

GENDER ANALYSIS IN GRAIN MAIZE VALUE CHAIN IN NORTHERN AND CENTRAL BENIN

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Summery:

Maize is one of the most important food crops in the world and, together with rice and wheat, provides at least 30% of the food calories to more than 4.5 billion people in 94 developing countries. (Bekele Shiferawet *al*, 2011). It is produced across Benin and mainly women and young people are involved in the maize grain value chain. Study aim to carry out a gender analysis in the maize grain value chain in northern and central Benin. Specifically it analyze the division of labor according to gender in the grain maizevaluechain, identify the factorsthat influenceaccess to and control of resources and measure thedistribution ofprofits fromthe commercialization activities. Data have been collected at random in a stratified method including 90 producers, 33 processors and 33 corn traders. The Harvard analytic framework of Harward, the descriptive statistic and the binominal logitpatterens have been used for the analysis In termsof resourceaccessibility, the results showed that men have moreaccess and control the resources in both areas than women with limited access tocredit, training, land and informationin the chain. Moreover, the logistic regression results noted that socio-economic factors such as level of education, accessibility to credits and equipment positively affect the control of resources by women.

Key words: Gender, value chain, grain maize, Northern and central Benin

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1. Introduction

The agricultural sector plays an important role in the economies of sub-Saharan African countries, mainly in Benin. The activities in this sector are dominated by crop production characterized by a range of food crops that are the basis for food and nutrition security of the population. Maize is widely cultivated throughout Benin, ranks first with nearly 70% of the area of grain sown (APR 2010). It is also a key ingredient in animal feed and used extensively in industrial products, including the production of biofuels (Bekele Shiferaw *et al.*, 2011). The analysis of the value chain of maize grain can solve not only the problem of demand, but also constraints such as non-organization of producers of grain for better market access, poor state of rural roads, lack of transport infrastructure and the lack of financing. This study was designed to analyze existing imbalances in the value chain and questions about relations among the increasing number of actors. Within the chain, there are inequalities such as lack of training for women at all levels of the chain, which is not the case for men; access to credit, resources, inputs and equipment for the actors the restricted chain. The loads, poor access of women to land, lack of appropriate processing technology and the lack of means to get (Terrillon, 2014), lack of effective treatment equipment (threshing machine, hulling); the high cost of family treatment equipment are major constraints that women often encountered in the value chain of maize (USAID, 2010).

So therefore, this research action is a starting point for any researcher interested in the study of the value chain in the agricultural sector because it sets not only milestones with the categorization of actors according to the level of poverty or vulnerability but also and especially to highlight the gender inequalities and power between the actors in the chain.

Studies on the gender issue and the policies and programs on agriculture have shown that the integration of the gender issue means a more efficient use of resources and enables rural women with little resources to have more control over their livelihoods (Hafkin and Hambly, 2002). Indeed, the integration of the gender issue allows men as well as women to have fairly equal opportunities, to participate into development activities in order to take benefit (Hafkin, *op. cit.*).

The analysis of this study focused on the conceptual framework related to value chain and gender mainly women and youth.

2. Conceptual framework

Value Chain: The chain of value thus describes all the activities required to bring a product or service from conception through different production stages its distribution to final consumers, and then destroyed after use (Kaplinsky and Morris 2000). Production, as such, is just one of the steps required to create added value. There are a set of activities that are linked to each other in the chain. Although often described in vertical way, intra-chain links are often in two kinds. For example, design offices, on the one hand, influence the nature of production and marketing processes, but on the other hand, are influenced in turn by the constraints in their relationships downstream in the chain. The advantage of this approach is to break down the activity of the company in sequences of elementary operations and to identify the sources of potential competitive advantages. These sources appear by comparing the value chain of the company with competitor's value chains, where possible. According to Strategor (1993), the overall performance of the value chain can be improved both by strengthening each link and by strengthening also the relation between the links.

