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Socio-Economic Impact of Support Actions for the Vegetable Sector in Northern Côte d'Ivoire

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Abstract

Subject Description: Financial, technical, and organizational support for the agricultural sector is a powerful tool in the fight against rural poverty. This study evaluates the socio-economic impact of a project to revitalize agricultural value chains in Côte d'Ivoire.
Objective: It aims to identify the achievements of the support actions undertaken in order to propose corrective measures that could be developed through local initiatives.
Methodology: A qualitative and quantitative approach was used. The sample consisted of 11 groups benefiting from the market gardening value chain revitalization activities. Seven (7) sub-prefectures in the Poro Region were covered. Focus groups of 9 people in average were conducted in each group. Descriptive statistics, fact-based systems analysis, and the chi-square test were used.
Results: At the social level, the groups received more assets, particularly kitchen equipment and vehicles. However, donations to the village and the canteen did not increase significantly. In terms of organization, the project helped formalize the groups. Regarding irrigation methods, no significant improvement in water sources was observed. Furthermore, the project did not significantly impact existing marketing methods. Onions were the only crop produced by the groups, with an average yield of 5.95 tons per hectare on 0.3 hectares. However, after the project, the groups achieved an average yield of 15.10 tons per hectare on 3 hectares. In addition to onion, tomato, eggplant, okra, and pepper were adopted to varying degrees.
Conclusion: Ultimately, the project had a noticeable impact on the lives of the groups, especially at the social and organizational levels.

Keywords: *Development Project; Evaluation; Women; Market Gardening; Poro Region; Ivory Coast*

Introduction

In Africa, agriculture remains the most important economic sector. It contributes at least 40% of exports, 30% of GDP, 30% of foreign exchange earnings, and 70 to 80% of jobs. It helps reduce poverty and supports economic growth through its contribution to GDP, employment, and trade. It remains the primary source of income for 90% of the rural population (Alessandro & Soumah, 2008). A West African

country, Côte d'Ivoire has an economy essentially based on agriculture (Soro, 2018). Indeed, the agricultural sector employs two-thirds of the country's working population and remains the main source of income (Ballé, 2024). Hence the famous statement by the first president of the Republic of Côte d'Ivoire: "The success of this country rests on agriculture" (Dasylva & Coulibaly, 2017). According to the country's agricultural policy, outlined in the National Agricultural Investment Program (PNIA II) for the period 2017-2025, the agricultural sector must play a central role in achieving Côte d'Ivoire's national development objectives, particularly in terms of poverty eradication through increased household income.

Today, the government and development partners are encouraging women in villages, especially in northern Côte d'Ivoire, to organize themselves into groups or cooperatives to improve their living conditions and those of their households, notably through market gardening. Attanasso (2004) indicated, in this regard, that approximately 60% of the rural population in developing countries lives below the poverty line, with nearly 570 million women residing in rural areas. According to FAO (2016), financial, technical and organizational support to the agricultural sector thus becomes a powerful vector in the fight against poverty, especially for speculations practiced by women.

However, Côte d'Ivoire, which has implemented extensive agricultural policies from the colonial era to the present day, has long based its agricultural development on an agro-export economic model, prioritizing the extensive exploitation of the most profitable resources in terms of economic returns, such as coffee, cocoa, and timber (Zamblé, 2015). Following recommendations from impact assessments of past policies, a series of structuring projects have been initiated in Côte d'Ivoire since 2012 to support agricultural sectors. Among these is the Support Project for the Revitalization of Agricultural Sectors in Côte d'Ivoire (PARFACI) from 2014 to 2019, which benefits women's groups for sustainable vegetable production. PARFACI aims to strengthen the capacities of group members in vegetable crop management, group organization and operation, the use of irrigation systems, and the importance of collective vegetable sales.

This study assesses the socioeconomic impact of the project's services on women's groups that benefited from project support in the Poro Region of northern Côte d'Ivoire, based on the groups' baseline situation before the project, in order to propose corrective measures. It is conducted three (3) years after the implementation of the support actions.

1. Methodology

The approach used is based on the characterization defined by Rogers and Patricia (2012) and Rogers (2014), which summarizes evaluation as the systematic assessment of the design, implementation, or results of an initiative for learning or decision-making purposes. It relies on empirical data and generally on the methods characteristic of social research, focusing on the process of collecting and synthesizing evidence.

1.1. Data Collection

This study was realized from 2023 to 2024 based on data available in reports and data from ground. The target population is consisted of women producers in the project's intervention area and members of the offices and specialized committees of the beneficiary groups in the Poro region.

