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Analysis of the Performance of Rice Producers in Cameroon

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This study, which aimed to analyze the performance of rice producers in Cameroon, is inspired by the observation that the expense linked to the importation of rice has a very negative influence on the Cameroonian trade balance. Although the state injects significant financial resources to boost local production, to carry it out, we set ourselves the objectives of carrying out a cross-analysis of the evolution of rice production in Cameroon, with the evolution of yields, cultivated areas, and rural populations. The regions covered were those of the Far North, North, West, and Center, which produce most of the rice in Cameroon. Individually, 50 questionnaires were administered randomly to the producers met, including 30 in Yagoua, 10 in Lagdo, and 10 in Mora. At the joint initiative group (JIG) producer level, an interview guide made it possible to collect information from managers; five GICs were interviewed in Yagoua, two in Mora, and five in Lagdo. The analysis of the data made it possible to conclude that rice cultivation is an activity which does not develop spontaneously in a region, but it needs significant support to be boosted. Although it is clearly established that it would be more interesting for Cameroon to invest in the production of improved, high-yielding seeds, it remains necessary to develop and rehabilitate cultivable areas which constitute an imperative for production and may be possible. The country also faces the problem of rural exodus, which means that the workforce needed to produce is not sufficiently available. Finally, it appears that rice from traditional areas is the least profitable with the most negative gross margin, followed by rainfed rice, then rice from irrigated areas of SEMRY which particularly suffers from the very high cost of fertilizers, and finally by the rice of the flooded lowlands. Several recommendations were therefore made to enable Cameroon to truly boost its local production.

Keywords: rice, evaluation, performance, trade balance, producers, Cameroon

Introduction

Cameroon displays relative food self-sufficiency but imports more than 75% of the rice consumed, despite significant production potential (Achancho, 2013). Cameroon has 240,000 hectares of arable land available for rice cultivation, but barely 25,000 ha are developed. This developed area includes 13,000 ha for the Yagoua Rice Expansion and Modernization Company (SEMRY) and the rest distributed among other production

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possibilities in Ndop, Santchou, Nanga Eboko, Kousseri, and Lagdo (DESA, 2022). The Ministry of Agriculture and Rural Development (MINADER), through DESA (2022), estimates that paddy rice production increased from 277,796 tons in 2016 to 290,449 tons in 2020, an increase rate of 4.5%. However, Andzongo (2018) noted that, despite the great potential for local rice production, the Cameroonian state spends hundreds of billions each year to import rice in order to ensure the food security of populations whose needs are largely greater, above the current local production level. As an illustration, in 2023, economic operators imported a total of 620,407 tons of cargo rice into Cameroonian territory for a bill of 200.8 billion FCFA (360 million euros according to the INS, 2024). According to Folefack (2014), this situation contributes to a significant deficit in Cameroon's trade balance, with the socio-economic consequence of a loss of foreign currency and an eternal food dependence on external sources. With the aim of filling the obvious imbalance between supply and demand for rice in Cameroon, the Cameroonian government, accompanied by its international partners, established in 2009 a national strategy for the development of rice cultivation in Cameroon (SNDR). It appears from the SNDR document that despite the scale of investments to absorb internal demand for rice, Cameroonian production was only able to satisfy domestic demand up to 20%. According to Malaa et al. (2011), coordinator of the NERICA project at IRAD, before 2008 rice produced in Cameroon represented less than 15 percent of the national market and today more than 30 percent, which testifies the progress that has been made. Despite these significant advances, the level of local production still remains far from meeting needs. According to the SNDR (2009) and Malaa et al. (2011), several factors can explain this situation, including: socio-economic constraints, unavailability of quality seeds, poor structuring of the sector, high cost and the unavailability of inputs, biotic (birds, etc.) and abiotic (low soil fertility, iron toxicity, etc.) stresses; other problems are around the high production cost of irrigated rice which requires considerable investments for the development of production basins, the location of the three main production structures, both far from large urban centers (Yaoundé and Douala) and close to border markets (Nigeria, Chad, CAR), and the preference of consumers in southern regions for imported rice because it is of better quality. This low production has made Cameroon heavily dependent on imports. The expense linked to the very significant importation of rice significantly influences the Cameroonian trade balance.

In the same vein as the DSNDR, the Ministry of the Economy has set up a plan to revive the rice sector in Cameroon. This plan to revive the rice sector proposed by the Ministry of the Economy in 2024 is estimated at 1,400 billion FCFA, or nearly 60% of the budget intended for the development of rice fields. The budget is intended to be ambitious. Indeed, it consists of: the establishment of a coordination framework to ensure the synergy of development initiatives in the rice sector; the structuring of the sector, in particular the role of the actors; the availability and accessibility of inputs (improved and adapted seeds); promoting the use of good farming practices; appropriate mechanization, through capacity building of stakeholders. The emphasis will therefore be placed on the promotion of first and second processing with an emphasis on respecting standards and quality, but also the improvement of the regulatory and legal framework and the strengthening of communication around locally produced rice.

According to the Minister of Economy, Planning and Regional Development, Alamine Ousmane Mey, quoted by Zra Dieudonné (2019):

> The implementation of this plan should, over five years, bring national production to approximately 1.5 million tons of paddy rice (representing 1 million tons of marketable rice). And, increase the level of processing from 65% to 100% and get Cameroonians to consume rice Made in Cameroon by 2024.

Due in 2024, it may be unfortunate to note that this situation has really not changed, despite the very laudable initiatives of the government and its partners. It is therefore a question of this article analyzing the performance of rice producers in Cameroon, in order to detect the blockages which prevent the achievement of the targeted objectives, and to consider prospects for improvement. Specifically, it will be a question of carrying out a cross-analysis of the evolution of rice production in Cameroon, with the evolution of yields, cultivated areas, and rural populations.

Material and Method

To carry out this study, the samples were constituted on the basis of the classification of ecological zones according to their rice potential, as presented by the document of the National Rice Development Strategy (DSNDR). Indeed, it appears from this classification that Cameroon is divided into six ecological zones with rice growing potential. Of these six zones, four have significant rice production, and constitute the population of this study, these are the zone of: the Far North; North; West and North-West; Center, East, and South.

To collect data in the field, questionnaires administered to producers were developed. The interview guides were administered to those responsible for the management and support structures, and to those responsible for the decentralized services of MINADER. The administration of these survey tools was direct, that is to say, it was a question of going to the field, physically meeting all the actors concerned, in the different selected areas. We worked in the Far North zone in Yagoua, Maga, Mora, and Maroua; in the North zone in Lagdo and Garoua; in the Center, East, and South zone, in Nkolbisson and Nvangan; in the West and North-West zone it was not possible to go to Ndop due to the unstable security situation, but information was collected indirectly through resource people there.

At the end of the discussions with the heads of the decentralized services of MINADER and the heads of the support structures, it was a question of meeting as many actors as possible for each category. Most of the producers belonging to GICs and cooperatives, the discussions were most often carried out in groups, and on the basis of interview guides, in order to collect the maximum possible information with the little time available. Individually, 50 questionnaires were administered randomly to the producers met, including 30 in Yagoua, 10 in Lagdo, and 10 in Mora. At the producer GIC level, an interview guide made it possible to collect information from managers: five GICs were interviewed in Yagoua, two in Mora, and five in Lagdo.

For the statistical analysis of the data, SPSS software and the Excel spreadsheet were used, they made it possible to bring out tables, averages, and all the statistical elements necessary for a good descriptive analysis. The verification of the hypotheses could be done with the correlation test which was accompanied by that of the normal distribution.

Results

This section aims to analyze the different stages of rice production in Cameroon. This analysis is carried out according to the Structure-Behavior-Performance paradigm, which is organized into three main stages which are as follows: the structure of production, the behavior of producers, and the performance of producers.

Structure of Rice Production

Although in most cases, producers carry out their activities individually, they are grouped together in cooperatives and GICs which constitute a consultation framework, structured to facilitate exchanges with state management structures. If on the side of the UNVDA (Upper Noun Valley Development Authority) in the

North-West, producers still have the obligation to sell their production to the structure, on the side of the SEMRY (company for the expansion and modernization of rice cultivation of Yagoua) it is much more liberal, this is because of the fact that SEMRY is no longer capable of providing the necessary inputs to producers who now take care of them by their own means.

In Cameroon there are several categories of producers, who are identified in the different production areas. These are individuals, private companies, and farmers' organizations (POs). These different categories of producers are found both in irrigated areas and outside irrigated areas. In fact, the irrigated areas are lands developed with a water channeling system, which allows the plots to be supplied with water, from pumping stations or by simple gravity. Figure 1 presents an irrigation water distribution system in the SEMRY farms.

Figure 1. Water distribution system in the irrigated areas of SEMRY.

