcha (10.72 hectares) and Nambidougou (8.42 hectares). The acreage averages hide disparities among farmers. Indeed, these inequalities emerge when the minimum and maximum surfaces are analyzed (table 4).

Table 4: Minimum and maximum surface of crops in the surveyed villages in Mankono

		Hermankono	Soundougouba	Nambidougou	Tchatchatcha	***Together***
Cotton	Minimum	2	1	1,5	1	*1.37*
	Maximum	15	13	8	14	*12.5*
Maize	Minimum	1.5	0.25	1	1	*0.94*
	Maximum	8	10	3	5	*6.5*
Rice	Minimum	1.5	1	1	0.25	*0.94*
	Maximum	7	5	4	4	*5*
Yam	Minimum	0.25	0.25	0.25	0.25	*0.25*
	Maximum	1	1	0.5	0.75	*0.81*
Total	*Minimum*	*1.31*	*0.62*	*0.94*	*0.62*	*0.87*
	Maximum	*7.75*	*7.25*	*3.87*	*5.94*	*6.2*

Source: Our surveys from January 2013

In the villages, the surfaces cultivated by farmers, taking into account all crops vary between 0.87 and 6.2 hectares (Table 4). These surfaces vary from one village to another; Hermankono (1.31 to 7.75 ha) Soundougouba (0.62 to 7.25 ha) Nambidougou (0.94 to 3.87 hectares) and Tchatchatcha (0. 62 to 5.94 hectares).

The analysis of area occupied by crops gave overall 1.37 hectares for smaller farms against 12.5 hectares for the largest size cotton farm. Our observation have revealed that the largest cotton farm (15 hectares) is located at Hermankono and the smaller ones (1 hectare) were identified at Soundougouba and Tchatchatcha.

After cotton, maize occupies an important place in the agricultural area. Indeed, as a whole, we have noticed that maize plots ranged from 0.94 to 6.5 hectares. In Soundougouba, some farmers cultivated 10 hectares of maize. Moreover, there were very small plots (0.25 hectare) of maize in Soundougouba. In the villages, rice fields are concentrated between 0.94 and 5 hectares. The largest exploitation (7 hectares) has been identified in Hermankono and the smaller (1 hectare) in Soundougouba and Nambidougou.

In agricultural areas, yam is marginal; its plots of land in general range between 0.25 and 0.81 hectares. This general trend is contradicted in Hermankono and Soundougouba. In these villages there were fields of yams having a size of one hectare. Based on these results, the presence of the cotton crop in the agricultural landscape has no significant negative impact on food crops and the environment. In opposition to this observation, the study of Kokoye & al. (2013), concerning the production of cotton in Benin, has showed that the cotton allows farmers to make a profit which they invest in the development of land. According to them, these investments expose the soil to the degradation and the final results are the food insecurity and the environmental damage.

In their area of study, Kokoye & al. (2013) did not deny the presence of certain food crops such as maize and sorghum that ensure household food security in rural areas. The synergy between cotton and food crops in terms of crop supervision, fertilizer use and plantings combine to make two types of essential production to achieve food security.
Cotton crop and food crop are both necessary for food security

Cotton production allows farmers to generate income in the surveyed villages (table 5).

Table 5: Cotton production and the incomes generated by the farmers in the surveyed villages of Mankono

	Production (in tons)	income generated (FCFA)	Average income (FCFA) per farmer
Hermankono	57.6	15,264,000	1,387,637
Soundougouba	96.5	25,572,500	1,704,834
Nambidougou	33	8,745,000	1,249,286
Tchatchatcha	155	41,075,000	1,711,459
Total	***342.1***	***90,656,500***	***1,590,465***

Source: Our surveys from January 2013

The incomes mobilized by farmers growing cotton are estimated in overall to 90,656,500 FCFA. On average, farmers have an annual income of 1,590,465 FCFA and a detailed analysis showed that the average income, taking into account the villages balance between 1,387,637 and 1,711,459 FCFA. These cotton incomes allow almost all farmers to finance food production. With the money they earn, they buy condiments and sometimes food in villages or urban markets.

According to our opinion survey in the villages, the cotton does not reduce the potential for food production. In addition, almost all farmers provide the food needs of their households which average number is estimated to 8 individuals. This average does not really vary from one village to another. This observation was also made by Fortucci (2002) when he revealed that in developing countries, the income generated by cotton contribute to household food security in rural areas. Through the contribution of currency based on exports, cotton cultivation contributes to the national economy. According to Fontan (2006), the use of cash crops allows States to generate foreign currency in order to repay debt and to finance imports. These cash crops are really important for fighting food insecurity and rural poverty.

In Mankono, the results showed a high food production. This food production is partly autoconsumed by farmers and their families (table 6 and figure 3).

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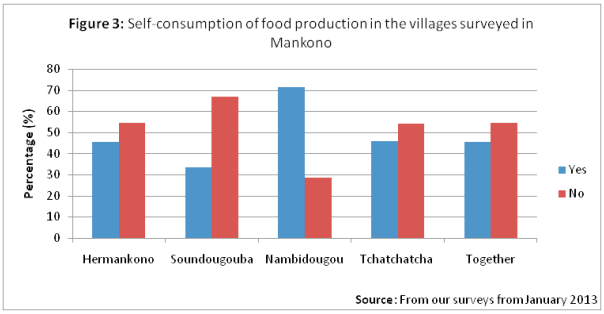
Table 6: Production of food (in tones) in the surveyed villages in Mankono

	Maize	Rice	Yam
Hermankono	49.1	40.8	23.75
Soundougouba	61.6	50.75	20.75
Nambidougou	13.25	20.5	0.78
Tchatchatcha	76	76.15	14.65
Total	***199.95***	***188.2***	***59.93***

Source: Our surveys from January 2013



In fact, 45.6% of farmers reported that they produce exclusively for home consumption. However, only a tiny proportion of food production is for sale. This part, which hardly exceeds 25% of food production, is for the local market. The coexistence of cotton and food crops contributes to food security, but the tradeoff between the two types of cultures leads to competition that farmers can overcome.