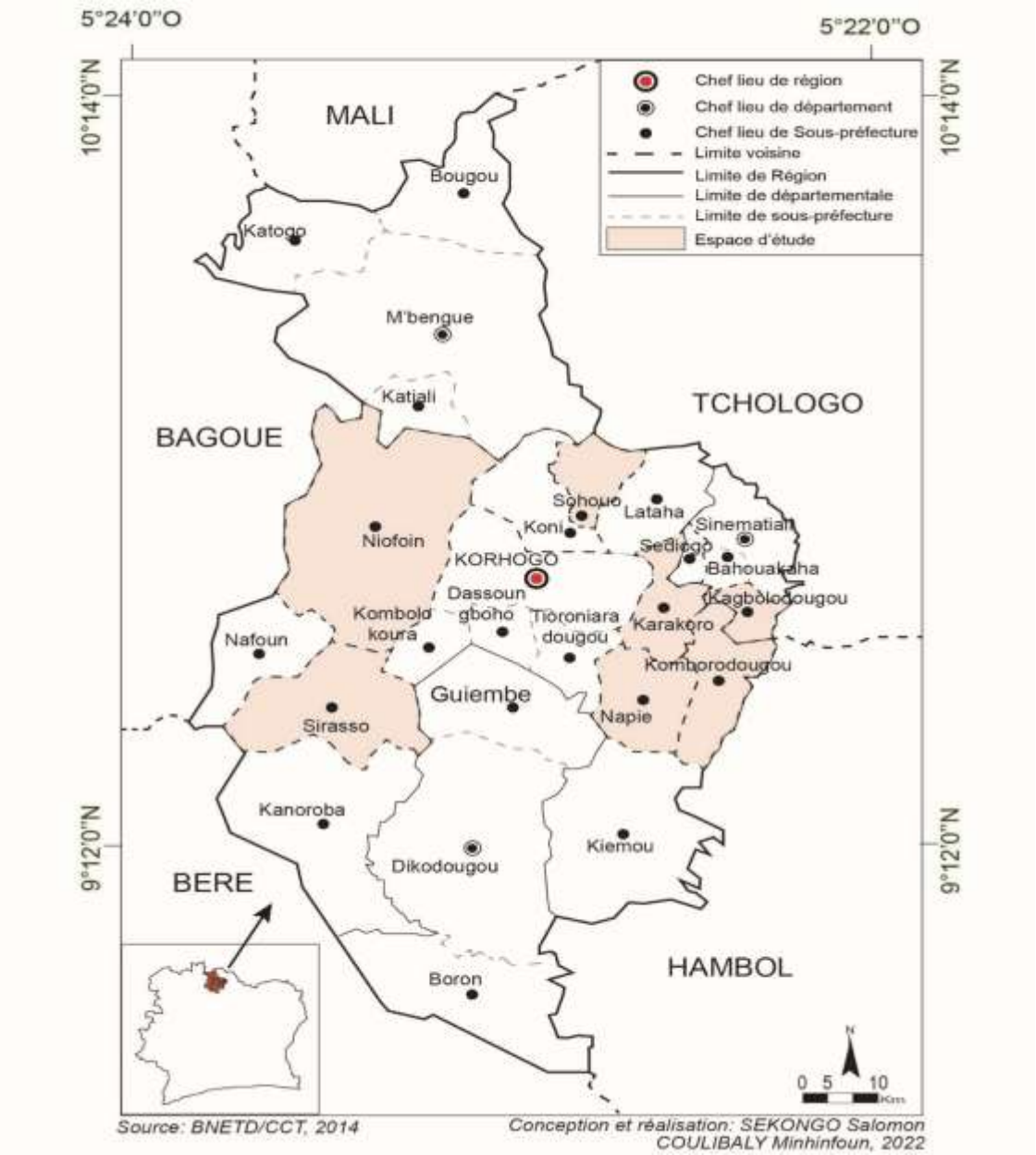
The primary data for the study were collected using a questionnaire and an interview guide administered to the groups. The questionnaire was given to the various members of the offices and specialized committees of the target groups. It comprises three main sections: the baseline situation, the

determination of indicators during the project, and the post-project indicators. The baseline situation is established at the social, structural, technical, and commercial levels.

The interview guide addressed the perceptions of group leaders regarding the support provided by the project and the prospects for revitalizing the functioning of these structures. Secondary data were collected from the project's reference documents and available literature on the subject of the study.

The villages surveyed are the localities identified by project to receive support. These twelve (12) villages were selected based on the presence of a watercourse used for agricultural purposes and existing cooperative initiatives among farmers. The survey therefore involved a census of the groups benefiting from project support. These localities, shown in Figure 1, are all located in the Korhogo department and distributed across seven (7) sub-prefectures.

Figure 1: Presentation of the study area in the Poro Region



Between 9 and 14 people from the executive offices and various specialized committees, per locality, participated in focus groups. In total, 12 focus groups were conducted with 105 producers. The sample composition is presented in Table I.

Table I: Distribution of respondents by locality

Sub-prefectures	Number of members	Localities	Number of members
Karakoro	33	Lavonnonkaha	12
		Nambodielikaha	8
		Pokaha	13
Komborodougou	16	Sibirikaha	6
		Naborikaha	10
Kagbolodougou	14	Fodiolokaha	8
		Nonnangoun	6
Napie	5	Sekongaha	5
Sohouo	7	Dagbaplé	7
Sirasso	9	Sirasso	9
Niofoin	21	Tolman	7
		Kanihoua	14
Total			**105**

In practical terms, the data collection process involved visiting each village hosting a target group to administer the questionnaire to its members. In addition, a focus group approach was used to conduct group interviews. These interviews provided the qualitative data necessary to explain the choices made and the level of results observed.

1.2. Data analysis

1.2.1. Selection and definition of impact indicators

Impact indicators are verifiable and measurable signs that work by comparison to a baseline situation, highlighting the actual impact of the project (Khaled, 2013). These indicators can be either quantitative or qualitative. Quantitative indicators refer to units, proportions, ratios, or rates. Qualitative indicators, on the other hand, generally take the form of a statement and are reported using words (Ghozlene, 2016).

To assess the impact of the recovery project, social indicators, structural indicators, irrigation indicators, production indicators, and marketing indicators were used. A brief commentary on each indicator is provided. According to El Mahmedi and *al.* (2005), impact indicators are variables that can be manipulated to influence the process and better achieve the objective.

a- Social Indicators (SI)

These indicators allow for verification of the presence and evolution of assets: kitchen equipment (KE), product storage (PS) facilities and motorized tricycles (MT). They also consider social actions (SA) within the groups in terms of donations to the village, to the school canteen and in cases of death or marriage. Groups in each sub-prefecture must possess at least one asset and carry out a social action within the group or village. According to Luthi (2011), their role is to assess the level of member involvement and to prevent potential social dysfunctions (n = number).