Given the very high cost of developing these spaces, they are mainly developed by the state, either directly or through projects. They are made available to its structures such as SEMRY, MEADEN (study mission for the planning and development of the North), and UNVDA for exploitation, or directly made available to producers through the associations in charge of water. In Figure 2, we can observe irrigated plots, developed by SEMRY.

Figure 2. Irrigated areas developed by SEMRY.

There are three rice growing systems in Cameroon. These are irrigated rice, lowland rice, and rainfed rice. Irrigated rice: It is done in the irrigated areas which are developed, with the construction of water conduction canals which supply the plots. Water supply can be done from pumping stations, which pump water from a stream, and discharge into the conduction canals which are responsible for distribution within the plots. This is

also the system used in Yagoua by SEMRY and in part of the Ndop production basin, by the UNVDA. Figure 3 shows a SEMRY pumping station in Yagoua.

Figure 3. Pumping station and drain station water pipeline.

The water supply can also be done by gravity, the cultivated areas are developed, with the construction of water conduction channels which end upstream at the level of the valves built at the outlet of the reservoir lakes, built following the installation of a dam. This system is used in Maga by SEMRY, and in Lagdo by MEADEN. It should be noted that with irrigated rice, we have the possibility of doing two cultivation cycles per year. Figure 4 shows the irrigation valves of Lake Maga, which feed the distribution canals.

Figure 4. Lake Maga floodgates.

Lowland rice: It is grown on lowlands which are exposed to flooding in the rainy season. In fact, when the rains begin, producers sow their rice normally, hoping that it will be sufficiently developed when the waters flood. Rice therefore develops normally during the rest of its cycle being in water, until maturity, including flowering.

Producers often face two problems: not having the means to regulate the water level, the water sometimes rises to the point of completely covering the plants, leading to significant mortality. Furthermore, it also happens that the water is slow to leave, while the rice is already ripe, thus delaying the harvest, with all its consequences, or that the rains stop early, and that the water leaves when the rice is not yet mature, which leads to a significant presence of empty balls. This system has the advantage that, rice being a crop that likes enough water, it benefits naturally from the water supply, and the ground being completely covered by water, the

grasses do not grow and the plants evolve without competition from weeds. This system is observed at the flooded lands of the village Tchakaramary in the district of Mora, Department of Mayo Sava, in part of the Ndop production basin, which goes as far as the Noun, in the Nkoutaba zone, in the plain of Mbo'o, and many others. It benefits from PADFA supervision in some of these localities, such as Ndop and Koutaba. Figure 5 shows a plot after harvest, in the flooded lowlands of the village Tchakaramary.

Figure 5. Example of plots from the flooded lowlands of Tchakaramary after harvest.

Rainfed rice: It is grown on dry land like corn. It is done in all regions of the country, and its sowing time varies depending on the agro-ecological zone in which you are located. It benefits from rainwater, and is generally done in a single cycle per season. Rainfed rice faces the Adventists who require clearing which can be done two to three times in one cycle. Its promotion is carried out by PRODERIP in the central, eastern, and southern regions. PADFA also supports the development of this system in four regions which are: the North, the Far North, the West, and the North-West.

Producer Behavior

To produce rice, rice farmers need a certain number of resources to be available. The first and most important remains the land. In all of the production basins visited, we observe a serious problem linked to land acquisition, sometimes leading to conflicts between communities and investors. Indeed, if it is true that the acquisition of land remains a fairly delicate problem for agropastoral investors in Cameroon, they still benefit from the possibility of renting space from those who own it, although those in the North complain that owners prioritize fertile land and rent less fertile land. They can also benefit from plots in irrigated areas already developed by the state for rice cultivation. In areas where these plots are allocated directly to producers, they are free, but producers are responsible for maintaining the drains built for water channeling. This is for example the case in the Lagdo area in the Northern region. As for the plots allocated by the state through its structures such as SEMRY in the Far North and UNVDA in the North-West, they are allocated subject to the payment of a fee which serves to amortize the cost of the work carried out. As for SEMRY, this fee is 103,000 FCFA/ha/year, and it gives right not only to the plot, but also to water supply and plowing; although in terms of plowing, producers complain of the slowness which means that some are forced to sow late and harvest late. This situation results in difficulty in harmonizing the hunting of birds which are responsible for significant post-harvest losses. At the UNVDA, producers rather make their production available which is marketed by the structure, and their money is returned to them after having taken the sums linked to the structure's support expenses.

After the land which makes the creation of the plantation possible, the seed remains the most essential resource to ensure the best yields, and guarantee good harvests for producers. It is therefore imperative to develop more efficient varieties. In the field, unlisted local varieties were identified, which are still cultivated; particularly in areas that have integrated rice cultivation into their habits a long time ago. All occupants of the irrigated areas of SEMRY are subject to the cultivation of IR46, those of UNVDA produce Tox2 and Tainan; PRODERIP and PADFA for their part popularize NIRICA3. PADFA also promotes the NRICA L46 in the lowlands in the Far North, and the NERICA8 in the lowlands in the West of Cameroon. The M3 from Chad was also identified near Yagoua, in addition to the Basti in the experimental phase. Several producers, particularly in Mayo Sava, received NERICA3 seeds from PRODERIP, and more than five years later, they continue to take seeds from their crops to resow during the following campaigns, yet these certified seeds must be renewed after two production cycles.

This situation is due to the fact that there is no sustainable national seed production policy on the field, although a national strategy for the development of the rice seed sector (SNDSR) was adopted in 2015 by MINADER, with the overall objective of ensuring the availability of quality seeds to the majority of rice producers by 2018. To date, the implementation of this strategy still remains a dream for producers who nevertheless have very well appreciated the progress made in the first years of the introduction of these improved seeds. It should be noted that the support projects which support these producers by providing them with improved seeds are limited in space and time. Not only are they not able to reach all the producers operating on the national territory, moreover at the end of their mandate, they are forced to close the doors when they do not have the chance to obtain new financing from donors, leaving their producers without guidance allowing them to continue renewing their seeds. They no longer know where to find quality seeds which were provided to them by the projects, for some of them find themselves obliged to abandon rice cultivation in the face of the drastic drop in yields, or for others to return to old practices in continuing to collect seeds from their production despite low yields.

Apart from seeds, the supply of inputs remains one of the biggest difficulties facing rice farmers. In fact, the price of fertilizers has almost doubled on the market in less than three years, going for example from around 19,000 FCFA for a 50 kg bag of urea to 45,000 FCFA. This state of affairs means that most producers are no longer able to fertilize their plots normally, and obtain automatically reduced yields. Despite this complicated situation, they are still lucky that the rice does not yet face significant phytosanitary problems, and the plots are flooded most of the time, the grass does not grow, except of course in the plots reserved for rainfed rice cultivation. This rather complex situation regarding the availability of fertilizers means that, despite the use of identical quality seeds, different yields are recorded in the plots, depending on the fattening capacity of each fattening producer.

It should be noted that the workforce needed to carry out production activities is essentially family in the northern part of the country; with the exception of producers with large areas, who take on temporary labor at specific times, to carry out very specific activities. Apart from the producers who work on the plots developed by the various state support structures, the others are fighting to plow their plots themselves. Plowing is manual for those who do not have the means, and costs 20,000 FCFA for a one-hectare plot. Those in the middle class use animal traction which costs on average 17,500 FCFA for a one-hectare plot, the wealthier rent tractors which are faster and cost more.

Performance of Rice Producers in Cameroon

To evaluate the performance of rice producers in Cameroon, four main variables were taken into account for which it was possible to obtain data. This is a dependent variable which is the evolution of the level of production; and the independent variables which are: yield, cultivated areas, and population.

Evolution of rice production. Regarding local rice production in Cameroon, the research provided the data as summarized in Table 1.

Table 1

Evolution of Rice Production in Cameroon (in Tons)

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rice production (in tons)	61,271	62,011	44,548	47,175	49,958	58,369	64,525	68,267	72,009	134,659	153,078
Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Rice production (in tons)	174,089	181,818	194,094	153,246	278,281	359,320	260,000	334,200	334,442.99	339,974.36	362,294.45

Note. Source: FAOSTAT.

First of all, we start by testing the normal distribution, to ensure the possibility of using this data in future analyses. For this purpose, the test carried out using SPSS software gave the results presented below (see Table 2).

Table 2

Test of Normal Distribution

Null hypothesis	Test	Sig.	Decision
The distribution of rice production in Cameroon is normal with an average of 172,164.99 t and a standard deviation of 117,563.44	One-sample Kolmogorov-Smirnov test	0.276	Retain the null hypothesis

Note. The significance level is 0.05.

The distribution of rice production in Cameroon being normal, it is now a question of observing the evolution of Cameroonian rice production over a period of 22 years, going from the year 2000 to 2021. A careful analysis of these data allowed us to obtain very interesting results. These results are summarized in the curve presented in Figure 6.

