International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Factors Affecting Food Shortage in Sub-Saharan African: Case of Benin, Burkina and Niger

Mohamed Nasser BACO

Université de Parakou (UP) / Laboratoire Société Environnement (LaSEn), BP : 27 Parakou, République du Bénin

Abstract: ***The issue of food shortage is recurrent in Sub-Saharan African and drives several resources each year. Despite local, national and regional policy to end famine in this region of the world, little has been done because thousands of families continue to experience more than six months of food shortage. This study aimed to estimate and explain the parametersaffecting food shortage in Sub-Saharan African by using linear regression. It reveals that practice of microdose and fallow, education, number of meal eat per day, household size and size of farm cultivated determine food shortage length in Benin, Burkina-Faso and Niger.***

Keywords: cereals, food shortage,microdose, Sub-Saharan African

1. Introduction

In Sub-Saharan African, food shortage is a recurrent issue. Each year, thousand of rural households have to deal withthe end of their food stock. Several factors can determine foodshortage in this region of Africa. One of the key factors is the low agricultural productivity in general and cereals (maize, sorghum, millet) productivity in particular. Unlike other regions of the world, cereal production in Sub-Saharan African has been stagnating at $1t.ha^{-1}$ since 1960s mainly due to low inherent soil fertility, soil degradation and recurrent droughts escalated by climate variability (Sanchez, 2002; Vohland and Barry, 2009). Harsh climate characterized by low and erratic precipitation patterns and recurrent droughts, contribute to decrease the productivity of cereals. The second important cause is the demography in Sub-Saharan African. This region has a particularly high population growth rate (3.4%) and by comparing this growth rate to the yield of cereal grain (<1%), cereal production per capita has decreased from 150 kg/person to 130kg/person over the last 35 years (Gichuru and al., 2002). The low of food productivity has leaded the World Food Summit to declare Sub-Saharan African as the only region of the world with decreasing food production per capita. This affects particularly rural household because of chronic cereal deficit. Several others factors contribute to food shortage and a lot of studies have focused attention on the factors deeply explain food shortage and food security in Africa in general and in Sub-Saharan African in particular. However, any study has determinedfactors affecting the length of food shortage in Sub-Saharan African countries. The present study, aims to analyse the factors affecting food shortage in West Africa.

2. Literature review

Agriculture accounts for about 30-50% of Gross Domestic Product, represents the major source of income for 70-80% of export earning in West African countries. Small scale farmers constitute the majority of agricultural food producers in Sub-Saharan Africa (SSA) of which rain-fed agriculture is the mainstay(World Bank, 2007). In SSA in general and semi-arid regions of West Africa in particular, agricultural productivity is low, which leads to chronic food insecurity. Africa's food insecurity is directly related to insufficient total food production in contrast to South Asia and other regions where food insecurity is primarily due to poor distribution and lack of purchasing power (Sanchez, 2002). About 180 million Africans (up to 100% since 1970) do not have access to sufficient food to lead healthy and productive lives. Depletion of soil fertility, along with the concomitant problems of weeds, pests, and diseases, is a major biophysical cause of low per capita food production in Sub Saharan Africa. This is the result of the breakdown of traditional practices and the low priority given by governments to the rural sector (Sanchez and al., 1997).A recent study shows that while the rates of adoption of improved crop varieties have been similar in Asia, Latin America, the Middle East, and Sub-Saharan Africa during the last 38 years, such varieties are responsible for 66 to 88% of the crop yield increases in the first three regions, but only 28% in Africa (SPIA, 2001).

3. Material and Methods

3.1 Study area

Data has been collected in three countries of Sub-Saharan African region. These countries are Benin, Burkina-Faso and Niger. Food shortage is a recurrent issue in these countries. In Niger in 2005, almost a quarter of the population (2, 5 million people) needed food aid due to severe drought. This situation recurred in 2010 when crop failure in the 2009 season led the most severe famine in the country's history (http://www.afro.com/article/16745). Benin has experienced a food crisis in 2007-2008. During this period, staple foods have recorded the highest price never reached in the past (1000 FCFA = 2 dollars US for rice imported). A political action to cope with this crisis has led to create 88 shops in all 77 departments to make available staple food (maize, rice and sorghum) at subsidized price (Houngbo, 2013). A similar policy exists in Burkina-Faso.

