

Spatial Integrations and Maize's Prices Transmissions on Markets of Collines' District in Benin: Debates - Stakes and Perspectives

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Abstract--This paper supplies an analysis of chronological series application to examine the spatial integration of markets and maize's prices transmission. The results of cointegration tests indicate the existence of segmentation of six markets of maize. No long-term balance link appear between the six markets. Causality tests results reveal that the market of Glazoué plays the function of reference market in the network of the six studied markets of maize, because the values of previous prices are important for predicting the price of maize on all markets dependent of prices level in Glazoué. It is plausible that price support policies lead to positive changes which affect significantly the agricultural income. It is suitable to encourage the agricultural cooperatives; enhance training and information of traders and producers by local markets institutions is very necessary and essential to increase the sold maize's added value.

Keywords: *Integration; Transmission; Co-Integration; Segmentation And Dependence*

JEL: *Q11, Q17, O55*

I. INTRODUCTION

The inefficacy of agricultural markets integration constitutes a major obstacle for efficient working of themselves. This situation weakens more food security guarantee of vulnerable levels of society. Integration's weaknesses inhibit the systems of marketing, processing and distribution in developing countries (FAO, 2010). In the African Sub-Saharan countries, the incapacity of States in the organization of agricultural sectors, in the farmers' groupings cooperative, in the modern methods of storages of speculations surpluses, in the transport from production areas instead of processing and consumption, limit the availability and the accessibility of foodstuffs in the time and space. This is true all the more as road infrastructures are non-existences or are in a deplorable condition. The existent industrial installations of processing and distribution are little outstanding and inefficient. Therefore the costs of marketing of foodstuffs are considerable and represent an important part of consumer prices. These difficulties are reflected on the functioning of the food-producing markets marked by prices variability which is observed from a place to another one. So, the limited impact of commercial reforms on the food security require a better knowledge of the structure of transaction costs on one hand, and on the other hand as far as the level of spatial integration of the markets of main foodstuffs is concerned. The command of markets' integration level also allows to verify if markets liberalization policies

allow prices to really play their role of allowance of resources inside the same country or between two countries. The increase of prices of basic products on the international markets with the prices transmission is thus only harmful in a context of agricultural markets integration. Indeed, the knowledge of the level of markets integration allows to estimate the transmission of price fluctuations resulting from the outside (imported inflation for instance). Agricultural markets integration is discussed for a long time in link with the foodstuffs markets liberalization in developing countries. That is why markets integration stays *assine qua non* condition of farm produces markets. Without spatial integration of markets, valuable signals will not be transmitted from excess regions to adverse regions. The functioning of the distribution and marketing chains are more connected to endogenous factors. The concept of markets integration indicates above all, a situation where would exist no obstacle in the transfer of goods between two or several markets. Baulch (1997) shows that two markets committed in the business relation are said integrated into the space when the difference of prices between these two markets is equal to the cost of transfer. Barrett (1996) indicates that prices on two markets move in the same direction when the exchanges are really between both markets. It means that changes of prices in one of the markets are reflected in those of the other one. Analysis on markets integration give then information onto the way shocks on a market are transmitted to the other markets. This allows to estimate not only the competitiveness of concerned markets, but also the effectiveness of arbitration in the time and space and finally the efficiency of the mechanism of price formation. The command of the degree of markets integration also reports the efficiency of markets functioning. Indeed, the efficiency of the functioning of agricultural markets in the space is in relation with the degree of freedom of the traffic of farm produces between excess markets and adverse markets. This traffic is favored by the availability and the transparency of information about the condition of markets, as well as by reactions of producers and intermediaries in respond to the variable conditions of the supply and demand of farm produces. In Benin, several factors explain the weakness of agricultural markets integration in developing countries, such as traditional mechanisms of preservation which are little successful and sometimes ineffective for the maize surplus after subsistence farming. The transaction costs of maize

