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Determinants of the choice of multi-modes of governance by producers and processors of paddy in Benin

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This research aims at analyzing the factors that influence the choice of the multi-modes of governance by producers and processors of paddy in Benin. Unlike previous researches, it analyzes these factors simultaneously for both producers and processors. Furthermore it explains the multiple choices of governance modes by actors. Finally, this research analyses the influence of institutional environment on the governance mode choice by the actors. Data were collected in Benin from 320 producers and 140 processors of rice selected randomly. The results indicate that the majority of producers (78.04%) and processors (92.69%) use the spot market to sell and procure paddy against 32.78% and 26.43% of producers and processors respectively for the contractual marketing and procurement. Nearly 26.35% of producers use at least two modes of governance to market the paddy, against 19.70% of the processors to procure paddy. Producers and processors that belong to an innovation platform use more formal contracts and farmer associations to market and to procure paddy. The quantities of paddy sold by producers and purchased by processors are unstable on the spot market and through informal contracts. In opposite, these quantities are stable for formal contracts. Knowledge of traditional institutions by the actors positively influences participation in formal and informal contracts. Knowledge of modern institutions negatively affects participation in informal contracts. The innovation platforms can be used to facilitate contracts between farmers and rice processors. Modern and traditional institutions may also be used to assist stakeholders in the enforcement of contracts.

Keywords: Governance mode, Multivariate probit, Producers and processors of rice, Benin.

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1. Introduction

The agri-food systems are experiencing significant changes in the world since the 1990. These changes are related to the globalization of the supply and marketing, the use of quality standards and products differentiation (Reardon et al., 2009). They are responses to liberalization that led to the opening of local markets to imported products. Consequently, the actors of local value chains, especially those of developing countries, need to organize their activities so as to effectively respond to competition from imported products. In this sense, the buyers are looking for suppliers who can offer products that meet the requirements of quality, quantity and delivery time in order to cope with market dynamics (Weatherspoon and Reardon, 2003; Poulton and Lyne, 2009). In these developing countries, small producers face constraints that limit their ability to deliver to buyers products that meet their needs. Among these constraints it can be cited limited access to credit, to production inputs (seeds, fertilizers) and to information on production technologies (Bijman, 2008, Reardon et al., 2009; Barrett et al., 2011).

The negative impacts of these problems on farmers, and in some cases the problems themselves, can potentially be redressed through improved market coordination between farmers and other value chain actors (Vroegindewey, 2015). A common strategy for improving market coordination is the use of buyer-supplier governance structures, such as contracting and longer term partnerships (Prowse, 2012; Reardon, et al., 2009). Governments and development actors also increasingly consider the use of these modes of governance as tools to reduce poverty and stimulate agricultural growth (Jia and Bijman, 2014).

A mode of governance is an organizational option used by an economic agent to carry out a transaction. Economic agents, when coordinating their activities, adopt modes of governance which, according to Williamson (1975) allows them to minimize transaction costs. The main modes of governance which addresses the economy of transaction costs are: the spot market, hybrid forms (contractual forms) and hierarchy (Williamson, 1975). The choice of mode or combination of modes of governance is influenced by the attributes of the transaction and the institutional environment under which actors interact. The identification of factors that influence the choice of different modes of governance is essential for the formulation of policies that

ensure good coordination of relations between stakeholders and provide consumers with quality rice.

The critical challenge in the development of African rice value chains is the governance of quality throughout the supply chain (Rizzoto and Demont, 2011; Demont and Rizzoto, 2012). According to Swinnen (2010), spot market force alone is sub-optimal to achieve governance of quality throughout the supply chain. Thus, according to this author, other governance mechanisms such as contracts, alliances and vertical integration are needed to compensate this market failure and to ensure that suppliers (producers and processors) develop the capability to comply with the changing demands of consumers. In order to face this challenge, it is necessary to understand the logic of the choice of modes of governance used by producers and processors to exchange paddy. Understanding these logics by identifying the factors that influence the choice of modes of governance will be useful in the formulation of measures favorable to the orientation of actors toward modes of governance that meet the current challenges of the dynamics of agro-food systems.