Gender: used for the first time in 1972 by Ann Oakley in his book entitled "Gender and Society", the gender refers to the different roles, rights and responsibilities of men and women and the relationship between them. The gender does not simply mean women or men, but the way in which their qualities, behaviors and identities are determined through the process of socialization. The gender is generally related to inequality of power and access to choices and resources. The different roles of men and women are influenced by historical, religious, economic and cultural realities. These roles and responsibilities may change with time (GWA, 2006).

3. Methodology of study

3.1. Study location

The site of the study located in the Sudano-sahelian zone with the rainfall which varies between 1100 and 1200 mm for Ouèssè against 600 mm for N' Dali (Akomagni, 2006) per year. The rainfall affects both and greatly agricultural production and therefore affects processing and

marketing activities. While the good distribution and the correct levels of rainfall create the conditions for a good agricultural year (Mohammed et al, 2007).

A literature review allowed the collection of secondary data on the constraints, inequalities within chain, and types of relationships between actors, the role and responsibility of these actors. This first phase is completed by an exploratory phase which allowed initially making contact with resource persons. Then make an inventory to identify the main actors in the grain maize value chain and identify different aspects addressed in depth phase. As regard the depth phase the main data collection technique is maintenance through a structured questionnaire. The data collected are qualitative and quantitative (socio-economic characteristics, activities, resources; Price; costs...)

3.2. Sampling

The sample of grain farms was drawn from the database of 179 producers, 68 transformers and 71 traders established under basic preliminary studies of the project Feed the Future (FtF) coordinated by CORAF and funded by USAID. In this study only producers, processors and traders of N' Dali, Nikki and Ouèssè are selected at random and in a stratified ways. In total one hundred and fifty-six (156) actors are selected including (90) producers, (33) transformers and (33) traders. The surveys were conducted in six villages (Kèmon, Tosso, Marégourou, Ouénou, Biro and Saka-Bansi), areas covered by the Feed the Future (FtF) project.

3.3. Analysis tools

The data have been processed using spreadsheet Excel and Stata software. The Excel spreadsheet allowed to gather descriptive statistics based on the calculation of statistical parameters such as average, frequencies, standard deviations and the construction of graphs and tables. Logistic regression, mainly Logit model has been used to find out the factors affecting the choice of actors on the alternative methods according to gender.

Harvard analytical framework has been used to analyze the different profiles:

- **Profile of access and resources control** identifies and lists the resources used to carry out the job identified in the profile of the activities related to women and men. It shows

who has access to resources. The decision-making process shows the person who will make the decision in the household, for the realization of production activities, marketing or consumption of maize and participation into trainings. The information collected allows a nice analysis of the suggested interventions: what resources are needed? Who uses them?

- **Profile of influence factors:** It determines the factors that affect the change in resources and which control or is responsible for its management according to gender.

- **Logit regression model**

The choice of binomial Logit model justified by the explained variable which can take only two modes called variable dichotomous (1; 0). The dependent variables are women's resource access and women control of resources.

The independent variables are dichotomous and listed such as: education, credit, equipment related to marketing and marital status. It also depends on certain conditions to be fulfilled by women before checking resources. The probability that the actor have access and control over resources, that is to say $CWOMEN=1$ and $AWOMEN=1$ is then:

$$P_i(AWOMEN) = F(\beta_0 + \beta_1 NEDUC + \beta_2 ACRED + \beta_3 SMATRI + \beta_4 AELIC + \beta_5 AELIPW + \beta_6 AGE + \beta_7 EXPACM + \beta_8 PLATEFORM)$$

$$P_i(CWOMEN) = F(\beta_0 + \beta_1 NEDUC + \beta_2 ACRED + \beta_3 SMATRI + \beta_4 AELIC + \beta_6 AGE)$$

Considering β , vector of coefficients, X the vector of explanatory variables and P the vector of probabilities, it makes:

$$P = \frac{e^{x\beta}}{1 + e^{x\beta}}$$

- **Choice of model variables**

The explained variable of the model is women's access to resources. It is noted AWOMEN

The explained variable of the second model is the control of resources by women. It is noted CWOMEN.