$SI_1 = nKE_{After} - nKE_{Before} \geq 1$ (1)
$SI_2 = nPS_{After} - nPS_{Before} \geq 1.$ (2)
$SI_3 = nMT_{After} - nMT_{Before} \geq 1.$ (3)
$SI_4 = nSA_{Dvillage\ After} - nSA_{Dvillage\ Before} \geq 1$ (4)
$SI_5 = nSA_{Ddm\ After} - nSA_{Ddm\ Before} \geq 1$ (5)
$SI_6 = nSA_{Dcant\ After} - nSA_{Dcant\ Before} \geq 1.$ (6)

b- Structuring Indicators (STI)

These are qualitative indicators (Ghozlene, 2016) and aim to determine the formal (F) or informal (IF) legal status of the groups, the existence of statutes and internal regulations, the method of land ownership (LO) (with land title or verbal agreement), and the level of organization and operation of the groups, i.e., the organization of elective general assemblies (EGA), ordinary general assemblies (OGA), and the use of minutes.

c- Irrigation Indicator (IDI)

This involved identifying the most frequently used irrigation source by the groups: well, drilling, dam and river. IDI = 1, representing drilling, dam or river. This is a qualitative indicator.

d- Production Indicator (PI)

Its role is to quantify and evaluate the production of agricultural groups according to their crops to assess the cultivated areas, and to track changes in production yields (RP). The demands for services and collective services provided by these groups aim to improve these indicators. It is with this in mind that agricultural businesses are led to develop strategies to improve their performance and attract more customers. They are also encouraged to create added value for their customers in order to enhance their satisfaction (Guenzi and Troilo, 2007).

$Ip = nSP_{After} - nSP_{Before} \geq 1.$ (7)

n= number ; SP = Speculation produced

According to the onion's technical data sheet, the yield (Y) should meet : 25 T/ha $\leq$ Y $\leq$ 35 T/ha

e- Marketing Indicators (MI)

This indicator identifies the type of vegetable sales within the groups. It can be group sales or individual sales. It will be noted as MI = 1 if the sale is group sales and 0 if it is not. According to Molho and *al.* (2009), group sales promote customer loyalty and motivation.

1.2.2. Data analysis tools

Descriptive statistics were used as a preliminary tool for data analysis. They provided useful information for further in-depth analysis. Their parameters were used to calculate the completion rate of the planned actions.

The Chi-square test was applied to the determined indicators. It showed whether the project had a significant impact on the groups. The risk of error in this test is $\alpha = 0.05$ (Nadjia, 2010). When the probability (p) is less than 0.05, the impact is significant. Similarly, if p is greater than 0.05, the impact is not significant. The analysis was performed using SPSS Statistics 23.0.

2. Results

2.1. Baseline situation

The baseline situation is presented successively at the social, structural, technical, productive, and commercial levels.

In total, 100% of the groups in the Kagbolodougou sub-prefecture possessed only kitchen equipment. As for the groups in the Karakoro sub-prefecture, 67% had storage facilities for products and 33% had kitchen utensils. All groups in each sub-prefecture made donations in the event of the death or marriage of a member of the group. Only the groups in the Karakoro and Kagbolodougou sub-prefectures recorded donations for the village, compared to 67% for the Karakoro sub-prefecture and 50% for Kagbolodougou.

In terms of structure, no group was formally constituted. Furthermore, all the groups in the various sub-prefectures had acquired their sites for all production seasons through verbal agreements, without land titles or lease contracts. Regarding their operational methods, the interview results show that all the groups in the visited sub-prefectures hold at least one elective general assembly per year.

The most frequently used water sources for production activities in each sub-prefecture are quite varied. Wells were the most common source in the sub-prefectures of Komborodougou, Napié, Sohouo, Sirasso, and Niofoin, with a usage rate of 100%.

Regarding agricultural production, onion were the only crop grown by the groups. The Fodiolokaha group, with a small area of 0.3 hectares, had a yield of 5.95 tons per hectare, while the Lavonnonkaha group had a yield of 4.61 kg per hectare on 2.79 hectares. Table II presents the production situation in the groups.

At the marketing level, all the groups in the sub-prefectures sold all of their produce retail and individually.

Table II: Production of the groups before the project

Sub-prefectures	Localities	Areas (ha)	Production (Tons)	Yield (T/ha)
Karokoro	Lavonnonkaha	2.79	12.9	4.6
	Nambodielikaha	0.84	3.9	4.6
	Pokaha	1.49	6.8	4.6
Komborodougou	Sibirikaha	0.72	9.7	13.5
	Naborikaha	0.69	2.3	3.3
Kagbolodougou	Fodiolokaha	0.3	1.8	6
	Nonnangoun	0.51	5	9.8
Napié	Sekongaha	1.11	6.9	6.2
Sohouo	Dagbaplé	1.81	7.3	4
Sirassso	Sirasso	0.5	4.3	8.5
Niofoin	Tolman	1.52	4.04	2
	Kanihoua	0.69	5	7.2

2.2. Determination of indicators during the project

The situation during the project is presented successively at the social, structural, technical, productive, and commercial levels. The data obtained are illustrated for the variables "group assets," "social actions undertaken," and "irrigation source."

The data collected from the groups revealed that all these organizations have the necessary kitchen equipment for catering during large events in the visited localities. All groups are now equipped with motorcycle tricycles. Regarding infrastructure, in the sub-prefectures of Karakoro and Kagolodougou, 67% of the groups have product storage facilities, compared to 50% in Sirasso. These rates are illustrated in Figure 2.

Furthermore, the results reveal that 100% of the groups made donations in the event of a death or marriage. In addition, all the groups in the sub-prefecture of Kagolodougou also made donations to the school canteen. This type of action was recorded in 50% of the groups in the sub-prefecture of Komborodougou and 67% in Karakoro. Only 50% of the groups in the sub-prefecture of Niofoin made donations to the village (Figure 3).

It was also noted that only 33% of the groups in the sub-prefectures of Komborodougou and Kagbolodougou had been formally registered, while all those in Napié, Sirasso, and Niofoin had successfully regularized their status. Land acquisition remained verbal, without land titles or lease agreements. Overall, it was observed that all the groups in the sub-prefectures had organized ordinary general assemblies and elective general assemblies, and had drawn up meeting minutes.

