ISSN: 3064-9846
Research Article
Science Set Journal of Economics Research

Local Communities Facing COVID-19: Influence of the PASDeR on Farmer Family Farming in Northern Benin

Gbènoukpo Modeste Arnaud Dedehouanou[1, 2*]

[1]*Department of Economics, University of Parakou, Parakou-Benin*
[2]*University of Quebec, Montréal-Canada, Benin*

[*]**Corresponding author:** Gbènoukpo Modeste Arnaud Dedehouanou, Department of Economics, University of Parakou, Parakou-Benin, University of Quebec, Montréal-Canada.

Submitted: 03 September 2025 **Accepted:** 11 September 2025 **Published:** 18 September 2025

https://doi.org/10.63620/MKSSJER.2025.1095

Citation: *Dedehouanou, G.M. A. (2025). Local Communities Facing COVID-19: Influence of the PASDeR on Farmer Family Farming in Northern Benin. Sci Set J of Economics Res, 4(5), 01-14.*

Abstract

To protect populations against the spread of COVID-19, countries have taken preventive measures such as lockdowns, prohibitions, curfews, etc., as well as individual and collective barrier gestures against the circulation of the virus. The consequences have been widely varied. The present study, therefore, aimed to analyze the effects of these implemented anti-COVID-19 measures on Peasant Family Farms in Benin. The study was based on collected data from 1,282 beneficiary farms and used quasiexperimental models highlighting effects, impacts, and efficiency. The survey was conducted from June 2020 to December 2022 in Benin. The results revealed that the anti-COVID-19 measures taken by the program had slight and insignificant increases in income and productivity, whereas for employment, these increases remained not only positive but also significant. Furthermore, the results show that Peasant Family Farms worked more in several fields during this period to improve economic and social welfare. These findings suggest the promotion of such initiatives in local communities, followed by a liberal fellowship from national or federal authorities.

Keywords: Benin, COVID-19, Family Farming, Local Communities, Welfare.

Introduction

Since November 2019, the whole world has been shaken by the outbreak of the coronavirus (COVID-19) epidemic, which is caused by an emerging infectious disease. This pandemic is impacting global food systems, disrupting agricultural value chains, and posing risks to household food and nutritional security [1]. COVID-19 has been declared a Public Health Emergency of International Concern (PHEIC), threatening people's lives and livelihoods. It has spread rapidly, and the virus affects many countries and territories, including Benin.

Thus, to protect populations against the spread of COVID-19, all countries have taken preventive measures such as lockdowns, prohibitions on gatherings, border control, curfews, and the observance of hygiene rules, as well as individual and collective barrier gestures against the circulation of the virus.

In addition, to harmonize and combine efforts to fight this pandemic, a regional consultation was organized in March 2020 within the ECOWAS region. At the end of this consultation, in accordance with the recommendations, Benin adopted a plan to mitigate the effects and impacts of COVID-19 on the agricultural sector and food and nutritional security.

The mechanism set up at the level of Local Communities (LC) focused on facilitating access to production factors and the market, and it aimed to set up, for the benefit of producers, a campaign credit, interest-free, with a partial reimbursement of 50%, a kit in kind (seed, herbicide, etc.), agricultural inputs (seeds, insecticides, fertilizers), specialized technical advice on plowing, sowing, various maintenance, and harvests. The sectors that were considered were maize, rice, and soybeans.

The results of studies carried out by the Initiative Prospective Agricole et Rurale (IPAR, 2020) in Senegal reveal major differences in the way COVID-19 and containment measures affect the lives of rural households. The authors revealed that the availability of and access to staple cereals (rice, millet, and maize) as

well as other basic necessities (oil, sugar, fish, meat, and milk) have not been disrupted for the majority of rural households, with the exception of those located in areas where the movement of goods and people is usually very dense, particularly the center-west of the groundnut basin (between Thiès and Touba) and the eastern zone of the country (around Tambacounda) and Kédougou.

According to Barbara et al. (2021), the 2009 swine flu (H1N1) epidemic preliminarily generated an economic cost between 0.5 and 1.5% of the global GDP. For these authors, this estimate should be considered a markup because the work on South Korea's case shows a significantly lower impact, at 0.1% of GDP. For example, the AIDS epidemic would have had a higher cost, leading to an annual reduction in GDP of 1.2 percent on average; however, the effects of the epidemic are heterogeneous and can vary between 0.4 percent and 2.1 percent depending on the countries studied, reflecting the degree of prevalence of the virus, which was particularly high in sub-Saharan African countries.

In recent years, studies on the economic implications of the effects of health shocks (epidemics) have multiplied, surpassing existing studies, which are limited or almost outdated in scope. Russell (2004) studied the direct and indirect costs of HIV, tuberculosis, and malaria-related diseases; McIntyre et al. (2006) focused on the household-level impact of out-of-pocket medical expenses and loss of work days due to illness in the literature. Acharya et al. (2013) focused on the protective effects of voluntary insurance versus the economic implications of the disease, including recent insurance interventions. However, considerable gaps remain. In particular, the post-2000 literature on health impacts has not covered the implications of disease for nonmedical consumption, labor supply, or informal coping mechanisms, except for (Acharya et al., 2013), which assessed only the impacts of insurance programs on household spending on primary health care in poor countries.

Gertler and Gruber (2002), by studying Indonesia through ordinary least squares (OLS) and instrumental variable (IV) methods and by measuring health shocks by the change in the index of limitation of the ability of the head of household to perform his tasks and activities of daily living (ADL), showed that health shocks induce a decrease of 7.60% in relative hours of labor supply and a 10% decrease in per capita income. In their study of Taiwan through an ordered probit model, Mete and Schultz (2002) showed a relative decrease in labor supply of 27.30% and a significant decrease in per capita income of 102.60%.