Competition between cotton crop and food crop production

Almost all the farmers claimed that the cotton is more profitable than food crops. However, the results revealed a competition between cotton and food crops in the villages. This competition exists at factors such as the agricultural calendar and the availability of lands (tables 7 and 8).

Table 7: Effect of time of cotton production on food production in the surveyed villages in Mankono

		Yes	No	*Together*
Hermankono	Number	8	3	*11*
	Percentage (%)	72.7	27.3	*100.0*
Soundougouba	Number	13	2	*15*
	Percentage (%)	86.7	13.3	*100.0*
Nambidougou	Number	5	2	*7*
	Percentage (%)	71.4	28.6	*100.0*
Tchatchatcha	Number	22	2	*24*
	Percentage (%)	91.7	8.3	*100.0*
Total	*Number*	***48***	***9***	***57***
	Percentage (%)	***82.2***	***17.8***	***100.0***

Source: Our surveys, January 2013

Table 8: Availability of lands for the cotton and food crops in the surveyed villages in Mankono

		Yes	No	*Together*
Hermankono	Number	11	0	*11*
	Percentage (%)	100.0	0.0	*100.0*
Soundougouba	Number	3	12	*15*
	Percentage (%)	20.0	80.0	*100.0*
Nambidougou	Number	1	6	*7*
	Percentage (%)	14.3	85.7	*100.0*
Tchatchatcha	Number	6	18	*24*
	Percentage (%)	25.0	75.0	*100.0*
Total	*Number*	***21***	***36***	***57***
	Percentage (%)	***36.8***	***63.2***	***100.0***

Source: Our surveys from January 2013

According to 82.2% of the farmers, the production of coon takes too much time, and therefore, impact on food production. In addition, the hardness of the activities required by cotton production and the coincidence of activities with food crops is a limiting factor. In addition, 63.2% of the farmers admitted that they do not have enough land resources for cotton and food crops. With this family agriculture that requires abundant workforce, substantially all farmers opt for food crops in case of coincidence with the cotton.

The competition between cotton production and food crops was formerly observed in Southern Tchad (Geraud, 2000). According to him, the introduction of the cotton crop has weakened cropping systems and especially the organization of society. This weakening was based on the profitability of cotton production that has resulted in individualism and the neglect of cereals. This study also showed that cotton is in competition with food crops in the cropping system. In addition, it contributes to the impoverishment of the soil and the monopolization of the workforce. As noticed in our study, the competition between cotton production and food crops is valid at key times in the agricultural calendar.

In his conclusion, Geraud (2000) showed that cotton cultivation has led today to a general modernization of agriculture. This modernization is based on the improvement of the cultivation techniques, the use of agricultural inputs, the animal traction and the increasing of food availability. But this complementarity between the cotton crop and food crops is not evident in Tchad. Indeed, cotton is the only source of currency for the State and the only way for farmers to obtain cash income. This cash crop remains essential in the culture system.

This economic context is different from that of Côte d'Ivoire where other export crops, including cocoa, coffee, palm oil, rubber plantations and cashew, allow entry of foreign currency for the State and mobilization of income for farmers. Thus, the causes of food insecurity in the villages of Mankono are elsewhere and can be summarized as political instability, poverty, environmental degradation, climate change and the unavailability of lands.

In fact, many studies have highlighted the causes of food insecurity. Smith & al. (2000) argued that the inability of people to have access to food is based on multiple causes including political instability and poverty. For Babatunde & al. (2007), poverty increases food insecurity in the world. According to them, it has devastating effects in developing

countries. Thompson & al. (2010) estimated that climate change has a negative impact on food security because it causes regression of food production, land degradation and increasing prices. The issue of availability of land has been addressed by Fontan (2006) which revealed that export crops are often charged of taking the place of food crops. In this sense they are the cause of the context of food insecurity in rural areas.

To face food insecurity in developing countries, particularly in Africa, some studies suggest a green revolution supported by social and economic measures as well as the political willing (Sasson, 2012). He also thinks that the green revolution in Africa is based on international donors who must fulfill their commitment to help African farmers and rural communities by protecting them against unfair trade competition and the dumping of cheap agricultural food products from abroad.

This green revolution is supported by Norman (2012). But he wants it to be done with technologies that are less dependent on resources that become relatively rare, such as arable land and water or too expensive, such as energy and petrochemical inputs. In short, he wants a biological agriculture that relies on endogenous potential and reduces the dependence of farmers towards external inputs.

CONCLUSION

In the area of study , there is a synergy between cotton production and food production. This synergy is based on the system of agricultural extension, the use of fertilizer for cotton to produce food crops and the equitable distribution of area planted between cotton and food crops. This synergy has shown that cotton production and food crops are both essential to ensure food security in the villages. Moreover, the coincidence of activities related to agricultural calendar and the availability of land is a source of competition between cotton production and food crops. Despite this competition, which is also controlled by the farmers, the study recommends the cohabitation between cotton production and the major food crops such as maize, rice and yam. Promoting the development of multi-activity in rural areas is the objective of the cohabitation between cotton production and food crops.

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