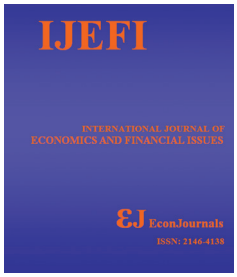

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Effect of Market Gardening on Monetary Poverty among Rural Households in Senegal

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ABSTRACT

The objective of this study is to analyse the effects of market gardening on the monetary poverty of rural households in Senegal, particularly in the Sedhiou region. Data was collected from 280 households. A comparison of household monetary poverty indices calculated using the method developed by Foster, Greer and Thorbeck shows that poverty is more pronounced among non-market gardening households and that market gardening reduces the incidence of poverty by the 1.14%, its depth by 5.52% and its severity by 6.07%. Analysis of the Lorentz curve shows that market gardening helps to reduce income inequality within households that practise it. It also appears that market gardening is an important source of monetary income for households, as it accounts for 21% of their agricultural monetary income and 9% of their total monetary income. Policies promoting the development of market gardening would contribute significantly to increasing farmers' incomes and reducing monetary poverty.

Keywords: Foster Greer and Thorbeck (FGT) Indices, Lorentz Curve, Market Gardening, Monetary Poverty, Senegalese Farming Households
JEL Classifications: O13, O15, I 32

1. INTRODUCTION

Poverty is a scourge that affects many countries and is a regional, national and international concern. In fact, 8.5% of the world's population lived in extreme poverty in 2024 (World Bank, 2024) and nearly 35% of the population of sub-Saharan Africa still lives in extreme poverty, with inequalities widening under the impact of climate, geopolitical and social crises (Mattes and Lekalake, 2025). Poverty is a multidimensional concept. The United Nations Development Programme (UNDP) specifically defines it in three terms: " Extreme poverty ", which refers to a person who does not have the income necessary to meet their basic food needs, " general poverty " refers to a person who does not have sufficient income to meet their basic non-food needs, and " human poverty ", refers to the absence of basic human capabilities: illiteracy, malnutrition, reduced life expectancy, poor maternal health, preventable disease (Benicourt, 2001; Khanfar, 2019). The World Bank (WB), for its part, uses the monetary approach to poverty, which consists of using income or consumption criteria and then combining different areas that reinforce or aggravate each other to reduce or increase the level of poverty among poor populations (Khanfar, 2019). Since 2015, the international community has set itself the goal of "ending poverty in all its forms everywhere" by 2030 through the Sustainable Development Goals (SDGs). Market gardening therefore appears to be a means of combating poverty, especially in the context of climate change. In the literature, it has been shown that market gardening reduces poverty and food insecurity (Compaore et al., 2021; Rakotomalala, 2017; Kalumbu et al., 2015; Kouakou, 2020; John et al., 2015; Ibriga et al., 2023; Eric et al., 2018).

In Senegal, the poverty rate is estimated at 37.5%, with a high proportion in rural areas (53.3%) (ANSD, 2024). At the regional

level, the Sedhiou region, which has one of the highest poverty rates in the country at 64.4% after Kedougou (65.7%), is one of the areas most affected by food insecurity, with a rate of 40.1% (ANSD, 2024). Poverty is therefore a very real phenomenon in Senegal. Furthermore, in order to reduce the vulnerability of the agricultural sector, improve food self-sufficiency and the lives of farming households, several strategies have been put in place, including market gardening, a branch of horticulture that has grown in popularity in recent years. Its growth has accelerated with the implementation of several integrated industrialisation initiatives and the implementation of various agro-industrial projects (MAER, 2014, 2018; SND, 2024). Indeed, it was initially concentrated in the Niayes area, but then diversified geographically. This practice is relatively more widespread in the southern and northern regions, particularly in Ziguinchor, Sedhiou and Saint-Louis (more than 20%) and, to a lesser extent, in Kolda and Matam, with respective proportions of 16% and 12% (DAPSA, 2023). In this context, faced with the problem of poverty and the growth of market gardening in this area, it would be interesting to answer the following question: what role does market gardening play in reducing the monetary poverty of rural households in Senegal, particularly those in the Sedhiou region?

To our knowledge, few studies have explored the relationship between market gardening and monetary poverty in the Senegalese context, where agricultural policies promote horticulture. Thus, the objective of our study is to determine the impact of market gardening on the monetary poverty of rural households in Senegal. This work is divided into three sections. First, we have a section on the literature review, followed by a section on methodology and, finally, a section on results and discussions.

