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Functions and Impacts of Multi-Stakeholder Platforms in Benin

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Abstract

The purpose of Multi-Stakeholder Platforms (MSPs) is to improve the wellbeing of the different actors who participate in the activities of the platform. There is the need to understand the mechanism to ensure that the different stakeholder category of the platform have an equitable benefit. Thus, this study was set out to describe the operation of the agricultural multi-stakeholder platforms and assess the impact of their activities on the production and revenue of the different beneficiaries. The required data was collected from 285 stakeholders using structured questionnaires. The econometric approach based on the Local Average Treatment effect (LATE) was used to identify the impact of the participation in the MSP activities on the revenue and yield of the producers. The results revealed that the yield of rice increased by 2 tons/ha as a result of stakeholder participation in the MSP activities. Likewise, participation in the MSP activities led to an increase in the revenue by CFAF 43,038. The results also revealed that participation in bundling increased producers' revenue by CFAF 28,367. Training received by the producers and the development of the lowlands increased revenue from rice by 0.82 and 0.72 tons/ha respectively. The study confirmed that good benefits are generated on the platform due to the complementary effect of stakeholder's interactions. However, it will be necessary to conduct a follow up study on on the knowledge level and the technical efficiency, outpuit from this would guide the development of activities at the level of the platforms.

Key Words:

Multi-stakeholders Platform; impact, production revenue, stakeholder's participation

1. Introduction

Cultivated in more than 113 countries and on all continents except Antarctica, rice is the staple food for more than half of the world population (Hirsch, 1999). More than 2 billion people in Asia obtain 60 to 70 percent of their energy intake from rice and its derived products (FAO, 2001). In Benin, rice is becoming more and more important in the diets of the populations in the urban as well as rural areas (Adégbola and Sodjinou, 2003). The needs in average rice consumption per adult-equivalency and per year are 35 kg in the big cities and 32 kg in the rural areas (CEPED, 2010). The total amount of rice consumed in 2009 was 255,520 tons (Kumako, 2015). Rice production in Benin is not among the most dynamic value chains. In fact, the production volume had never gone beyond 100,000 tons per year before 2007. From 2008, various development initiatives were undertaken following the world food crisis. The initiatives led to a boom in rice production, with a peak of 206,943 tons in 2013 (FAO, 2013). Despite an increase in the national rice production experienced these last decades, the local production does not meet the national rice needs (Adekambi, 2005). In fact, the national production currently covers only 47 percent of the country's needs (MAEP, 2010), thus necessitating importation of large volumes (971,365 tons in 2012). (Lavinon, 2015). This is despite the country's high potential in natural resources (205,000 ha of lowlands and 117,000 ha of flood plains) (Adégbola *et al.,* 2011).
The low rice production is due to the fact that the rice sector is characterized by low productivity linked to the use of 'archaic' tools, unimproved seeds, poor management of water, poor organization of the sector, inadequacy of technical supervision, lack of infrastructure, and absence of funds for production activities. These constraints hamper development and modernization of the sector, a situation that makes rice production uncompetitive and hence a poor wealth creator. Several traditional agricultural research for development (ARD) approaches were used to remedy these inadequacies. According to the traditional model, innovation starts with conception by scientists and spreads to adoption by farmers through extension agents (Knickel *et al.,* 2009). Research, transfer and adoption are independent activities, and less attention is given to the context in which these processes are integrated. These poor approaches are widely blamed for contributing significantly to the poor performance of the sector in improving the means of subsistence of end users, and of small producers in particular. The poor performance of these approaches is manifested in low adoption rates of technologies and poor links among stakeholders in the value chain (Adekunle *et al.,* 2014).

To address the problems associated with the traditional approach, the Forum for Agricultural Research in Africa (FARA) proposed a new approach titled Integrated Agricultural Research for Development (IAR4D). The IAR4D approach aims at integrating research within an innovation system including all stakeholders of the agricultural value chain. This is the same as a participatory approach in innovation and dissemination, which entails moving an innovation from a product to a process (Knickel *et al*., 2009). In such a system, innovation does not follow a linear path that starts with research, going through processes of development, transfer, dissemination, adoption, production and ending in the introduction and successful utilisation of new products and procedures (Adekunle *et al.,* 2014). It rather tends to involve continuous feedback between the different steps (Dantas, 2005), by relying on the knowledge of the stakeholders involved at each step. The structure of the IAR4D concept is an innovation platform (IP) comprising agents (enterprises, research institutes, intermediaries, clients, authorities, and financial organizations) who interact and are motivated by the common conviction that an

increase in agricultural production can help to improve the wellbeing of all members (Eicher, 2006).