NEDUC:The level of education attained by a woman can be decisive in the control of resources and relative analyses. Thus the higher the level of education attained by women is, the more likely she controls the chain resources could be high.

MSTATU:refers to the marital status of the actor. It takes the value 1 if the woman is single, 2 if she is married, 3 if divorced and 0 if widow. The man or the woman married has a high responsibility level enabling him or her to analyze the possible alternatives before making a decision. The marital status of the Chief Operating Officer can positively or negatively influence the access and control of resources.

ACRED:This variable concerns the access to credit (in-kind and cash). It takes the value 1 if the actor has access to credit and 0 if the actor does not have access to credit. The absence of credit limits the control of resources. In fact, the credit would allow the individual as well to cope with expenditures that would generate activity (innovations). The influence of the credit is positive if the actor finances its activity and negative if not.

AELIC:This variable influences the control of resources by women that is it allows her to actively exercise its activity. It takes the value 1 if the woman has access and 0 if not.

AELIPW:This variable concerns access to farming equipment. It takes the value 1 if the actress has access to farming equipment and 0 if the actress does not have access. The lack of equipment reduces the production of women and therefore limits the adoption of technologies. In fact, equipment would allow the individual as well to cope with expenses related to the rental charges that would result in the use of the equipment. The production is positively influenced when the farmer doesn't have the equipment and it is negatively influenced when the latter has his/her own equipment.

PLATFORM:This variable refers to technological innovations. It concerns the mechanization by the adoption of the technologies in the different links of the grain corn value chain. The PLATFORM variable takes the value 1 if the actor participates into the PLATFORM and 0 if he/she does not participate. The PLATFORM allows the operator to be not only informed about activities, but also to assimilate the conditions to make use of the technologies.

AGE:This is the age of the actor of the concerned link. We think that young people are more dynamic in searching for information and they have less aversion to risk (Ibrahim, 2002), that is thanks to their sense of adventure (courage), young people are more likely to take risks than old persons. The young actors have a higher probability to set for innovation. The sign of the coefficient in this case can be positive for young people, and negative for very old people. On the other hand, extension agents often tend to approach the older, because they consider them as leaders or leaders of opinion and more experienced. Thus, a priori the sign of the coefficient of the variable AGE cannot be determined. The coefficient can take the positive sign as well as the negative sign.

4. RESULTS

4.1. Analysis of access and control profile of productive resources related to gender

Results show that women use production resources at almost the same level as men. However, men have easy access to resources unlike women above all at level of access to credit and training (Table 1). As for the control of resources, men have power to take decisions on the use of productive resources (land, equipment, credit, training and knowledge on production) compared to women. Also it is worth noting that Northern women have more control over the access to credit and training than others of the center. Selected maize grain producers participate in training in organizational management of cooperatives and farmer organizations.

Table 1: Access and control profile of resources by producers

4.2. Analysis of access and control of profile of processing resources related to gender

The transformers have low access to almost all resources. They have low access to credit and processing techniques. However, in the Center, 10% of women have access to training that is not the case with women in the North. Which is the same fact regarding the control of resources. This explains the low power of maize transformation in Benin. These results confirm the absence of men at the level of the transformation in Benin and the restricted access to the resources of the actors of this link.

Table 2: Access and control of processing resources

Resources	Northern				Central			
	Access (%)		Control (%)		Access		Control	
	Men	Women	Men	Women	Men	Women	Men	Women
	Men	Women	-	-	0%	10%	-	-
Training	0	-	-	20	0	30	-	30
Credit	-	20	-	-	-	-	-	-
Means of transport	-	-	0	2	0	0	0	0

Source :SurveyFtF, 2015

4.3. Analysis of access and control of profile of marketing resources related to gender

The results show that women and men have low access to almost all resources related to marketing except at the level of the means of transport where they have no access. This is explained by the fact that actors have not their own means of transportation and are forced to rent motorbikes or cars for the transport of their goods. Regarding training, the merchants of North and center are not trained in marketing. Also traders have low access to information in both areas. This situation can be explained by the fact that traders have access to the physical information on corn supply chain, the provider and the market price. However, women have restricted access to means of transport than men.