2. LITERATURE REVIEW

2.1. Conceptual Framework and Measurement of Monetary Poverty

Poverty is multidimensional. The UNDP specifically defines three concepts of poverty: Extreme poverty or absolute poverty, general poverty or relative poverty, and human poverty. The UNDP does not officially define monetary poverty, but it does refer to it. It places human poverty at the heart of its analysis. The UNDP therefore favours a multidimensional approach in which human poverty is defined as the denial of the fundamental opportunities and prospects on which all human development is based: living a long, healthy, constructive life and enjoying a decent standard of living, as well as freedom, dignity, self-respect and respect for others (UNDP, 2006). Poverty is not limited to a lack of income but also includes deprivation in terms of health, education, housing, security and human dignity (UNDP, 2024). The World Bank uses a monetary approach to poverty. Its reasoning is based on identifying two types of poverty: Absolute poverty (not having sufficient income to meet basic food needs defined on the basis of minimum caloric requirements) and relative poverty (not having sufficient income to meet basic non-food needs). The World Bank's monetary approach is based on income or consumption criteria, and poverty is often measured on the basis of insufficient income (Sambou et al., 2021). In literature, we identify two approaches to poverty: The monetary approach advocated by utilitarians or welfarists, and the non-monetary approach. The utilitarian approach, also known as the monetary or welfarist approach, is defined as the degree of satisfaction achieved by an individual in relation to the goods and services they consume. It is therefore based on the principle that each individual satisfies their well-being according to their preferences. However, as utility cannot be directly measured and observed, resources (income and consumer spending) are used to measure well-being (Blasco et al., 2022). The theory of well-being therefore serves as a reference for the analysis of monetary poverty. Thus, poverty is defined as a state in which an individual or household does not achieve an acceptable level of income or consumption in a given society according to that society's standards (Sambou et al., 2021, Gublin, 2014). Similarly, according to Blasco et al. (2022), monetary poverty is generally defined as a situation where a household's income is below a set threshold, either in absolute or relative terms. Monetary poverty is thus measured using a resource threshold. A person is considered poor when they live in a household where the standard of living is below the poverty threshold (INSEE, 2014). Within the monetary approach, the most commonly used poverty measures are the Foster et al. poverty indices (1984). Several authors have used the Foster et al. (1984) poverty indices to analyse monetary poverty (Hadrachi and Kamli, 2022; Pignataro and Costa, 2023; Awomi and Tariang, 2025). Non-monetary approaches, unlike utilitarian approaches, are based on the definition of well-being from a social perspective, as well-being is not translated in terms of monetary resources, but in terms of freedoms and achievements (Sambou et al., 2021). In this non-monetary approach, we distinguish between:

- The capabilities approach developed by Sen (1987). This approach is based on the concept of social justice. In Sen's reasoning, what is lacking is not utility or basic needs, but the human abilities or capabilities deemed fundamental to achieving a certain standard of living. Indeed, according to the author, well-being is not related to the possession of goods, but to being well-fed, well-educated, in good health, participating in community life.
- The basic needs approach (education, health, hygiene, sanitation, drinking water and housing), which focuses on identifying the needs common to all human beings that are necessary to achieve a certain quality of life. In this approach, an individual is considered poor if they do not meet their basic needs in relation to a certain standard of living. The needs-based approach has many drawbacks due to the relative definition of basic needs.
- Apart from these two approaches, there is also the cumulative deprivation approach and other approaches combining subjective poverty, transitional poverty and the instantaneous approach (Gublin, 2014). However, in our research, we limit ourselves to the monetary approach to poverty.