Regarding irrigation, water sources are quite diverse. The groups in the sub-prefecture of Napié all used boreholes. Wells remain the least used water source for irrigating plots. The river is used primarily in Sirasso and Sohouo by approximately 80% of the groups. As for dams, their use is dominant in Tolman (82%) and Lavonnonkaha (83%). In contrast, in the other sub-prefectures, the groups used at least 10% of the other irrigation sources (Figure 4).

Regarding production levels, 100% of the groups have additional crops. These include tomatoes, eggplant, okra, and chili peppers. The Lavonnonkaha group, with an area of 4.29 hectares, has a yield of 16.28 tons per hectare of onions, while the Sirasso group has 5.43 tons per hectare on 0.5 hectares. Several groups have had difficulty adapting to the production of crops such as tomatoes and chili peppers, especially in the localities of Komborodougou, Sirasso, Sohouo, and Napié. In these localities, on areas ranging from 0.3 to 0.6 hectares, no significant production has been obtained. Apart from onion cultivation, the crops introduced within the groups are grown on relatively small areas, except in the locality of Karakoro, where they range from 0.92 to 1.78 hectares. Production statistics are presented in Table III.

Regarding marketing, only the groups in the sub-prefecture of Karakoro made group sales to wholesalers, representing 40% of the surveyed entities.