In view of economic theory, which emphasizes the effectiveness of responses to various shocks to the economy, few studies have been devoted to evaluating the measures taken to fight health crises among populations to make decisions in a global context of economic imbalance that affects almost all sectors of activity. This paper differs from works carried out on COVID-19 by evaluating the anti-COVID-19 measures taken by a program on grassroots populations, particularly in local communities—more particularly in an area used for the resurgence of jihadist attacks.

It can therefore be expected that households' ability to respond to catastrophic health expenditure shocks or to maintain non-health-related consumption levels during periods of economic hardship due to chronic disease is likely to be limited under these conditions [2-4]. Coping and support processes may be particularly important when heads of household or breadwinners are affected.

The paper is structured as follows: the first section reviews the literature on responses to health and other shocks; the second section highlights the methodological approach; and the third section presents the results and analyses. Finally, the study has provided concluding remarks.

Review of Theoretical and Empirical Approaches to Examining Shocks to the Local Economy

Schultz (1964) highlighted that small-scale family farming is effective given the imperfections of rural markets (administered prices, high input costs, and difficult access to credit). Family farming has many advantages, including the capacity for intensive work and adaptation to shocks; the rapid processing of fragile products; and the support of domestic demand with the strong propensity to spend income locally. The articulation of family, economic, social, and environmental logics seems to be better suited to the preservation of biodiversity. Rather, microdevelopment research programs seek to increase the autonomy of smallholder farmers by adapting local cultivation techniques and improving the functioning of markets (for land, inputs, credit, etc.).

Theoretical Underpinnings

John Maynard Keynes' theory of the multiplier effect could form the basis of this study. Indeed, this theory promotes the idea that public investment can stimulate economic growth by providing jobs and improving demand for goods and services. In the context of agriculture, this theory has been applied by economists such as Khandker and Faruqee (2003), who have shown that agricultural finance can have a significant multiplier effect on the economy by creating jobs, increasing farmers' incomes, and stimulating demand for goods and services in rural areas. For example, multiplier theory argues that agricultural finance can help reduce poverty by stimulating economic growth in rural areas. Indeed, when farmers receive agricultural finance, their production can increase, which stimulates demand for agriculture-related goods and services, creates jobs and increases incomes in rural areas even in times of unanticipated shocks.

On the other hand, if we look more closely at economic theory for what can justify international aid and thus for the technical and financial support of partners, we are led to consider economic theories of justice: Rawls (1971); Sen (1999); Fleurbaey (1996); and Roemer (1996). Unfortunately, the criteria of justice are problematic and lead to questionable redistribution policies. Economists prefer to deflect the problem by invoking the altruism of the wealthy and improving the well-being of all people. Partner aid or subsidies would then be a policy to generate improvements in the Pareto sense. This policy is based on the need to safeguard global public goods.

Another area concerning the issue of international public goods is health. Some diseases, such as HIV/AIDS, tuberculosis, poliomyelitis, malaria, and currently COVID-19, although of greater concern in the Global South, entail international externalities with very high costs. Treatments and preventions, which are still

far from the reach of the countries of the South, require collective action (research, for example) and management at the global level. In this way, international aid improves the well-being of all people. Under these conditions, aid is a policy that generates improvements in the Pareto sense. Another justification for aid is the existence of interstate externalities that need to be internalized.

In brief, international aid is not just a gesture of generosity. Beyond the altruism of the wealthy, the need for justice, global public goods, and interstate externalities requires the intervention of an international public force.

Empirical Developments

In their study on development assistance in the agricultural sector, Kaya et al. (2013) found that official development assistance (ODA) positively affects agricultural growth and productivity. In 2008, through their study, the World Bank showed that countries that benefit from agricultural subsidies have better yields than nonrecipient countries. International Development Association (IDA) beneficiary countries have recorded much higher returns than other nonrecipient countries. Alabi (2014) showed that official development assistance has a positive and significant impact (10%) on agricultural GDP. Increasing the volume of aid should increase yields and help individuals cope with economic shocks. According to Giffron (2014), ODA in agriculture improves agricultural growth and productivity. He showed that Asian countries experienced the "green revolution" thanks to agricultural subsidies. Aid to these states has been a catalyst for agricultural financing (infrastructure, agricultural advice, etc.). Unsatisfactory results were obtained in the case of Senegal by Diagne et al. (2021), who studied the effects of Chinese cooperative interventions on food security; however, overall, the method used was criticized by program stakeholders. N'Dao et al. (2021), in their study on the effect of agricultural ODA on rice production, showed that ODA allocations to the agricultural sector between 2009 and 2018 increased significantly but had no effect on increasing rice production. Periods of crisis, such as COVID-19, could therefore have no effect but further exacerbate the situation despite the intervention of partners (ODA). In their study on the "Influence of access to agricultural finance on the yield of rice producers in Malanville", Adjeran et al. (2023) showed that access to credit has a significant and positive effect on farm productivity and profitability. Similarly, the production system and soil fertility also significantly impact farm productivity.

Research Methodology

Estimates for the Evaluation of the Effects of Anti-COVID-19 Measures

In the present study, the existing data were used to design a common evaluation design for the outcome indicators. Indeed, taking into account the situation and the elements of the context, the appropriate evaluation model was identified as experimental, quasiexperimental, implicit (naïve), double difference, discontinuity regression, etc.

On the basis of the system of available statistical information and on the basis of stakeholder exchanges, the comparison of the group of beneficiaries to another group was carried out.

