

Diagnostic study of obstacles related to the production of Cajou Nuts in the Odienne Region in the North of the Cote D'Ivoire

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Abstract

The cultivation of cashew nuts is now rapidly developing in Côte d'Ivoire precisely in the great Center and North of the country. It has become one of the flagship cultures that the peasants cannot do without. Introduced into the Ivorian agriculture from 1959-1960, the cashew tree industry has produced a progressive increase in production in recent years at the national level, ranging from 500,000 tons in 2013 to 700,000 tons in 2015. The sub-Prefecture of Odienné occupies a dominant position with a growing production of 33,006 tons in 2015. However in the process of production, the farmers encounter many problems. Indeed, the use of the rudimentary tools added to the repetitive conflicts existing between breeders and farmers still make this environment hostile to the practice of this cash crop. The objective of the study was to analyze the obstacles that the farmers encounter in the process of the culture of the cashew tree in the sub-prefecture of Odienné and to envisage effective strategies of production. The study is subdivided into three axes. The first axis presents the methodological framework of the research, the second deals with the results and the third makes the recommendations.

Keywords: Producers, pathogens, cashews, orchards, constraints.

Introduction

Côte d'Ivoire has developed cash crops in the savannah areas. These include crops such as cashew and cotton. This diversification of agricultural products in rural Côte d'Ivoire is one of the main strategies adopted by farmers to cope with food and agro-ecological constraints (Tuo, 2007). Indeed, the first plantations of cashew nuts were introduced in the north as plant cover to slow the advance of the desert in the early years of 1959-60 by two state-owned companies: Technical Assistance Company for Modernization of Agriculture in Côte d'Ivoire (SATMACI) and Forest Development Company (SODEFOR) (Gouma, 2003).

In 1972, noting that the economic function took over the ecological function, SODEFOR then transformed forest plantations in fruit plantations for the production and sale of cashews (Guma, 2003). The cashew nut industry has grown rapidly and prodigiously in the north of the country and more precisely in the sub-prefecture of Odienné, which generates a progressive increase in production in the last three years. However, we ask ourselves: Why, despite this progression in production, are the peasants still working in precarious situations?

In this context, it is important to question the growth of this activity which appears as a potential source of wealth for the populations and above all to analyze the constraints it faces in order to make recommendations.

It is in this perspective that this study aims to identify and analyze the obstacles that the peasants of the sub-prefecture of Odienné face in the culture of the cashew nut.

Methodology

Located in northern Côte d'Ivoire, the sub-prefecture of Odienné comprises eighteen (18) localities (villages). For this study, the choice of villages first focused on the criterion of size and distance. Thus, we randomly selected the localities located between 1 and 30 km at the most, distant from the city in order to solve the constraints of means of displacement, with regard to the spacing of the localities and the state of the tracks. Thus, we have obtained ten (05) localities (Odienné, Odienné-sienso, Néguela, Koudougou, Kotouba), in which we were able to investigate 54 producers using the probabilistic sampling method, more precisely the random sampling method.

Therefore, the study favored a combination of techniques and methods in the collection and processing of data collected in the field, including the questionnaire and interview guide that were mobilized to gather information. The questionnaire developed includes both quantitative and qualitative variables in order to identify the production techniques of cashew nuts and their impact on the peasants who produce the cashew nuts. As far as the maintenance guide is concerned, it is addressed to the management structures and cooperatives involved in the cashew sector in order to obtain some useful information for a better understanding of the sector. The information sought through the various questions made it possible to identify the functioning of the sector. This information relates to the roles played by the structures involved, the marketing of cashew nuts, the management of the sector, the activities carried out and those being carried out, the impact of cashew cultivation on the Producers.

The combination of all these methods has been useful in identifying major trends in numbers, percentages, averages, and the crossing of variables to test their independence. The presentation of the results in this form allowed for a quantitative analysis and the qualitative analysis is based on the interpretation of the

answers, the explanation of the behaviour of the producers and those responsible for the management of the sector.