Figure 2: Assets of the groups during the project

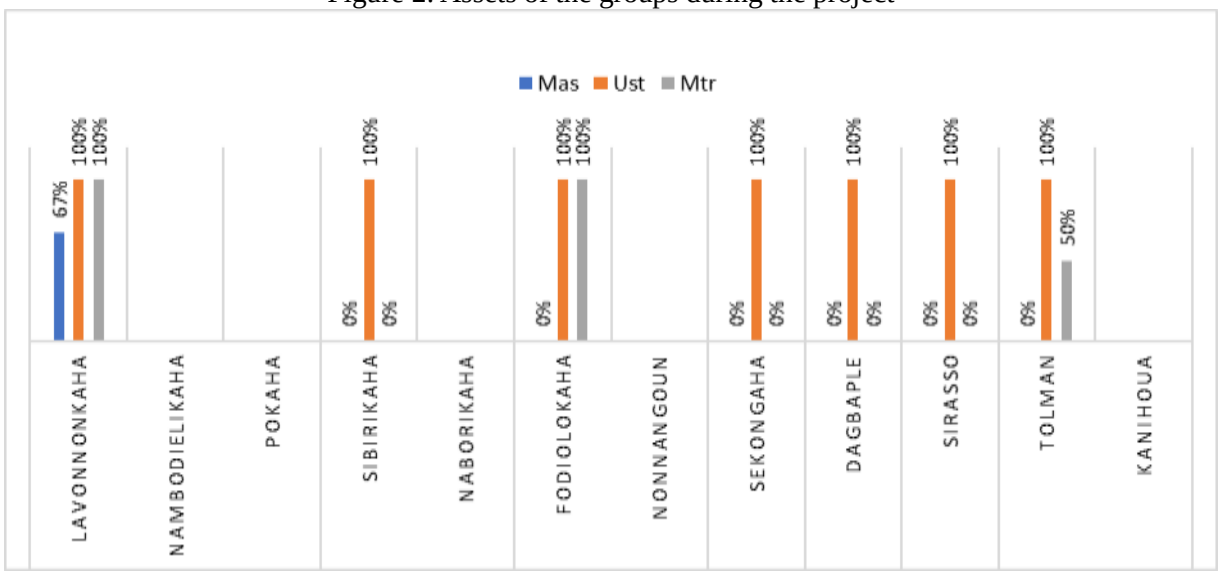


Figure 3: Social actions of the groups during the project

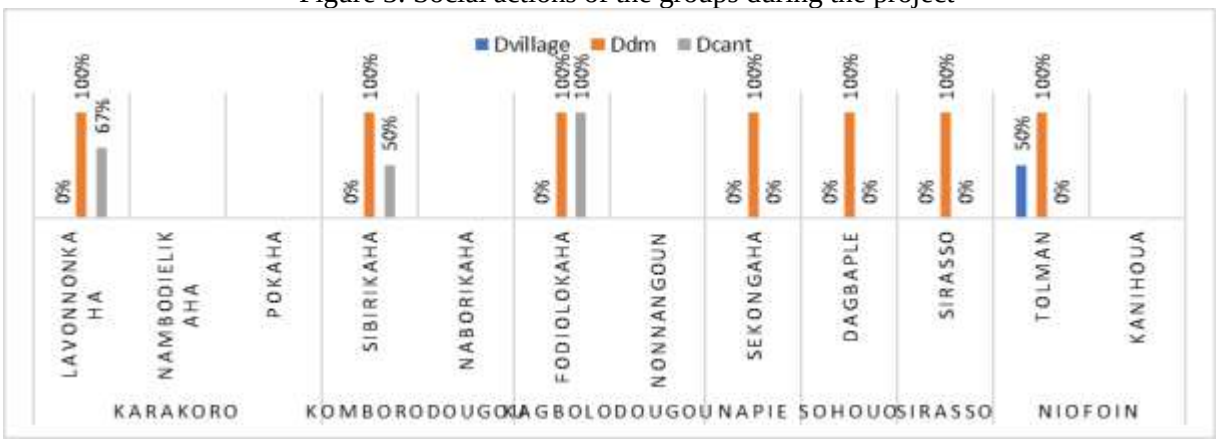


Figure 4: Irrigation sources for the sites during the project

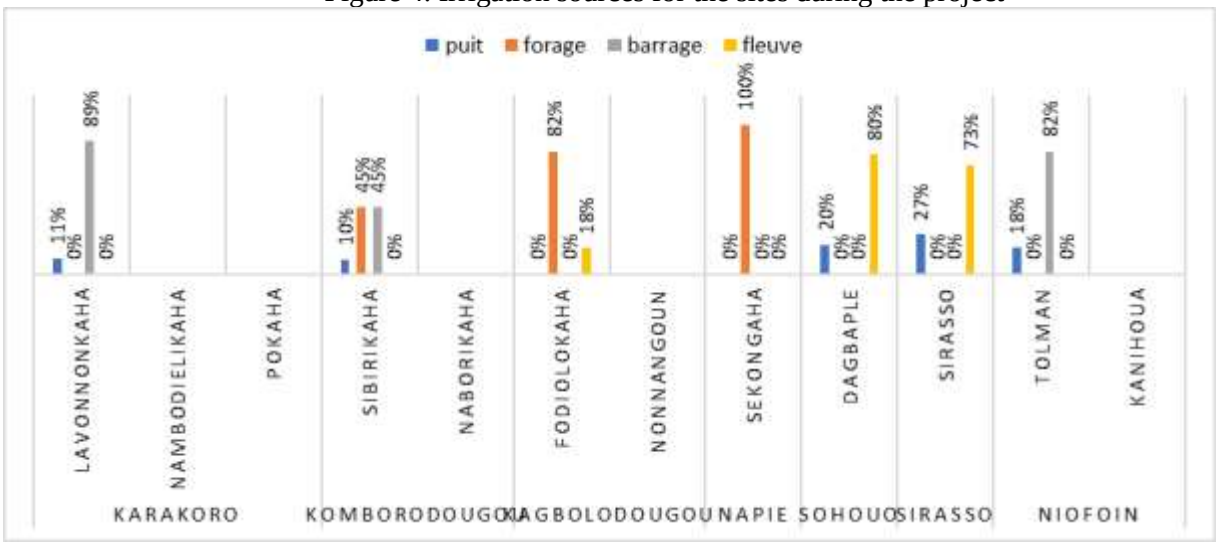


Table III: Average production of the groups during the project

Sub-prefectures	Onion		Eggplant		Okra		Tomato		Pepper	
	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)
Karakoro	2.87	14.92	1.01	67.4	1.78	0.05	0.92	2.34	0	0
Komborodougou	0.7	9.7	1.37	1.11	0.75	0.66	0.3	0	0	0
Kagbolodougou	1.08	11.9	0.28	1.18	0.4	1.24	0.35	10.1	0	0
Napié	1.29	15.6	0.54	0.61	0	0	0.4	0.13	0	0
Sirasso	0.5	5.43	0	0	0.15	2.1	0	0	0	0
Niofoin	1.3	22.4	0.6	1.8	0.17	1.4	0.19	0.25	0	0

2.3. Determination of post-project indicators

As with the situation during the project, the post-project situation is presented successively at the social, structural, technical, productive, and commercial levels. The data obtained are illustrated for the variables "group assets," "social actions undertaken," and "irrigation source."

After the project, it was noted that all groups in all sub-prefectures have the necessary kitchen equipment to support community activities. Furthermore, the groups in the localities of Karakoro, Komborodougou, Kagbolodougou, and Niofoin still have tricycles to ensure the mobility of market garden produce. In addition, 67% of the groups in Karakoro have storage facilities, compared to 50% in Niofoin (Figure 5).

Regarding the other social aspect, it also appeared that all the groups continue to make donations in the event of a death or marriage. In this group, half of the Niofoin groups make donations to the village. While in Kagbolodougou all the groups make donations for the school canteen, the contributions in Karakoro (67%) and Komborodougou (50%) are more average (Figure 6).

From a structural standpoint, it was observed that all groups have been formalized, but are still producing on plots acquired verbally, without written transfer contracts or land titles.

Only 67% of the groups in the sub-prefectures of Komborodougou and Kagbolodougou have held ordinary (OGM) and/or extraordinary (EGM) general assemblies. Furthermore, in the localities of Karakoro and Niofoin, all the monitored producer organizations held OGM/EGM meetings and subsequently used their minutes, particularly for monitoring recommendations. This level of participation was also observed in the Sirasso groups.

Regarding irrigation, in the Sirasso locality, the groups made less use of the irrigation source provided by the project. The results reveal that 66% of the groups irrigate from the river and 34% from wells. Figure 7 shows the distribution of irrigation sources by locality.

Across all localities, all groups cultivate at least two (2) crops in addition to onions. However, production parameters vary considerably from one locality to another. Eggplant cultivation is the most

well-established in the post-project period, with areas ranging from 0.25 to 1 ha and yields between 1.13 and 6.4 T/ha. For onions, the Lavonnonkaha groups have the largest cultivated area at 3 ha with a yield of 15.1 T/ha, while those in Sibirikaha, with an area of 0.3 ha, have the lowest yield of 3.5 T/ha. These discrepancies highlight the significant variability in production parameters in the post-project period. Table IV presents the details of production variables by locality and by crop. In terms of marketing, it emerged that all the groups sell their produce retail and individually. The additional crops, generally grown on small plots with low yields, have not prompted innovative marketing strategies.