Recent researches on the rice sector in Benin were interested to the issues of competitiveness (Codjo et al, 2016; Adegbola et al, 2011). However, researches exploring the factors influencing the choice of modes of governance are scarce. Also, unlike most previous research on the determinants of modes of governance in Benin (Arinloyé, 2013, Kpenavoun, 2009), this current one considers both producers and processors. Indeed, the paddy producers deliver paddy to processors through various modes of governance. The identification of factors that influence the choice of governance modes simultaneously for producers and processors allow to identify joint measures which can be applied to both categories of actors. This research has been developed in this dynamic in order to analyze factors influencing the choice of modes of governance by producers and processors of paddy in Benin.

The rest of this article is structured around four sections. The first section presents the theoretical framework that served as guideline for this research. The second section is devoted to the methodological approach. The third section analyzes and discusses the results. A final section presents the conclusion and recommendations.

2. Theoretical framework

2.1 Theoretical model

This section uses the random utility theory to model the process of decision making of the actor (producer or processor) in front of the choice of mode of governance. Economic theories used to explain the process of decision making of farmers are generally rooted in the theory of utility maximization or profit (Griliches, 1957). Utility is explained in terms of the benefits that the actors in the chain can gain from their activities. Actors can get different profit levels in different contexts, and it is considered that their choice of what to produce or what to sell is influenced by their expected profit (Doll & Orazem, 1984).

The choice of modes of governance meets the criterion of efficiency (Williamson, 1975). The actors thus adopt a mode or a combination of mode of governance that provides him the highest utility compared to unadopted modes of combinations of modes. The utility function describing the adoption of a mode of governance is defined as follows:

$$U_m = \beta_m X_m + \varepsilon_m, m = 1, \dots, M \quad (1)$$

With U_m a latent variable corresponding to the gain on the choice of $m^{i^{eme}}$ mode of governance. X_m is a vector of factor explaining the choice of $m^{i^{eme}}$ mode of governance and β_m vector of corresponding parameter. At last ε_m is a vector of error term.

From equation 1 it can be derived the decision of choosing a mode of governance:

$$y_{im} = \begin{cases} 1 & \text{si } U_m > 0 \text{ soit } \beta_m X_m > -\varepsilon_m \\ 0 & \text{si } U_m < 0 \text{ soit } \beta_m X_m < -\varepsilon_m \end{cases} \quad m = 1, \dots, M \quad (2)$$

With y_{im} represent the decision of the actor i to choose the mode of governance m . To assess the effect of the simultaneous choice of two modes of governance, the multivariate probit is used to estimate the model.

Relations between governance modes are appreciated from the estimated coefficients of correlation. A non-zero correlation coefficient, from choosing a pair of governance mode

indicates that the choice of these modes is influenced by the same factors, thus, adoption of the decisions of the two mode of governance are dependent.

2.2 Determinants of the choice of governance modes

Theoretically, choice of a mode of governance depends on the importance of transaction costs related to this mode of governance (Renkow et al., 2004; Vakis et al., 2003; Williamson, 1975). As some of these transaction costs are difficult to quantify, this research focused like Kpenavoun (2009) and Arinloyé (2013) on the factors that determine these costs. These are: socioeconomic and demographic factors, attributes of the transaction and of the institutional environment.

2.2.1 Socioeconomic and demographic factors

The impact of socioeconomic and demographic factors on the behavior of the actor facing the choice of mode of governance was discussed in literature. Thus, farm size influences the choice of governance mode (Arinloyé, 2013; Kpenavoun, 2009; Polson & Spencer, 1991). For Moustier (2012), farm size plays an important role in the decision of buyers to use or not contracts. Factors such as age, sex, level of education of farm manager also affect the choice of mode of governance or participation in the contract (Ambaliou, 2014; Arinloyé, 2013). Also the number of years of experience of the producer and household size determines the choice of a mode of governance (Kpenavoun, 2009). Moreover, farmers feel safe in an arrangement where they have long-term relationships with their customers (Lu, 2007).

2.2.2 Attributes of the transaction

Williamson (1979) explains that economic transactions basically have three attributes: asset specificity, uncertainty and frequency of the transaction. They determine the extent and nature of transaction costs and are considered essential for arbitration between modes of governance.