Table 3: Access to /and control of marketing resources

Resources	Northern				Central			
	Access (%)		Control (%)		Access (%)		Control (%)	
	Men	Women	Men	Women	Men	Women	Men	Women
Market	4	26	-	-	20	40	-	-
Information	4	10	-	-	9	11	-	-
Training	39	25	-	-	24	20	-	-

Credit	17	4			40	30	-	-
Means of transport	-	-	-	-	-	-	-	-

Source :SurveyFtF, 2015

4.4. Analysis of factors influencing the control of resources by women

4.4.1. Results of the logit model

The summary of the empirical estimation results of the socio-economic factors that influence the control of the resources of actors in the value chain (Table 4).

Quality indicators of the two models (see Table 4) are the chi-square, the likelihood ratio and pseudo R². The likelihood ratio has proved to be significant at 1% after the Chi-square test; the model is globally significant at 1%. The results of the models are valid. Variations in the independent variables therefore detail then the variations of the dependent variable in an acceptable manner.

Appraisals of the model have given respectively 0.89 for McFadden's Pseudo R² and 0.93 for the two dependent variables (women's resource access and control of resources by women). In general way the model is good and meaningful (up to 89% for the first and 93% for the second). The changes in the dependent variable are explained by the independent variables. We consider that at the level of estimated parameters, variables whose probabilities are below thresholds of 1%, 5% or 10% have a significant influence on the likelihood of having access and control to resources by women.

Table 4: Empirical results of the binomial logistic regression

Variables	Access to resources			Control of resources		
	Coefficient(β)	Error standard	Probability	Coefficient	Error standard	Probability
NEDUC	0.842	0.250	0.681	0.393	0.235	0.094*
ACRED	0.989	0.443	0.026**	0.818	0.471	0.083*
AELIC	-1.082	0.484	0.026**	2.07	1.068	0.052**
LAGE	-0.2116	0.898	0.814	0.383	1.082	0.723
LEXPACM	-0.360	0.269	0.181	-	-	-
AELIPW	-1.124	0.563	0.014**	-	-	-
PLATFORM	0.279	0.397	0.279	-	-	-

SMATRIE	-0.795	0.357	0.026**	0.405	0.484	0.402
Number observation	155			156		
Loglikelihood	-90.699			-60.727		
Chi-square AWOMEN (8)	14.41			12.48		
Significance (prob> chi2)	0.0000			0.0000		
R ² de McFadden	0.8955			0.933		

*** Significance at 1%, ** Significance at 5%, * Significance at 10%

Source: Empirical results of the binomial logistic regression with STATA 13 software

The access to resources is significantly influenced by the following variables: access to credit for women (ACRED *), access to equipment related to commercialization (AELIC **) and access to equipment's related to the production of women (AELIPW**). The level of education (NEDUC), the age (LAGE), the number of years of experience in the activity (LEXPACM), participation in a platform and marital status (SMATRI) affect due to their sign, the access to resources, but not significantly.

The control of resources by women is significantly influenced by the following variables: the level of education (NEDUC *), the access to credit (ACRED *), and access to the marketing-related equipment (AELIC**). The variable age of the actor (LAGE) and marital status (SMATRI) influence the control of resources by women throughout their signs but not significantly.

4.4.2. Analysis and interpretation of the results

The variable ACRED on the access and control of resources by gender is significant.

The access to credit increases the likelihood to access and control resources, since the estimated coefficient is positive (b = 0.989 for access and 0.818 for control.)

This situation is well justified, because when women are sensitized and well trained, they easily assimilate conditions especially since credit allows actors not only to fund their activities within

the chain, but also to face expenses that would arise from both the use of fertilizers among farmers and new technologies of processing and marketing.