Figure 5: Assets of the groups after the project

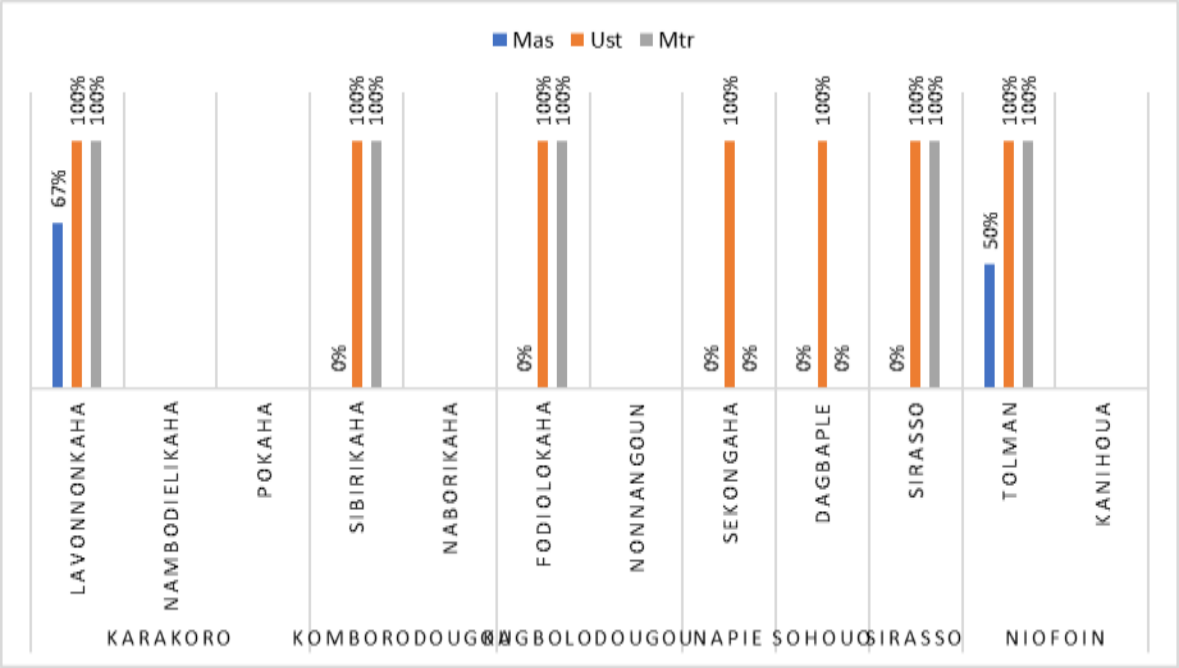


Figure 6: Social actions of the groups after the project

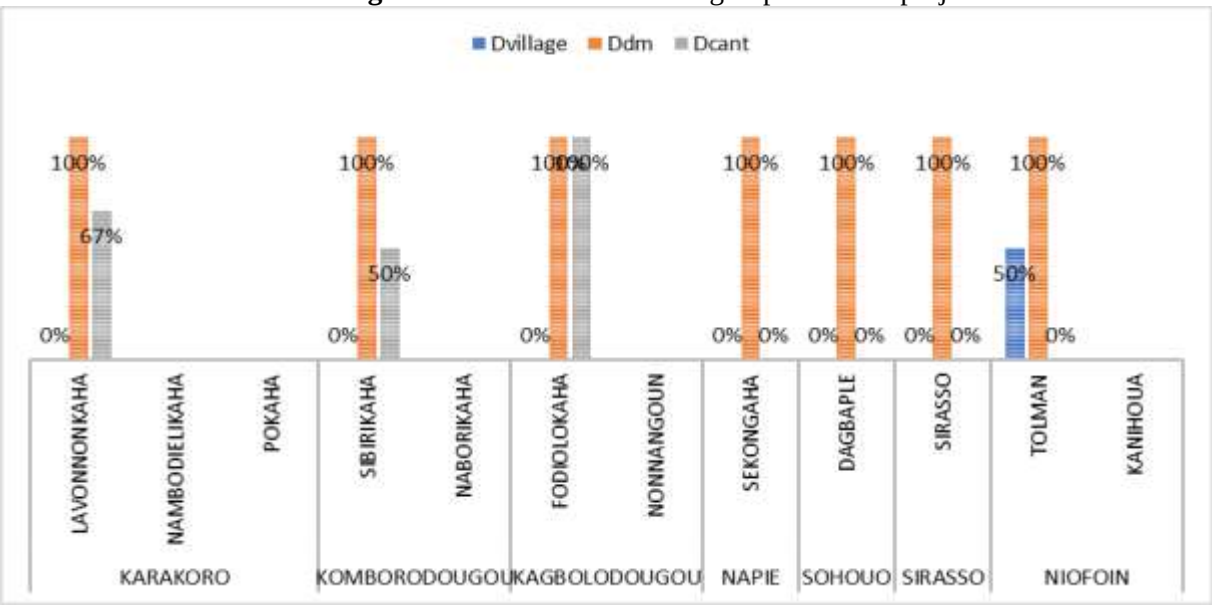


Figure 7: Irrigation sources for the sites after the project

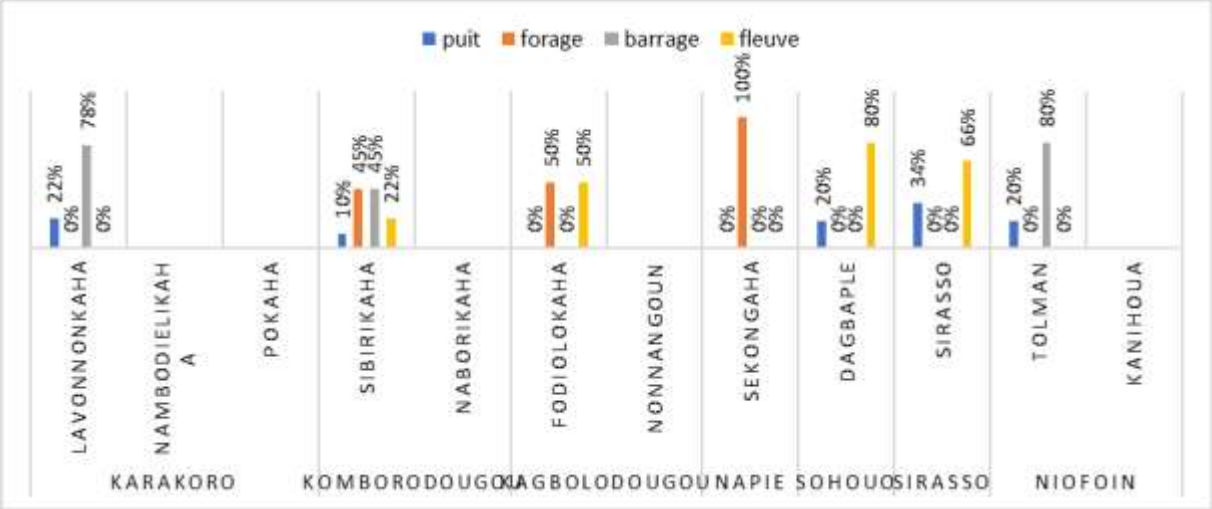


Table IV: Average production of the groups after the project

Sub-Prefectures	Onion		Eggplant		Okra		Tomato		Pepper	
	Yield (T/ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)	Areas (ha)	Yield (T/ha)
Karakoro	2	18.84	0.6	4.8	0.83	0.61	0.45	2.57	0.5	1.7
Komborodougou	0.4	5.02	1	3.02	0.75	0.75	1.25	2.8	0	0
Kagbolodougou	0.2	3.13	0.25	1.46	0.5	0.64	0	0	0	0
Napie	0.5	2.76	0.3	1.13	0	0	0.4	0.13	0	0
Sohouo	1	2.7	0.75	1.73	0	0	0.6	0	0	0
Sirasso	0.5	5.71	1	5.8	0	0	0	0	1.2	1.53
Niofoin	0.75	10.29	0.25	6.4	0.25	5.42	0.3	0.64	0	0

2.4. Evaluation of the overall impact of the project

These results compare the data recorded before and after the project using a Chi-square test, the objective of which is to assess the significance of the measured differences. The most representative categories of the variables were selected for testing. The parameters analyzed and the related statistics are presented in Table V.

The generated statistics show that the kitchen equipment owned by producer groups has significantly increased across all beneficiary organizations (χ^2_{Ust} = 10.5 and P = 0.005). This observation also holds true for vehicles, which allow for greater mobility for the leaders and harvests of the members of these organizations (χ^2_{Mtri} = 7.778 and P = 0.005).

In terms of social practices, the results of the statistical test revealed that donations made by producer groups did not vary significantly, whether for the benefit of the village, the canteen, or community events ($\chi^2_{DVillage}$ = 1.077 and P = 0.299, χ^2_{Dcant} = 1.110 and P = 0.774). From this perspective, the project did not enable the groups to increase their donation activities following the support received.

From a legal standpoint, it was observed that all groups had formal status after the project. This was not the case before the project (χ^2_{Formal} = 14; P = 0.00 and $\chi^2_{Informal}$ = 14; P = 0.00). The project therefore had a positive impact on the formalization of the existing groups. This provides them with a fundamental structural basis for improved administrative functioning and increases their credibility with potential partners. Furthermore, it was found that the project did not have a significant impact on the formalization of land acquisition by the groups (χ^2_{Verbal} = 14; P = 0.000).

Following the project, no land title exists for any of the beneficiary groups. The plots are still being used based on verbal land allocations by the landowners. This section notes that the project's support enabled the registration of both ordinary and extraordinary general assemblies in all the beneficiary organizations (χ^2_{Age} = 14 and P = 0.000). By facilitating these meetings, which are key forums for members to express their views, the project has contributed to improved organization and functioning of the groups.