- Asset specificity

Asset specificity is the difficulty to use the assets for alternative transactions, or their non redeployability (Moustier, 2012). It includes site specificity (high cost of relocation), physical assets specificity (investments in specific equipment), dedicated assets specificity (response of supplier to the exclusive demand of a buyer), human assets specificity (Williamson, 1979). The

central idea of Williamson's work is that asset specificity plays a big role in choosing a mode of governance (El Malki, 2010). Indeed, increasing of the specificity of assets involves the use of an integrated form. When the assets involved in a transaction are generic and not specific, the most effective mode of governance (the least expensive) is to use the market. However, when asset specificity is average, the company will use a hybrid form on the condition that the level of uncertainty is not too high (Williamson, 1996; Bensalk, 2013). Moreover, the number of parts included in the arrangement certainly influences the choice between bilateral agreements (easy to monitor and involving dependence) and multilateral (difficult to manage but allow comparisons) (Ménard 2004; Arinloyé, 2013).

- Uncertainty

Uncertainty means internal disturbances (direct result of information asymmetries: behavioral uncertainty) and external (non-predictable environmental disturbances) to which transactions are subject (Williamson, 1979). In the presence of uncertainty, agents can be tempted / can attempt to renegotiate the terms of the original agreement which has the effect of increasing the cost of contracting and thus the effectiveness of the agreement. The economic consequences of these two sources of uncertainty are more important when the agents are bound by specific assets. A high level of uncertainty discouraging supplier in his investment in specialized assets if appropriate safeguards is absent (Lu, 2007). In particular, in an environment characterized by uncertainty, asymmetric information and lack of a third party to enforce contracts, the preferred choice of a mode of organization may be related to the problems of contractual relations (Bensalk, 2013).

To measure uncertainty, the information on the stability of the price of the exchange and the stability of the amount of paddy exchanged were used in this research like Arinloyé (2013).

- Frequency of the transaction

Frequency of the transaction affects transaction costs and has an ambiguous effect on the mode of organization (Crocker and Masten, 1996). On the one hand a high frequency may support the setup costs of specialized governance. Further, more the transaction is repeated, the more we know his partner and the harder it becomes for him to be opportunistic (Williamson, 1985;

Bensalk, 2013). On the other hand, more the transaction is repeated and more people have opportunities to behave opportunistically. According to this logic, it would be justified to organize the frequent transactions within a governance structure that minimizes opportunistic behavior (Royer, 2009; Bensalk, 2013). The high frequency of transactions (and volume) can generate economies of scale on the operating costs of the mode of governance. But it can also encourage economic agents to respect their commitments, thus reducing the chances of opportunism (Moustier, 2012). This ambiguity about the impact of the frequency of transaction costs that this attribute is not the most important and is a high school in the theory of transaction costs and thus in choosing a mode of governance (Royer, 2009; El Malki, 2010).

2.2.3 Institutional environment

The institutional environment is the framework within which transactions take place and who dictates the rules of exchange between the actors. It influences the choice of organizational options of agents. A favorable institutional environment reduces transaction costs. For Kpenavoun (2009), the institutional environment is a very important level of analysis insofar as it is the basis of the production, trade and distribution. Indeed, it weighs, ex ante, on the choice of transaction modes of organization; how it determines the level of transaction costs; and how it influences the conditions of realization or failure of ex post transactions. Bakkour (2013), points out that the nature of feasible contractual arrangements ("implementable") depends closely on the actual characteristics of the institutional framework in particular of the nature of its imperfections. For example, when the market fails, the political and economic institutions contribute to its optimal functioning, and it resulting lowering transaction costs, which will increase production (El Malki, 2010). So they determine the effectiveness and the existence of markets and organizations, and promote the development and growth (El Malki, 2010; Royer, 2009). In summary, the organizational choices of agents are influenced by the institutional environment (Royer, 2009).

