

Research Article

PROFITABILITY OF THE CASSAVA PRODUCTION AND PACKAGING SYSTEM IN THE DEPARTMENT OF TIVAOUANE, SENEGAL

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ABSTRACT

Cassava plays a major role in improving the food security of populations and reducing poverty in rural areas. Despite its importance, its production in Senegal remains low compared to other African countries. Nowadays, it faces many constraints. It is in this context that a study was carried out on the cassava production system in the Thiès region "cassava granary". It was carried out in eight municipalities located in the department of Tivaouane with some located in the agro-ecological zone of Niayes and the others in that of the north-central peanut basin. Surveys were carried out among the largest cassava producers in these communes. The analysis of the results showed that cassava is only cultivated in the rainy season with the same cultural practices that have remained for years. Of the five varieties listed by the president of the Interprofession Cassava of Senegal, only four are cultivated in the areas surveyed. The Terrasse (43%) and Kombo (36%) varieties are more cultivated by our contacts in the Niayes area. Soya (75%) and Wallet "Parydiey" (20% of our sample) dominate in the north-central peanut basin.

Keywords: cassava, food security, varieties.

INTRODUCTION

In 2018, nearly 280 million tones of cassava were produced across the world on an approximate area of 24.6 million ha, making the plant the 4th largest crop production after rice, wheat and corn. Africa represents 60% of this global total (FAOSTAT, 2019). Cassava production plays a key role in food security, a current challenge for all Sahel countries. In Senegal for example, the government, by Ministerial Order – No. 5737 MAEH of 07/09/2004, had established a Special Program for the Recovery of the Cassava Sector in Senegal (PSRFMS). Indeed, the objective of this was to help stimulate the economy but also to increase the income of actors. Cassava is not one of the main crops, but occupies a relatively important place in agricultural activities since it accounts for 25% of total vegetable production [1]. It was cultivated well before independence and is increasingly expanding into agro-ecological zones. In 2008 (a record year for national production), statistics from the Ministry of Agriculture revealed that cassava was grown almost everywhere in the country, mainly in the regions of Thiès, Kaolack, Kolda, Fatick, Louga, Diourbel, and St. Louis. Thiès, a region with high potential for cassava production, produces more than 90% of national cassava production [3]. It is one of the regions where agriculture occupies an important place in socio-economic activity. However, despite its importance and the efforts made by the State, cassava has not yet experienced real development in the basic diet of the population. Today, one of the main notable constraints in the areas of the country hosting this crop is the more or less considerable drop in production.

Except for 2008, Senegal has so far failed to reach the one million tonne mark compared to other countries. Indeed, it moved from seventh (2012) to ninth (2017) position among cassava producing countries in West Africa (FAOSTAT, 2019). Thus, a study entitled "Study of the cassava production system in the department of Tivaouane" was carried out in eight (08) communes of Tivaouane distributed in the agro-ecological zones of Niayes and the north-central peanut basin, whose general objective is to study the economic aspect of the cassava production system in these eight (08) communes.

MATERIALS AND METHODS

Presentation of the site

Geographical and administrative location

The study took place in Tivaouane, one of the departments of the Thiès region, located as the crow flies 22 km northeast of the city and approximately 62 km from Mbour (another departmental capital). Limited to the west by the Atlantic Ocean, to the north and east by the department of Kébémér (region of Louga), to the southwest by the department of Thiès (region of Thiès) and to the southeast by the Bambey department (Diourbel region), the Tivaouane department, covers 3,217 km² of the national territory and includes four (04) districts: Méouane 1,058 km², Niakhène 867 km², Pambal 670 km², MérinaDakhar 622 km². (fig.1).

In total, seven (07) municipalities are concerned by our study; some located in the agro-ecological zone of Niayes and the others in that of the north-central groundnut basin (CNBA). These are respectively:

- DarouKhoudoss, TaïbaNdiaye, NottoGouyeDiama for the Niayes
- Chérif Lo, Koul, Méouane, Pambal and Pir for the CNBA.