Results and Discussion

Characteristics of the cashew tree

a- History

The cashew tree is a tree originating in the Caribbean and northeastern Brazil. It is now widely cultivated in all tropical areas, as in Africa, the West Indies, Asia and India. It was introduced in Côte d'Ivoire between 1959 and 1960, more precisely in the north of the country, with the intention of slowing down the desert by its forest character and serving as a hedge (tree fence) in plantations north. Today, it has become the main cash crop in the north of the country. Thanks to its economic character (the marketing and high demand of nuts on the national and international market as well as the valuation of the apple of cashew "false fruit", the apple is called false fruit because it is the magnification of the fleshy peduncle, as to the true fruit it is the magnification of the pistil) and covers almost the whole region of the North and the center half of the country. To this day, the cashew tree has become one of the country's flagship crops, which the peasants of the North cannot do without.

b- Description of the cashew tree

The cashew tree is a tree of the Anacardiaceae family with a rotating root, the fruiting of which occurs in two stages: the cashew nut which first grows progressively from the peduncle into a fleshy false fruit called cashew apple. The plant has a vegetative cycle that ranges from 20 to 30 years on average and reaches full bloom from the seventh year onwards. The first harvest begins in the third year when the cashew orchard is well maintained. When the tree is old, it exudes (drops) a gum and becomes unproductive. The different parts, fruits and flowers of cashew tree are shown in figure 1 below (Anonymous, 2004).



Figure 1: Overview of the fruit and the flower of the cashew tree (source ANADER, 2016)

c. Ecology

The cashew tree is a rustic species that tolerates a wide range of variation. Climatically, it is found on a wide variety of tropical and subtropical sites between latitudes 27 ° N and 28 ° S (TANDJIEKPON, 2005). It adapts well to arid and semi-arid zones with a drought period of between 4 and 6 months, and develops under a rainfall ranging from 500 to 3700 mm (LOUPPE et al., 2003; TANDJIEKPON, 2005). It is also a species that tolerates wide variations in temperature, the average being between 22 ° C and 35 ° C. The cashew tree adapts to diversified soil types (friable soils (sand, gravel, even scree). However, it thrives on light, drained, deep and fertile soils (LOUPPE et al, 2003). It does not support superficial cuirasses (hard soils) or floodplains in low-lying areas. It is a small tree that reaches a maximum height of 15 m except the dwarf hybrid varieties originating in Brazil which have an average height of 2,5m. As for the trunk of the cashew tree, it is short and rarely straight. The bark is gray, rough. The branches are very tormented. The crown (the extremity of the tree), which is always green, is regular and hemispherical; it can extend laterally up to ten meters from the trunk in very old trees. The inflorescence is a cyme (inflorescence formed of a main axis) terminal of small male flowers or hermaphrodite pentamerous, greenish to purplish. The cashew nut is an akene in the form of a kidney of 3 to 5 cm long. It is suspended from a false fruit. The edible cashew apple is the hypertrophied, fleshy and juicy stalk. The fruit contains a single seed "almond cashew".

Emergence of conflicts in the production zones of cashew nuts

Cashew production now covers the whole of the north, half of the central and eastern parts of the country. This crop relies on a multitude of small producers operating in a dozen regions (Bafing, Denguélé, Haut-Sassandra, Lacs, Marahoué, Moyen-Comoé, Nzi-Comoé, Savanes, Bandama Valley, Worodougou and Zanzan). In these regions, the departments of Korhogo, Ferkessedougou, Bouna, Boundiali, Mankono, Séguéla, Odienné, Dabakala, Katiola, Bondoukou and Tanda are major production areas. The campaign starts in February and ends in June of the current year (ie 5 months). Denguéle is the region most covered by the cashew tree crop with a 14.9% area occupied in 2001. Today, the area occupied by the cashew cultivation in Côte d'Ivoire has increased from 750,000 Hectares in 2007 to more than 1,500,000 hectares in 2013, more than 3.5% of the country's surface area. The area is only increasing from year to year, estimated on average between 3000 and 4000 hectares each year (Ministry of Agriculture, 2014). However, it should be noted that this favorable area for the production of cashew nuts is also an area par excellence for breeding with transhumance practices. Thus, in addition to conflicts between farmers and herders, these departments are confronted with land conflicts between farmers and even between neighboring villages, linked to the extension of fields.