In this research, information related to the knowledge of modern institutions (police, gendarmerie, justice ...) and traditional institutions (leadership, kingship...), were taken into account. Knowledge of the institutions in this case is whether the players have the information about these institutions in relation to trade. Indeed, when a transformer buys paddy from a

producer, his behavior is based on a belief that paddy is in compliance with the terms of the transaction. So what leads to pay the producer without worry. This belief itself depends on the existence of legal rules allowing them to obtain redress for wrongdoing. The impact of this rule is itself dependent on a second belief, this time related to the fact that actors who do the transaction believe that there are authorities (organizations) who will be able to enforce the rule law. When people know the institutions, they can assess the power of these institutions to assist in enforcing partner commitments. Therefore, knowledge of institutions is an important factor in decision making actors and determines the choice of modes of governance used to complete a transaction.

3. Methodology

3.1 Data used

The data were derived from agricultural surveys conducted by both the Africa Rice Centre (AfricaRice) and the National Institute of Agricultural Research in Benin (INRAB). They were collected in the rice development hub of Glazoué which include the districts of Dassa, Glazoué, Savalou and Bantè. In each of these districts, a list of rice producers villages and those with processing units was elaborated with the help of the leaders of the Regional Action Centres for Rural Development (CADER) and associations of producers and processors. It was complemented by a survey of other producers or processing units of each village does not belong to associations. Ten (10) and five (05) villages were randomly selected in each district respectively for producers and processors. From the list of producers and processors set up in each sampled village, eight (08) farmers were randomly selected in each village production and seven (07) Transformers for rice processing villages. In total 320 producers and 140 transformers were investigated. Table 1 shows the number of village producers and processors investigated.

Table 1 : Number of villages and respondents per district

District	Producers		Processors	
	Number of villages	Number of respondents	Number of villages	Number of respondents
Dassa	10	80	5	35
Glazoué	10	80	5	35
Savalou	10	80	5	35
Bantè	10	80	5	35
Total	40	320	20	140

3.2 Empirical model

The governance mode indicates the type of agreement between the producer and the processor. This research focuses on four mode of governance. These are the spot market, formal contracts (written), informal or relational contracts and producers associations.

Drawing on the work of Arinloyé et al (2012); the choice of mode of governance by an actor is explained by the socioeconomic characteristics of the household (H_i^k), the attributes of the transaction (AT_i^t), and the institutional environment (EL_i^p). The socioeconomic characteristics of the household are included in the model to account for the effect of individual characteristics on the choice of governance. Variables related to the institutional environment to control the effect of the latter on the choice of the actor. The explanatory variables included in the model, their descriptions and levels are presented in Table 2.

Table 2: Description of variables included in the regression model

Variables	Descriptions	Level
Socioeconomic characteristics		
Belonging to an Innovation Platform	Binary variable indicating if actor i belong to an innovation platform	0=No, 1=Yes
Formal education	Binary variable indicating if actor i received formal education	0=No, 1= Yes
Training	Binary variable indicating if actor i received agricultural training	0=No, 1= Yes
Sex	Binary variable indicating if the sex of actor i	0=Women, 1=Men
Attributes of transaction		
Stability of quantity exchanged	Categorical variable indicating the level of stability of amount exchanged	1 = Weakly stable 2 = Moderately stable 3 = Highly Stable
Stability of the price of exchange	Categorical variable indicating the level of stability of the price of exchange	1 = Weakly stable 2 = Moderately stable 3 = Highly Stable
institutional Environment		
Knowledge of modern institutions	Binary variable indicating if actor i know modern institutions	0=No, 1= Yes
Knowledge of traditional institutions	Binary variable indicating if actor i know traditional institutions	0=No, 1= Yes

The model is as follow:

$$\begin{cases}
 MC_i = \alpha_0 + \sum_{k=1}^5 \alpha_{1i} H_i^k + \sum_{t=1}^4 \alpha_{2i} AT_i^t + \sum_{p=1}^2 \alpha_{3i} EI_i^p + \varepsilon_a \\
 CF_i = \beta_0 + \sum_{k=1}^5 \beta_{1i} H_i^k + \sum_{t=1}^4 \beta_{2i} AT_i^t + \sum_{p=1}^2 \beta_{3i} EI_i^p + \varepsilon_b \\
 CI_i = \gamma_0 + \sum_{k=1}^5 \gamma_{1i} H_i^k + \sum_{t=1}^4 \gamma_{2i} AT_i^t + \sum_{p=1}^2 \gamma_{3i} EI_i^p + \varepsilon_c \\
 AP_i = \delta_0 + \sum_{k=1}^5 \delta_{1i} H_i^k + \sum_{t=1}^4 \delta_{2i} AT_i^t + \sum_{p=1}^2 \delta_{3i} EI_i^p + \varepsilon_d
 \end{cases} \quad (2)$$