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Cultivation practices

Number and average total surface area of cassava plots

In the areas surveyed, the total number of cassava plots available to producers varies from one to eight. Analysis of the data reveals that the majority of these have a number of plots equal to one or two. In fact, the proportions rise to 35 and 27.5% respectively (Niayes surveyed area); 37.8 and 33.33% (north-central groundnut basin). As for the rest of the producers surveyed in the Niayes area: 12.5%, 10%, 5%, 7.5%, 2.5% declared having respectively a number of plots equal to three, four, five, six and eight. In the north-central peanut basin, it should be noted that 13.3% of the producers surveyed have three plots, 6.7% have four and less than 5% have five. This results in equal proportions of those owning six and seven plots respectively, i.e. 2.2% each (Figure 3).

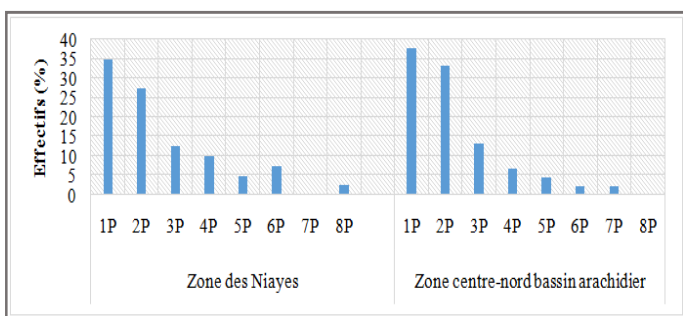


Figure 3: Total number of cassava plots (P) of producers in the area

As for the total areas of the producer's cassava plots, they extend on average over 1.5 to 11 ha. Figure 4 presents the average total areas according to the number of cassava plots of the producers surveyed in the Niayes zone and that of the north-central peanut basin. Indeed, this shows that in the Niayes surveyed area, cassava producers owning one, two, three, four, five, six, eight plots, respectively cultivate areas of 1.5 ha; 3.4 ha; 6 ha; 8.7 ha; 11 ha, 11 ha and 8 ha. At the CNBA, the areas planted by respondents with one, two, three, four, five, six, seven cassava plots are respectively of the order of 2.7 ha; 4.7 ha; 7.4 ha; 4.7 ha; 8 ha; 8 ha; 6 ha (fig.4).

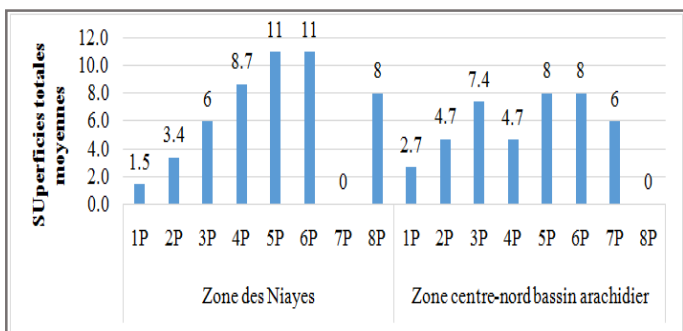


Figure 4: Average total surface area depending on the number of cassava plots owned in Niayes and the north-central peanut basin

Source and selection of cuttings

In the areas surveyed in Niayes and CNBA, various means are used by producers to obtain and select cuttings.

Producers source cuttings using two (02) means: purchase for 40% of those surveyed in Niayes and 46.7% of those in the CNBA and self-production used respectively by 60% and 53%. Concerning the purchase, it is done from a local producer, at the market or at the level of institutes/NGOs/projects. 30% of respondents from Niayes compared to 40% of those from CNBA get their supplies from a local

producer. 2.2% of producers surveyed in the CNBA said they bought their cuttings at the market. However, for purchasing at the institute/NGO/project level, it is carried out by 10% of respondents in the Niayes area and 4.4% of those in the CNBA

NB: The selection of cuttings for the following campaign is carried out well before planting. Indeed, after cutting selected cassava stems, producers preserve them by burying them in a hole of not too deep dimensions, depending on the number of cuttings, while waiting for the first rains.