Some people consider that it is through the innovation platforms that the research results could be beneficial to producers and contribute to improving significantly their overall performance (Byerlee and Alex, 1998). It is in this framework that the Africa Rice Center (AfricaRice) in close collaboration with the National Agricultural Research Institute of Benin (INRAB) and the Farmers' Organizations (FOs) have initiated, through the project "Realizing the Agricultural Potential of inland valley lowlands while maintaining their environmental services" (RAP), the setting up of Multi-Stakeholder Platforms (MSP) in the rice sector. Thus, the first Multi-Stakeholder Platforms were established in February 2009 in Benin in the departments of Mono and Couffo. After eight years of operation, it is important to determine if activities planned within the platform were really carried out in favour of the beneficiaries and how their participation in the platform was beneficial to them.
The objective of this study was to evaluate the performance of multi-stakeholder platforms on innovations and the impact of their implementation on the production and revenue of the beneficiaries.

The rest of this document is structured as follows: Section 2 presents the mode of operation of the platforms. In section 3, the detailed methodology is given. The results chain and the impact factors are explained in section 4. Section 5 presents the factors that determine eligibility for participation in MSP activities; the results of the impact models are discussed in section 6. Section 7 concludes the study.

Operation of the Innovation Platforms

1.1 Goal and key principles of an innovation platform

The goal of creating the platforms is to help stakeholders (local communities and political leaders) to analyze their own constraints and weaknesses as well as their opportunities and strengths. The platforms also help stakeholders to strengthen their capacity to innovate through better access to and utilization of existing knowledge and news, information, and services that improve the performance of their enterprises. They are also intended to improve sharing of knowledge and coordination between the key stakeholders responsible for implementation of the project activities and to create backup institutions and policies.
The main principles of agricultural innovation platforms according to CORAF/WECARD report of 2012 are:

- concentrating on innovation rather than production;
- collective interaction and non-linear collaboration between stakeholders;
- linkages to access knowledge and trainings;
- existence of new stakeholders and new roles in the innovation process;
- attitudes, practices, and interactions of behavior modes that determine the desire for innovation;
- polities are important in innovation;
- the demand side should be included in the innovation process;
- Change to adapt to change; and
- Building on information that "holds".

1.2 Types of stakeholders in innovation platforms

Innovation platforms catalyse and facilitate collective actions through multi-stakeholders' processes and the value chains to sustainably improve living standards and enhance the impact of local and national development. The innovation platforms have five groups of stakeholders:
1) small farmers;
2) input dealers, agro-food processors, and traders;
3) public and private service providers (research and extension) and management services (business development);
4) financial services (banking institutions and microfinance); and
5) members of the regulation team (who define the norms and the rules).
They are therefore composed of three groups of stakeholders:
a) stakeholders of the value chain (producers, processors, small-scale farmers, cooperatives…)
b) service providers (research, extension, projects, communication, microfinance)
c) regulators (politician/union/Members of Parliament/Senators/communes/mayors).

1.3 Key factors of the operation of an innovation platform

To be a member of a MSP, one must adhere to an organization that is a member of the MSP. Membership fees within the groups are CFAF 2000. The MSPs of Dogbo and Houéyogbé were established in 2009 with support from the RAP[1] project. The organizations that are members of the MSPs were selected based on the following criteria:

- The number of years of experience in the village; and
- The social credibility of the group.

Each MSP is made up of stakeholders in various professions, who are volunteers. These stakeholders are: land owners, farmers, fish farmers, traders, processors, transporters, producer organizations (URP, CRR, CRM), NGOs (Protos, ODIB), town councils, Research (INRAB, AfricaRice) and Extension (CeRPA, CeCPA).
The innovation platform is a management tool for the multi-stakeholder process in the value chains. It uses a combination of common learning systems and approaches to trigger the strong commitment of the stakeholders in each step of the process. In this respect, the specific complexes following participatory approaches, dissemination paths, and functional learning tools are adopted. These include;

(i) The participatory approaches and the collective action tools that are made of participatory development approaches, participatory development management, participatory research and extension approach, participatory varietal selection, participatory analysis, gender approach, participatory learning and research action, participatory agricultural management, practical agricultural schools (farm school, farmer-to-farmer approach) and demonstration plots;

(ii) The extension channels that include learning among agricultural producers, the collective action of agricultural producers, the adoption of technologies that take into account market evolution and the participatory approach of the market chain; and

[1] *Realising the Agricultural Potential of inland valley lowlands while maintaining their environmental services*

(iii) Function learning through joint systemic analysis, documentation, experimental learning and information/knowledge sharing among the stakeholders and the platform.

2 Methodology

2.1 Theoretical frame

The theoretical frame that backs up this impact evaluation is that of the "potential results", developed by Rubin (1974). To describe the concept of "potential results", let us consider Y_i as the revenue of a rice farmer i, who participates or does not participate in the MSP activities. Let A_i be the decision to participate, to be taken in such a way that $A_i = 1$ if the producer participates in the activities and $A_i = 0$ if the producer does not. By supposing that the equation of the revenue depends on the observed and non-observed factors, and by using the notation of classical regression, the revenue Y_i can be written as follows:

$$Y_i = \lambda + \gamma x_i + \beta A_i + \varepsilon_i, \qquad E(\varepsilon|\lambda, \gamma, \beta, x_i, A_i) = 0 \qquad (1)$$

where λ, γ and β are unknown parameters to be estimated; x_i are independent variables; and ε_i the error term. β is the mean causal impact of A on Y in all observation units.
There are three main potential sources of bias in the programme impact measurement (Godtland *et al.,* 2004). First of all, participants in the activities are likely to be different from non-participants in the distribution of their observed characteristics, leading to a bias due to the "selection on observables".