2.2. Market Gardening and Monetary Poverty

According to the monetary approach, poverty is defined as a state in which an individual or household does not achieve an acceptable level of income or consumption in a given society according to that society's standards. In this context, several authors have shown that producers benefit from the multiple socio-economic functions of market gardening, including reducing unemployment, the main activity of peri-urban agriculture, generating income,

contributing to healthcare, food security and waste management through the recycling of biodegradable materials in agriculture and livestock farming (John et al., 2015; Kalumbu et al., 2015; Owolabi et al., 2019). According to Compaore et al. (2021), market gardening represents a credible alternative for overcoming poverty, particularly in peri-urban and rural areas. Using the Khi 2 method, they show that the income of market gardeners influences their decision to send their children to school, but also contributes to improving their living conditions, including covering education-related costs. They found that market gardeners' incomes vary between 10,000 CFA francs and 300,000 CFA francs per season and that 73% of producers are able to save money from their market gardening income. Similarly, Rakotomalala (2017) shows that market gardening has improved the income of farms without changing their land allocation patterns. Kouakou (2020), using descriptive and analytical statistics, a budgetary approach and social analysis methods, shows that income from market gardening improves the daily food satisfaction rate of market gardeners' families, their level of education and their access to healthcare. He emphasises that market gardening is a source of empowerment and improves the living conditions of market gardeners. Thus, market gardening is an income-generating activity that improves the well-being of farmers (Ibriga et al., 2023). Yolou et al. (2015) used descriptive statistics to show that the net monthly income of market gardeners is equivalent to the monthly salary of a senior executive in the Beninese civil service, i.e. more than four times the GMIW (guaranteed minimum interprofessional wage), indicating how economically profitable market gardening can be. Other authors have shown that vegetable gardens have helped reduce poverty rates by contributing significantly to household needs, providing food for personal consumption and generating income from vegetable harvests (Davis et al., 2017; Mdiya and Mdoda, 2021; Tanimonure et al., 2025). Overall, the literature teaches us that market gardening has a positive impact on reducing poverty among farming households.

3. METHODOLOGY

3.1. Analytical Framework

This study falls within the analytical framework of welfare theory on the one hand and rural households on the other. Welfare theory (or welfare economics) is a branch of economics that studies how resources can be used and distributed in order to maximise collective welfare. It seeks to define, measure and compare economic situations based on their ability to improve individual satisfaction and social efficiency. The agricultural household is an economic agent whose production and consumption activities are linked; it is a producer-consumer. He therefore derives satisfaction from the consumption of agricultural goods and market goods. His well-being therefore requires a minimum standard of living and a minimum level of utility from the monetary and non-monetary income at his disposal.

3.2. Specification of the Method for Analysing the Impact of Market Gardening on Household Monetary Poverty

To analyse the impact of market gardening on household monetary poverty, we will use the method developed by Foster et al. in 1984. This involves comparing the monetary poverty indices of households practising market gardening with those of households not practising it. Finally, we will study income inequality using the Lorentz curves for the two categories of households.

3.2.1. Comparison of poverty indices for the two types of households

A poverty index is an indicator used to determine the level of poverty within a certain group in a certain geographical area. To calculate it, data on the incomes of the individuals concerned must be obtained, a poverty line must be established, and the percentage of individuals below this line must be calculated. There are several poverty indices, the most commonly used being those developed by Foster et al. in 1984, which combine the incidence of poverty, the depth of poverty and the severity of poverty. The class of indices developed by Foster et al. (1984) is defined by:

$$FGT_{\alpha} = \frac{1}{N}\sum_{i=1}^{q}\left[\frac{Z_i - Y_i}{Z_i}\right]^{\alpha} \quad (1)$$

FGT_{α} represents the poverty index, α the poverty weighting parameter, n the total number of households, q the number of poor households, and Z_i the poverty threshold for household i. This threshold is set by the latest Harmonised Survey on Household Living Conditions (EHCVM) in Senegal 2018/2019 at 333,441 CFA francs per person per year.

Y_i is the household income per adult equivalent obtained by dividing the total household income by the number of adult equivalents.

- For $\alpha = 0$, the index FGT_0 measures the incidence of monetary poverty. It corresponds to the proportion of poor households;
- For $\alpha = 1$, the FGT_1 index measures the depth of monetary poverty. It is the difference between the average expenditure of poor households and the poverty threshold. It allows the incidence and degree of poverty to be measured simultaneously;
- For $\alpha = 2$, the FGT_2index indicates the severity of poverty. This index corresponds to the dispersion around the average expenditure of poor households. It reflects consumption inequality within the poor population.

In this study, the contribution of market gardening to poverty reduction is assessed by comparing the extent of poverty among farming households engaged in market gardening with that of farming households not engaged in this activity, based on poverty indices calculated for each of the groups concerned.