Cultivated varieties

In the areas surveyed, producers only cultivate local varieties. In total, five have been listed. These are: Soya, Wallet "Parydiey", Niaregui, Boss, Kombo and Terasse. These varieties take their names by analogy from some locality or thing. However, it should be noted that some only grow one variety in their plots while others combine two. Following these two criteria, two respective figures were designed. Figure 5 represents the shares in relative values of producers cultivating a single variety in their plot. It reveals that the Terasse and Kombo varieties are those most cultivated in the Niayes surveyed area, respectively 43% and 36%, followed by Wallet and Niaregui all in equal proportions (10%). In the north-central part of the peanut basin, the Soya variety used by 75% of producers is the one that takes precedence over the others. This is followed by the Parydiey "Wallet" varieties, grown by 20%, Kombo and Terasse, all used by 2.5% of respondents (fig.5).

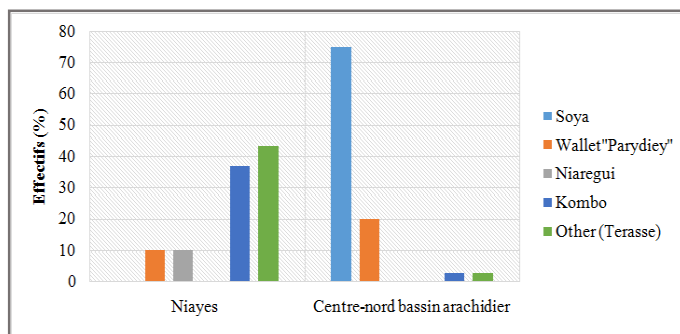


Figure 5: Proportion of farmers planting a variety of cassava on their plots

Figure 6 presents the shares in relative values of producers combining two varieties of cassava in their plots. The analysis shows that in the Niayes area, the Parydiey-Terasse and Niaregui-Terasse associations are those which are the most carried out. They are respectively cultivated by 40% and 20% of respondents. As for the north-central peanut basin, 80% of the producers surveyed use the Soya variety combined with the Wallet "Parydiey" variety. The other 20% were associated with Wallet-Kombo varieties (fig.6).

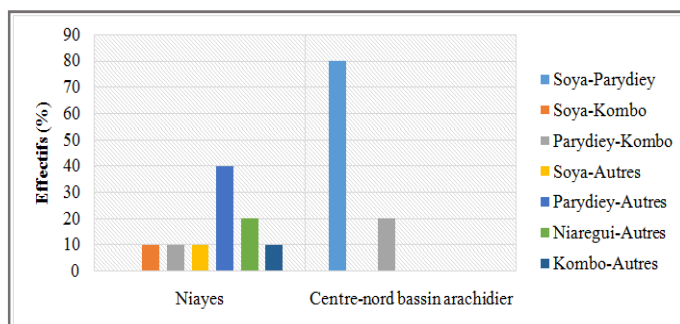


Figure 6: Proportion of producers planting two varieties of cassava on their plots

Harvest

It includes several phases, namely: staking with the daba, uprooting, piling up the dug up plants and cutting the tubers.

Harvest method and time

In these areas, the harvesting operation is carried out in the same way. Once mature, the cassava plants are dug up and grouped into small piles within the plot. Due to its arduous nature, the operation is mostly carried out by paid labor hired by the producer. The number varies depending on the surface area of the plot. However, most of those interviewed said they undertake seven laborers on average, over an area of one hectare.

Average yields and income from cassava sales

- **Average returns obtained when there is no loss**

Questions about the usual average yields obtained were addressed to producers.

NB: The different average yields were calculated through weighing and the number of bags obtained on the cultivated area. Yields vary depending on the varieties and the cycle.

As shown in Figure 7 presenting the average yields of producers of a variety obtained, when there is no loss, the best average yields are obtained with the varieties Kombo (12 months), Terrasse (12 months) and Niaregui (≥ 12 months) compared to others in the Niayes surveyed area. They are of the order of 4,170 kg/ha, 4,488 kg/ha and 4,000 kg/ha.