3.2 Sampling and data collected

The unit of this study is the household. Households have been randomly selected at village level in each department/ region. In total, the study sample consists of 378 households distributed as follows: 90 households in Benin, 120 households in Burkina and 108 households in Niger.

Data collected related to demographic and socioeconomic characteristics (eg. age and gender of household head, household size), farm size, size of farm affected by degradation, proportion of, number of months of food shortage, etc.

3.3 Data analysis

The main objective of this paper is to find out and compare factors that explain the length of food shortage in Benin, Burkina-Faso and Niger.A summary of the factors retained are first presented (mean and standard deviation for quantitative variable; proportion of each modality for qualitative variable)and compared. The test ANOVA has been used to compare quantitative variable and χ^2test of homogeneity to compare qualitative variable. An econometric regression model has been used to determine factors which explain the length of food shortage in these three counties.

The functional form of the model is:

$$y = c + \beta_1 Age + \beta_2 Gender + \beta_3 Educ + \beta_4 SizHH + \beta_5 Microd + \beta_6 Sizfert + \beta_7 Sizcult + \beta_8 Fallow + \beta_9 Meal$$

Were y is the dependent variable measured in the number of months of food shortage; β_i are parameters estimated and age, sex;soil are independent variable. A complete description of the variables specified in this model, and the priori expectation arepresented in table 1.

Table 1: Effect expected of independent variable on the length of food shortage

Independent variables	Effect expected	Assumptions
Age	-	Young household headsexperience food shortage more than the older household heads since they have accumulated less assets to improve their productivity
Gender	-	Male household heads lessexperiencedfood shortage because they have broader source of income and labor supply.
Educ(level of education)	-	Education may promote adoption of new technologies by increasing household's access to information and ability to adapt to new opportunities
SizHH (Size of household)	+	Household with big size may more experience than household with small size
Microd (practice of microdosing)	-	Practice of microdosing may improve food productivity and then reduce food shortage
Sizfert (Size of farm fertilized	-	Fertilizing improve productivity and may reduce food shortage
Sizcult (Size of farm cultivated)	-	The extension of size cultivated may increase food production and then reduce food shortage
Fallow(fallow practice)	-	The practice of fallow improve soil fertility and production; this can led to reduce food shortage
Meal (Number of meals per day)	-	A few number of meal per day may reduce food shortage

4. Results and Discussion

A summary description of the independent variables is presented in table 2 and 3.Agriculture remains a man activity since they are at least five times greater than woman in this sample. The test of homogeneity is highly significant (χ^2= 20,605; p= 0, 00) and allow to conclude that the repartition of gender among these three countries is different. Household of the sample are less educated. At least one household head out of three in the sample have never gone to any kind of school and less than 25% have reached the primary school level. By comparing the distribution of education level in the three countries we can affirm that there is a difference in the distribution of the level of education in the study area (χ^2= 76,161; p= 0, 00).Microdose practice is widespread in Niger and Burkina-Faso while it is barely known in Benin. The proportion of household heads thatuse this innovation is three times greater in Niger than in Burkina –Faso. This inequality of microdose practice is confirmed by statistical test (χ^2= 112, 37; p=0, 00). The trend is inversed with fallow practice. This practice is widespread in Benin and not practiced in Niger. The test of homogeneity is highly significant (χ^2= 121, 98; p= 0, 00) and allow to conclude that the repartition of fallow practice among these three countries is different.

With regard to the distribution of age of household head, ANOVA test shows that household head are statistically the same age which is be about 46 years. In the study area, each household head has to feed at least 9 people. Householdswith great size are in Burkina-Faso with 14 people. This is four people more in Benin and two people more in Niger. The comparison of household size is significant at 5% level of significance (F = 11,101; p = 0, 00) and allow to affirm that in the study area, there is a difference between household size. The comparison of the size of farm fertilized doesn't lead to the same conclusion. There is also a difference between countries with regard to the size of farm fertilized (F = 11,101; p = 0,00). The number of meal per day can be used to discriminate household of the three countries because there is a statistical difference between households (F = 32,294; p = 0,00). Households in Benin eat more times than Burkina's and Niger's households.