The experimental group included all the Peasant Family Farms (PFFs) (1135 PFFs out of 1282) that benefited from specific support as part of the response to the COVID-19 pandemic. Given the urgency of the health crisis and its impact on PFF, the program did not randomize PFF.

For a better evaluation of the effects of PASDeR interventions, it is essential to identify (if conditions allow) a control group (counterfactual). To this end, documentary research and preliminary exchanges have shown that the farmer family farms monitored by the Department Unions of Producers (DUP) have not benefited from emergency anti-COVID-19 measures. This group is therefore a priori a potential control group (counterfactual) in the context of measuring the effects of PASDeR interventions. Thus, it was decided to carry out the necessary comparison tests or a matching to identify a comparison group as closely as possible to the characteristics of the beneficiaries of the anti-COVID-19 measures.

To determine the comparability of the groups, two main databases were used. These are data relating to the reference situation of the beneficiaries of the anti-COVID-19 measures and data relating to the Union Communale des Producteurs (UDP-UCP).

The diagnosis consists of checking whether membership in the beneficiary group is correlated with certain observable or unobservable characteristics. To this end, the null hypothesis is posited.

- H0: The variables do not influence program participation, as does the alternative hypothesis;
- H1: Variables influence program participation

The dependent variable, "Programme participation or nonparticipation", was a dichotomous variable. The independent variables "sex, age, area sown, quantity of products obtained/sold, turnover, average farm income, etc." were used to test the comparability of the two groups.

To better diagnose certain qualitative variables, certain qualitative variables were quantified. The main advantage of quantification is commensuration [5]. Indeed, a common measurement creates specific relationships between objects, which makes it easier to represent them and, above all, to compare them with respect to the aspect measured [5].

To assess the comparability of the groups, a correlation test was first used for certain variables. The aim is to check whether membership in the program is significantly correlated with certain variables. For this purpose, data from both groups were compiled.

Table 1: Results of the correlation test between the two groups

Program Membership	Correlation coefficients
Sex	-0.0421
Age	-0.384
Area sown	-0.0435

Quantity of products obtained	-0.017
Quantity of products sold	-0.017
Number of employees used	0.03
Average turnover	0.0155
Average income	0.0231

Source: Author, 2023.

In light of these results, it can be concluded that no variable is significantly correlated with program membership. These results indeed reflect the fact that membership in the program is not influenced by any variable. Thus, all the other things being equal, we can assume that the two groups are almost identical in terms of these observable characteristics [6].

To confirm the previous results, a mean test (or test of variance) was used for the same characteristics except for sex. The mean test is also recommended in the literature to check for similarity between two groups. The mean test is performed on the ex-post data [7].

Table 2: Test of Mean and Test of Variance Results

Characteristics	Exp Group	Control group	P value (ttest)	P value (sdtest)	Significance
Age	40.72	41.47	0.1959	0.4169	Not
Area sown	1.16	1.23	0.1429	0.9753	Not
Quantity of products ob-tained	24.34	24.63	0.5675	0.5586	Not
Quantity of products sold	23.53	23.56	0.9269	0.652	Not
Number of employees used	112	97	0.4619	0.106	Not
Average turnover	362767.84	358314.69	0.6020	0.8902	Not
Average income	150732.08	146291.22	0.4365	0.4847	Not

Source: Author, 2023

Based on the results shown in Table 2, we can see that no significant difference can be observed in any of the variables studied. It is reasonable to confirm, all other things being equal, that the common observable characteristics of the two groups are similar [8].

In terms of unobservable characteristics, the data collected did not include unobservable characteristics such as PFF motivation, interest in PFF, values and ideologies of PFF members, or the level of family support of PFF members. All other things being equal, we can make the strong assumption that the two groups are similar in terms of unobservable characteristics [9].
COVID-19 has led the various actors involved in the agricultural sector to intervene with PFF. In addition to the Beninese State and many technical and financial partners (TFPs), several other interventions have been applied to farmers in the different regions of Benin. Thus, the treatment groups (PFF beneficiaries of the PASDeR anti-COVID-19 measures) and comparison groups had similar levels of exposure to the other interventions. The beneficiary and nonbeneficiary farmers all had access to services, particularly from the State through the ATDA, the DDAEP, the Local Authorities, the FNDA, etc., as well as to the services of NGOs, TFPs, etc [10].

According to the previous results obtained for both groups of beneficiaries and nonbeneficiaries, the following can be assumed: (a) In the absence of randomization before the intervention, the use of experimental models to evaluate the effects of anti-COVID-19 measures is rejected; (b) Nonbeneficiary farmers have been randomly identified as a nonrandom control (counterfactual) group, not exposed to anti-COVID-19 measures and can therefore be used to make inferences about the results of anti-COVID-19 measures; and (c) Quasiexperimental models are used in this study, and any difference observed in the results of the two groups can be attributed to the intervention (internal validity) [11].

The evaluation concluded that quasiexperimental models are appropriate for evaluating all the quantitative indicators.

Data Collection and Study Period

Data were collected through an electronic data collection tool from beneficiaries and nonbeneficiaries of the anti-COVID-19 measures. In addition, interviews were conducted for other types of information. The study runs from June 2020 to December 2022 [12].

Table 3: Sampling of PFF beneficiaries surveyed

Line Labels	PFF beneficiaries			PFF Respondents			Collection rate (%)
	Female	Male	Total	Female	Male	Total	
Maize	69	306	375	67	272	339	90.4
Rice	222	398	620	190	328	518	83.55
Soybean	78	209	287	73	205	278	96.86

Grand Total	369	913	1282	330	805	1135	88.53

Source: Data collection, August 2023

Of the 1282 PFF beneficiaries, 1135 PFF were met, for a collection rate of 88.53%. More than 96% of the soybean producers, 90.4% of the maize producers, and 83.55% of the rice producers were interviewed as part of this evaluation [13].