As for the CNBA, the best yields are obtained with the varieties Soya (cycle: 8-10 months) and Wallet (cycle: 12 months), i.e. respectively 8,900 kg/ha and 11,200 kg/ha in the north-central peanut basin (fig.7)

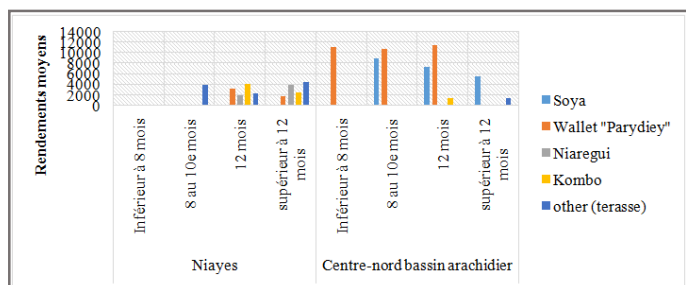


Figure 7: Average yields obtained by producers of a variety of cassava

As for producers combining two varieties of cassava in their plots, the results in Figure 8 show that in the Niayes zone, when there is no loss, the best yields are 6,430 kg/ and 6,400 kg/ha. were obtained respectively from those interviewed combining Soya-Terrasse and Parydiey-Terrasse. Concerning the CNBA, the producers cultivating Parydiey-Kombo are those who had the best yield, i.e. 6,400 kg/ha, harvested between the 8th or even 10th month (figure.8).

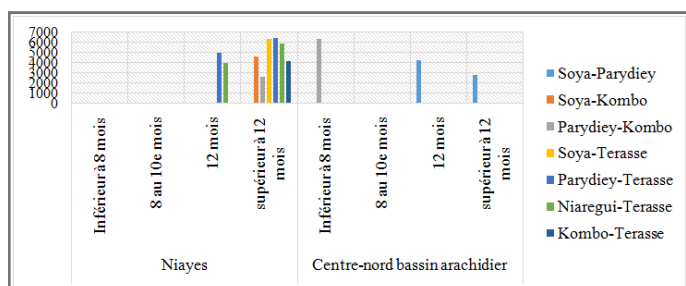


Figure 8: Average yields obtained by producers of two varieties of cassava

Income in FCFA from the sale of cassava

They are presented in Table 5 which shows that these are on average 463,125 FCFA with a minimum of 150,000 and a maximum of 1,500,000 FCFA in the Niayes surveyed area. In the CNBA, average income is 503,989 FCFA with a minimum of 120,000 and a maximum of 1,500,000 FCFA. These revenues are noted when the producer does not record losses related to pests and diseases.

Table 2: Approximate average income from the sale of cassava by producers

Agro ecological zones	Niayes		North-central peanut basin			
	Average income	Minimum	Maximum	Average income	Minimum	Maximum
Sans perte	463 125	150 000	1 500 000	503 989	120 000	1 500 000

Yields obtained and approximate income from the sale of cassava in case of loss

- **Returns obtained in the event of a loss**

Figure 9 shows the average yields obtained by producers of a single variety in the event of loss. This reveals that in the Niayes surveyed area, the yields of the Kombo and Parydiey varieties drop considerably compared to those obtained when there are no losses. These are of the order of 1,182 kg/ha (12 months) and 1,050 kg/ha (>12 months). In the CNBA zone, the Soya and Parydiey varieties are those whose yields have declined with values respectively equal to 1,975 kg/ha (harvested at 12 months) and 1,500 kg/ha (harvested at 12 months (fig.9).

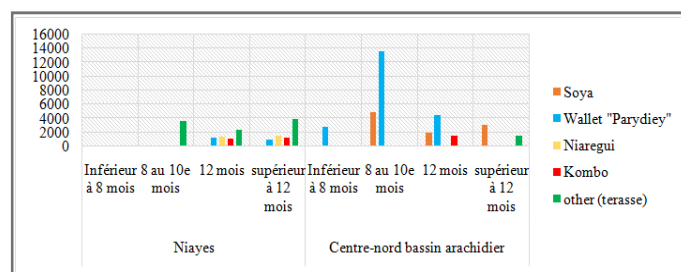


Figure 9: Average yields obtained in case of loss by producers of a single variety

Figure 10 shows the average yields obtained in the event of loss by producers of two varieties. Indeed, this shows that yields continue to decline over the years. Concerning the surveyed area of Niayes and CNBA, the average yields of producers combining Soya-Kombo and those combining Soya-Parydiey varieties are respectively 480kg/ha and 933kg/ha (fig.10).