Regarding irrigation methods, the test results show that the project's actions did not significantly impact irrigation methods such as the use of wells, boreholes, and dams (χ^2_{Wells} = 14 and P = 0.51, $\chi^2_{Drilling}$ = 3.818 and P = 0.282, χ^2_{Dams} = 5.111 and P = 0.402). Therefore, the beneficiary groups' access to water was not improved.

Regarding marketing, individual sales remained the dominant method practiced within the groups. Strategies to improve income through collective sales could not be consolidated. From this result, it appears that the project did not have a significant impact on vegetable marketing methods at the group level ($\chi^2_{Individual}$ = 2.137; P = 0.630 and $\chi^2_{Collective}$ = 4.203; P = 0.292).

Table V: Statistics on project impact assessment indicators

Domains	Variables	Terms	Chi 2 (χ^2)	p-value
At the social level	**Group assets**	Kitchen Equipment	10.5	0.005**
		Motorcycles and tricycles	7.78	0.005**
	Social actions	Donation to the village	1.077	0.299
		Donation to the canteeen	1.110	0.774
In terms of structure	**Legal situation**	Formel	14	0.000***
		Informel	14	0.000***
	Ownership of the production areas	Verbal agreement	14	0.000***
	Organization and operation of the group	Extraordinary General Meeting	14	0.000***
Regarding irrigation	**Types of irrigation**	Wells	6.612	0.51
		Drilling	3.818	0.282
		Dams	5.111	0.402
In terms of marketing	**Marketing methods**	Individual	2.137	0.630
		Collective	4.203	0.292

3. Discussion

The results of this study showed an improvement across all the selected indicators, including social aspects, organizational structure, irrigation, production, and the marketing of harvested products.

Regarding social actions, all groups provided donations in the event of the death or marriage of a member's relative. Only the groups in the sub-prefectures of Karakoro and Kagbolodougou recorded donations, with 67% for the village and 50% for the Kagbolodougou locality. These rates were achieved through support from the German Cooperation (GIZ) and the mutual aid initiative undertaken by members of these organizations. These results align with Ghozlene's (2016) assertion that social performance stems from the collective's commitment to improving the well-being of its members. They then commit to pooling their ideas and energy in order to make what belongs to the individual benefit the whole. Soro (2018) states that the arrival of projects in the Poro region has enabled women's groups to expand their activities by strengthening their capacity for social contribution. Regarding their structure, all the groups were informal before the project. They had acquired their production sites through verbal agreements without land titles or lease contracts and had held at least one elective general assembly.

In addition to social activities, at least 33% of the groups in the sub-prefectures of Komborodougou and Kagbolodougou have been formalized, as well as 100% of those in Napié, Sirasso, and Niofoin. All the groups in the sub-prefectures acquired their sites through verbal agreements, without land titles or lease contracts, and have also held ordinary general assemblies, elective general assemblies, and kept meeting minutes. The availability of these administrative documents shows the level of maturity of the groups and is consistent with the objectives (Ryckmans, 1997).