Table 4: Sampling of PFF respondents

	PFF Followed	PFF Sample	Collection Rate
Experimental Group	1282	1135	88.53%
Control Group	1526	1145	75.00%
Total	2808	2280	81.18%

Source: Data collection, August 2023

Data collection was also carried out on non-COVID-19 beneficiaries. The snowball method was used to distinguish nonbeneficial PFFs from beneficiary PFFs that had almost the same characteristics as beneficiaries. To this end, 1145 nonbeneficial PFFs were interviewed out of 1526 expected PFF participants, for a collection rate of approximately 75%.

Analysis and Discussion

Situation of Beneficiaries of the PASDeR3 Anti-COVID-19 Measures

COVID-19 situation 1 at the program level is as follows:

Table 5: Item of component 1 of the PASDeR3 anti-COVID-19 measures

Nature	Number of beneficiaries			Amount set up in FCFA		
	Male	Female	Total	Male	Female	Total
COVID volet 1	913	369	1282	175042500	61109500	236152000

Source: Data collection, 2023

A total of 1282 (913 men and 369 women) farms received the first part of the COVID-19 emergency measures, for a total of 236,152,000 FCFA, an average of 184,205 FCFA per farm (191,700 FCFA for farms run by men and 165,600 FCFA for women), a difference of 26,100 FCFA. It should be noted that more than 71% of the beneficiaries were men. This high proportion of men raises the issue of gender mainstreaming in the program's interventions. However, the background documents developed as part of the mitigation of these measures warned a relatively higher percentage of women and young people (at least 60 percent). It is clear in these circumstances that the objective requested by the donor in implementing this measure is not achieved at the level of this indicator. The reasons given during the survey seem to be the low involvement of women in association bodies; however, social burdens, particularly Beninese realities, are also real obstacles to the achievement of these objectives [14].

Analysis of the Area Sown by Beneficiaries

The area sown during the COVID-19 implementation process is as follows:

Table 6: Trends in area sown in hectares

Characteristics	Measure	
	Ex ante	Ex Post
Department		
Alibori	1.86	1.88
Atacora	1.07	1.26
Borgou	1.94	1.96
Donga	1.53	1.73
Gender		
Female	0.98	1.11
Male	1.29	1.36
Sector		
Maize	1.82	1.95
Rice	1.49	1.52
Soybean	1.76	1.9
Age group		
Inf 35 years old	1.17	1.27
Sup 35 years old	1.57	1.6
Total (ha)	1.2	1.29

Source: Author, 2023

Overall, in the program intervention area, 1.2 hectares of area were sown compared to 1.29 hectares with the implementation of the intervention, representing a difference of 9%. Looking at the departments, even if it is very low, the situation is also positive (0.86 against 0.88 in Alibori, 1.07 against 1.26 in Atacora, 1.94 against 1.96 in Borgou and 1.53 against 1.73 in Donga). Atacora and Donga are the departments whose differences remain high compared to those of Borgou and Alibori.

In terms of gender, the situation remains favorable in both departments but stronger among women than men; hence, there is a beneficial multiplier effect for women. For all sectors, the area sown has improved, but even more so in the maize and soybean sectors. Rice is still cultivated very little in the program's intervention area. Both young people and adults have seen slight improvements in the area sown, although these improvements as a whole are still very small compared to the expected targets [15].

Analysis of the Quantity of Products Obtained

The quantity of products obtained in 100 kg bags is as follows:

Table 7: Evolution of the quantity of products obtained in 100 kg bags

Characteristics	Measure	
	Ex ante	Ex Post
Department		
Alibori	29.46	38.95
Atacora	17.78	32.09
Borgou	25.17	34.00
Donga	21.03	26.05
Gender		
Female	21.58	39.19
Male	25.67	33.00
Sector		
Maize	27.70	37.17
Rice	24.09	33.40
Soybean	21.31	34.48
Age group		
Inf 35 years old	19.28	27.89
Sup 35 years old	26.52	34.08
Total	24.49	34.79

Source: Author, 2023

Approximately 35 bags of 100 kg, all products combined, are obtained on average following the intervention of the program, compared to 25 bags before the intervention, making a difference of 10 points attributable to the actions implemented. At the level of the Alibori, 39 bags followed the intervention against 25 and 32 against 17 in the Atacora, 34 against 25 in the Borgou and, finally, 26 bags against 21 in the Donga. There were 39 bags in women compared to 21 before the procedure and 33 in men compared to 25. Among the different age groups, the situation is much more favorable among young people than among adults [16].

Farm-level Performance Analysis

In terms of performance, the situation is as follows:

Table 8: Performance of PFF beneficiaries

Characteristics	**Measure**	
	Ex ante	**Ex Post**
Department		
Alibori	1.58387097	2.07180851
Atacora	1.66168224	2.5468254
Borgou	1.29742268	1.73469388
Donga	1.3745098	1.50578035
Gender		
Female	2.20204082	3.53063063
Male	1.98992248	2.42647059
Sector		
Maize	1.52197802	1.90615385
Rice	1.61677852	2.19736842

Soybean	1.21079545	1.81473684
Age group		
Inf 35 years old	1.64786325	2.19606299
Sup 35 years old	1.68917197	2.13
Total (ha)	2.04083333	2.69689922

Source: Author, 2023

The reference data collected made it possible to calculate yields per hectare at the level of the three identified sectors. According to Table 8, yields per hectare were approximately 2.04 tons on average before the implementation of the intervention, compared with 2.69 tons at the end of the implementation of the measures. These yields by sector are 1.90 for maize, 2.19 for rice production, and 1.81 for soybeans. The present results can be explained by the availability of inputs (improved seeds and labor) and the implementation of agricultural advice.