with: MC_i , CF_i , CI_i , AP_i , binary variables, taking the value 1 if actor i (producer or processor) chose respectively the spot market, formal contracts, informal agreements and producer association and 0 if not . H_i^k , a vector of variable representing the socioeconomic characteristics of actor i; AT_i^t , a vector of variable representing the attributes of transaction; EI_i^p , a vector of variable representing the institutional environment of the actor i and ε the error term.

A multivariate probit model (MVP) or Seemingly Urelated Regression (SUR) can be used to estimate the model. The SUR model is used in the case where the dependent variables are

continuous (Green, 2008). As part of this research, the dependent variables are dichotomous. Therefore, the right model for the estimate is PMV (Cappelari and Jenkins, 2003). This model allows to analyze the relationship between the dependent variables considered (Arinloyé, 2013. Hailemariam, 2012; N'tcho, 2014). It also allows to take into account the multiple choices of modes of governance by the actors.

4. Results

4.1 Socio-economic characteristics of producers and processors

Table 3 below presents the socio-economic characteristics of producers and processors of rice surveyed. On average, farmers are older than processors. Rice production is dominated by men (62.82%). For cons, the transformation is much more an activity performed by women (94.70%). Indeed, processing is provided mainly by women who use traditional or modern baking kits parboil paddy. The transformation of white rice paddy is often done by some men (5%) who have the processing units. More than half of producers and rice processors have not received formal education. Producers and processors of rice receive in majority Agricultural trainings. This is explained by the intervention of various structures (AfricaRice, PPAAO, VECO NGO SNV, GTZ, etc.) that accompany the actors in the chain of rice values in their activities. 29.24% and 56.06%, respectively, of the producers and processors belong to a platform. These platforms are encouraging exchanges that facilitate the sharing of knowledge and brewing between actors. 56.48% of producers and processors know the modern institutions that fit the relationships between the actors against 25.43% for the traditional institutions. Thus, the actors use more modern institutions for conflict regulations. 71.15% of participants believe that the quantities marketed by producers and supplied by the processors are unstable. The majority of these players also think the prices are unstable markets.

Tableau 3: Descriptive characteristics of the sample

Characteristics		Producers	Processors	All
Number of respondent		300	140	440
Age (mean)		46,75	40,78	44,82
Sex (%)				
	<i>Men</i>	62,82	5,30	44,25
	<i>Women</i>	37,18	94,70	55,75
Formal education (%)				
	<i>Literate</i>	48,36	33,33	43,52
	<i>Non-literate</i>	51,62	66,67	56,48
Training (%)		84,12	89,39	85,82
Cultivated rice area (ha)		1,28	0,8	
Belonging to an innovation platform (%)		29,24	56,06	37,90
Knowledge of a modern institution (%)				
	<i>Yes</i>	62,82	43,18	56,48
	<i>No</i>	37,18	56,82	43,52
Knowledge of a traditional institution (%)				
	<i>Yes</i>	27,44	21,21	25,43
	<i>No</i>	72,56	78,79	74,57

4.2 Distribution of stakeholders by mode of governance used for transactions of paddy in Benin

Figure 1 shows the distribution of producers and processors by modes of governance used to exchange the paddy. These actors mainly use the spot market for transactions of paddy. 78.04% and 92.59% of the producers and processors use spot market. This result is consistent with that of Arinloyé (2013) which found that over 90% of the pineapple farmers in Benin use the spot market to sell their products. These results are also supported by those of Ji et al (2012) who found that the spot market represents 81% of pork transactions in Ethiopia. But very few actors make use of governance by relational contracts and producers' associations for the marketing of paddy always compared to the results of Arinloyé (2013), where 58% and 41% respectively pineapple producers sell through relational contract and producer associations. Indeed, 13% of producers use relational contracts to sell against 11% of paddy processors for their supply. The paddy supply of processor near producer associations is not developed. By cons, about 14% of the paddy producers market through producer associations. The modernization of the rice value chain also requires a modernization of the supply of processors through contracts. It is therefore

necessary to accompany the actors so they can adopt modes of governance that guarantee traceability and quality of paddy.