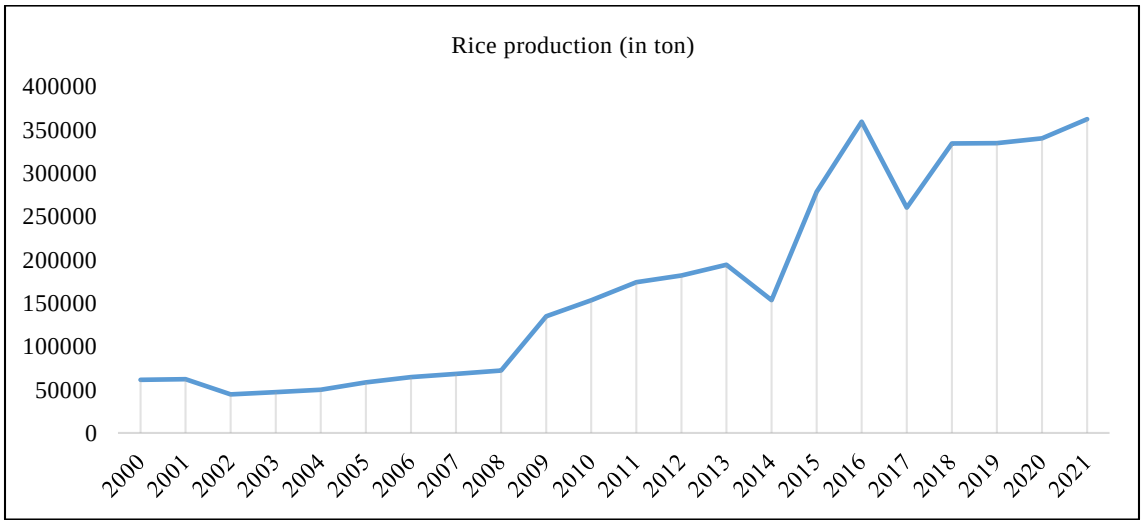

Figure 6. Evolution of rice production in Cameroon, from 2000 to 2021.

Looking at Figure 6, which traces the evolution of rice production in Cameroon, from the year 2000 to 2021, we observe several phases of evolution. After a small drop in production observed from 2001 to 2002, we observe a growing and constant phase which goes from 2002 to 2008 and which can be described as a recovery phase, with a growth rate of 38.13%, due to an evolution of 6.35% growth per year. The second phase which goes from 2008 to 2013 can be described as a take-off phase, with a growth rate of 62.89%, at a rate of 12.58% annual growth. In 2014, we observed a significant drop in production, at a rate of -26.65%, then a strong acceleration in production between 2014 and 2016. The growth rate during this period was 57.35%, due of 28.67% per year. After the spectacular rise in production between 2014 and 2016, we again observed a significant drop in 2017, at a rate of -38.2%, then a rise in 2018, with a rate of 22.2%, and finally a not very significant development until 2021 with a rate of 7.75%, at a rate of 2.58% per year.

While it is clear that the curve in Figure 6 presents a sawtooth pattern, it is important to note that, overall, there has been a very significant change in the level of rice production in Cameroon, over the course of the period from 2002 to 2021, although since 2018 the level of production tends to become constant. Rice production in Cameroon during this period increased from 44,548 tons in 2002 to 362,294 tons in 2021, i.e. multiplied by 8.13 at a growth rate of 87.7% at a rate of 4.61% per year.

Knowing that the 10 regions of Cameroon have significant rice-growing potential, it is important to classify these regions according to their level of production, in order to identify the assets of the best producers and see to what extent to capitalize on them at the level of the regions which have been struggling to get their rice production off the ground. Table 3 presents the level of production in each region, from 2014 to 2018.

Table 3

Evolution of Rice Production (in Tons) by Region

Regions	2014	2015	2016	2017	2018
Adamaoua	1,166.675	1,072	923	854	1,275
Center	10,256	10,524	18,745	20,393	20,120
East	285	358	736	801	825
Far North	120,252	167,806	186,641	203,051	164,471
Coastline	34	47	53	57	59
North	26,665	37,036	41,354	44,990	47,824
Northwest	32,184	43,353	49,662	54,028	74,019
West	4,557	6,340	7,069	7,691	5,076
South	1,962	2,608	3,021	3,287	3,648
Southwest	-	-	-	-	-

Note. Source: INS (2019).

From Table 3, we obtain Figure 7 which allows a better analysis of the evolution of rice production in each region of Cameroon.

Figure 7 clearly shows the gap between the production of the Far North region and that of other regions. In 2018, we observed a drop in production in the Far North region, while in the same year, national production saw a significant increase. This increase in national production during this period can be justified by the fact

that we observe in the North-West region, which is the second largest production basin in Cameroon, a significant increase due to an improvement in yields of UNVDA producers who now benefit from the support of PRODERIP.

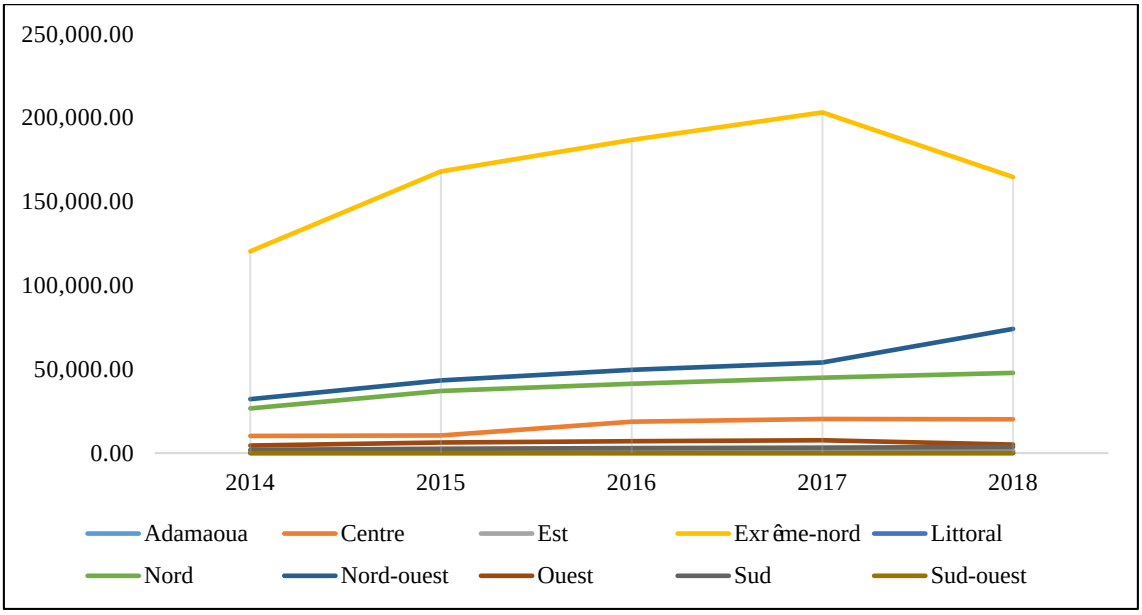

Figure 7. Evolution of rice production by region.

In order to carry out a more in-depth analysis of the situation, from Table 3, the production rates by region were calculated for each year, then the average production rate was then determined for each region. The results obtained are recorded in Table 4.

Table 4

Distribution of Production Rates by Region

Regions	2014	2015	2016	2017	2018	Average
Adamaoua	0.59%	0.40%	0.30%	0.25%	0.40%	0.39%
Center	5.19%	3.91%	6.08%	6.10%	6.34%	5.52%
East	0.14%	0.13%	0.24%	0.24%	0.26%	0.20%
Far North	60.9%	62.3%	60.5%	60.5%	51.8%	59.2%
Coastline	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
North	13.5%	13.7%	13.4%	13.4%	15.0%	13.8%
Northwest	16.31%	16.11%	16.11%	16.12%	23.33%	17.59%
West	2.31%	2.35%	2.29%	2.29%	1.60%	2.16%
South	1%	0.97%	0.98%	0.98%	1.15%	1%
Southwest	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

Note. Source: Author.

From Table 4, the curves of the evolution of production rates by region as presented in Figure 8 below have been drawn.