Indeed for several years the producers of cashew are confronted with real problems of conflict between breeders and producers, so that this situation can lead in the long run to the war. Indeed, the dry season represents not only the harvesting period for cashew nuts, but also the period during which it is difficult to find fresh grass for the animals. During this period the peasants being occupied, the animals are no longer monitored, they are left to their own devices. These animals sometimes spend the whole day in unfenced orchards in search of the cashew apple. Unable to detach the apple from the nut, the animals swallow the seeds. After having defecated in pastures, some breeders find themselves on the markets with bags of cashew nuts without being neither producers nor owner of orchard. This situation causes a lot of damage to some producers who lose a lot of their nuts, and finally they find themselves with less money at the end of the campaign. This result is consistent with that of TUO G. (2007) in his study on "Analysis of the cashew nut sector in Côte d'Ivoire: strategies for development and poverty reduction", which considers that breeders consciously free their animals because the cashew apple is very loved by these and even very nourishing for them. In addition to this nutritional benefit for animals, breeders derive a financial profit from cashew nuts after defecation of the latter. This is not to the taste of producers.

Cashew tree plantation and production

a. Cashew tree materials

The current variety comes from Brazil since the years 59-60. Until now, there are still no varieties selected in Côte d'Ivoire, research is ongoing by the National Center for Research in Agronomy (CNRA). In order to obtain the planting material, producers identify in the orchards the vigorous trees producing abundantly, they gather under these trees, between February and June, period of production, large nuts, well filled and they dry them in the shade during 7 to 10 days.

b. land preparation

For the choice of the ground, it is advised not to plant the cashew tree at an altitude of more than 600 meters. With regard to soil type, the tree can grow on poor soils, but it grows better on fertile soils. He cannot stand the flood. The cashew tree prefers deep and well-drained soils (especially if rainfall is important). In addition, cashew trees should not be planted on superficial breastplates, clay soils, hydrophobic soils and shallows. It supports both gravelly soils (CNRA, 2008). As far as the preparation of the ground is concerned, according to the CNRA, it is advisable to start the preparation of the ground 2 to 3 months before the planting in the field. To do this, you must manually or mechanically clear the land and burn the giblets if necessary. After the plot has been cleaned, picketing is carried out at the chosen density. Then, holes of 50 cm in diameter and 80 cm deep are made by separating the earth from the surface of the earth below. Thereafter, the holes are left open for

at least 15 days for good aeration. Afterwards, the surface soil has to be filled with the manure consisting of 500 g of tricalcium phosphate, 500 g of dolomite and 5 to 10 kg of manure or cow dung or 500 g of poultry droppings, and 1 At 2 months for the decomposition of the organic fertilizer before the planting of the plants. Finally, mounds of 20 to 30 cm high should be constructed at the site of the holes, and light troughs should be constructed around them to recover surface water and encourage their infiltration (CNRA, 2008).

c. cashew tree plantation

Two main methods exist in the establishment of cashew plantations: the direct seeding method and the use of nurseries. Traditional planting techniques (nursery use) account for 16.39% and direct seeding of two to three seeds per site is the most commonly used and occupies 74.59% (TANDJIEKPON, 2005). For crop production purposes, crowns (the branches borne by the stem of a tree) must be free at a density of not more than 100 feet per hectare of large cashew trees (not more than 15 m

high), that is the case of the current Ivorian orchards or a spacing of 10m x 10m. The density of 69 feet per hectare is also sometimes used, ie a spacing of 12 mx 12 m. For dwarf cashews (2.5 m height), the density of 204 feet per hectare is used, ie a spacing of 7 m X 7 m. This fruit production can, however, be associated with annual crop production giving rise to an agroforestry type system, combining perennial and annual crops. This is the case for most producers when the plants are still young in order to enhance the area colonized by the plants when they hear their productions. In addition to fruit production, cashew is also used as a hedge of protection or delimitation of plots. In this context, the seeds are sown in line with a gap of about 50 cm, so as not to leave space for the introduction of the pest and also to attenuate the impact of the wind on the cultivated plot. The tree is also used for green firewalls because of its ability to cover the soil perfectly and to prevent the development of herbs and the fire because of its foliage that falls to the ground. In this case the tree is planted at a distance of 4m x 4m. Current young Ivorian orchards and adults are shown in Figure 2 and 3 below



Figure 2: Young orchard (6 years) of spacer cashew 10m x 10m (Investigation, 2016)