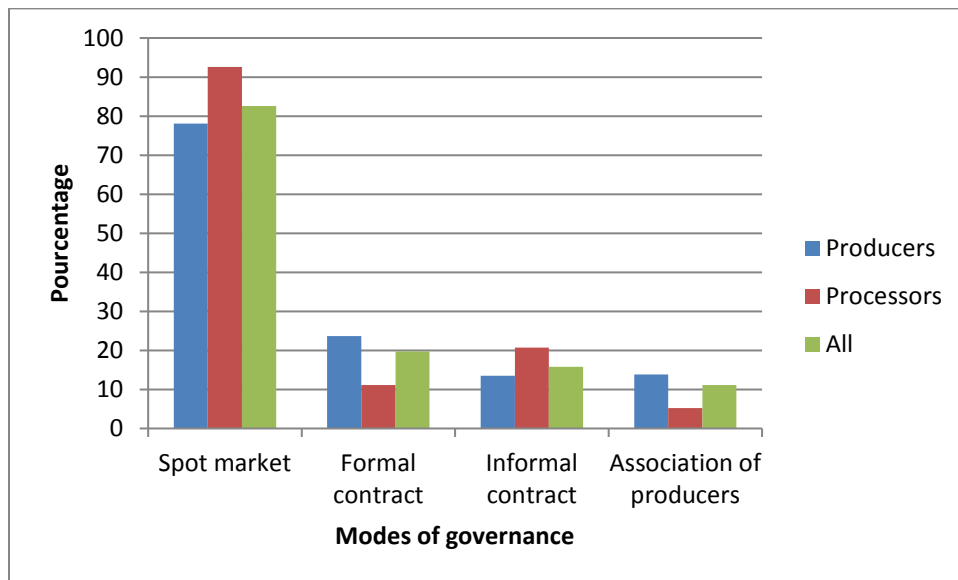


Figure 1: Distribution of producers and processors by modes of governance

4.3 Distribution of actors by number of governance mode used for transactions of paddy in Benin

Table 4 shows the distribution of producers and processors by number of modes of governance used for transactions of paddy. Actors using more than one mode of governance combine the various alternatives available to them from the four types of modes of governance presented. It appears from the analysis of Table 4 that 67.87% of producers use only one mode of governance to market the paddy against about 32%, using at least two modes of governance. Concerning processors, 74% use a single mode of governance to procure paddy, against 25% using at least two modes of governance. This result nuance that obtained by Arinloyé (2013) which found that 80% of pineapple producers in Benin uses at least two modes of governance. Using multiple modes of governance is a strategy to ensure the market in case a buyer does not meet its commitments.

Table 4: Number of modes of governance in which actors are involved

Number of mode of governance	Producers		Processors		All	
	Obs	Proportion	Obs	Proportion	Obs	Proportion
1	188	67,87	98	74,24	286	69,93
2	73	26,35	26	19,70	99	24,21
3	16	5,78	7	5,30	23	5,62
4	0	0	1	0,76	1	0,24

4.4 Determinants of the choice of modes of governance

The result of the multivariate probit model is presented in Table 5. The Wald test is used to examine whether any of the parameters of the model that currently have non-zero values could be set to zero without any statistically significant loss in the model's overall fit to the data. This tests the overall significance of the variables we have included in the econometric model (McGeorge et al. 1997; Ryan and Watson, 2009). The results show that the Wald Chi2 is statistically significant at the 1 percent level, indicating that the subset of coefficients of the model are jointly significant and that the explanatory power of the factors included in the model is satisfactory. The model is significant (P-value <0.001) at the 1%. These factors explain the choice of different modes of governance as well as by the producers by processors.