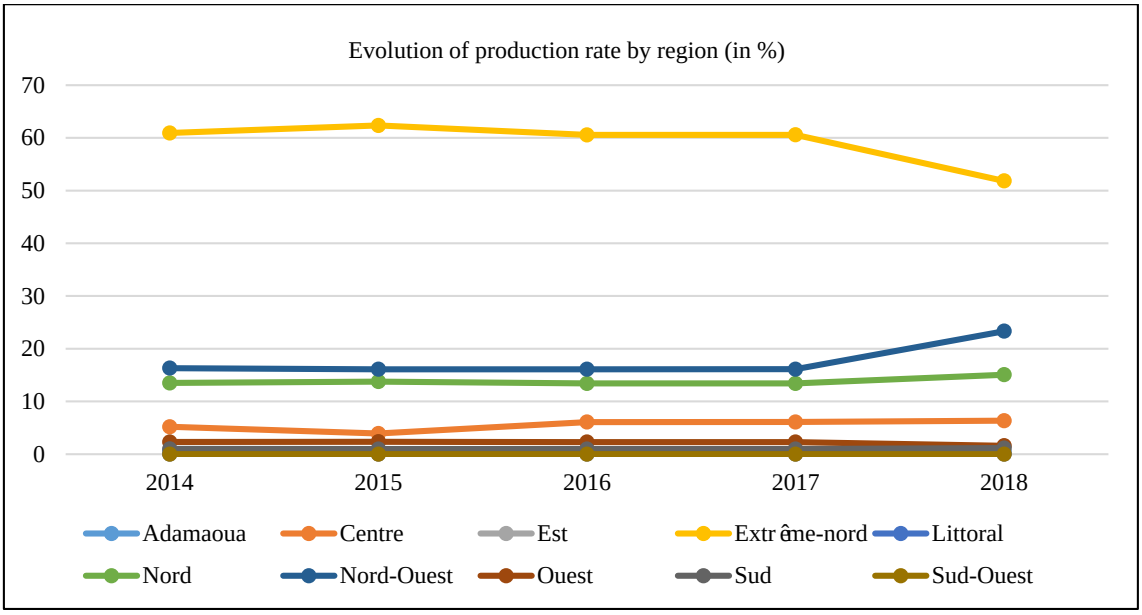

Figure 8. Evolution of production rates by region.

Figure 8 shows that the production rate by region is relatively stable over the years, although in 2018, we observed a regression in the Far North region in favor of the North-West region, which is clearly increasing.

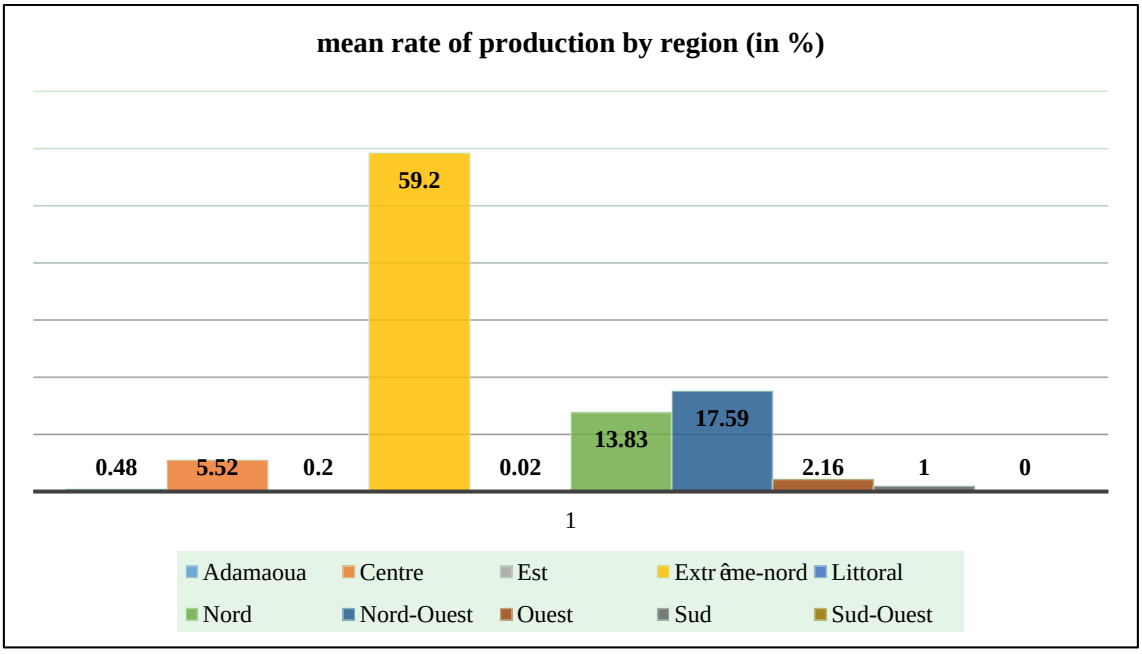

Figure 9. Production rate by region.

Figure 9 shows that rice production in Cameroon is driven by three main regions which are: the Far North region, the North West region, and the North region, which respectively produce 59.2%, 17.59%, and 13.83% of national production. Besides these three regions, we also have the Central, Western, and Southern regions which come respectively with productions of 5.52%, 2.16%, and 1%. The regions of Adamaoua, the East, the coast, and the South-West have almost zero production, yet have enormous rice-growing potential.

It is important to note that the regions with the best production rates are those which house state supports structures. These structures have deployed significant resources for the development of irrigated areas. These developments contribute to considerably improving the level of production in these areas. This is the case with SEMRY in the Far North, which produces between 80% and 85% of rice in the Mayo Danay Department, a department which represents, taking 2018 figures, 60.8% of rice production in the region. This is also the case for UNVDA in the Ndop zone in the North-West, and MEADEN in the Lagdo zone in the North. In the Central, Western, and Southern regions where flourishing production is observed, we note the installation of projects such as PFRIA-C (Avangane irrigated rice farming pilot farm project, central region) and the PDRM (Mont Mbappit rural development project), which contribute to improving production by making improved seeds available to local producers and by developing irrigated areas. We also note the intensification of PRODERIP activities in the Central and Southern regions, which also contribute to increasing their level of production. The regions of Adamaoua, the East, the coast, and the South-West do not benefit from any support aimed at boosting their rice production, with the exception of the Eastern region where there is slight activity of PRODERIP, which explains their almost zero level of production. We can conclude that rice growing is an activity that does not develop spontaneously in a region, but it needs significant support to be boosted.

Evolution of yields. The aim here is to carry out an analysis of the evolution of yields based on the data summarized in Table 5.

Table 5

Evolution of Yields

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Yield (t/ha)	3	3	1.11	1.18	1.24	1.29	1.29	1	1	2.74	1
Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Yield (t/ha)	1.34	1.42	1.16	1.2	1.22	1.3	1.19	1.18	1.24	1.23	1.22

Note. Source: FAOSTAT.

From the data in Table 5 summarizing the evolution of rice yields in Cameroon from 2000 to 2021, we estimate the average national rice yield in Cameroon at 1.44 t/ha. These data made it possible to draw the curve presented in Figure 10.

We observe on the curve in Figure 10 that in 2002, there was a drop in yield of around 2/3; we go from 3 t/ha to 1.11 t/ha. In 2009, we observed a spectacular rise which went from simple to almost triple; we therefore go from 1 t/ha to 2.74 t/ha in 2010, we observed another fall of around 2/3 which brought down a yield of 1 t/ha, then slight increases in 2011 and 2012 which resulted in a fall in 2013 to the tune of 1.16 t/ha. Subsequently, the curve is approximately constant until 2021. The observation is therefore that the dates on which we observe these variations in yields coincide exactly with those where we observed disturbances in the rate of evolution of the curves representing the evolution of production. We can therefore conclude that the evolution of rice yields is closely linked to the evolution of the level of production. The rice yield in Cameroon went from 3 t/ha between 2000 and 2001 to 1.22 t/ha in 2021; this makes a regression rate of -59.33% in 22 years, therefore an average rate of -2.69%/year. It is therefore a question of identifying what were the causes of this fall in the rice yield rate in Cameroon, and of finding how to raise this rate to at least the height of what it was in the 2000s (3 t/ha).