Figure 3: Orchard adult (21 years) of spacing cashew 10m x 10m (Investigation, 2016)

d. Cashew tree fertilization

The plot is cleaned on several levels, but there are two important levels: cleaning (weeding) the plot and fertilizer. Cleaning is done 2 to 3 times a year for the first two years and 1 to 2 times from the third year. As far as

fertilizer, there are two types of fertilizers that are organic and chemical fertilizer. The addition of fertilizer also promotes a harmonious development of the tree. For manure fertilizer, the fertilizer should be spread over the canopy about 1 m wide:

- The first year: 200 g of NPK 11-22-16 or 400 g of NPK 10-18-18 per plant,
- The second year: 600 g of NPK 11-22-16 or 800 g of NPK 10-18-18 per plant.

The intake is carried out at one time when the rains are well established or in two stages, at the beginning and

towards the end of the rainy season. It is not advisable to bring manure on rainy days, which would lead to the leaching of the fertilizer (CNRA, 2008). Currently, in terms of crop protection, pesticides are not commonly used on cashew in Côte d'Ivoire. In case of disease or pest, it is recommended to consult the CNRA or the Council of Cotton and Cashew (CCA)

Table 1: Cashew tree distribution

Cashew tree locations from the city(km)	Cashew tree age (years)	Cashew tree plantation (Ha)	Cashew tree density (tree/Ha)
0-5	04	440	07,01 %
6-10	05	550	08,77 %
11-15	06	660	10,52 %
16-20	07	770	12,28 %
21-25	10	1100	17,54 %
26-30	25	2750	43,85 %

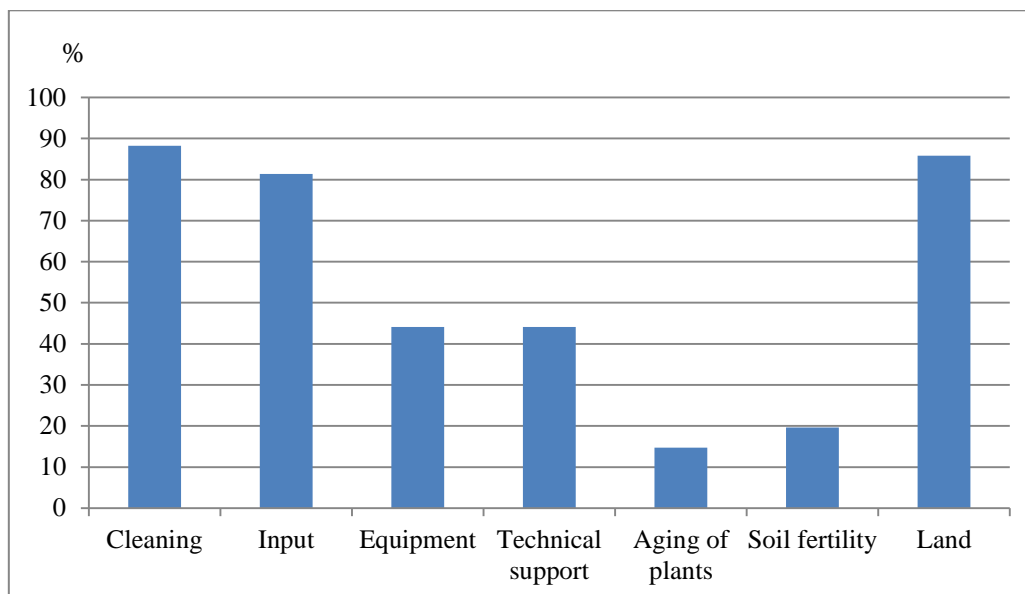
e. Cashew tree Production

The various constraints related to the production of cashew in the localities of study are summarized in the

graph 1 below. They relate to the context or situation of the moment.