A second source of bias in the impact may arise when there is a dissemination of MSP knowledge within the communities. In the presence of the dissemination, the comparison between those taking part in MSP activities and non-participants in the same village is likely to underestimate the impact. A last source of bias is that those taking part in the activities may be different from non-participants in the distribution of non-observed characteristics (for example, in the capacity of the farmer that affects at the same time the decision to participate in the activities and the desire to look for new knowledge), which leads to the selection on non-observables. In the absence of an appropriate instrument to participate in the programme, it is difficult to control explicitly the selection of non-observable factors. Observable and non-observable variables must be controlled, otherwise it is possible to wrongly conclude that there is a relation of causality between the participation in the activities and the revenue. Estimating the impact of farmers' participation in the activities on the revenues is therefore likely to be biased. Thus, the correct estimation of equation (1) needs the instrument A_i.

By admitting that the impact of the participation in the activities on the revenue (β) is heterogeneous, interaction terms were included in the model. The impact of the participation in the activities on the revenue (β) is therefore rewritten as being a function of the independent variables *x* and of the non-observed heterogeneity (v).

$$\beta = \alpha + (x - \bar{x})\delta + v_i \qquad E(v_i|x_i) = 0 \qquad (2)$$

Where $\bar{x}$ is a vector of sample means of x.

By replacing the value of β given by equation (2) in equation (1), the estimation model is presented as follows:

$$Y_i = \lambda + x_i\gamma + \alpha A_i + A_i(x_i - \bar{x})\delta + A_i v_i + \varepsilon_i \quad (3)$$

Using the method of the instrumental variable to estimate the impact of participating in the MSP activities on the revenue of the household requires the presence of $A_i v_i$ in the error term of equation (3). According to Dimara and Skuras (2003), the decision of a producer to participate or not to participate in the MSP activities is determined by the expected utility resulting from the difference between the expected services from the participation and the non-participation. Producers, by taking into account their own non-observed gain v_i, and exogenous variables x may auto-select themselves. This leads to a correlation between $A_i v_i$ and *z*. The conditional value expected of $A_i v_i$ given by (*z*, *x*), can be written as follows:

$$E\left(A_i v_i \middle| x_i z\right) = E(v_i | A_i = 1, z)\Pr\left(A_i = 1 \middle| z\right) \neq 0 \quad (4)$$

Wooldridge (2007b) demonstrated that:

$$E(A_i v_i | x_i z_i) = \emptyset_i(\theta_0 + x_i\theta_1 + z_i\theta_2) \quad (5)$$

where $\emptyset_i(.)$ is a standard probability density function and the correctional function.
The equation (3) can therefore be rewritten as follows:

$$Y_i = \lambda + x_i\gamma + \alpha A_i + A_i(x_i - \bar{x})\delta + \rho\emptyset_i(\hat{\theta}_0 + x_i\hat{\theta}_1 + z_i\hat{\theta}_2) + \varepsilon_i \quad (6)$$

2.2 Impact estimation model

The objective of this study is to estimate what the situation of the producer members of the MSP would have been if they did not choose to participate in the activities of the MSPs. To solve the problem of selection bias and generate estimations with fewer possible biases at the level of the impact results, the counterfactual approach based on the method of instrumental variables (VI) (Rubin, 1974; Imbens and Wooldridge, 2009), was used.
Learning from Wooldridge (2007b), the heterogeneous model of the impact of the participation in the MSP activities on the revenue of the households presented by equation (6) was estimated in two steps.

The first step consisted of estimating a probit model of the factors that influence the probability to participate in the MSP activities on the exogenous variables x and z. The exogenous variables x are common to the participation and revenue equation while the exogenous variables z belong exclusively to the participation equation. This "exogeneity" restriction of the variables z is determining for the estimation of the revenue model to be consistent. The specification of the model of participation is presented as follows:

$$Ai = \delta + \alpha_1\, dmarche + \alpha_2\, Nnatsol + \alpha_3\, Agroup + \alpha_4\, Naexpri + \alpha_5\, Supdispo + \alpha_6\, Taillem + \alpha_7\, Narvil + \alpha_7\, Npriprod + \varepsilon_i \quad (7)$$