3.2.2. Analysis of income inequality among market gardening and non-market gardening households

The Lorenz curve is used to measure income or wealth inequality in a given society. In the diagram, the fractions of the population (as a percentage) are shown on the horizontal axis and the fractions of income (also as a percentage) on the vertical axis. The curve is obtained by connecting the points that represent the share of income received by each fraction of the population. The diagonal line of this diagram represents perfect equality (each percentile

of the population receives the same proportion of total income), while the Lorenz curve represents the observed reality: The greater the gap between the two, the greater the inequality. This gap is called the Gini coefficient, and it is measured by comparing the area representing inequality (the area between the diagonal line and the Lorenz curve) to the total area between the diagonal line and the x-axis. Perfect equality corresponds to a coefficient of zero, while maximum inequality (where a single inhabitant has all the income) corresponds to a coefficient of 1.

The further the Lorenz curve deviates from the diagonal line, the greater the inequality. The population is generally divided into ten fractiles. These are referred to as population deciles. The first decile represents the poorest 10% of the population, the second decile the poorest 20%, and so on. The equation of the curve is given by:

$$L(P)=\frac{1}{\mu}\int_{0}^{P}Q(q)dq \quad (2)$$

L(P) is the cumulative percentage of total monetary income held by a proportion P of the population, μ is the average income level, and Q(q) is the q-decile of the income distribution.

3.3. Data Sources and Sampling

This study was conducted in two stages: First, documentary research, and second, primary data collection. Primary data were collected from farming households that practise market gardening and those that do not. We have a sample of 280 observations, including 175 for market gardening households and 105 for non-market gardening households. The Sedhiou region was selected for the study because it has one of the highest poverty rates in the country, at 64.4% after Kedougou (65.7%), and is one of the areas most affected by food insecurity, with a rate of 40.1% (ANSD, 2024). It comprises three departments: Sedhiou, Bounkiling and Goudomp. The survey was conducted in these three departments. In each department, villages were selected based on the extent of market gardening practices. Within these villages, households were selected at random, but respondents had to meet the following criteria: be an agricultural producer engaged in market gardening for the first group, and be an agricultural producer not engaged in market gardening for the second group. Data collection was carried out on two levels. First, we conducted a preliminary survey to test the relevance of the questionnaire and then the survey itself. The questions focused on any changes in their lives and livelihoods over a specific period of time, as well as socio-economic factors covering various areas, namely food production, sources of real income, changes in expenditure, food consumption, asset accumulation, and general well-being.

4. RESULTS AND DISCUSSION

4.1. Overall Statistics

Of the 280 households surveyed, 42.14% are male and 57.86% are female, with an average household size of 16. The majority of heads of households are married (88.93%), 3.57% are single and 7.50% are widowed. The average age of the head of household is 44. In terms of marital status, 55% are monogamous and 45% are polygamous. From a religious perspective, the majority of the population is Muslim (89.64%), only 10.00% are Christian and 0.36% follow traditional religions. It was found that 30.36% of heads of households had never attended school, 22.5% had completed primary education, 18.21% had received Koranic education, 9.64% had completed secondary education and, finally, 6.79% had been taught to read and write.

With regard to housing characteristics, 97.86% of respondents are homeowners (60.71% for market gardening households) compared to 2.14% who are tenants. The majority live in houses with tin roofs (86.79%), compared to 8.93% with concrete roofs, 3.93% with slate roofs and 0.36% with thatched roofs. In contexts of monetary poverty, households use less expensive materials (thatch, sheet metal), while wealthier households invest in tiles, concrete or slate. Thus, the type of roof directly reflects the income level and investment capacity of households. This is confirmed by the work of Halkos and Aslanidis (2023), which shows that housing characteristics are closely linked to economic and social inequalities.

In terms of lighting sources, 72.14% of respondents have access to electricity, compared to 27.86% who do not. The majority of households use firewood as fuel (98.57%), compared to 1.43% who use coal. As for drinking water sources, 91.43% consume water from wells, compared to 1.79% from boreholes, 6.43% from taps and 0.36% from rivers. In the present century, up to 27.86% of respondents do not have access to electricity, with a heavy reliance on firewood at the expense of gas and well water at the expense of tap water. These results indicate low income, energy vulnerability and limited access to modern infrastructure. These results are consistent with those of Di Falco and Lynam (2023), who showed that poor households in sub-Saharan Africa mainly use firewood and traditional lighting sources. The same is true for the World Bank (2022), which shows that the lack of electricity and dependence on firewood are markers of monetary poverty, as they reflect low income and limited access to modern services.