Table 2: Cashew tree Production

Cashew tree locations from the city(km)	Cashew tree age (years)	Cashew tree production (kg/year)	Type of treatment for Cashew tree
0-5	04	60	fertilizer and insecticide
6-10	05	150	fertilizer and insecticide
11-15	06	220	fertilizer and insecticide
16-20	07	300	fertilizer and insecticide
21-25	10	700	fertilizer and insecticide
26-30	25	1000	fertilizer and insecticide



Graph 1: Different constraints related to the cultivation of cashew

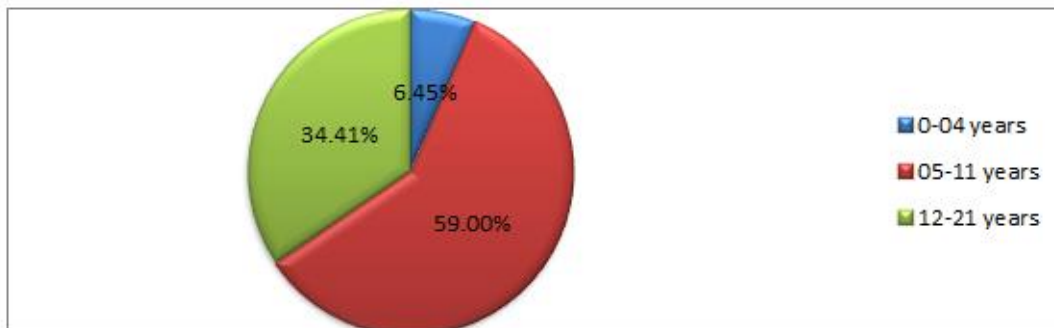
The survey shows that several constraints are related to the production of cashew nuts. Among the constraints mentioned by the surveyed producers were lack of cleaning (88.23%), lack of input (81.37%), lack of

equipment (44.11%), lack of technical support (44.11%), aging of the plants (14.7%), fertility of the soil (19.6%) and lack of land (85.78%).

In addition to these, cashew producers use very few inputs (fertilizers and pesticides) in orchards. Pesticides are preferred over fertilizers whose use is virtually absent, whatever their nature. This could be explained by the high cost of inputs. There is also the cost of labor which is a brake. The work of LUNDY.P. (2010) on "Agricultural sectors in Gros-Morne: diagnosis and analysis of the situation of agricultural producers" shows that most mango orchards also suffer from a lack of

cleaning. Nevertheless, producers are taking advantage of this situation at the time of the campaign. However, it can be seen that young cashew trees benefit from fertilizers only when they are in combination with annual crops, including cotton and maize.

Graph 2 below shows the distribution of orchards in survey areas by age

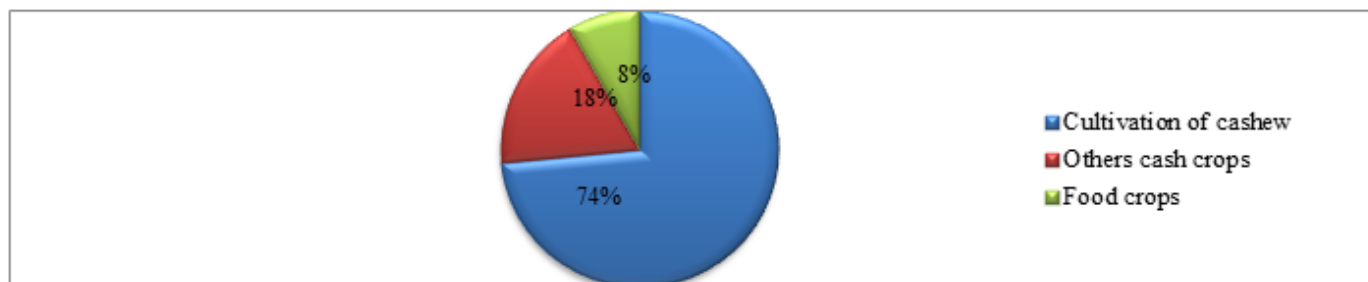


Graph 2: Distribution of orchards according to their age

Considering the age variable, orchards are distributed as follows: 6.45% of orchards are between 0-04 years old; 59% of the orchards are between the ages of 05-11

years and 34.41% of the orchards have an age between 12-21 years. This distribution makes it possible to estimate the old age of the orchards.

Graph 3 below shows the distribution of arable land for producers.



Graph 3: Distribution of arable land by different crops

The results of the survey show that the cultivable areas of the producers are mainly occupied by the cashew tree crop, ie 74% of the space available to it. A small part is devoted to food crops (8% of its area) and the rest of the land is occupied by other cash crops (cotton and mango), or 18%. This shows that the area reserved for food crops is becoming increasingly scarce and constitutes a permanent danger (famine) for these populations for years to come.