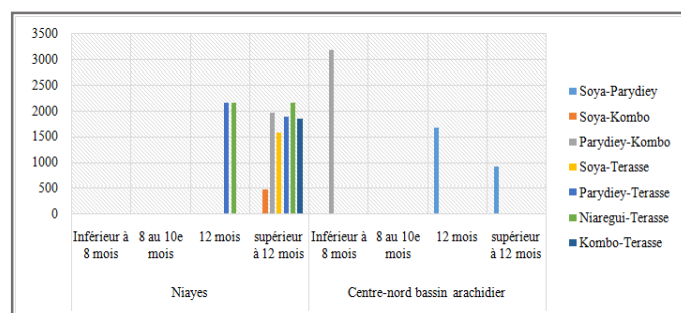


Figure 10: Average yields obtained in the event of loss by producers of two varieties

Approximate income in FCFA from the sale of cassava in the event of a loss

Questions about cassava income from the sale of cassava in the event of a loss were addressed to producers, among others. And the analysis of table 6 reveals that average incomes increased from 463,125 to 271,150 FCFA in the Niayes surveyed area and from 503,989 to 182,633 FCFA in the north-central peanut basin.

Table 3: Approximate average income from sale in case of loss

	Niayes			North-central peanut basin		
	Average income	Minimum	Maximum	Average income	Minimum	Maximum
In case of loss	271 150	50 000	500 000	182 633	0	750 000

Conditioning

In the two respective areas, most of the type of packaging is carried out by bag. Indeed, a good number of those interviewed declared that they sold wholesale, with often a few claiming to sell in detail. However, the bags differ in their weight depending on the dimension or even size of the cuttings. Figure 11 shows different types of weighing of bags reserved for packaging and “backfilling” cuttings (fig.11).

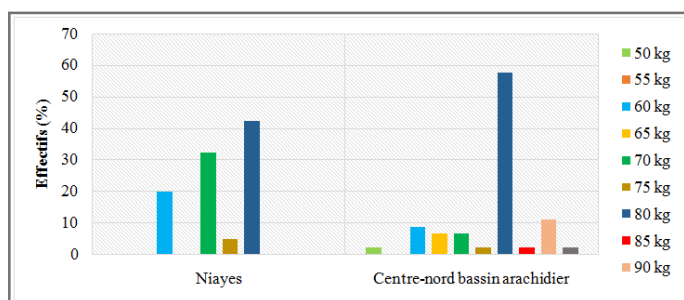


Figure 11: Approximate weights of bags reserved for packaging

Workforce

Level of involvement of family members in cassava production

In the families of producers, men, women and young people (girls and boys) are all involved in cassava production. They constitute the family workforce. In Niayes, the proportions of men are approximately equal to those of women (respectively 36.2 and 37.1%). Young people are little involved in these activities (26.7%). As for the north-central groundnut basin, young people (37.9%) and women (33.5%) are the most involved in production, unlike men who are less involved (28.5%) (Figure 12).

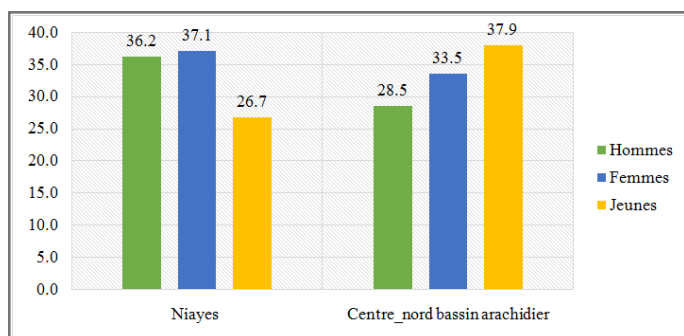


Figure 12: Level of involvement of the producer family in cassava production

Salary labor

Apart from the family type, two types of labor are employed by producers. These are:

➤ Salary type, temporary

As for this type of labor, it is only used during the harvesting operation. In general, the average remuneration is 2,000 FCFA/employee per day.

In Appendix 3, the figure on the number of respondents in (%) whether or not they employ paid labor. This reveals that only 15% of Niayes respondents declared using an average number of employees equal to three (03). Regarding the north-central peanut basin zone, 73.3% use this workforce with the employment of an average number of employees equal to seven (07) men.