With regard to access to credit, only 17.86% have access, compared to 82.14% who do not, and only 25% of households receive transfers, compared to 75% who do not. Access to credit and transfers are key factors in the fight against monetary poverty, and the vast majority of our respondents do not have access to them. 62.50% of households practise market gardening, compared to 37.50% who do not.

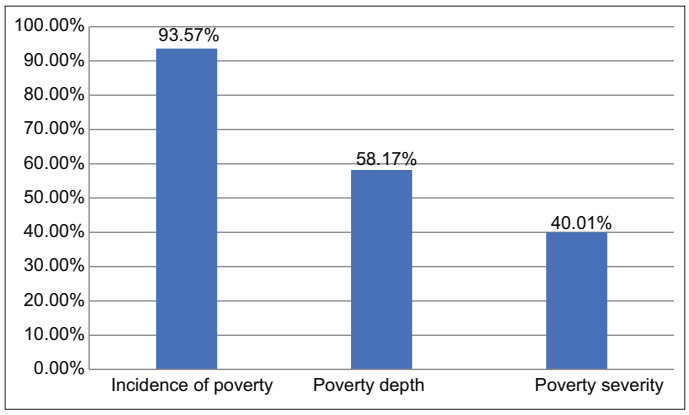
The average annual income per adult equivalent is 152,150.061 CFA francs, which is below the poverty line of 333,441 CFA francs in Senegal. More than half of the population surveyed lives in poverty. Of the 280 households, 262 are below the poverty line, with an incidence of 93.57%, a depth of 58.17% indicating how far the living standards of the poor population are from the poverty line, and a severity of 40.01% measuring the seriousness of poverty. The Figure 1 shows the monetary poverty indices of households in both groups.

4.2. Effect of Market Gardening on Household Monetary Poverty

The results show that the average annual income per adult equivalent of market gardening households is 158,844.0571 CFA francs. This income is below the poverty line of 333,441 CFA francs in Senegal. More than half of market gardeners live in poverty. In fact, 163 market gardening households are below the poverty line, with an incidence of 93.14% and a depth of 56.10%, indicating how far the living standards of the poor population are from the poverty line, with a severity of 37.74% measuring the seriousness of poverty. Figure 2 shows the monetary poverty indices for households engaged in market gardening.

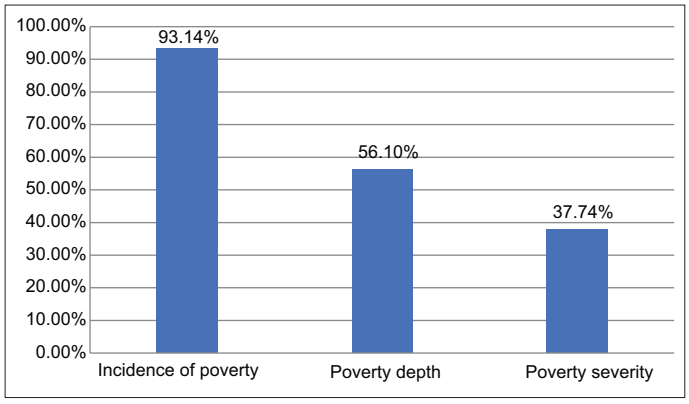
When considering non-market gardening households, we see that they have an average annual income per adult equivalent of 140,993 CFA francs. This income is well below the monetary poverty line and lower than the average monetary income of households engaged in market gardening. This already shows that market gardening has a positive impact on income growth and confirms the findings of Compaore et al. (2021), Yolou et al. (2015), and Mdiya and Mdoda (2021). The calculation of the indices shows that of the 105 households in the sample of non-market gardening households, 99 live below the poverty line, giving an incidence of 94.29%. The depth of poverty is 61.62%, which means that the incomes of non-market gardening households living below the poverty line only allow them to meet the minimum needs necessary to avoid poverty. Finally, the severity of poverty among these households is 43.81%. The disparity or inequality of income among the poor in the non-market gardening population is therefore greater than that among the market gardening population, where the severity of poverty is 37.74%, as indicated above. Figure 3 shows the monetary poverty indices for non-market gardening households.