Analysis of the Quantity of Products Sold

The quantity of products sold in 100 kg bags is as follows:

Table 9: Evolution of the quantity of products sold in 100 kg bags

Characteristics	Measure	
	Ex ante	Ex Post
Department		
Alibori	28.56	37.00
Atacora	17.14	23.80
Borgou	23.60	30.62
Donga	20.40	24.67
Gender		
Female	21.19	31.40
Male	24.49	30.55
Sector		
Maize	25.58	33.29
Rice	23.85	28.15
Soybean	20.46	32.69
Age group		
Inf 35 years old	21.86	28.16
Sup 35 years old	24.17	28.83
Total	23.54	30.80

Source: Author, 2023

More than 30 bags of kilos of products were sold after the implementation of the COVID-19 emergency measures, a deviation of 7 points from the origin. This trend can be observed at the level of department, gender, sector, and segment of the population. While waiting to see the significance of the differences, we can therefore conclude that the COVID-19 emergency measures have had a positive effect on trade through the sale of products, and since the health crisis has been accompanied by moderate price inflation, it is clear that we undoubtedly expect a significant increase in revenues; hence, the welfare of the farms that have benefited from this intervention. The sale of the products would have been better if all marketing channels had not been affected by the closure of weekly markets in rural areas and the Russia-Ukraine conflict [17].

Production Stock Analysis

In addition, a cross-analysis of the quantities of products obtained and sold makes it possible to obtain more or less important results.

A stock is defined as the quantity of a product obtained and not sold by producers. This quantity may be lost, consumed, given away, or may be used for intermediate consumption in future seasons.

Table 10: Recipients' Production Stock

Characteristics	Measure	
	Ex ante	Ex Post
Department		
Alibori	0.90	1.95
Atacora	0.64	8.29
Borgou	1.57	3.38

Donga	0.63	1.38
Gender		
Female	0.39	7.79
Male	24.49	30.55
Sector		
Maize	2.12	3.88
Rice	0.24	5.25
Soybean	0.85	1.79
Age group		
Inf 35 years old	1.00	1.72
Sup 35 years old	1.35	2.17
Total	0.95	3.99

Source: Data collected, 2023

According to the results in Table 10, before the implementation of the anti-COVID-19 interventions, the production stock was approximately one 100 kg bag on average. The stock is more accentuated at the level of maize producers, where more than two bags of 100 kg are not sold. On the other hand, at the end of the implementation of the interventions, the production stock averaged approximately four 100-kg bags. Additionally, rice producers have obtained an increase in their stock in five 100-kg bags. There is also a production stock of more than eight (08) unsold 100-kg bags in the Department of Atacora.

Consequently, it can be assumed that access to and availability of food were not threatened for the majority of PFFs. Furthermore, the availability of and access to basic products (rice, maize, and soybeans) have not been disrupted for the majority of farms, with the exception of those located in urban areas where the movement of goods and people is usually very dense, particularly in the communes of Parakou, Natitingou, Djougou Center, and others [18].

The results revealed that more than 71% of the PFFs said they had no particular problem accessing or buying rice (74.8%), soybeans (45.8%), or maize (71.2%). On the other hand, the results reveal a serious problem in terms of the availability of inputs essential for production, namely, seeds, fertilizers, materials, and financial resources. Food consumption patterns have changed in terms of quantity (58.48%) and quality (68.7%) for the majority of PFFs in rural areas, with the exception of border areas such as the Communes of Tchaourou and Nikki Malanville. Indeed, the majority of PFFs said they had reduced the amount they consumed during meals, with 54.3% in Pole 1 Rice Bastion schools and up to 80.7% in rural PFF schools.

Analysis of the Number of Employees Used for Production

The analysis of the employment situation was carried out on the basis of the methodology of calculating the equivalent number of jobs. Prior to the implementation of this intervention, the sectors that benefited from this support used 112 people (21543 hours of work) to achieve ex ante production. However, with the intervention, the number of people increased significantly to 217 employees (416647 hours of work). We can already conjecture that the anti-COVID-19 measures taken by all the actors, particularly the PASDeR, mitigated or even improved the employment situation at the level of the beneficiaries [19].

Table 11: Number of Employees Used

Characteristics	Measure	
	Ex ante	Ex Post
Sector		
Maize	64	117
Rice	36	73
Soybean	12	27
Total	112	217

Source: Author, 2023

The number of jobs has almost doubled in each sector. As a result, maize producers went from 64 ex ante employees to 117 ex post employees. In the case of soybeans, 27 employees were counted ex post, compared to 12 employees before the implementation of the intervention. As a result, the introduction of credit has encouraged the recruitment of the workforce at the PFF level.

Analysis of the Income of PFF Beneficiaries

One of the impact indicators of this intervention is revenue, which is measured by turnover minus costs. As a result of this intervention, income per farm rose from approximately 148,000 CFA francs to 282,000 CFA francs, an increase of more than 90%. An analysis disaggregated by sex, department, and age also showed that the trend was maintained, which simply proves that the expected objective was achieved [20].