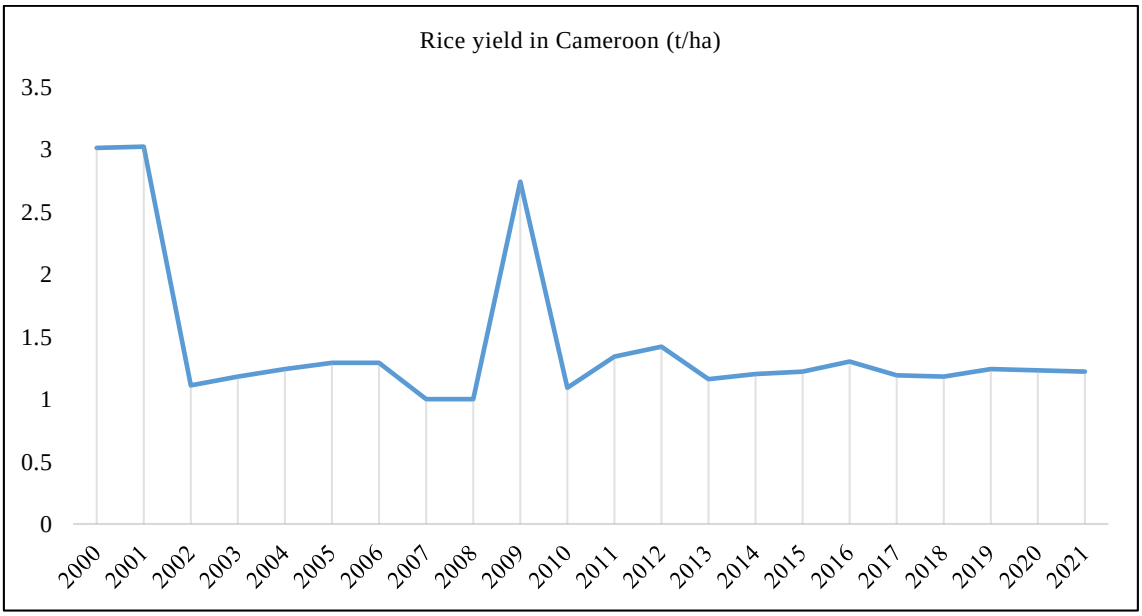

Figure 10. Evolution of rice yields in Cameroon.

By applying the rule of three, we obtain the following results:

If in 2021 1.22 t/ha → 362,294.45 t

3 t/ha → 890,887.99 t

So by keeping all other parameters capable of influencing the level of production unchanged, we observe that if Cameroon manages to return to a yield of 3 t/ha, its production would be 890,887.99 t, for a rate of increase of 59.33%. This would make it possible to satisfy the country's need for rice, whose projections from 2018 give an estimate of 829,980 t in 2021. The probable solutions to achieve this are: the introduction of improved, high-yielding seeds, the use of adequate quantities of fertilizer, and scrupulous compliance with technical itineraries. We unfortunately observe on the curve that, since 2013, the yields tend to remain constant, which could sign that there is no progress recorded in this area of activity which would be a huge asset for achieving the objectives of national production.

Evolution of cultivated areas. Regarding the evolution of cultivated areas, the data obtained are summarized in Table 6 below.

Table 6

Evolution of Cultivated Areas

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cultiveted areas (ha)	20,354	20,505	40,000	39,743	40,236	45,000	50,000	68,268	72,012	49,012	139,976
Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cultiveted areas (ha)	129,296	127,886	166,734	126,901	226,779	276,175	217,302	282,287	269,215	275,797	296,209

Note. Source: FAOSTAT.

In order to easily analyze the data, they were used to construct the curve represented by Figure 11 below.

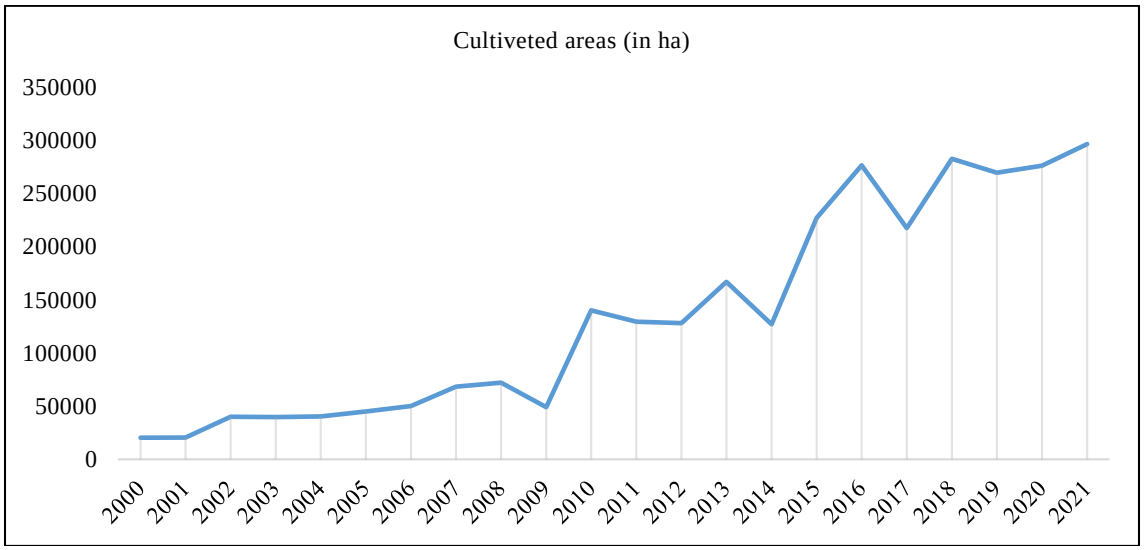

Figure 11. Evolution of cultivated areas.

By observing this curve of the evolution of rice areas cultivated in Cameroon, we see at first glance that its evolution is significantly similar to that of rice production. First of all, we observe a sawtooth evolution, and as on the rice production curve where we record significant drops in production in 2014 and 2017, we also observe a drop in cultivated areas in 2014 and 2017. In overall, when we do a global analysis of the data going from 2002 to 2021, we observe an evolution in cultivated areas which goes from 20,354 ha to 296,209 ha, for an average growth rate of around 93.13% at a rate of 4.23% per year. These data are very close to those of the evolution of rice production. Following these observations and findings, we are tempted to conclude that the level of rice production depends on the cultivated areas. This could therefore explain the importance that the government attaches to the development and rehabilitation of rice fields across the country, whose importance is manifested by the multiple projects already carried out, and those underway on the ground which are summarized in Table 7 below.

Table 7

Rehabilitation and Development Projects for Cultivable Areas, Underway in Cameroon

Project name	Execution period	Regions	Departments	Localities	Areas to be developed (ha)	Areas to be rehabilitated (ha)	Total
Three-year emergency plan (PLANUT)	2017-X	Far North	Logone and Chari	Zina, Makary, Logone Birni, Goulfey	13,000		13,000
Viva-Bénoué project	2020-2025	North	Bénoué	Lagdo	10,000	1,000	11,000
Viva-Logone project	2020-2026	Far North	Mayo Danay, Logone and Chari	Maga, Kai-kai, Vélé, Yagoua	8,900	4,000	12,900
Total					31,900	5,000	36,900

The table shows that if all the rice field rehabilitation and development projects underway in Cameroon are completed, there will be more than 36,900 ha of land available for cultivation; added to the 296,209 ha of 2021, we will have a total of 333,109 ha developed. By carrying out simulations based on the rule of three, we obtain the following results:

If in 2021 we have 296,209 ha ⟶ 362,294.45 t

333,109 ha ⟶ 407,426.99 t

This result presents a rate of increase in production of around 11.07% following the completion of all the developments undertaken by Cameroon. So with the accomplishment of all these major works which swallow up enormous financial resources, Cameroon will barely be able to satisfy around half of its rice needs, which is estimated in 2021 at 829,980 t.

In order to take the reflections a little further, it seemed important to carry out a cross-analysis of the evolution of rice production and cultivated areas. By combining the data from these two variables, we obtain Figure 12 below.

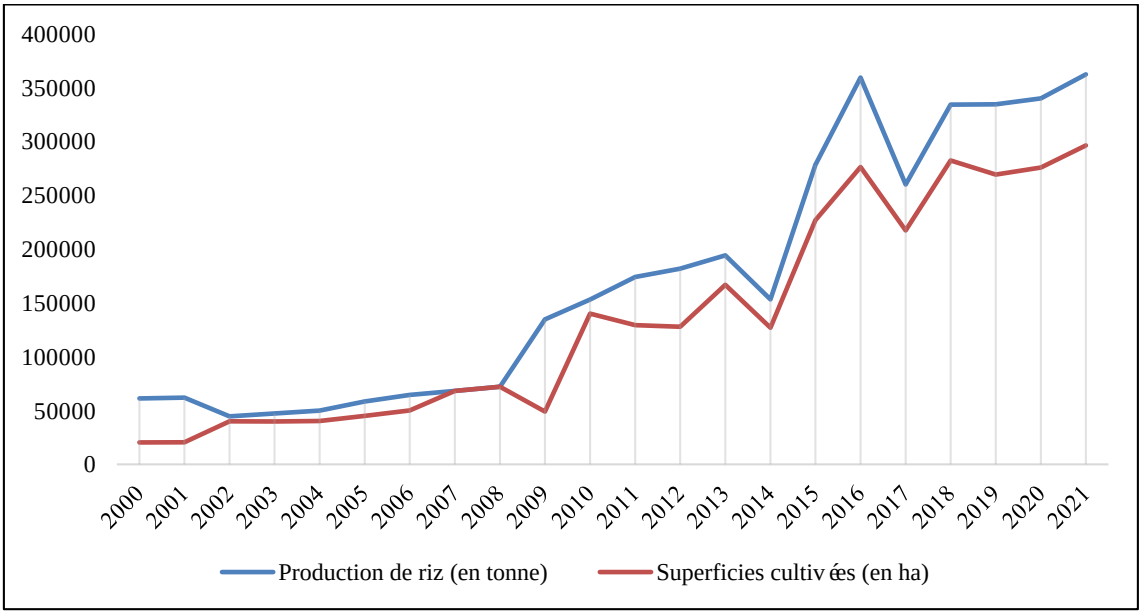

Figure 12. Evolution of cultivated areas and rice production.