The likelihood ratio of the null hypothesis of independence ($\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$) between the decisions of choice of different modes of governance is significant at 1%. Thus, the null hypothesis of independence between the decisions of choice of modes of governance is rejected. The values of rho (ρ_{ij}) indicates the degree of correlation between governance modes taken in pairs. The values of rho ρ_{21} , ρ_{31} , ρ_{41} and ρ_{32} are significant at the 1% level with the top three negative values. These results conclude with ρ_{21} , ρ_{31} and ρ_{41} the actors who use the spot market to exchange paddy, are less likely to use other modes of governance.

Belonging of an actor to an innovation platform plays a very important role in the choice of mode of governance. This variable is positively and significantly (5%) correlated with formal contracts and producer associations. Therefore actors who use formal contracts or producer associations to exchange paddy are those who belong to an innovation platform. Indeed, the Enterprise of Service and Organization of Producers (ESOP), the leading platform of white rice

value chain in Bantè sign formal contracts with several paddy producers to ensure its supply. Besides ESOP, other processors sign contracts with producers to provide the raw material.

Formal education is positively and significantly (5%) linked to the spot market, indicating that formal education positively influences participation in spot market. This finding contradicts that of Lapar and Son (2008) who found that formal education positively influences participation in contracts.

Participation in agricultural training has a significant and positive influence on the use of formal contracts and producer associations. This influence could be justified by the fact that most training initiated for the stakeholders are carried out through producer associations. These results confirm those of Arinloyé (2013) who explains that the institutional support received by producers influences the choice of mode of governance including producer associations.

Fluctuations in quantities of paddy exchanged between producers and processors have a positive and significant influence (1%) on the spot market and the informal contract, but negatively influence the paddy exchanges through producer associations. Thus, the quantities traded through the spot market and informal contracts are more stable than those exchanged through formal contracts. In fact, the quantities of paddy exchanged through informal contracts are typically small quantities which vary very little. For cons, the quantities traded through formal contracts generally depend on the buyer's ability to pre-finance the production or supply inputs to producers, from one season to another, if the buyer can have less financial capacity to finance producers. What makes fluctuate quantities traded through this mode of governance?

Paddy price fluctuations affect negatively and significantly (1%) participation in informal contracts. Indeed, the price of paddy for this mode of governance vary greatly. Fixing the selling price depends on the conclusion of the contract period and the existence or not of pre-financing. Indeed, relational contracts often allow producers to obtain pre-financing of their trading partner to adjust sometimes even non-agricultural issues. So they can get pre-financing to solve problems of schooling for children, health or other problems that require financial resources. When the producer asks for a pre-financing of the buyer in times of labor, the price charged for the disposal of paddy is low compared to that of the flowering period. Similarly, when the contract is concluded just before the harvest, the price is higher than in flowering period. It's true

there is no known standard for pricing for this mode of governance. However, the actors are unanimous on the fact that when the buyer has to pay an advance on the producer, the longer the period of concluding the informal agreement is far from the delivery period of paddy, the higher the selling price is low. Therefore the sales prices for informal contracts are very unstable.

The institutional environment is an important parameter for the success of trade and especially for enforcing contracts. Knowledge of modern institutions is negatively and significantly (5%) correlated with informal contracts. Therefore, when the actors know these institutions, they exploit modes of governance other than informal contracts for transactions. Indeed, informal contracts are often subject to dispute because this type of contract generally provides low producer prices and has no trace of the clauses. The fear of the actors face the modern institutions, leading them to avoid informal contracts fault what they risk when they do not honor their commitments, the rigors of the laws of these institutions.

Regarding traditional institutions, their knowledge is positively and significantly correlated with the formal and informal, but negatively correlated with the spot market. Thus, most players use traditional institutions for the resolution of contractual conflicts they face. Thus, when these institutions exist and are known to the players, they can easily participate in contracts, whether formal or informal. Traditional institutions may be leveraged to support the implementation of contracts.