Table 12: Changes in the incomes of PFF beneficiaries

Characteristics	Measure	
	Ex ante	Ex Post
Department		
Alibori	223007.22	326800.39
Atacora	70482.36	279127.91
Borgou	110774.26	233440.96
Donga	135251.51	200763.10
Gender		
Female	122847.59	239890.34
Male	159010.73	299928.81
Sector		
Maize	120435.17	258546.10
Rice	185355.70	284332.62
Soybean	114354.04	308287.50
Age group		
Inf 35 years old	130402.09	264213.61
Sup 35 years old	168214.63	292633.40
Total	148509.70	282494.87

Source: Author, 2023

The anti-COVID-19 measures have focused mainly on income-generating activities. The sources of income most cited by households were agriculture (78.78%), nonagricultural activities (48.6%), livestock (25.8%), and remittances received from migrants (3.2%). For the majority of PFFs surveyed (50.1%), the measures taken (closure of markets, halt of movement between cities, etc.) to stem the spread of the virus have led to a decrease in income.

Analysis of Food Security Conditions

To assess the evolution of the food situation, data were collected on the number of PFFs with sufficient main cereal production throughout the lean season. Even if this information is not sufficient to better assess the food security situation of PFF, it provides an essential and consistent proxy for it.

Table 13: Evolution of the effect of food security on beneficiary PFF

Characteristics	Rate of PFF of sufficient cereal production (%)	
	Ex ante	Ex Post
Department		
Alibori	15	37
Atacora	9	20
Borgou	8	18
Donga	4	5
Gender		
Female	12	22
Male	24	59
Sector		
Maize	19	27
Rice	9	36
Soybean	8	17
Age group		
Inf 35 years old	5	12
Sup 35 years old	7	17
Total	35.71	80.05

Source: Author, 2023

More than 80% of the holdings surveyed under this intervention had sufficient cereal production following the intervention, whereas before it was approximately 36%. Therefore, we can conclude that the number of resilient PFFs is becoming increasingly important, and this importance is largely due to this intervention. This short-term analysis may not be maintained in the

medium or long term if the intervention is ad hoc.

A few weeks after the pandemic-related restrictive measures were implemented, a significant proportion of the PFF households did not need to resort to specific strategies to meet their basic food needs. As a result, these PFF countries did not have to urgently find solutions to cope with the shocks caused by market closures and mobility restrictions aimed at stemming the spread of the coronavirus. This says a lot about the capacity, most certainly temporary, of resilience of PFF accustomed to dealing with recurrent crises. An important factor is that the shock occurred at a time when the PFF was preparing for the lean season. This means that COVID-19 has added to the usual difficulties [21].

Indeed, 35% of the PFFs had a stock of cereals with a very short duration, estimated at 14 days on average. This situation is the consequence of the poor agricultural season of 2019, which, in addition to the shocks of the measures induced by COVID-19, precipitated the very early entry of the majority of PFF into the lean season.

Analysis of Quasiexperimental Model Data: Small Advantages of Beneficiaries Over Nonbeneficiaries of Anti-COVID-19 Measures

The effects of the anti-COVID-19 intervention on the PFF of the Program Intervention Zone (PASDR3) obtained at the end of the implementation of the intervention were more or less satisfactory. Indeed, all the other things being equal, it can be assumed that the anti-COVID-19 measures have improved the overall welfare of beneficiaries, especially those of PFF, who are the most vulnerable to the shocks caused by the COVID-19 pandemic.

Table 14: Summary of outcome measurement results

Indicator	Groups		Raw Effects	P value	Significance	Observation
	Beneficiary	Witness				
Area sown	1.29	1.21	0.0775	0.4220	No	Nonsignificant effect
Quantity obtained	34.79	30.98	3.8109	0.087	No	Nonsignificant effect
Number sold	30.8	29.23	1.5686	0.553	No	Nonsignificant effect
Number of hours of work	217	141	76***	0.004	Yes	Significant effect
Income	282495	281042.7	1452.3000	0.603	No	Nonsignificant effect

Source: Authors, 2023

Nonsignificant Advantages in Terms of Area Sown by Beneficiaries Over Nonbeneficiaries: At the level of the areas sown, the specific effects remain very fragile (7.75%), which shows the fragile nature of the intervention, and this fragility can be observed at all levels of disintegration.

Table 15: Specific effects on area sown

Characteristics	Area sown		
	Beneficiaries	Witnesses	Effects
Department			
Alibori	1.88	1.84	0.04
Atacora	1.26	1.05	0.21
Borgou	1.96	1.84	0.12
Donga	1.73	1.46	0.27
Gender			
Female	1.11	1.06	0.05
Male	1.36	1.24	0.12
Sector			
Maize	1.95	1.75	0.2
Rice	1.52	1.49	0.03
Soybean	1.9	1.68	0.22
Age group			
Inf 35 years old	1.29	1.08	0.21
Sup 35 years old	1.6	1.32	0.28
Total	1.29	1.21	0.0775

Source: Author, 2023

Table 15 shows that the situation of beneficiaries is not very different from that of nonbeneficiaries. Indeed, the area sown by the beneficiaries of the measures increased to 1.29 ha compared to 1.21 for the nonbeneficiaries, a difference of 0.0775. The area sown on behalf of the maize sector is approximately two hectares for beneficiaries, compared to 1.75 hours for nonbeneficiaries. Producers in the departments of Borgou and Alibori have planted more space, unlike in the department of Atacora, where the areas sown are the lowest [22].

There were Nonsignificant Advantages in Terms of the Quantity of Beneficiaries Over Nonbeneficiaries: The implementation of anti-COVID-19 measures for PFF has increased the quantity of products available to beneficiaries on average.