$dmarche$: is the distance to the nearest market. It is a continuous variable.
$Nnatsol$: is a binary that takes the value 1 if the producer exploits a lowland and 0 if not. The expected sign is positive.
$Agroup$: is the fact of belonging to a group or association. It is binary and takes the value 1 if the producer belongs to an association and 0 otherwise. The fact of belonging to an association

increases the contact with other producers and improves the probability to know or to adopt the CEF. The expected sign is positive;
$Naexpri$: is the number of years of experience in rice production. It is a continuous variable. The expected sign is positive.
$Supdispo$: is the total available acreage. The expected sign of this variable may be positive or negative.
$Taillem$: is the size of the household. It measures the labour force available in the household. The more labour force the household has, the more focused it would be on innovations. The expected sign is positive;
$Narvil$: is the number of years of residence in the village. This is a continuous variable. The expected sign is positive.
$Npriprod$: The agreement on the selling price is a continuous variable. The expected effect of this variable is positive.
In the second step, the impact model of the participation in the MSP activities on the revenue of equation (6) was estimated by using the Local Average Treatment effect (LATE) introduced by Imbens and Angrist (1994). For the LATE estimation, the estimator proposed by Abadie (2003) was used. This estimator is a generalization of the one proposed by Imbens and Angrist (1994) and for which the randomness of the instrument is not required or instrument z is independent from y_{1i} and y_{0i}[2] conditionally from x. This estimator requires using at least an instrument z that affects directly the status of the participation in the MSP activities but indirectly the results y_{1i} and y_{0i} once the independent variables x are controlled.
In this study, the instrumental variable is the knowledge of the existence of the MSP (z) with $z=1$ for the producers who know of the existence of the MSP and $z=0$ for the producers who don't. In fact, the choice of this instrument is justified by the fact that knowing the existence of the MSP can influence participation in the MSP activities. It is the producers who are aware of the existence of the MSP that can be members of the MSP and therefore participate in the activities. On the contrary, the fact of being aware of the existence of the MSP does not influence directly the yield and the revenue. A producer may be aware of the existence of the MSP and still not participate in the MSP activities. Thus, to participate in the activities of a MSP, it is not enough to be aware of its existence. In summary, being aware of the existence of the MSP may influence its adoption but does not influence directly the yield and the revenue. Thus, this variable respects the definition of the instrument as presented by Abadie (2003) and Heckman (2010).
According to Abadie (2003) and Lee (2005), the average impact for the sub-population of potential participants (LATE) can be used from the function of Local Average Response Function (LARF) » defined by $f(x,t) \equiv E\ (y|x, \mathrm{a}, \mathrm{a}_1 = 1)$. With $f(x,t)$ the LARF. Thus:

$$\widehat{LATE}_{larf} = \frac{1}{p(t_1=1)} \sum_{i=1}^{n_1} \hat{k}_i \,.\, h(y_i, x_i, \hat{\theta}) \qquad (5)$$

With $\hat{k}_i = 1 - \frac{z_i}{p(t_1=1)}$ the weight of those 'obeying',

[2] y_{1i} and y_{0i} represent respectively the variable of interest (the revenue for example) if the producer has participated in the activities ($a_i = 1$) or not ($a_i = 0$).

$h(y_i, x_i, \hat{\theta}) = f(x, 1, \hat{\theta}) - f(x, 0, \hat{\theta})$ and $\hat{\theta}$ a parameter to be estimated by the method of ordinary least squares (MOLS).

In addition to the instrumental variable introduced in the impact model, other independent variables were introduced based on the literature on the revenue determinants (for the revenue model) and the yield (for the yield model).

Glèlè *et al*. (2008) identified ***the number of years of experience*** as a factor affecting positively the revenue. The number of years spent in a given activity influences positively the acquisition of the experience for that activity. Thus, more experienced producers are therefore likely to have higher revenues than the others. The ability of the producer increases with experience and may favour yield improvement. However, Ahouandjinou (2008) showed that experience is not a determinant of the revenue of the shea processor in North Benin. This continuous variable may therefore have a negative or positive sign.

According to Hessavi (2013), mutual aid, information and sharing of know-how are the benefits that a producer can have from being a member of an association. Producers belonging to a group will have practical knowledge on the technical production itineraries and therefore will have higher revenues compared to others.
Belonging to a group or association is a binary variable that takes the value 1 if the producer is a member of a group and 0 if not. Jagwe *et al*. (2010) and Mathenge *et al.* (2010) argue that groups of producers can be good platforms in building social capital, from which small producers can obtain information about the market at lower prices, hence the reduction of fixed transaction costs to participate in the market. The effect expected from this variable is positive.

The sex of the producer is a binary variable that takes the value 1 when the producer is a man and 0 when the producer is a woman. Gender intervenes significantly in the socio-economic situation of the individual. In general, women, because of their weak physical capacity compared to men, cannot carry out activities requiring strong labour force. Customs in the traditional society, especially in African societies, are also often a hindrance to women's development. For this reason, the revenue obtained by a woman will be lower than that obtained by a man.

The variable formal education is a binary and takes the value 1 when the person interviewed is educated (no matter the level reached) and 0 when not. Arouna *et al.* (2011) demonstrated that producers who received formal education applied the innovations more than those who did not. It is expected that formal education will reduce the risk of innovation perceived and increase the degree of openness to innovations. It is also expected that education will influence positively participation in the MSP activities.
Problems may come out if some independent variables are highly correlated. The coefficients of partial correlation were therefore verified for all variables included in the model.