By observing these curves simultaneously, we see that indeed, the increase in rice production evolves at approximately the same rate as the increase in cultivated areas. This therefore confirms that the level of rice production actually also depends on the level of cultivated areas. This could therefore lead us to believe that the falls observed in 2014 and 2017 were due to the reduction in cultivated areas.

This idea will have difficulty being validated 100%, perhaps at certain levels we observe an evolution of the curves which goes in the opposite direction. This is the case in 2002, where while the cultivated areas increased, the level of production fell. This is also the case in 2009, then in 2011 and 2012, where while the cultivated areas decrease, the level of production increases; hence the need for a correlation test which will make it possible to evaluate the link which exists between these two variables. From the perspective of a correlation test, it is a question here of first carrying out a normal distribution test, the results of which are summarized in Table 8 below.

Table 8

Normal Distribution Test

Null hypothesis	Test	Sig.	Decision
The distribution of cultivated areas is normal with an average of 135,440.32 t and a standard deviation of 99,113.8 t	One-sample Kolmogorov-Smirnov test	0.383	Retain the null hypothesis

Note. The level of significance 0.05.

The distribution being normal, we can therefore carry out the correlation test. The results obtained for this purpose are summarized in Table 9 below.

Table 9

Correlation Test

	Value	Asymptotic standard error	*T* approximated	Approximate meaning
Interval by interval Pearson *R*	0.984	0.008	24.705	0.000
Ordinal by ordinal Spearman correlation	0.950	0.025	13.652	0.000
Number of valid observations	22			

Since both groups of data used have a normal distribution, we take into account the Pearson correlation coefficient, which is 0.984. This means the existence of a strong correlation between the level of rice production in Cameroon and the cultivated areas.

These results lead to the conclusion that, although it is clearly established that it would be more interesting for Cameroon to invest in the production of improved, high-yielding seeds, it remains necessary to develop and rehabilitate the spaces cultivable which constitute an imperative for production to be possible.

Evolution of the Cameroonian population. Population is a parameter which seems to have a significant impact in determining the level of production. Indeed, it is assumed that the more a population grows, the more labor is available to produce. Knowing that production takes place mainly in rural areas, as part of this study we will focus particularly on the rural population. Table 10 brings together data on the evolution of the Cameroonian population, ranging from the year 2000 to 2021. It also brings together data on the rural population over the same period.

Table 10

Evolution of Cameroonian Population

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Population	15,091.59	15,493.25	15,914.03	16,354.33	16,809.41	17,275.17	17,751.33	18,251.87	18,777.08	19,319.27	19,878.04
Rural population	8,318.116	8,441.086	8,567.125	8,696.474	8,828.9	8,964.62	9,103.242	9,244.465	9,387.386	9,530.836	9,673.887
Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population	20,448.87	21,032.68	21,632.85	22,299.59	23,012.65	23,711.63	24,393.18	25,076.75	25,782.34	26,491.09	27,198.63
Rural population	9,816.164	9,957.503	10,097.48	10,235.717	10,371.907	10,505.784	10,637.19	10,766.102	10,892.584	11,016.661	11,138.276

Note. Source: FAOSTAT.

From the data in Table 10, the growth rate of the Cameroonian population is estimated at approximately 44.51% in 22 years, which makes an average growth rate of 2% per year. As for the rural population, it is estimated at 25.31% in the same period, at a rate of 1.15% per year. We observe that the rural population is growing at half the rate of the population as a whole. Figure 13 below will provide a better appreciation of this change in the population.

The curves in Figure 13 show that the Cameroonian population as a whole is growing at a significant speed, while the rural population tends to stagnate. This could explain the fact that we find an accumulation of populations in large cities, which constitute a mass of consumption, while rural populations are smaller and aging; However, it is in these rural areas that we find production areas which require a very significant workforce to optimize the productivity of farms, and we therefore face the problem of rural exodus. In order to assess the

extent to which this phenomenon affects rice production in Cameroon, a correlation test was carried out to verify the link that exists between the evolution of the rural population and the level of rice production in Cameroon. First of all, we start by doing the normal distribution test which gives the following results (see Table 11):

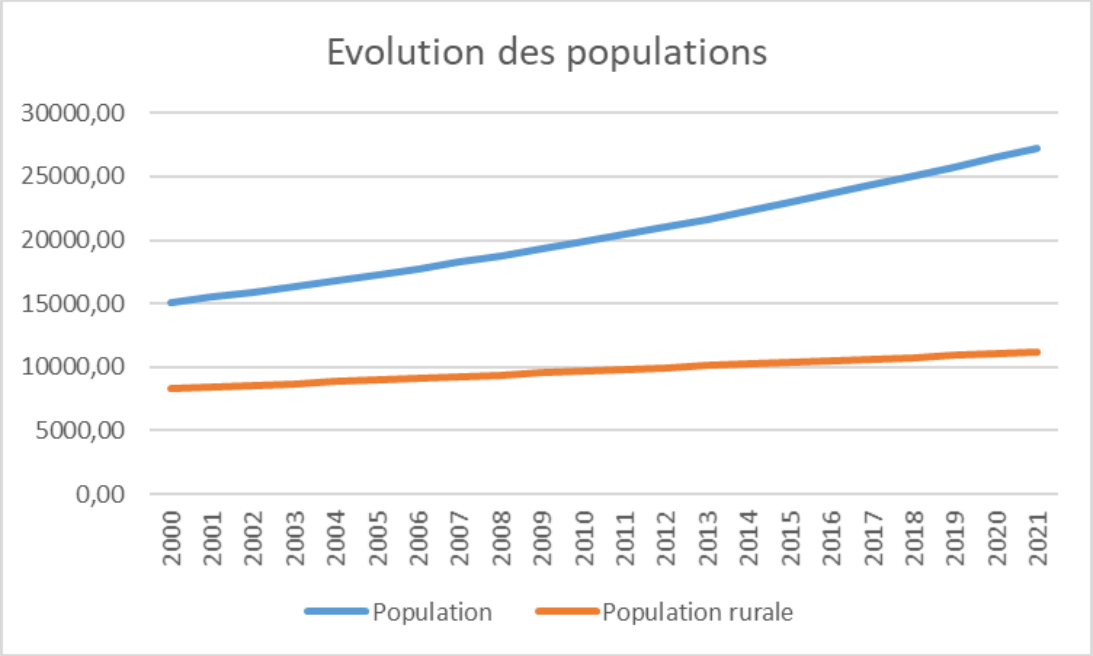

Figure 13. Evolution of Cameroonian population.

Table 11

The Normal Distribution Test

Nul hypothesis	Test	Sig.	Decision
The distribution of the rural population is normal with a mean of 9,735.98 and a standard deviation of 889.4	One-sample Kolmogorov-Smirnov test	0.999	Retain the null hypothesis

Note. The level of significance is 0.05.

The distribution of the rural population being normal, we can move on to the correlation test which gives the following results:

Table 12

Correlation Test

	Value	Asymptotic standard error	*T* approximated	Approximate significance
Interval by interval Pearson *R*	0.942	0.02	12.539	0.000
Ordinal by ordinal Spearman correlation	0.953	0.027	13.998	0.000
Number of valid observations	22			

From Table 12, the correlation coefficient gives the result 0.942. There is therefore a strong correlation between the evolution of the level of rice production in Cameroon and the evolution of the rural population.

These results lead to the conclusion that the fight against rural exodus is a very important factor in boosting rice production in Cameroon. The country must therefore develop very effective strategies to reverse the direction of immigration of populations in general, and young people in particular.

Estimation of producers' gross margin. To be objective and do a good analysis, it was a question of collecting the necessary data to estimate the gross margins of the different categories of producers in the same locality. The Yagoua area was therefore chosen because it is home to all categories of producers which are: producers operating in the irrigated areas of SEMRY which is a support structure belonging to the state; producers of rainfed rice and flooded lowlands supervised by PADFA which is a MINADER project; and producers of traditional areas involved in the production of flooded lowland rice.