This result is contrary to the report by KHUMBANYIWA.G, DOSSO.H and KASALU-COFFIN.E (1996) in their study entitled "cashew in the production system at the farmer level: an approach to economic profitability and management terroir ". The latter report that arable land in Ghana is mostly occupied by other crops (54%) and fallow (27%), compared with only a minority of arable land occupied by the cashew tree crop (19%). This difference in results can be explained by the difference between climatic and environmental conditions. This may also depend on other physical factors and soil conditions, lack of control over the technical route and a regular rainy season.

The different types of pathogens in the production of cashew nuts

There are several pathogens that attack the cashew tree; the most common in the cashew cultivation are powdery mildew and anthracnose.

f. Pest and disease

Powdery mildew

They are champions who attack the plants by their leaves and bringing out symptoms like dots with white spots on the leaves and the fruits are destroyed, hence its other name of "white miller." The powdery mildew generates desiccation and death of the plant. The favorable conditions for these diseases are that the attacks occur especially at the end of the season at the altitude of the freshness and the humidity which causes the proliferation of greasy plants (D. Blancard, 2013). Powdery mildew alone can result in yield losses of 70 to 100% (sijaona, 2001). Powdery mildew is controlled by

sulfur if the disease persists. However, it is advisable to consult CNRA for solutions.

Anthracnose

They are champions who attack plants by its leaves and apples. The most noticeable symptoms appear on the leaves with gray necrotic spots with regular contours that can form large beaches encompassing ribs on the apples of brown crevice beaches which blacken and then lead to rotting of the fruit. These attacks occur during the period of freshness and humidity and cause a drop in production of about 40% (Topper, 2002). Research is ongoing on the fight against the disease; currently in the presence of these diseases it is advisable to consult CNRA.

g. Pest Control Agents

There are several types of pests that attack the cashew tree, the most encountered in Côte d'Ivoire are: drillers of stalks, Suckers-suckers including Helopel, caterpillars of Lepidoptera.

Stem borers

These are insects that exhibit symptoms of galleries dug inside branches and trunks. They have a negative impact on cashew yield (yield reduction). There are two levels of fight against this scourge. At the level of the mechanical control, it is advisable to cut the branches very attacked and to burn them systematically. At the level of chemical control, pesticides do not exist at present; in the presence of pests it is advisable to consult CNRA for the taking of solutions.

f. The biting-suckers of which Helopel

It is the insects that attack the cashew tree by the bites on the young leaves, on the flowers and fruits in formation. This causes the young leaves, flowers and fruits to dry out on the tree. At the level of the struggle, there is no mechanical control. For chemical control, it is advisable to consult CNRA.

The caterpillars that attack the cashew tree by the destruction of flowers and fruits. There is no mechanical control. At the level of chemical control, research is underway to make pesticides available to producers to control these pests. At present, in case of presence of these pests, it is advisable to consult CNRA, structure par excellence of the research in this field.

h. Cashew tree Harvesting

The fruit falls from the tree when the apple has reached full maturity and has taken on the characteristic red, purple, orange or yellow color, depending on the variety. Pick-up of nuts should be done under the tree (on the ground) every day or every day to protect them from soil pests, insects or livestock ingestion. When the apple is also to be valued, it should not be picked up on the ground. In this case, it must wait until it is ripe on the tree. Then you have to detach the fruit from the tree by a

small shake and separate the apple from the nut by a simple twist. Under the best conditions (good soil and good maintenance), according to CNRA, the following yields can be obtained:

- 60 kg of nuts per hectare in the 3rd year,
- 150 kilograms of nuts per hectare in the 4th year,
- 220 kg of nuts per hectare in the 5th year,
- 300 kilograms of nuts per hectare in the 6th year,
- 700 kilograms of nuts per hectare in the 7th year, and
- 1000 kg of nuts per hectare in the 10th year.

From 20 years, maximum yields are obtained (1500 to 2000 kg of nuts per hectare); after 25-30 years production starts to fall (Anonymous, 2008).

Brief, the use of rudimentary tools for the production of cashew nut added to the harmful actions of harmful pathogens constitute real barriers to the culture of cashew in the region of Odienné. Since they do not have the necessary means to fight effectively against these ravaging animals, the peasants remain helpless. This makes them even more fragile in the process of producing cashew nuts in this locality.