The level of education (NEDUC) increases the likelihood of women to control the resources because it is significant and its coefficient is positive ($b = 0.393$). In fact, women who have studied up to high school are able to know the products. They have the opportunity to read, even in English, the labels of the products such as pesticides, equipment, new techniques of production, marketing and processing and to better understand their usage patterns. The educated woman will easily understand and assimilate what the trainers are going to teach them on different elements. Also, the more women have access to the marketing-related equipment, the more they manage resources. This justifies the positive sign of the variable AELIC ($b = 2.136$).

However, this variable negatively influences access to resources with its coefficient ($b = -1.082$). Similarly access to equipment related to production (AELIPW) reduces the likelihood of having access to the resources of the chain ($b = -1.124$). This means that when women have access only to specific equipment, this limits the probability of having access to other resources in the chain.

As regards to the marital status (SMATRI) variable that is significant, it negatively influences access to resources for women. This stipulates that married women have more responsibility for the management of resources.

Overall, the access and control of resources in the value chain of grain corn depend on the level of education, access to credit and access to marketing services. In addition to these variables access to resources also depends on access to productive resources and marital status also. Then, the level of education and access to credit (cash and kind) positively affect access to and control of resources by women in the corn value chain..

5. DISCUSSION

Access of women to the services and available resources issue is a real constraint that contributes to the marginalization of women in proportions that were globally poorly examined.

In the Northern and Central of Benin, men and women have high access to corn value chain resources. Access to land, training, credits and technologies remains very low especially at the level of women.

About the control and decision-making on resource men make more use of this power.

Women control as much as men resources except land, credits, and equipment whose control is always provided by men in both areas. These results are compliant with those of Adétonah et al, (2010) in «Analysis of gender and governance in the performance of the value chains of rice and vegetable crops based systems in Benin and Mali» and that of Coulibaly O. et al (2012) in «Analysis of the gender and the value chain of palm oil in Southern Benin: Case of Toffo, Allada and Bohicon»: which specifies that men and women have nice access to productive resources; access to different training and loans remains low; Women control as much as men resources except land whose control is always provided by men in the chain.

It is, however, important to put emphasis on the fact that the issue of access and especially of the control of land arise differently from one region to another, from one ethnic group to another according to the age of women. In the Centre, in some areas, women control over the management of land compared to the North where they have little control. Also, access and control of financial resources are restricted in the two areas. A small proportion of agricultural credits are granted to women, often because they have not enough safeguards, including land.

In addition, access and control of the resources of the corn value chain are positively influenced by the level of education, access to credit and access to equipment. In addition to these variables, access to resources depends on marital status. Indeed, the accessibility of credit allows women to have other resources and be in charge of its management. They have a higher control when they are married and have a high level of education.

Women contribution in the agricultural sector in developing countries is widely recognized as being mainly involved in manual work such as the cultivation of maize, processing activities traditionally referred to as 'feminine' and the marketing of grain corn. The low level of education, the low access to training and credit appear as obstacles in of the chain.

Thus, improving the accessibility to these resources for actors will enable further development of the different links within the chain. Furthermore, it is important to promote the empowerment of women in order to enhance their participation in the value chain including participation in training (agricultural) so as to improve the quality of their products, leadership roles at the level of trainings, institutions and self-help groups, signing of contracts with other actors in the chain or access to credit.

6. CONCLUSION AND RECOMMENDATIONS

All in all, it appears from this study that the levels of education, marital status are not the brakes to the production, processing and marketing of grain corn. Nevertheless, the production of grain corn remains an all-male activity. As far as processing and marketing are concerned, they are the prerogative of women's

In addition, men have more access and control the string resources in both areas (Northern and Center) that women especially at the center with restricted access to credit, training, land and information at the level of each link in the chain. This inequality is due to various socio-economic factors such as level of education, access to credit and marital status influencing control of resources in the chain.

At the end of this study, some recommendations deserve to be made towards researchers, NGOs, and the Government for:

- easy the access to credit of men and women at the level of each link in the chain through credit granting;
- make available to producers, processors and traders, equipment that will facilitate the work in Center and Northern of Benin;
- Sensitize men to further involve women in the value chain activities.

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