Producers of SEMRY Irrigated Areas

Having noted many incongruities in the declarations of the producers surveyed, it was preferable to use the operating account prepared for 0.5 ha and recorded in the final report of the social evaluation of the Viva-Logone project. Some adjustments were made based on developments observed on the field, and the projection was made over 1 ha. It should be noted that the bag of paddy rice as taken in this operating account weighs on average 80 kg, and it is sold locally between 13,000 and 14,000 FCFA at the time when the surveys were carried out in the field, that is to say between January and February 2023. To facilitate the calculations, the highest amount which is 14,000 FCFA was adopted for a bag of paddy; hence the unit price per kg which is 175 FCFA.

Table 13

Operating Account of 1 ha of Rice in the Irrigated Areas of SEMRY

Wording	Unit	Quantity	Unit price (FCFA)	Total price (FCFA)
Nursery				
Purchase seeds	kg	70	263	18,410
Nursery preparation and maintenance	h/j		12,000	12,000
Tearing	h/j		16,000	16,000
Transporting plants from the nursery to the rice field	h/j		8,000	8,000
Total 1				54,410
Plot preparation				
Planning and making bunds	h/j	2	15,750	31,500
Transplanting	h/j	2	16,000	32,000
Total 2				63,500
Maintenance				
Fertilizer (14-24-14)	sacs	4	40,000	160,000
Urea	sacs	4	45,000	180,000
Weeding	h/j		40,000	40,000
Total 3				380,000
Harvest				
Bird guarding	h/j		30,000	30,000
Harvesting and winnowing	h/j		120,000	120,000
Packaging bags	number	80	300	24,000
Transportation from field to home	bags	80	500	40,000
Total 4				214,000
Other charges				
Royalty	1 ha		102,000	102,000
Total 5				102,000
Total expenses				813,910
Turnover	kg	6,400	175	1,120,000
Gross margin	FCFA			306,090

As shown in Table 13, it appears from this operating account that the overall gross margin is 306,090 FCFA, which results in a gross margin of 3,826 FCFA per 80 kg bag of paddy. The monthly income of a producer who farms only 1 ha is therefore 25,507.5 FCFA, for families whose average size is 15 people. We therefore understand that a farmer in this context cannot make a living solely from rice cultivation, which explains the fact that they diversify the cultivated crops, and practice other activities such as motorcycle taximan and trade. The cost of producing a bag of rice is estimated at 10,174 FCFA. The contribution rates of each heading to the overall production cost are summarized in Table 14 below.

Table 14

The Contribution Rates of Each Heading to the Overall Production Cost

Wording	Cost (FCFA)	Rate (%)
Nursery	54,410	6.6
Plot preparation	63,500	7.8
Maintenance	380,000	46.8
Harvesting and guarding	214,000	26.3
Royalty	102,000	12.5
Total	813,910	100

We observe that the cost of maintenance which is made up of 89.47% of fertilizers and 10.53% of weeding comes in first position with 46.8% of the overall production cost, followed by harvesting costs with 26.3%. These two items represent 73.1% of the overall production cost. Knowing that if we want to improve the profit margin of a farm, we either increase the selling price or reduce the production cost, we understand that if we opt for reducing the production cost, we must prioritize these two sections, and in particular on the cost of fertilizers which alone is worth 41.77% of the overall production cost. Unfortunately, producers who face high fertilizer prices, and having no means to bring them down, are forced to instead reduce the quantities of fertilizer used, with the direct consequence of falling yields, and therefore consequently that of national production.

Rainfed Rice Producers, Supervised by PADFA

These producers benefit from support from PADFA, which allows them to benefit from free seed and inputs. To remain objective in the analyses, we take into account in the calculations the costs of inputs and seed which are provided free of charge. The operating account below presents the real situation of a 1 ha rainfed rice farm (see Table 15).

Table 15

Operating Account of 1 ha of Rainfed Rice, Among PADFA Producers

Wording	Unit	Quantity	Unit price (FCFA)	Total price (FCFA)
Nursery				
Purchase seeds	kg	70	263	18,410
Nursery preparation and maintenance	h/j		12,000	12,000
Tearing	h/j		16,000	16,000
Transporting plants from the nursery to the rice field	h/j		8,000	8,000
Total 1				54,410

Table 15 to be continued

Plot preparation				
Planning and making bunds	h/j		31,500	31,500
Transplanting	h/j		32,000	32,000
Total 2				63,500
Maintenance				
Fertilizer (20-10-10)	bags	4	40,000	160,000
Urea	bags	2	45,000	90,000
Weeding	h/j		120,000	120,000
Total 3				370,000
Harvesting				
Bird guarding	h/j		30,000	30,000
Harvesting and winnowing	h/j		120,000	120,000
Packaging bags	number	38	300	11,400
Transportation from field to home	bags	38	500	19,000
Total 4				180,400
Other charges				
Land rental	1 ha		10,000	10,000
Plowing	1 ha		16,000	16,000
Total 5				26,000
Total expenses				694,310
Turnover	kg	3,000	175	525,000
Gross margin	FCFA			169,310

We note that rainfed rice cultivation with its average optimal yield of 3 t/ha gives a fairly low balance, but very often improved by the inputs which represent 38.65% of the total production cost, and which are offered free of charge, giving the illusion of good profitability. It is moreover the fact of benefiting from these facilities which often gives certain producers the impression of making a lot of profits, and as soon as the support project comes to an end, the producers no longer benefiting from these facilities find themselves forced to return to traditional practices or abandon rice cultivation and engage in other activities. In addition, the workforce is essentially family-based, which further contributes to giving the impression of good profitability. The cost of producing a bag of rainfed rice comes to approximately 18,515 FCFA. Compared to irrigated rice, this cost is very high, and is explained by the low level of yield. The monthly income in a context of normal production is estimated at 14,109 FCFA per producer in 1 ha.

Rice Producers from Flooded Lowlands, Supervised by PADFA

Rice from flooded lowlands follows almost the same route, but with a better optimal yield of 6 t/ha. Table 16 presents the operating account of 1 ha for a producer in this category.

Table 16

Operating Account of a Flooded Bottomland Producer

Wording	Unit	Quantity	Unit price (FCFA)	Total price (FCFA)
Nursery				
Purchase seeds	kg	70	263	18,410
Nursery preparation and maintenance	h/j		12,000	12,000
Tearing	h/j		16,000	16,000
Transporting plants from the nursery to the rice field	h/j		8,000	8,000
Total 1				54,410

Table 16 to be continued

Plot preparation				
Planing and making bunds	h/j		31,500	31,500
Transplanting	h/j		32,000	32,000
Total 2				63,500
Maintenance				
Fertilizer (20-10-10)	bags	4	40,000	160,000
Urea	bags	2	45,000	90,000
Total 3				250,000
Harvesting				
Bird guarding	h/j		30,000	30,000
Harvesting and winnowing	h/j		110,000	110,000
Packaging bags	number	75	300	22,500
Transportation from field to home	bags	75	500	37,500
Total 4				200,000
Ather charges				
Royalty	ha	1	10,000	10,000
Plowing	ha	1		16,000
Total 5				26,000
Total expenses				593,910
Turnover	kg	6,000	175	1,050,000
Gross margin	FCFA			456,090

The gross margin in this category is 456,090 FCFA, which makes a margin per bag of around 6,081 FCFA, and a monthly income of 38,007 FCFA per producer on a 1 ha plot. Although this income is better compared to other categories of producers, it remains very low to allow rice farmers to be able to live exclusively from this activity. The cost of producing a bag of paddy is estimated in this category at 7,918.66 FCFA. This fairly low production cost compared to producers in the SEMRY irrigated areas can be explained by the fact that they do not need to pay a fee to have access to water, and they use a little less fertilizer for a yield not very different. We therefore confirm that, if we can reduce the use of fertilizers which are increasingly expensive and maintain the yield at the same level, we can make this activity more lucrative. A combination of the two systems would make it possible to easily do two cycles per season and improve profitability, by benefiting from the rise in water levels in the rainy season, then switch to irrigation in the dry season.

Producers from Traditional Areas

Based on the information collected from producers, an operating account was developed for producers in traditional areas. Here there is no purchase of seeds, producers take part of their production which they keep as seed for the next season. Having no means to buy fertilizers which are more and more expensive, the plots are not fertilized, and the problem of weeding does not arise, because the plots are flooded by the rising waters, sometimes after the lifting. They also do not pay a fee to have access to the land, but rather a rental for some.

It appears from Table 17 that the gross margin for 1 ha is -700 FCFA, which makes a gross margin per bag of -50 FCFA. In this context, contrary to what the figures show, producers have the impression of earning much more, because 95% of the cost of production is made up of family labor. Producers often do not take it into

consideration in their estimates, in addition they produce first for their own consumption, and only sell the surplus. The cost of producing a bag of paddy is estimated at 14,050 FCFA for producers in traditional areas.