Furthermore, it became clear that acquiring land titles is primarily a matter of customary procedures rather than a simple initiative by the women producers. Issoufou (2008) asserts, in this regard, that the land issue is of customary or state origin, in that few women's groups possess them. Along these lines, Halimatou (2006) states that in rural areas, women inherit farms but cannot obtain land titles due to rigid social rules that exclude them from land ownership. The Fodiolokaha group, with an area of 0.3 ha, had a yield of 5.95 T/ha, while the Lavonnonkaha group had a yield of 4.61 T/ha on 2.79 ha. These relatively low onion yields can be explained by the fact that these groups were, at that time, only benefiting from their first advisory support project for this crop. The level of technical expertise was then too low to achieve an optimal level of agronomic performance.

All the groups in the sub-prefecture of Napié used the river as their primary irrigation source. In contrast, in other localities, groups used at least 10% of other irrigation sources. The low rate of use of other irrigation sources is explained by the fuel allocations made by the project to power motor pumps and generators. This approach was discussed in the work of Merlet et al. (2018), who argue that in all regions of the world where rainfall is insufficient to allow for abundant and regular harvests, access to water for irrigation is an essential complement for sustainable agricultural production. Regarding production levels, almost all the groups adopted additional crops. These include tomatoes, eggplant, okra, and chili peppers.

The Lavonnonkaha group, with an area of 4.29 ha, has an onion yield of 16.28 t/ha, while the Sirasso group has 5.43 t/ha on 0.5 ha. This yield increase compared to the baseline period is due to the technical support provided by BFCD, commissioned by FIRCA, during the project's implementation. These results are consistent with Kiema's (2019) work, which shows that organizing an agricultural group strengthens the capacities of nearly 90% of its members in production-related areas and allows for the introduction of new crops. Good structure and operation thus represent a competitive advantage in a competitive environment.

In terms of the significance of the indicators, the project's actions had a significant impact on the kitchen equipment variable (χ^2_{Ust} = 10.5 and P = 0.005); the same was true for means of mobility (χ^2_{Mtri} = 7.778 and P = 0.005). Regarding their effects on social actions, the methods of donations to the village and the canteen did not show significant changes ($\chi^2_{DVillage}$ = 1.077 and P = 0.299, χ^2_{Dcant} = 1.110 and P = 0.774). These results are consistent with those of the FAO (1999), which state that only projects supporting women's activities succeed in breaking women's isolation and reducing their marginalization. The implementation of socio-economic activities specifically targeting women producers has laid the foundation for a new status and recognition of women, as well as their increased participation in village life and society in general, without disrupting the community balance between men and women. At the structural level, these actions have had a positive impact on the formalization of groups. In other words, thanks to the project, all informal groups were legally established. According to Soro (2018), women's groups without advisory support generally lack statutes and internal regulations and do not hold ordinary general assemblies. Furthermore, it appears that the project did not have a significant impact on the formalization of land acquisition for the groups. Referring to the work of Koné (2011) in northern Côte d'Ivoire, this could be explained by the fact that women rarely receive or inherit valuable land permanently with exclusive rights due to tradition.

It also emerged that the project had a positive impact on the organization and functioning of the groups (χ^2_{Age} = 14 and P = 0.00). This rather encouraging finding is a major result of the project. Moreover, Halimatou (2006) shows, in this regard, that with the development of cities and the monetization of exchanges, these practices, formerly reserved for productive rural areas, have developed in urban areas, but have taken on other forms.Today, forms of mutual aid are increasingly taking place through well-structured collective social organizations such as associations and groups, whether in a productive or non-productive context. Their development has contributed to the formation of social networks, which address various issues and serve to absorb shocks caused by unforeseen circumstances and multifaceted crises.

According to the results of the statistical test, the project did not positively impact the irrigation methods of the plots belonging to the groups (χ^2_{Well} = 14 and P = 0.51, $\chi^2_{Drilling}$ = 3.818 and P = 0.282, χ^2_{Dam} = 5.111 and P = 0.402). In this regard, Fossi and al. (2013) emphasize that strategies involving water management have developed further with climate change in order to secure and improve agricultural production. The project's lack of impact on this extremely important parameter for production activity raises the issue of the sustainability of the effects induced by the project. Water management is a key factor in the profitability and long-term viability of the production system.

According to the statistical analysis, the project did not have a significant impact on vegetable marketing methods at the cooperative level. Individual sales remain dominant among cooperative members. This finding is supported by the work of Garrido and Sanchez (2015), who reported that sales are organized individually in local markets, although farmers' organizations acknowledge that group sales allow them to negotiate from a stronger position and obtain more favorable terms. This demonstrates that the priority of individual interest and pressing financial needs dictate the actions of the women producers.

Conclusion

This study concludes that the project has indeed had a positive impact on the groups. This impact is positive at the social level, in terms of group structure, and in terms of group production. However, its actions have not significantly impacted the irrigation system or marketing methods.

On the social level, the groups have received more goods, particularly kitchen equipment and vehicles. In contrast to these improvements, donations to the village and the canteen have not seen a

significant increase. In terms of structure, the project has helped to formalize all the groups, transitioning them from an informal to an informal status. Regarding the level of organization and operation of the groups, the actions have had a positive impact, as they have enabled the regular holding of ordinary and extraordinary general assemblies. As for irrigation methods, the project has not been able to significantly improve irrigation sources to ensure greater productivity for the groups.

Regarding production before the project, onions were the only crop produced by the groups. The Fodiolokaha group, with the smallest area, had a yield of 5.95 T/ha, while the Lavonnonkaha group had a yield of 4.61 T/ha. During the project, all the groups introduced new crops. The Lavonnonkaha group recorded the highest yield of 16.28 T/ha of onions, while the Sirasso group had the lowest productivity of 5.43 T/ha. After the project, all the groups were able to adopt at least two additional crops besides onions. In this post-project period, the Lavonnonkaha group, with the largest area, showed a yield of 15.09 T/ha, while the Sibirikaha group observed the lowest yield of 3.53 T/ha of onions.

It was also noted that the project had not succeeded in significantly impacting the marketing methods of vegetables within the groups.

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