2.3 Sampling

The challenge in evaluating the impact of a programme, a project, or an intervention like that of the platform is that it is not possible to observe what would have happened to the participants in its absence. The key to the identification and measure of the impact is therefore to have a correct hypothesis, a group of comparison (control) that is similar to the intervention group

(treatment) with the exception that it did not receive the intervention. In the frame of this study, the comparison group was selected based on the characteristics[3] of the intervention villages that are Houinga-Houégbé (Commune of Houéyogbé), Vovokanmey, and Agbédranfo (Commune of Dogbo). Thus, the villages of Tokpota (Commune of Dogbo) and Davè (Commune of Houéyogbé) were chosen as comparison groups in each commune because they presented the same characteristics as those cited above.

The minimum size of the sample to be surveyed at the level of all the communes retained was determined based on the formula used by (Dillman, 2007):

$$N_s = \frac{N_p * p * (1-p)}{(N_p - 1)(B/C)^2 + p * (1-p)} \quad (1)$$

N_s: total number of rice producers to be surveyed;
N_p: total number of rice producers;
p: estimated proportion of the population presenting the studied characteristic in the study (50 percent or 0.5 is the most conservative);
B: acceptable error margin (1 percent);
C: confidence interval (C=2.58 for 99 percent of confidence level).

To know the number of MSP and non-MSP rice producers, two strata were made:

- Stratum1: producers participating in the MSP in all the pilot villages;
- Stratum 2: all producers not participating in the MSP and producers of the control villages.

The following formulae were used to determine the number rice producers to be surveyed at the level of each stratum:

$$n_1 = \frac{N_s * N_1}{N_p} \quad (2)$$

and

$$n_2 = \frac{N_s * N_2}{N_p} \quad (3)$$

n_1: the number of rice producers who are members of MSP to be surveyed;
n_2: the number of rice producers not members of MSP to be surveyed;
N_1: total number of rice producers who are members of the MSP;
N_2: total number of rice producers who are not members of the MSP.

Based on the list[4] of rice producers in the pilot and control villages, a random sorting was done using the spreadsheet Excel to choose the rice producers to be surveyed. Table 1 presents the number of rice producers to be surveyed in each village.

[3]: The size of the population, the geographic situation, the agricultural production and access to local organisations (NGO, Communal Sector of Rural Development, microfinance institutions, etc.) were the characteristics used.

[4] A complete survey of rice producers was carried out in each village

Table 1: Distribution of rice producers based on the participation or non-participation in the MSP activities per village

Communes	Villages	MSP		Non-MSP		Number
		Absolute frequency	Relative frequency (percent)	Absolute frequency	Relative frequency (percent)	
Houéyogbé	Houingah-houégbé	46	58.23	33	41.77	79
	Davè	-	-	8	100	8
	Agbédranfo	23	25.84	66	74.16	89
Dogbo	Tokpota	-	-	33	100	33
	Vovokanmey	33	68.75	15	31.25	48
Total		***102***	***39.69***	***155***	***60.31***	***257***

Source: Survey report 2017 FARA/INRAB

2.4 Data

Data used for this study were collected on a sample of 257 rice farmers (including 102 rice producers who were members of the MSP and 155 rice producers who were not members of the MSP). Three collection methods were used. First, the literature review and group discussions took stock of previous studies on the platforms and obtained data on the characteristics of the study zone. Then, individual interviews done using a structured questionnaire allowed us to collect data on the characteristics of the households, access to credit and to extension services, the size of the household, and membership of a group among other parameters.

Table 2 presents the descriptive statistics for the members of the MSP as well as those for the non-members. It also presents the statistical test of the mean difference between both groups. This allowed us to know the variables likely to influence the impact of the indicators.

The results showed that the total available acreage was higher at the level of the MSP members than at the level of the non-members. Members of the MSP had on average 2.70 ha of available land for agriculture. Among these lands, 0.21 ha were devoted to rice farming. The difference between the two groups for the total available acreage as well as for the acreage devoted to rice farming is significant at the threshold of 1 percent. Ninety-eight percent of the rice farmers who were members of the MSP had their rice farms in the lowlands while 90 percent of the farmers who were not members of the MSP had their rice farms in the lowlands. There was a significamt difference at the threshold of percent between the two categories of farmers.

At the level of the households' characteristics, the results show that the average size of the rice farmers' household was about 4.6 with a non-significant difference between the two groups. The difference between members of the MSP and those who were not members is significant at the threshold of 1 percent for the variables "Membership of a group", "Have had some training in rice production" and "To have access to production equipment". Comparing both groups, the distance to the nearest market and the yield were significant at the threshold of 5 percent. Generally, these results show that the two groups (Members of MSP and non-members of MSP)

presented many similarities in socioeconomic characteristics, except for the above- cited variables where the mean difference was statistically significant.
Therefore, we can suspect that the differences observed in the yields and the revenue were due to the variables “Membership of a group”, “Have had some training in rice production”, “To have access to production equipment”, and “the distance to the nearest market”.
To correct these differences, these variables were introduced in the impact model of the participation in the MSP activities in addition to other determinants of the revenue and the yield.