Figure 1: Monetary poverty indices for all households surveyed



Source: Authors based on survey data, April 2024

Figure 2: Monetary poverty indices for market gardening households surveyed



Source: Authors based on survey data, April 2024

It appears that monetary poverty is slightly more pronounced in non-market gardening households (with an incidence of 94.29%) than in market gardening households (with an incidence of 93.14%), representing a difference of 1.15%. The same is true for the depth and severity of poverty, which are also higher for non-market gardening households compared to market gardening households. Table 1 shows the difference in results:

We can conclude that market gardening reduces the incidence of poverty by 1.14%, its depth by 5.52% and its severity by 6.07%. Our results are therefore consistent with those of (Compaore et al., 2021; Rakotomalala, 2017; Kalumbu et al., 2015; Kouakou, 2020; John et al., 2015; Ibriga et al., 2023; Eric et al., 2018), who have shown that market gardening reduces poverty and food insecurity.

4.3. Market Gardening and Formation of Household Agricultural Monetary Income

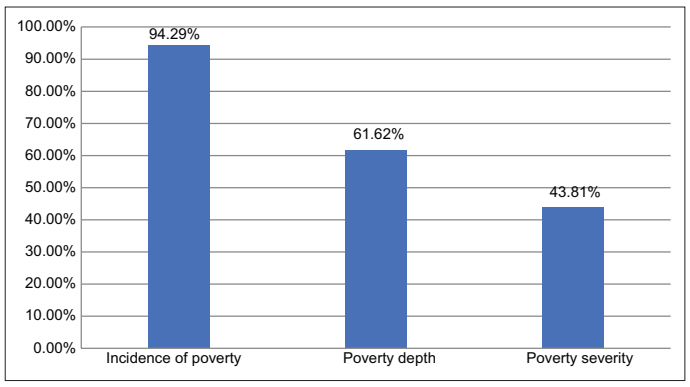
Market gardening is an additional source of monetary income for households that practise it. Figure 4 shows the contribution of market gardening to the monetary income of farming households. Data from the survey sample used indicate that households derive an average income of 124,115.429 CFA francs per capita per year from market gardening for the 2023-2024 market gardening season. This income accounts for 21% of their agricultural monetary income, or 9% of their total monetary income. Market gardening is therefore an important source of monetary income for households. It should be noted that agricultural income is the sum of monetary income from rain-fed crops and income from off-season crops (market gardening in this case).

4.4. Analysis of the Lorenz Curve

4.4.1. Analysis of the Lorenz curve for the two types of households

Figure 5 shows that there is significant income inequality among market gardening and non-market gardening households. The

Figure 3: Poverty index for non-market gardening households



Source: Authors based on survey data, April 2024

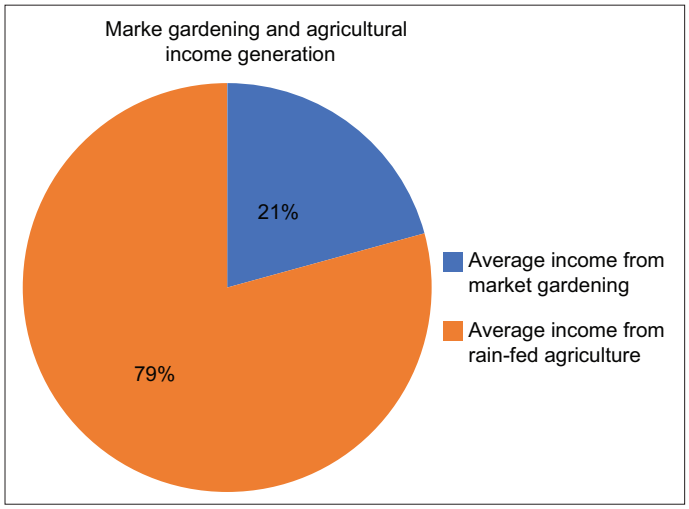
black diagonal line represents a situation in which the distribution of disposable income would be perfectly equal. The blue curves for market gardening households and the orange curves for non-market gardening households illustrate the actual income distributions of these two types of households, showing the inequalities. The further these curves are from the diagonal line, the greater the inequalities. With regard to market gardening households (blue curve), we can see that the poorest 10% of households account for barely 3.8% of the total disposable income of the sample population. The poorest 50% of market gardening households have only 27.1% of disposable income. Similarly, the poorest 80% of market gardening households have only 56.5% of total income, and the poorest 90% have only 72.2% of the income held by market gardening households. In other words, the richest 10% of market gardening households in the sample account for 27.8% of the disposable income of all these households.