Table 16: Specific effects on the quantity of product obtained

Characteristics	Product measurement achieved		
	Beneficiaries	Witnesses	Effects
Department			
Alibori	38.95	29.46	9.49
Atacora	32.09	17.78	14.31
Borgou	34	25.17	8.83
Donga	26.05	21.03	5.02
Gender			
Female	39.19	21.58	17.61
Male	33	25.67	7.33
Sector			
Maize	37.17	27.70	9.47
Rice	33.4	24.09	9.31
Soybean	34.48	21.31	13.17
Age group			
Inf 35 years old	27.89	19.28	8.61
Sup 35 years old	37.45	23.83	13.62
Total	34.79	30.98	3.8109

Source: Author, 2023

On average, PIZ PFFs produced more than 3 tons of food products during the health crisis. The beneficiaries of these measures produced 34.79 100 kg bags due to the intervention, unlike the nonbeneficial PFF, whose production was approximately 30.98 100 kg bags. The departments of Borgou and Alibori have the best production, unlike the department of Atacora, where production is well below average. Additionally, the maize sector remains very preponderant, with an average production of 37 bags for beneficiaries and 27 bags for nonbeneficiaries.

Nonsignificant Performance Advantages of Recipients Over Nonrecipients: In terms of performance, the effects of the measures on the beneficiaries are also quite small.

Table 17: Specific effects on performance

Characteristics	Performance Measurement		
	Beneficiaries	Witnesses	Effects
Department			
Alibori	2.071809	1.60109	0.47072
Atacora	2.546825	1.69333	0.85349
Borgou	1.734694	1.36793	0.36676
Donga	1.50578	1.44041	0.06537
Gender			
Female	3.530631	2.03585	1.49478
Male	2.426471	2.07016	0.35631
Sector			
Maize	1.906154	1.58286	0.3233
Rice	2.197368	1.61678	0.58059
Soybean	1.814737	1.26845	0.54628
Age group			
Inf 35 years old	2.162016	1.78519	0.37683

Sup 35 years old	2.340625	1.8053	0.53532
Total	2.696899	2.56033	0.13657

Source: Author, 2023

The results of the table above show that the implementation of anti-COVID-19 measures has improved the average yield of beneficiary PFF by approximately 0.13657 tons per hectare. These results also reveal that the anti-COVID-19 measures of the PASDeR have been part of the package of measures implemented by all actors, including the government and other TFPs.

There were Nonsignificant Advantages in Terms of the Quantity of Beneficiaries Over Nonbeneficiaries: The quantity of products sold follows the same trend as the quantity of products harvested. Thus, these measures have not had a sufficiently consistent effect on the sale of food products at the PFF level.

Table 18: Specific effects on the quantity of products sold

Characteristics	Product Measurement Sold		
	Beneficiaries	Witnesses	Effects
Department			
Alibori	37	28.56	8.44
Atacora	23.8	17.14	6.66
Borgou	30.62	23.60	7.02
Donga	24.67	20.40	4.27
Gender			
Female	31.4	21.19	10.21
Male	30.55	24.49	6.06
Sector			
Maize	33.29	25.58	7.71
Rice	28.15	23.85	4.30
Soybean	32.69	20.46	12.23
Age group			
Inf 35 years old	26.17	18.28	7.89
Sup 35 years old	35.55	22.77	12.78
Total	30.8	29.23	1.5686

Source: Author, 2023

Like the quantity of products obtained, the effects observed on the quantity of products sold are quite insignificant. Beneficiaries of anti-COVID-19 measures sold an average of 30.8 bags of food products, compared to approximately 29.23 bags for non-beneficiaries (a difference of 1.586).

On the other hand, older people-led PFF has significantly improved the production and sale of food products. Indeed, people over the age of 35 who were beneficiaries sold more than 32 bags of food products, compared to approximately 23 bags for those who did not benefit from the anti-COVID-19 measures.

Significant Employee Benefits from Beneficiary PFF Over Non-beneficiaries: One of the main impact indicators of the program is related to employability at the PFF level. The results obtained through the implementation of the interventions show that there has been significant progress in terms of employment at the level of the beneficiary PFFs.

The data obtained show that the effects on job creation are very significant. For a total of 217 jobs counted as beneficiaries, 76 employees were assigned to the intervention.

Table 19: Effects of Employment

Characteristics	Employment Measurement		
	Beneficiaries	Witnesses	Effects
Sector			
Maize	117	86	31
Rice	73	38	35
Soybean	27	19	8
Total	217	141	76***

Source: Author, 2023; ***: significance at 1%

Indeed, these results show, whatever the speculation, that the PFF beneficiaries of the measure have strengthened the teams dedicated to food production. These effects have been much more significant for rice producers, for whom approximately 35 jobs are attributable to the implementation of the anti-COVID-19 measure.

Nonsignificant Income Advantages of PFF Beneficiaries Over Nonbeneficiaries: The general trend in PFF income did not allow us to conclude that anti-COVID-19 measures had significant positive effects on improving the income of PFF recipients.

Table 20: Specific effects on income

Characteristics	Income Measurement		
	Beneficiaries	Witnesses	Effects
Department			
Alibori	326800.39	323007.217	3793
Atacora	279128	270482	8646
Borgou	233441	210774	22667
Donga	200763	175252	25512
Gender			
Female	239890	222848	17043
Male	299929	289011	10918
Sector			
Maize	258546	160746	97800
Rice	284333	225361	58972
Soybean	308288	293315	14973
Age group			
Inf 35 years old	274696	266115	48581
Sup 35 years old	265186	251810	13375
Total	282495	281043	1452

Source: Author, 2023

A slight, nonsignificant difference of approximately 1452 FCFA is the result of the comparability of average incomes between beneficiaries and nonbeneficiaries of the anti-COVID-19 measures. Specifically, however, the trends seem to be most often significant. Indeed, regardless of the department, sex, sector, or age group, the effects observed are above the average.