Table 2 : Descriptive statistics of the variables included in the rice impact models

Variables	Unit	All	Participation in the MSP		
			No	Yes	Test
Total available size	Ha	0.44	0.70	2.70	3.69***
Size available for rice in ha	Ha	0.25	0.27	0.31	0.78***
The land is a lowland	percent	93.8	90.96	98.03	5.26**
Size of the household		4.6	4.47	4.74	1.08
Age	Year	43.82	42.85	45.33	1.47
Sex	Woman (percent)	55.81	58.06	52.94	0.65
	Man (percent)	44.19	41.94	47.06	
To have had some formal education	percent	43.02	46.45	.37.25	1.45
Distance to the nearest market	Km	9.99	10.44	9.31	2.36**
Membership of a group	(percent)	76.35	67.09	91.17	4.63***
To have receive some training in rice farming	(percent)	56.20	37.41	85.29	8.55***
Number of years of residence in the village	Year	37.93	37.25	39.13	0.90
To have access to production equipment	percent	65.89	56.77	80.39	4.02***
Number of years of experience in rice production	Year	6.95	6.50	7.69	1.59

**** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent*

3 Results of impact pathway and outcomes

The MSP aims at improving the wellbeing of producers and their community. This involves improving the revenue and the yield of producers who are members, and improving the level of food security. However, this expected change in the wellbeing can only take place with a change of behaviour of producers who are members. These changes are triggered by incentive measures created by activities implemented within the MSP. Of these activities, we can cite development

of lowlands; training producers in the development of lowlands; the value chain; rice technical itineraries; collective marketing and rational utilisation of water; bundling; access to fertilisers; seeds; and insecticides. Utilisation of resources supplied by the MSP will yield results related to the wellbeing of the individual at the level of the producer such as increase in production and increase in the revenue. The result chain, made by producers who were members of the MSP from the activities, is presented in Table 3. It allows us to know the impact path and which indicator can be measured to estimate the effect of participating in the MSP activities.
For this study, based on the result chain, the revenue and the yield were the main outcomes chosen. In addition to the impact of participating in the MSP activities on these impact indicators, this study also evaluated the effect of the major activities[5] on the same impact indicators.

[5] These are training sessions, lowland development and bundling that are the major activities that trigger the participation of many members of the MSP (Annex 1)

Table 3: Result of impact pathways

Input	Activities	Output	Effect	Impact
Training	Relationship between MSP, SCDA, Town council	Training obtained on several themes; Training on economic analysis, exchange of experience	Building technical capacities	Improvement of production capacities; Yield improvement
Fertilizers	Establish relationships with SCDA and Town Council; Support application addressed to ODIB	Specific fertilisers available all time	Improving production technics, yield increase; Quick plant growth	Production increase
Seeds	Relationship with MSP, INRAB, Town Council, SCDA; Application addressed to CARDER, INRAB.	Seeds adapted to the soils; certified rice seeds (IR841, NERICA L20)	Improvement of average yields; Best production and management capacities through: good rice planting, the quality of new seed varieties (IR841, NERICA L14, L19 and L20)	Implementation of the recommendations from extension; Increase in the revenue; Production of certified seeds
Water	Application addressed to PADA	Funding acquired to develop the site	Water control for rice production and market gardening products	Yield increase
Non-developed lowland	Application addressed to PAFIRIZ to develop the site	Developing a rice site of 20 Ha	Increase in cultivated acreages	Production increase
Bundling	Application addressed to the regional Council of Rice farmers (CRR) and Services enterprises and Producers' Organizations (ESOP)	Organising the bundling of the products	Increase in the product acquisition price	Improvement of household living conditions; Improvement of children schooling
Credit	Negotiation and seeking for partnership	CREP is created in Houinga by an Italian GNO; The GNO ODIB gives credits to groups of producers	Development of producers' activities	Improvement of producers' living conditions

4 Determinants of producers' participation in the activities of the MSP

Table 4 presents the factors that determine participation in the activities of the MSP. The table shows that five variables were determining for participation in these activities. These were "the distance to the nearest market", "the land is a lowland", "membership of a group", "acreage available for rice in ha", and "To have concluded an agreement on the price of the product".
The coefficient of the variable « distance to the nearest market» was negative and significant at the threshold of 1 percent. One of the objectives of the MSP was to facilitate the quick selling of products. The market being the place where transactions are carried out, the geographic position of the MSP with the market is therefore a source of motivation for the producer. The longer the distance to the market, the less interested producers are in the MSP.
The variable « the land is a lowland» was positive and significant at the threshold of 5 percent. Among the activities of the MSP was the lowland development. The combined effect of the exploitation of a rich soil and that of development triggers adhesion to the MSP.
The groups of producers may be good platforms to form the social capital from which small producers can obtain information about the market at lower prices, hence the reduction of fixed processing costs to participate in the market (Mathenge *et al.*, 2010). The coefficient of the variable "membership of a group" was positive and significant at the threshold of 1 percent. As a criterion to adhere to the MSP, only a producer membership of a group increases the probability of that producer to be accepted in the MSP and to participate in its activities.
The coefficient of the variable « acreage available for rice in ha » was positive and significant at the threshold of 5 percent. By participating in the activities of the MSP, producers acquire knowledge in the technical production itinerary. Producers who have lands available therefore want to increase cultivated acreages to have a big production.
The fact of knowing in advance the selling price of their product is a motivating factor for producers. They could see some stability at the level of the selling price of their product. This is what explains why the coefficient of the variable "agreement on the price of the product" is positive and significant at the threshold of 1 percent.