➤ Sourgha type, seasonal

In Appendix 5, the table presenting the number (%) of users or not of sourgha type labor. Indeed, this reveals that 92.5% of those interviewed in Niayes declared using one (01) "sourgha" whenever necessary, which pays an amount of 224,450 FCFA on average for a duration of three months. As for the north-central groundnut basin, only 42.2% declared using it. The latter, for a period of five months, pays him a sum of 201,053 FCFA on average.

Sale and destination of the product

Concerning the sale of the product, it is carried out by bag. However, prices fluctuate depending on the periods. In normal times, in other words when the product is very present on the market, the average selling prices of the bag are around 18,425 FCFA in Niayes and 16,278 FCFA in the north-central peanut basin. However, they can respectively increase up to 29,463 FCFA and 30,900 FCFA during periods of low availability. (Appendix 3).

Most of the producers interviewed sell their product at the market. Transportation to these locations is facilitated by a Peugeot brand car rented by the operations manager. The markets targeted by those interviewed in Niayes are those of Notto and Thiaroye. Concerning the respondents from the north-central peanut basin, the destinations are in addition to the Notto and Thiaroye markets, those of Pire and Touba.

DISCUSSION

The results showed that producers holding one and two cassava plots are more numerous. Several explanations could arise from these results. Indeed, it should be emphasized that the producers surveyed do not only grow cassava. Due to the decline in cassava yield observed in recent years, producers do not hesitate to indulge in the cultivation of other crops by way of diversification. In the Niayes area for example, crops such as eggplant, tomatoes, bissap, mango trees, etc. are also cultivated by farmers. As for the north center of the groundnut basin, groundnuts, millet and cowpeas respectively constitute the other crops that generate income for farmers.

Concerning the origin of cuttings intended for planting, the proportions of producers using self-produced ones are much greater than those of buyers in the Niayes surveyed area and that of the north-central peanut basin. The apparently healthy and vigorous cuttings are those which are used for planting. Indeed, this results in the lack of financial means of some of them who declare the costs of cuttings expensive.

For the choice of the variety(s) cultivated, the results revealed that the local varieties Kombo and Terrasse are the most cultivated in the Niayes while that of Soya takes precedence in the north-central groundnut basin. The motivation for such choices stems from the fact that in Niayes, the aforementioned varieties, more particularly Terrasse, give good yields. As for the north-central groundnut basin, despite the low yields obtained with the Soya variety, producers still insist on its use. The choice is explained by the uniqueness of this variety in this area, but also by the high cost of cuttings for others. Our results are in accordance with those of [6], who found that Soya is the variety used by 90% of CNBA producers. The results also show that the Parydiey-Terasse and Soya-Parydiey associations are those which are respectively more used in the areas which were the subject of surveys in the Niayes and the north-central part of the peanut basin. The explanation that could be given is that in the event of attacks, the losses are not that considerable. Note that this association of varieties has the advantages of maintaining soil fertility, therefore allowing better productivity of the land (increased yields for example). However, failure to control this would lead to the phenomenon of competition (particularly with the population of plants) but also would make maintenance work (weeding) difficult...

Most producers stated that they did not use products for the preparation of cuttings intended for planting, due to lack of financial means. These results go hand in hand with those of [6] which showed that phytosanitary pretreatment is carried out on average by 1/3 of producers. And for the frequency of weeding, it differs depending on the duration of the cycle and varies from four to eight. The high frequency of weeding could be explained by the fact that some of the producers only harvest two years after planting. These results are out of phase with those of [8], [5] for whom, three hoeings are enough to fight against weeds. Hilling and ridging are operations not known in the area, which explains their non-use.

The producers surveyed in these areas proceed directly by digging up after the cassava reaches maturity. These results are completely out of sync with those of [5] who assert that the stem should be cut 25 to 35 cm from the ground using a machete before pulling out the tubers. The harvest period differs depending on the producer. Some, for financial reasons, harvest even before the end of the cycle (maturity) while others, to obtain large tubers (and better yields), prefer to leave the plant a little longer. These results are supported by those of [9], for whom the extension of crop cycles also constitutes an alternative for producers to cope with the fertilizer deficit.