Table 17

Operating Account of 1 ha of Rice in Traditional Areas

Wording	Unit	Quantity	Unit price (FCFA)	Total price (FCFA)
Nursery				
Nursery preparation and maintenance	h/j		12,000	12,000
Tearing	h/j		16,000	16,000
Transporting plants from the nursery to the rice field	h/j		8,000	8,000
Total 1				36,000
Preparation parcels				
Planning and making bunds	h/j		31,500	31,500
Transplanting	h/j		32,000	32,000
Total 2				63,500
Harvest				
Bird guarding	h/j		30,000	30,000
Harvesting and winnowing	h/j		30,000	30,000
Packaging bags	number	14	300	4,200
Transportation from field to home	bags	14	500	7,000
Total 3				71,200
Other charges				
Land rental	1 ha		10,000	10,000
Plowing	1 ha			16,000
Total 4				26,000
Total expenses				196,700
Turnover	kg	1 120	175	196,000
Gross margin	FCFA			-700

Discussions

At the end of the analysis of the performance of rice producers in Cameroon, we note a certain number of obstacles which do not make it possible to boost local production, despite the injection of significant financing. We note, for example, the slow pace of plowing observed by state support structures, which are unable to deliver the plots on time to all producers. This situation leads to a shift in sowing periods at the producer level, with the direct consequence of difficulty in harmonizing the hunting of birds which are responsible for significant post-harvest losses; it also causes a delay in sowing for certain producers whose plots are delivered late. Ngoucheme, Tabi, Meli, and Fouadou (2020) confirmed the need to respect sowing periods by affirming that sowing rice at the right time is important for a high yield. Chaudhary, Nanda, and Tran (2003) went further by specifying that plowing practices affect the growth of plants during germination, emergence, and establishment stages of the plant. Quality and timing of soil preparation are important to ensure good yield. Poor and untimely soil preparation can lead to serious invasion of the field by weeds. Soil erosion in upland rice crops, in aquatic rice crops, and in irrigated rice crops exposes plants to harmful substances released by the decomposition of organic matter in the soil (Chaudhary et al., 2003). Another obstacle of capital importance is the permanent unavailability of improved seeds among certain producers who are obliged to take part of their harvests to use as seed, with the consequence of very low yields, or for some the abandonment of rice

cultivation. In the same vein, the national strategy document for the development of rice cultivation in Cameroon specifies that the lack of selected seeds constitutes one of the major constraints for the development of rice cultivation in Cameroon. We also note the increase in fertilizer prices, which are no longer easily accessible by most rice farmers; they are finding it increasingly difficult to fertilize their plots to meet prescribed needs. According to the IFDC (International Fertilizer Development Center), two out of five people on earth today owe their lives to the increased crop yields that fertilizers have made possible, as of the second quarter of 2021, global fertilizer prices began to increase dramatically. In more developed markets, farmers have been somewhat protected from this price rise, with a better crop-to-fertilizer price ratio than farmers in sub-Saharan Africa (SSA). According to IFDC estimates, this region of the world could have seen a 30% drop in fertilizer demand in 2021. A reduction of 30%, or around 2 million tons, in 2022 translates to a drop of food production of 30 million tons, equivalent to the food needs of 100 million people. This will have a significant impact on food import requirements in Africa, as global food prices continue to rise. According to Gabriel Ba ŕobe, Minister of Agriculture and Rural Development who spoke in the newspaper *Cameroon Tribune* on July 8, 2022, today we have reached the level where urea which cost 19,000 FCFA actually costs 45,000 FCFA per bag, NPK fertilizer which cost 21,000 FCFA per bag, actually costs between 35,000 FCFA and 40,000 FCFA. The small producer can therefore no longer access fertilizer. Despite all these difficulties that production faces, there is a significant change in the annual growth rate of rice production which is around 4.61%, although it remains much lower than that estimated by MINEPAT (2020) for the period from 2009 to 2018, or 11.6%. Knowing that the data used by MINEPAT go from 2009 to 2018, we can understand that this acceleration in the growth of rice production follows the numerous measures taken by the government in the aftermath of the hunger riots of 2008; targeting several areas of intervention including the increase in cultivated areas. It should be noted that according to our results, the evolution of the level of rice production is substantially identical to that of the cultivated areas. While rice production is evolving at an annual growth rate of around 4.61%, cultivated areas are growing at a rate of 4.23%. This therefore leads to think that the important parameter on which we relied to increase the level of rice production in Cameroon is the increase in cultivated areas; it would therefore be appropriate to currently focus on improving yields which, according to our results, would have an impact twice as significant. Analysis of FAO data shows an average rice yield in Cameroon of 1.44 t/ha, which is much lower than the capacities of the varieties currently available in the field. Especially when we know that, according to Business in Cameroon (2013), trial results have shown that in many parts of the country, paddy yields can reach 8 to 10 tons/hectare, with the possibility of making more than one crop per year in certain areas. This low level of yield is due to several factors including: the low level of fertilizer use due to lack of resources, the use of unsuitable seeds, and lack of water control. The evaluation of the performance of rice producers in Cameroon shows that they have very low profitability, and cannot make a living solely from rice cultivation, which explains the fact that they are obliged to diversify the crops cultivated, and to practice other activities like motorcycle taxi and trade. To succeed as a rice farmer, it is imperative to improve yields and reduce production costs. If we opt for reducing the cost of production, we must prioritize the cost of fertilizers which alone is worth 41.77% of the overall cost of production. Rice production in Cameroon is carried out by three regions which are: the Far North, the North, and the North-West. These are the regions where the state has injected the means, through its structures which are: SEMRY, MEADEN, and UNVDA. Knowing that all other regions have great rice-growing potential, it is imperative to install similar

structures there to ensure the development and rehabilitation of irrigated areas, and allow each region to be able to self-supply, while reducing handling costs linked to the transport of rice from the northern production basins to the southern part of Cameroon. This solution could also help combat the phenomenon of rural exodus which leads young people to leave rural areas which are production areas, to go to cities, in search of new prospects. Indeed, rural-urban migration remains a major persistent socio-economic malaise for Cameroon, as well as other developing countries. Catherine Coquery-Vidrovitch (1991), for example, proposed the push-pull theory which states that the unfavorable economic reality of the rural area pushes away the potential migrant, while the attractions of the urban environment pull him in. We must therefore think about making our rural areas attractive to further encourage the return of populations.

Conclusion

By way of conclusion, we can say that this study, which aimed to cross-analyze the evolution of rice production in Cameroon, with that of yields, cultivated areas, and rural populations, is inspired by the observation according to which, despite all the efforts made to boost the level of local rice production, more than half of the rice consumed in Cameroon comes from imports. The expense linked to the very large import of rice has a very negative impact on the Cameroonian trade balance, which leads to the question of knowing what the blockages are that prevent us from effectively boosting production at least to the level of the needs of the populations. To try to provide a satisfactory answer to this question, it was necessary to evaluate the performance of local rice producers in Cameroon. As part of this study, the regions of the Far North, North, West, and Center, which produce most of the rice in Cameroon, were covered. At the end of the analysis of the performance of rice producers in Cameroon, we note several obstacles which do not make it possible to boost local production, despite the injection of significant financing. We note, for example, the slow pace of plowing observed by state support structures, which are unable to deliver the plots on time to all producers. This situation leads to a shift in sowing periods at the producer level, with the direct consequence of difficulty in harmonizing the hunting of birds which are responsible for significant post-harvest losses; it also causes a delay in sowing for certain producers whose plots are delivered late. Another obstacle of capital importance is the permanent unavailability of improved seeds among certain producers who are obliged to take part of their harvests to use as seed, with the consequence of very low yields, or for some the abandonment of rice cultivation. We also note the increase in fertilizer prices, which are no longer easily accessible by most rice farmers; they are finding it increasingly difficult to fertilize their plots to meet prescribed needs. We also note the fact that populations are abandoning rural areas which are production areas to settle in metropolises. All these obstacles lead to very low yields recorded in the plots; analysis of FAO data gives us an average rice yield in Cameroon of 1.44 t/ha, but the results of the trials have shown that in many regions of the country, paddy yields can reach 8 to 10 tons/hectare, with the possibility of growing more than one crop per year in certain areas. Cameroon must therefore think of a program which aims to make rice cultivation profitability and leave planters unable to continue their activities in the latter’s absence.

Recommendations

In view of all the results observed, we can recommend to Cameroon, as prospects for boosting local rice production, the implementation of the following strategies:

- Create a body in charge of coordinating the activities of actors in the rice sector;
- Establish a research program aimed at developing high-yielding seeds;
- Create seed production centers in each region;
- Create fertilizer production factories in Cameroon;
- Establish a financing and supervision program for rural youth projects;
- Carry out a land reform which will facilitate access to land for young people;
- Create a national program to popularize rice cultivation in Cameroon;
- Develop irrigated areas in all regions;
- Create support structures for stakeholders in all regions.

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