Table 2: Descriptive statistics of qualitative independent variables

Variables	Modalities	Benin (%)	Burkina (%)	Niger (%)	Test
Gender	Women	1,1	22,22	15,7	χ^2= 20,605 P=0,00
	Men	98,9	77,8	84,3	
Education	Any	68,9	45,6	31,5	χ^2= 76,161 P=0,00
	informal	0	40,6	54,6	
	primary school	22,2	9,4	13,9	
	Secondary	8,9	4,4	0	
Microdose practice	Yes	11,1	29,4	77,8	χ^2= 112,37 P=0,00
	No	88,9	70,6	22,2	
Fallow practice	Yes	75,6	57,2	2,8	χ^2= 121,98 P=0,00
	No	24,4	42,8	97,2	

Table 3: Descriptive statistics of quantitative independent variables

Variables	Countries	Mean	Standard deviation	Test
Age	Benin	44,91	13,32	F = 0,904 p = 0,406
	Burkina	45,49	12,65	
	Niger	47,23	13,55	
Household size	Benin	9,69	4,937	F = 11,101 p = 0,00
	Burkina	13,3	7,078	
	Niger	11,55	4,807	
Size of farm cultivated	Benin	3,16	1,496	F = 11,547 p = 0,00
	Burkina	5,31	3,254	
	Niger	4,27	4,885	
Size of farm fertilized	Benin	0,76	1,054	F = 11,101 p = 0,00
	Burkina	1,03	1,254	
	Niger	1,25	2,172	
Number of meals per day	Benin	2,81	0,449	F = 32,294 p = 0,00
	Burkina	2,26	0,59	
	Niger	2,19	0,712	

The result of the linear regression model is given in table 4. The parameters estimated for the model are evaluated at 5% level of significance. The model is highly significant (F= 17,207; ddl= 374; p= 0, 00).The results revealed that apart from gender, ageand the size of farm cultivated which were found not statistically significant in explaining the food shortage;microdoseand fallow practice,number of meal per day, household sizeand size of farm fertilized were statistically significant at 5% level. The sign of the constant is positive. This implies that in the absence of independent variables, the food shortage length would increase.

Microdosingpractice is negatively correlated with food shortage length. This finding shows that households who adopt and practice microdosing are less exposed to food shortage. Therefore we can assume that microdosepractice can increase food production. This results is consistent with several findings (Tabo and al. 2006; Tabo and al., 2008; Bagayoko and al., 2011).

The variable gender is not statistically significant and has a negative correlation with food shortage length. This sign is consistent to our priori expectation, and this indicates that households headed by menexperienced less food shortage than households headed by women. This is probably due to the fact thathouseholds headed by menhave broader source of income and labor supply.

The variable education is not significant and is positively related to food shortage length. This parameter is not consistent with our a priori expectation and refutes the results of Babatounde and al., (2007) and Salcedo and al., (2010) who find that households with an educated head is more likely to be food secure than one with an educated head.

Fallow practice is negatively correlated and statistically significant with food shortage length. After keeping soil in fallow, soil can be regenerated and improve food production. Number of meal per day is negatively correlated and statistically significant with food shortage length. This is not consistent with our a priori expectation and can be interpreted as the fact that food consumption per day is a priori strategy to better manage with food availability.

The variable age is negatively correlated and not statistically significant with food shortage length. This result is consistent with our a priori expectationbutdoesn't confirm the result of Salcedo and al., (2010) who found that the age of household head is positively correlated and statistically significant with food security.

Household size contributes to reduce food shortage as indicated the results in table 4. This parameter is negatively correlated and statistically significant with food shortage. This can be explained by the fact that large families have more labor available to produce more and then reduce food shortage. This result is contrary to thoses found by Salcedo and al., (2010) and Babatounde and al., (2007).

The size of farm fertilized has positive effect on food shortage. This is contrary to our a priori expectation and can be explain by the fact that even if the size of farm fertilized increase, it contribute to a low food production because the size of farm which is not fertilized it too large.

The extension of farm cultivated has negative and significant effect on food shortage as households who have big farm size experience short food shortage. This result show that with more space to make agriculture, family can cope with food shortage.