I. The cashew market

The cashew market is a commercial space for meeting the demand for cashew nuts. This market is characterized mainly by a strong variation of prices during the year especially at the level of the producers. It is also characterized by the annual breeding cycle of cashew nuts marked by a shift in the harvest period between countries in the northern hemisphere and those in the southern hemisphere. Indeed, the countries of the southern hemisphere (Brazil, Kenya, Indonesia, Mozambique) with 20% of the world supply mainly produce between September and December, while 80% of the world supply is produced between February and June by The northern hemisphere in which Côte d'Ivoire is located (RICAU, 2013). The availability of the nut for the year is therefore determined by this last hemisphere. The actors involved in the cashew market are multiple (independent producers or grouped into cooperatives, buyers, sellers). Some are looking for customers for sale while others are looking for partners to purchase. In terms of purchasing, the market remains heavily influenced by India (1,350,000 tons), Vietnam (850,000 tons), and Brazil (250,000 tons) (RICAU, 2013), which are the main demand for nuts for the functioning of their agri-food industries. It should be noted that in the functioning of this market, the important phenomenon of shoddy buyers who buy products in poor condition and below the price of the price (350 FCFA) set by the State.

At this level, survey data reveal that producers prefer to sell their products to trackers than to cooperatives because trackers are always in contact with them and facilitate their task. In fact, for the cleaning of the cashew plots, they give them inputs and loans when they need them, and in the countryside they buy cashew nuts from producers. While cooperatives not only do not intervene for cleaning but buy the product first by credit.

This action by trackers impedes the application of prices fixed by the State on the ground.

j. Cashew tree production improvement

In the light of this analysis, this far from exhaustive study of the following cashew tree production improvement is made with regard to ANADER, the Cotton and Cashew Council (CCA), the State and the producers.

At the site of ANADER

ANADER as a support structure for agricultural development must:

- Train producers on good agricultural practice in order to improve their yields;
- Provide producers with new varieties of seed in order to improve their yield;
- Strengthen the capacity of producers on crop management techniques in order not only to make a good campaign but also to improve their conditions and living environment;
- Sensitize producers on the integrated crop mix in order to maintain food security.

To the Council of Cotton and the Cashew (CCA)

The Cotton and Cashew Council, the management structure of the sector must:

- Provide producers with specific plant protection products to control diseases and pests that attack cashew nuts;
- Bring buyers into line with the state-imposed field prices;
- Sensitize producers on the importance of bundling;
- Encourage cashew producers to join cooperatives to secure the marketing of nuts. This form of organization can better protect them and improve living conditions;

At the location of the Producers

Producers who are the beneficiaries must:

- Practice the advice given by ANADER on the management of the plot;
- Make firewalls to avoid bush fires in dry season fruiting period;
- Let the fruit fall off of themselves before picking them up for quality nuts.
- Practice the combination of cultures to avoid food inadequacy;

At the place of the State

The State in its role as regulator of the sector must:

- Find solutions to fight the different conflicts that arise between cashew growers and herders;
- Promote the culture of cashew nuts, which play a very important role in the economic and social equilibrium of farmers. This would be an opportunity for non-graduate students to invest in agriculture, notably the cashew tree industry;

→ Support farmers in commercialization with the aim of protecting them and improving income.

→ Facilitate the mechanism for granting loans to financial institutions for producers. These loans will enable farmers to acquire inputs and other land-based maintenance or cultivable plots to improve crop yields.

Conclusion and Recommendation

The cultivation of cashew nuts and other perennial crops has become the main cash crop in the savanna region of Côte d'Ivoire. Again called "brown gold" cashew represents a hope for the populations of the far north. The country is the world leader in cashew production in 2015 with a production of 700,000 tons. This is why the Ivorian government in its agricultural policy puts a special emphasis on the development of the sector which contributes to 8.8% GDP of the country. It is with this in mind that the Government is making considerable efforts by setting up management structures for the promotion of this sector.

However, despite these efforts, much remains to be done. The results of the study show that farmers' strong motivation for the cultivation of cashew nuts remains hampered today by major problems in terms of occupancy of arable land and the scarcity of arable land for other crops And food (food). This situation may lead to a brake on food security (food self-sufficiency). Moreover, cashew producers are also confronted with a real conflict between breeders and producers, which often lead to loss of life.

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