Table 1: Differential between market gardener and non-market gardener poverty indices

Poverty indices / Household group	Incidence of poverty (%)	Poverty depth (%)	Poverty severity (%)
Non-market gardening households	94.29	61.62	43.81
Market gardening households	93.14	56.10	37.74
Difference	1.14	5.52	6.07

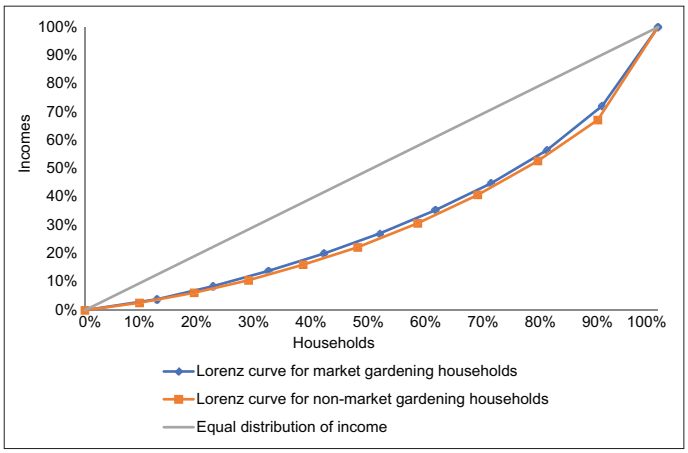
Source: Authors based on survey data, April 2024

Figure 4: Contribution of market gardening to the formation of household agricultural monetary income



Source: Authors based on survey data, April 2024

Figure 5: Income distribution curve



Source: Authors based on survey data, April 2024

Among non-market gardening households, the poorest 10% of households account for barely 2.6% of the total disposable income of the sample population. The poorest 50% of market gardening households have only 22.2% of disposable income. Similarly, the poorest 80% of non-market gardening households have only 52.7% of total income, and the poorest 90% have only 67.2% of the income held by non-market gardening households. In other words, the richest 10% of non-market gardening households in the sample account for 33.8% of the disposable income of all such households.

4.4.2. Comparison of Lorenz curves for market gardening households and non-market gardening households

According to Figure 5, the distribution of income between the first and second deciles of the population is almost the same for market gardening households as for non-market gardening households. However, from the second decile onwards, there is a slightly more unequal distribution of income among non-market gardening households. In fact, 90% of the poorest non-market gardening households have only 67.2% of the total disposable income of their group, while 90% of the poorest market gardening households have 72.2% of the total income of their group. We can therefore conclude that, all other things being equal, market gardening has contributed to reducing income inequality within households that practise it. These results confirm those of Gérard et al. (2020), who showed that market gardening can reduce inequalities if access to inputs and markets is equitable.

5. CONCLUSION AND RECOMMENDATION

In Senegal, poverty is a reality and affects rural households more than urban ones. In order to reduce the vulnerability of rural households and improve their well-being, several initiatives have been implemented, including the development of market gardening, one of the components of horticulture. The objective of this study was to analyse the effects of market gardening on household monetary poverty. To achieve this objective, data was collected from 280 farming households practising market gardening (175) and those not practising it (105). The Sedhiou region, which has high rates of poverty and food insecurity, was selected. To assess the impact of market gardening on household monetary poverty, we used the poverty measurement method developed by Foster et al. (1984) and then compared the monetary poverty indices of households practising market gardening with those of households not practising it. On the other hand, we used the Lorentz curve to highlight income inequality within non-market gardening and market gardening households.

The results show that poverty is more pronounced among non-market gardening households and that market gardening reduces the incidence of poverty by 1.14%, its depth by 5.52% and its

severity by 6.07%. The results also show that market gardening contributes to reducing income inequality within households that practise it, all other things being equal. It also appears that market gardening is a significant source of income for households, accounting for 21% of their agricultural income and 9% of their total income. In view of these results, policies promoting market gardening and, above all, the industrial development of this activity would contribute enormously to increasing farmers' income and reducing monetary poverty and food insecurity.

6. FUNDING DETAILS

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