5 Analyses of results of the farmers' participation in MSP impacts

5.1 Impact of participation in the MSP activities on the revenue and the yield

Table 5 presents the results of the impact model of participation in the MSP activities on the revenue and the yield. The table shows that the revenue and the yield were positively and significantly influenced by participation in the MSP activities. The results show that the yield increased by 2 tons/ha following participation in the MSP activities. At the level of the revenue, an increase of about CFAF 43,038 is observed. These benefits obtained by the participants in the MSP activities are due to the fact that within the MSP, producers benefit from training on the technical production itineraries, a situation that helps them to obtain a higher production. Moreover, the selling price is by far higher because of the bundling done within these MSP. Likewise, producers of the MSP benefited from the facilities to access production inputs, a situation that significantly reduced their production cost. Activities of the MSP therefore impact at the same time on the revenue and yield

Table 4: Determinants of producers' participation in the activities of the MSP

Variables	Coefficients	Standard error
Distance to the nearest market	-0.24 ***	0.05
The land is a lowland	-0.04 **	0.32
Membership of a group	0.85 ***	0.36
Number of years of experience in rice production	-0.06	0.02
Available size for rice in ha	0.11 **	0.02
Size of the household	0.18	0.07
Number of years of residence in the village	0.005	0.01
Agreement on the price of the product	3.06 ***	0.40
Sex	-0.11	0.25
Age	0.003	0.012
Constant	-0.78	0.64
Log likelihood	-75.35	
LR chi^2	166.02*** (ddl=8)	
Pseudo R^2	0.50	
Observations	265	

****** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent***

Cavatassi *et al.* (2009) obtained an increase of 33 percent in the yield of potato and 20 percent in the revenue at the level of the beneficiaries of the platform in Ecuador. Sweet potato producers Members of the MSP in Peru who produced sweet potatoes registered yields that were significantly higher and received double the price on the traditional markets, with a profit margin of more than 20 percent (Thiele *et al.,* 2011).

Table 5 : Econometric results of the impact of participation in activities of the MSP on the yield and revenue

Variables	Yield		Revenue	
	Coefficients	**Standard error**	**Coefficients**	**Standard error**
Constant	**16.96*** **	**4.43**	**68730.51**	**34912.41**
Participation in the MSP activities	6.14	4.35	409761.3	366418.2
Yield			11272.74	2957.687
Agriculture as major activity			57769.49	25334.52
Sex			73831.99	8984.621
Membership of a group	1.87	2.18	656289.7***	8.41
Formal education	0.003***	0.001		
To have had some training on rice	-2.03	1.64		
Total available acreage			626.8014***	41.52
Access mode to the land	0.42	1.31	-138116.8	104255.8
Land size cultivated for rice in ha	-7.81***	1.31	-246539.4	14893.63
Number of years of residence in the village (years)	-0.05***	0.02	-1782.592	2391.72
Number of years of experience in rice production.	-0.10	0.09	3383.673	871.4004
To have access to production equipment	-1.39	2.45		
Total available acreage (ha)	-0.08	0.072		
Global impact of the activities (LATE)	2.00***	0.18	43038.85***	7627.80
F	*F (18, 120) = 5.70*		*F (13, 122) = 20.67*	
R2 adjusted	*0.38*		*0.65*	
Observations	*139*		*136*	

****** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent***

5.2 Impact of the major activities of the MSPs on the yield or revenue

Among the benefits that producer members of the MSP have, we must point out bundling, training, and development of lowlands. These are the major activities that trigger the participation of several members of the MSP. Tables 3, 4, and 5 present the results of the impact model of those activities on the revenue (for bundling) and the yield (for training and lowland development).

Table 6 shows that participation of producer members of the MSP in bundling affects positively and significantly the agricultural revenue of the participants at the threshold of 1 percent and therefore increases the revenue. Participation in bundling increases producers' revenue by CFAF 28367. This increase in the revenue could have an effect on food security and the wellbeing of the households of producers participating in the MSP. In other words, the MSP through bundling contributes towards improving food security and the wellbeing of the producers' households. Moreover, five determining variables of producers' participation in the bundling were identified. These were "membership of a group or association", "the available acreage for rice farming", "formal education" and "training received in rice farming".

Table 7 shows that participation of producer members of MSPs in the different training sessions had positive and significant effects on the yields of participants at the threshold of 1 percent. The different training courses received in the MSPs improved the yield of producers by 0.83 tons/ha. Producers who were members of the MSPs received training courses on the rice technical itineraries, the value chain, financial management techniques, bundling, and rational use of water. They owned these training courses, a situation that favored the improvement obtained in the yield.