The results of the approximate weights of the weighing bags used for packaging by the respondents revealed that many of them focused their choices on the weighing bag estimated at 80kg. Such a choice would, on the one hand, attract customers or, on the other hand, result from buyer preferences. These results are supported by [10], for whom the success of the sale depends on the appearance of the bag.

Compared to the very first years of cultivation, average yields have essentially decreased in both areas combined. The observation made from the analysis of these results is that the yield does not depend on the longevity of the cycle. Overall, the average yields usually obtained when there is no loss in the areas surveyed are of the order of 3.9t/ha and 6.7t/ha, respectively for Niayes and CNBA. These results are superior to those of [10], which showed that at the CNBA level, more precisely in Méouane and Koul, the average yields were of the order of 3t/ha. Concerning the loss situation, the yields obtained in these two surveyed areas are of the order of 1.8t/ha and 3.6t/ha. These results are close to those obtained by [6], which showed that the average yield obtained during this period in the Thiès region was of the order of 2.9t/ha.

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The results also showed that the average selling prices of a bag of cassava vary depending on the period. In fact, these, on the market, are more expensive during periods of default than during normal periods. Most producers rely on standards or prices set in the market. Cassava is quite perishable, so the producer is obliged to sell his product immediately after harvest, in order to minimize loss or damage. And still in its sales strategy, the producer during periods of shortage, increases the price of the bag while knowing that its customers feel the need to purchase.

Men and women in the Niayes surveyed area are much more present in cassava production than young people. As for the north-central groundnut basin, the observation is that men are less involved in production. The low level of involvement of young people could result in the phenomenon of rural exodus. These results fit well with the work carried out by IPAR (2015) showing that the countryside is becoming increasingly empty. From their investigations, they noted that "farms are getting bogged down in a process of continuous degradation and are gradually becoming home units for young workers who have gone to town in search of monetary income to help the families left behind. villages". As for the north-central peanut basin area, the explanation emanating from the results (high involvement of women and children in agricultural activities), in addition to the rural exodus of men, could be the aging of the population. And these results are in the same direction as those of [11], showing that in the area in question, there is a significant number of children and increasingly elderly people. According to [7], this category of labor concerns workers paid by the task or through sharing at harvest. In Niayes, the low use of daily wage labor (15% of respondents) could be explained by the level of involvement of men in agricultural activities which is quite high there, being able to partly carry out harvesting operations. . Concerning the north-central groundnut basin, a significant number of producers (i.e. 73.3%) declared that they employed labor. Given the arduousness of the harvest requiring a large workforce, they hire an average of seven employees during this operation. Indeed, the reason for the employment of such a number of employees could be due to a low rate of men involved in agricultural activities, but also to the rural exodus of young people who, faced with the economic difficulties of exploitation, engage in other non-agricultural activities. These results are similar to those of [4] stating that 28% of producers in this CNBA zone use external labor for harvesting.

The remuneration of a sourgha is very expensive. And this is what most of the CNBA respondents consider (i.e. 57.8%) who, faced with economic difficulties, do not have the means to pay. These results fit well with those of [4] showing that only 33.3% of CNBA operators use this type of labor.

Income decreases over the years. This would result in phytosanitary problems, notably the impact of diseases and pests on production.

CONCLUSION AND OUTLOOK

Through this study, we were able to show with the analysis of the cassava growing practices of producers in these areas. We can also note that:

- climate change, which must be taken into consideration even if cassava is relatively resilient. The drop in rainfall noted in recent years can affect the productivity of cassava which can certainly resist but up to 500mm;
- the reduction in cultivable areas due to the inextensibility of land, leading to the impracticality of fallow land, rotation, etc.
- the depletion of soils in mineral elements (low soil fertility) due to poor farming practices (e.g. fertilization dose not respected);

However, given the results emanating from this study, we propose the following perspectives:

Concerning the State

- further support CODEPROMAT for the revival of culture in the area; support to promote, for example, the professionalization of producers, but also the processing of cassava;
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Techniques

- carry out diagnostic studies on the cassava value chain in Senegal in order to be able to identify the actors concerned and the main problems in order to propose sustainable solutions;
- practice crop association, given the lack of land, in order to maintain and/or improve yields (e.g. legumes + cassava) and techniques such as hilling.

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