Table 5: Results of multivariate probit estimation for mode of governance choice

	Modes of governance			
	Spot market (SM)	Formal contract (FC)	Informal contract (IC)	Association of producers (AP)
Socioeconomic characteristics				
<i>Belonging to an innovation platform</i>	-0,28	0,61***	-0,04	0,41**
<i>Formal education</i>	0,36**	-0,18	0,25	-0,1
<i>Sex</i>	0,82***	-0,76***	-0,38**	-0,61***
<i>Agricultural training</i>	-0,40	0,38	0,42*	0,69**
Attributes of transaction				
<i>Stability of the price of paddy exchange</i>	0,48	0,33	-0,96***	0,37
<i>Stability of the quantity of paddy exchanged</i>	1,98***	-0,36***	0,87***	0,98
Institutional environment				
<i>Knowledge of a modern institution</i>	0,07	0,11	-0,56***	0,25
<i>Knowledge of a modern institution</i>	-0,56***	0,58***	0,39**	-5,11
<i>ρFC * SM</i>	-0,77***			
<i>ρIC * SM</i>	-0,52***			
<i>ρAP * SM</i>	-0,32**			
<i>ρIC * FC</i>	0,40***			
<i>ρAP * FC</i>	0,26**			
<i>ρAP * IC</i>	0,10			
Number of observations	409 (277 producers et 132 processors)			
Wald chi2(df)	162,87 (32)***			
Likelihood ratio test, H ₀ : ρ ₂₁ = ρ ₃₁ = ρ ₄₁ = ρ ₃₂ = ρ ₄₂ = ρ ₄₃ =0 ; chi2(6)=93,47***				

*Significant at 10 %; **significant at 5 %; ***significant at 1 %

4.5 Predictions of probabilities of actor's participation to different modes of governance

After estimating the multivariate probit model it is possible to predict the probabilities of actors participation to different modes of governance, the probability of simultaneously participating in all the modes of governance and finally the probability of participating in any mode of governance. Table 6 presents estimates of these predictions. The spot market has the highest predictive probability of participation. Therefore, the current situations favor the involvement of actors in the spot market. Regarding the formal and informal contracts, these probabilities are respectively 0.21 and 0.17. The probability is very low that the actors do not attend any form of governance. Thus, different actors are predisposed to participate in the spot market. However, it is unlikely that the actors involved in all modes of governance.

Table 6: Predictions of actors participation probabilities to different modes of governance

Mode of governance	Minimum	Mean	Maximum
Spot market	0,22	0,87	0,99
Formal contract	0,007	0,21	0,88
Informal contract	0,004	0,17	0,58
Association of producers	0,0001	0,12	0,44
All the modes of governance	0,0001	0,004	0,07
Zero mode of governance	0,0001	0,015	0,14

5. Conclusion

This research analyzed the determinants of the choice of modes of governance by producers and processors of paddy rice in Benin in through the theory of transaction costs. Four selected modes of governance were the subject of this research, namely the spot market, the formal contract, the informal contract and producer associations. To identify the factors that influence the choice of modes of governance, analyzes have focused on the socioeconomic characteristics of respondents, the attributes of the transaction and the institutional environment.

The results showed that 78.04% of producers and 92.59% of the processors mainly use spot market for transactions of paddy. In addition, 67% of producers and 74% of processors use mostly a single mode of governance for the transactions of their paddy. The use of formal contracts and producer associations is positively determined by belonging to an innovation platform. Participation in agricultural training positively influences contracts (formal and informal) and the use of producer associations. This may seem paradoxical that a trained actor still makes use of informal contracts. Knowledge of modern institutions negatively affects the use of informal contracts as against it positively influences the use of producer associations. Regarding traditional institutions, their knowledge positively determines the use of formal and informal contracts, but negatively the use of the spot market.

Efforts to promote contractual modes of governance must focus on innovation platforms. Thus, we must make it more dynamic existing platforms and promote adherence of other actors. This will facilitate the mixing between supplier and buyer. The success of this measure will have a direct impact on the quantities traded and the quality of paddy. Modern and traditional

institutions can be harnessed in the conclusion of contracts. This will allow for more consistent enforcement of contracts. To this end, the involvement of leaders of associations of producers, representatives of district chiefs or villages, police or other institutions that can influence the performance of contracts may favor the choice of modes of governance contractual.

In order to ensure the success of the contracts once the conditions of choice are favorable, future research should focus on the attributes that actors wish that the contracts contain. Thus, they must address the attributes that producers want their partners fit into those contracts and that these partners are also willing to offer. Such research should also address specific attributes of the contracts that the actors of innovation platforms wish that the contracts contain.

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