Table 8 reveals that development of the lowlands affects the participants' yield positively and significantly at the threshold of 1 percent. Development of lowlands by rice producers who were members of the MSP resulted in an increase in the rice yield by 0.72 tonne/ha. The lowlands have some naturally rich black soils that cannot be accessed easily for use. The development has therefore favoured utilisation of the potential of those lands. This has resulted in the yield improvement observed.

Table 6: Econometric results of the impact of participation in bundling on the revenue

Variables	Coefficients	Standard error
Participation in the bundling	8546.856	179293.5
Age	102714.7	81446.29
Size of the household	-20947.2	16277.31
Sex of the head of the household	-10439.95	83327.91
Yield of the paddy rice	-34595.57	19857.6
Total acreage available (ha)	-6972.436	6760.381
Size of land with rice (ha)	-353156.8***	141905.7
Agriculture as main activity	296219.6***	116708.2
Formal education	668.4946***	40.74
Membership of a group or association	199.0941***	76.79
Training received in rice farming	306063.6***	96068.7
Impact (Late)	***28367.46******	***915.124***
Difference	54983.58	87236.36
Participant	656289.7***	78070.94
Non-Participant	601306.1***	38924.44
Constant	656721.9***	232636
F(13, 118)	28.00***	
R^2 adjusted	0.72	
Observations	132	

****** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent***

Table 7: Econometric results of the impact of the participation in the training on the yield

Variables	Coefficients	Standard error
Participation in the training	2.22	3.53
Membership of a group	-4.23	5.26
Formal education	0.001***	.0005
Land access mode	-2.17	1.94
Number of years of residence in the village (years)	-0.07	0.07
Number of years of experience in rice production	-0.05	0.10
Available land size in ha	-0.15	0.15
Impact (Late)	***0.83******	***0.02***
Difference	0.61	0.495
Participant	3.92	0.41
Non-Participant	3.31	0.27
Constant	12.18	8.37
F(8, 65)	1.51***	
R^2 adjusted	0.72	
Observations	74	

**** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent*

Table 8: Econometric results of the impact of participating in lowland development on the yield

Variables	Coefficients	Standard error
Development of lowlands	1.94	2.18
Age	0.33***	0.09
Age2	-0.002***	0.0008
Sex	0.97	1.09
Size of the household	-0.21	0.15
To have access to production equipment	0.49	0.99
Available acreage in ha	-2.41***	0.62
Impact (Late)	***0.72******	***0.02***
Difference	0.38	0.31
Participant	3.73	.23
Non-Participant	3.35	0.21
Constant	-3.67	2.63
F(9, 104)	3.58***	
R^2 adjusted	0.72	
Observations	114	

**** Significant at 1 percent, ** Significant at 5 percent, *Significant at 10 percent*

6 Conclusion

This study assesses the impact of participating in the activities of the Multi-Stakeholder Platform (MSP) on the yield and revenue of rice producers in South-West Benin. The study shows that distance to the nearest market, type of land (lowland), membership of a group, available land size for rice, and the agreement on the price of the product are the determining factors for participating in the activities of the MSP. This participation influences significantly and positively the revenue and yield of the producer members of the MSP. Likewise, the bundling, lowland development, and the training courses received influenced the revenue and yield.

Studies on the effect of the MSP on the knowledge level and technical efficiency of the producers are necessary to better guide activities to be carried out at the level of the Multi-Stakeholder Platforms.

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Annex

Annex 1: Statistics of participants in the different activities of the MSP

Activities of the MSP	No	Yes
Lowland development	16	89
Bundling	0	105
Training	13	92
Access power pump	91	14
Access winnower	85	20
Access fertilizer	33	72
Access insecticides	88	17
Access seeds	18	87
Access borehole	45	60

Annex 2: Activities and organizing structures

Activities	Years	Results obtained	MSP	Organizing structures
Training on rice technical itineraries Training on value chain Training on financial management techniques Training on bundling and rational water utilisation	2009 to 2014	Ownership of technical itineraries. Improvement of production techniques Water control for production	MSP of Houéyogbé and MSP of Dogbo	INRAB, AfricaRice
Availability of fertilisers (Urea and NPK)	2009, 2011, 2013	Increase in cultivated acreages, Increase in production and in yield	MSP of Houéyogbé and MSP of Dogbo	(Secteur Communal du Développement Agricole) (SCDA)
Availability of certified seeds (IR841), NERICA L14, NERICA L20)	2009 to 2014	Increase in Increase in yield		INRAB, AfricaRice, SCDA
Access to water (borehole)	2009 to 2014	Increase in production, Water control for production Increase in production	MSP of Dogbo	(Groupe de projet pour la coopération au développement technique) (PROTOS)
Lowland development	2009	Water control for Better lowland	MSP of Houéyogbé	PROTOS, (Projet

		development Improvement of the living conditions of the household	and MSP of Dogbo	d'Appui à la Diversification Agricole) (PADA)
Bundling	2009 to 2014	Increase in the revenue Improvement of the living conditions of the households Improvement of children schooling		Conseil Régional des Riziculteurs (CRR) (Entreprises de Services et Organisations de Producteurs) (ESOP)
Availability of insecticides	2010 to 2014	Better lowland development	MSP of Dogbo	SCDA