Table 4: Results of regression model

Variables	Parameters	t-test	Signification
Constant	12,662***	11,28	0,00
Microdose practice	-1,03***	-3,74	0,00
Gender	-0,55	-1,54	0,12
Education	0,28*	1,85	0,06
Fallow	-2,18***	-8,36	0,00
Number of meal per day	-0,9***	-4,54	0,00
Age	-0,013	-1,21	0,22
Household size	-0,045**	-1,97	0,049
Size of farm fertilized	0,236***	2,62	0,009
Size of farm cultivated	-0,022	-0,54	0,58
F= 17,207; ddl= 374; p= 0,00; R^2 =30			

5. Conclusion

This study examined the factors influencing food shortage and revealed that the practice of microdose and fallow, education, number of meal eat per day, household size and size of farm cultivated determine food shortage in Benin, Burkina-Faso and Niger. Significant differences are found between household of the three countries with regard to independent variables by using ANOVA and χ^2 test. These variables which can be used to discriminate household are gender, microdose and fallow practice, level of education, household size, number of meals eat per day, size of farm cultivated and size of farm fertilized

These results can be used for formulate and better implemented policies in order to cope with food insecurity in the area of study.

6. Acknowledgements

We thank the Canada's International Development Research Centre (IDRC) and the Government of Canada, provided

through Foreign Affairs, Trade and Development Canada (DFATD) forhaving funded this research through the Canadian International Food Security Research Fund (CIFSRF) program. A special thanks is due to Drs Pierre B. I. IRENIKATCHE, Moussa BONZI, S. J. Baptiste TAONDA, François LOMPO, Germaine IBRO, Mahamane SABIOU and all the team members of the Microdose - CIFSRF Project.

References

[1] Babatunde, R.O., Omotesho, O.A. and Sholotan,O.S. (2007). Socioeconomics characteristics and food security status of farming households in Kwara state, North-Central Nigeria, pp:10
[2] Bagayoko M, Maman N, Pale S, Sirifi S, Taonda SJB, Traore S, Mason S.C. (2011): Microdose and N and P fertilizer application rates for pearl millet in West Africa. Afr. J. Agric. Res., 6(5), 1141-1150.
[3] Gichuru, M. P., Bationo, A., Bekunda, M. A., Goma, H. C., Kimani, S. K., Mafongoya, P. L., and Swift, M. J. (2002). African Academy of Sciences (in press) Soil Fertility Management in Africa: A Regional Perspective. *TSBF Institute*, 641
[4] Houngbo, E.N.(2013). Stratégie des « boutiques témoins » contre l'insécurité alimentaire au Bénin: Efficacité et perspectives pour l'Afrique. 1ère Conférence AGRAR, Yamoussoukro, 2013, 62 pages.
[5] Salcedo, S, Escudero, D., Bruges M. (2010). Factors affecting food security in high-Andean communities in Peru and Ecuador: Elements for policy design and implementation. Key driversof security in mountains. Workshop, March 22-25, 2010, pp 22.
[6] Sanchez, P. A. (2002). Soil fertility and hunger in Africa. Science 295: 2019-2020
[7] Sanchez, P. A.; Buresh, R. J.; Leakey, R. R. B.; Philos. Trans. R. Soc. London Ser. B 352, 949 (1997). ; R. J. Buresh et al., Eds., Replenishing Soil Fertility in Africa (Spec. Publ. No. 51, Soil Science Society of America, Madison,WI, 1997); E. M. A. Smaling (Guest Ed.), Agricult. Ecosyst. Environ. 71.
[8] Special Panel on Impact Assessment (SPIA) (2001). Contributions Made by the CGIAR and Its Partners to Agricultural Development in Sub-Saharan Africa (Consultative Group on International Agricultural Research, Washington, DC, 2001)
[9] Tabo, R., Bationa, A., Maimouna, D.K., Hassane, O., Koala, S. (2006): Fertilizer microdosing for the prosperity of small-scale farmers in the Sahel-Final report. Global theme on agroecosystems. Report no.23. ICRISAT, pp. 24.
[10] Tabo, R., Bationo, A., Hassane, O., Amadou, B., Fosu, M., Fatondji, S. S. K. D., & Koala, S. (2008). Fertilizer microdosing for the prosperity of resource poor farmers: a success story. *Increasing the productivity and sustainability of rainfed cropping systems of poor smallholder farmers*, 269.
[11] Vohland, K., and Barry, B. (2009). A review of in situ rainwater harvesting (RWH) practices modifying landscape functions in African drylands. *Agriculture, Ecosystems&Environment*, *131*(3), 119-127
[12] World Bank (1997) *World Development Report, 1997*. World Bank, Washington, DC.