Concluding Remarks

The implementation of the intervention in all municipalities/departments benefiting from the program has yielded mixed results for all PFFs benefiting from these measures. Even if some estimates have given small and nonsignificant increases in income and productivity, it is important to note that the net effect on the three streams remains perceptible and merits continued intervention to obtain PFF out of the various shocks resulting from international crises.

With respect to employment, there has been a significant improvement, which puts into perspective that the farms benefiting from this intervention continue to work in the fields to feed the population and improve their economic and social welfare. The implementation of anti-COVID-19 measures has, of course, laid the foundation for the resilience of the most vulnerable PFFs. However, these measures will not escape the recurring concern that usually arises at the end of development projects. Thus, the question arises as to whether the gains made during this exercise will be able to maintain or even amplify the trends if the measures are not renewed.

In view of the results obtained, it is clear that the implementation of the intervention has made it possible to improve the levels of several indicators, particularly those related to productivity, and thus offers signs of the sustainability of the achievements. However, the only indicator with significant effects remains the jobs generated by PFF. Despite this windfall, the employment situation must be taken with great care, especially in a national context marked by an increase in precarious employment and underemployment and a drastic reduction in the level of decent employment. Indeed, it is therefore possible that, with the probable constancy of this health crisis, overgraduates will compete with the most vulnerable population in terms of employability.

In addition, it is useful to note that while it is plausible that the PFF beneficiaries in this phase will improve their resilience in the very short term, it is also possible that producers of other speculations will be very negatively impacted by the crisis and, in the medium term, will bring with them the current benefits of anti-COVID-19 measures.

Statement and Declarations

The author states that the data that support the findings of this work are provided by the indicated sources in the manuscript and are freely available from the corresponding author upon reasonable request. The author certifies that he has no affiliation with or involvement in any organization or entity with any financial interest or nonfinancial interest in the subject matter or materials discussed in this manuscript.

JEL Code: H43; H54; I38; Q12.

References

1. World Health Organization. (2020). Safety evaluation of certain food additives: prepared by the eighty-sixth meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA).
2. Cochrane, J. H. (1991). Production-based asset pricing and the link between stock returns and economic fluctuations. The Journal of Finance, 46(1), 209-237.

3. Kochar, A. (1995). Explaining household vulnerability to idiosyncratic income shocks. The American Economic Review, 85(2), 159-164.
4. Morduch, J. (1995). Income smoothing and consumption smoothing. Journal of economic perspectives, 9(3), 103-114.
5. Espeland, W. N., & Stevens, M. L. (1998). Commensuration as a social process. Annual review of sociology, 24(1), 313-343.
6. Acharya, A. S., Prakash, A., Saxena, P., & Nigam, A. (2013). Sampling: Why and how of it. Indian journal of medical specialties, 4(2), 330-333.
7. Adjeran, B. B., Djagoun, V. D., & Yabi, J. A. (2023). Influence of access to agricultural finance on the yield of rice producers in Malanville. International Journal of Accounting, Finance, Auditing, Management and Economics, 4(6-2), 78-90. https://doi.org/10.5281/zenodo.10210288
8. Alabi, T., Bahah, M., & Alabi, S. O. (2014). The girl-child: A sociological view on the problems of girl-child education in Nigeria. European Scientific Journal, 10(2).
9. Barbara, M. A., Le Gall, C., & Moutel, A. (2021). Effets économiques des épidémies. Trésor-Eco, March.
10. Diagne, M. M., Ndione, M. H. D., Gaye, A., Barry, M. A., Diallo, D., Diallo, A., ... & Faye, O. (2021). Yellow fever outbreak in eastern Senegal, 2020–2021. Viruses, 13(8), 1475.
11. Fleurbaey, M. (1996). Théories économiques de la justice. (No Title).
12. Gertler, P., & Gruber, J. (2002). Insuring consumption against illness. American economic review, 92(1), 51-70.
13. Kaya, O., Kaya, I., & Gunter, L. (2013). Foreign aid and the quest for poverty reduction: Is aid to agriculture effective?. Journal of Agricultural Economics, 64(3), 583-596.
14. Khandker, S. R., & Faruqee, R. R. (2003). The impact of farm credit in Pakistan. Agricultural economics, 28(3), 197-213.
15. McIntyre, D., Thiede, M., Dahlgren, G., & Whitehead, M. (2006). What are the economic consequences for households of illness and of paying for health care in low-and middle-income country contexts?. Social science & medicine, 62(4), 858-865.
16. Mete, C., & Schultz, T. P. (2002). Health and labor force participation of the elderly in Taiwan. Available at SSRN 317981.
17. Rawls, J. (1971). Atheory of justice. Cambridge (Mass.).
18. Roemer, J. E. (1996). Theories of distributive justice. Harvard University Press.
19. Russell, S. (2004). The economic burden of illness for households in developing countries: a review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome. The Intolerable Burden of Malaria II: What's New, What's Needed: Supplement to Volume 71 (2) of the American Journal of Tropical Medicine and Hygiene.
20. Schultz, T. W. (1964). Transforming traditional agriculture. Transforming traditional agriculture.
21. Sen, A. (1999). La possibilité du choix social [Conférence Nobel]. Revue de l'OFCE, 70(1), 7-61.
22. Trannoy, A. (2017). Are Fleurbaey's and Roemer's theories of equality of opportunity irreconcilable? Economic Review, 68, 57-72. https://doi.org/10.3917/reco.681.0057