between various markets in Centre of Benin are nearly invaluable. These costs vary with the number of police stations or customs office parked throughout marketing chains. The prohibitive taxes are unverifiable throughout the marketing chain. The constraints in relation with the maize marketing in Benin seem not to improve the food security of populations. This food security remains still dependent on the persistence of obstacles related to the storage, to the processing and to the routing of maize towards the zones of the South where the consumption is very strong (78 % of consumption)¹. The markets integration in Centre of Benin does not seem to play a determining role in the improvement of producers and consumers' well-being. The local economy of zones sheltering these six markets do not manage to mobilize their local resources directed essentially on the marketing of the maize. The statistics from District development plans are alarming. These statistics undergo downward trends. Between 2012 and 2014, commercial in comes have registered negative rates of increase about - 26.12 % (PDC, 2014). These negative rates confirm the farm households and traders do not reach higher levels of well-being and agricultural in come of maize. The analysis of the markets integration of maize in the agricultural regions of Benin justifies itself for several reasons. The maize constitutes more than 86 % of the households' diet in district of Collines in Benin (ONASA, 2013). The by-products of this speculation are diverse forms according to zones, customs and ethnic groups. In the Centre region, the production of maize occupies more than 65 % of exploited lands, MAEP (2012). This zone of Benin often releases a surplus about 45 % of expected productions. Farmers who practised this culture of maize in district of Collines are small sizes and is estimated at more than 230 000 (MAEP, 2013). The average maize rotation system by farmer shows that maize is the most cultivated, with 1.87 ha by farmer, and is met in 88 % of farms. The cotton in the second rank, cultivated with 1.35 ha by farmer and is met in 76 % of farms, the manioc and the yam vary with 0.35 ha and 0.47 ha respectively and with 36 % and 54% of operating rates. Other speculations (peanut, rice, millet) occupy each less than 0.9 ha and met almost all the farm households (ONASA, 2013). The high yields recorded at the level of maize and cotton are explained by previous effects of cotton which benefits to the maize in this region of Benin. The cotton benefits nowadays enormous financial, technical and institutional supports compared with the other disorganized sectors. The agricultural policy strategic choice of Benin is really focused on the so-called "white gold" instead of the other agricultural productions.

II. DATA

The data used in this article are provided by "Office National d'Appui à la Sécurité Alimentaire" (ONASA). Information on the weekly prices from maize markets is

¹ ONASA (2013)

obtained with ONASA from January 2011 to July 2014; in other words the period of the study extends over 43 months. The districts of Collines are selected as zone of study. Indeed, this article concerns six markets of the districts of Collines (Dassa, Savé, Glazoué, Savalou, Ouèssè, and Bantè). Markets are all situated in the same fifth agro-ecological zones. This agro-ecological zone is characterized by the soudano-Guinean climate with a pluviometry from 100 to 1200 mm. The cotton is at the head of rotation; the sarco-earthing up and the ridging are practised. Two seasons of cultures are exploited; the maize and the cotton occupy an important place in the agricultural production and the maize is also at the head of rotation. Soils are tropical ferruginous based on variable characters. The vegetation is arborous savanna and the PCV is 240 days.

III. LITERATURE REVIEW

The instability of agricultural markets depends on characteristics of the supply, demand and the price which are not equal for all agricultural markets. The stable markets are small-sized, difficult for access and badly known by farmers. Agricultural markets integration thus has a leading role in the balance of agricultural food-producing supply. This is the way integrated markets strengthen the increase of the agricultural supply and the stability of food security (Laporte, 1990). In countries of South of Sahara, measures of markets integration are used to estimate on one hand the degree of vulnerability of regions in front of idiosyncratic shocks (Ravallion, 1986; Baulch and al, 2008), and on the other hand to analyze the impact of the markets development and the liberalization policies (Goletti and al, 1995). For the analysis of agricultural markets integration, several statistical, econometric methods and models are used. The first empirical applications in the agricultural domain are those of simple regressions or correlations of market prices (Lele, 1967; Blyn, 1973; Jones, 1972; Loveridge, 1991). These first applications aim to measure the integration of markets in a statistical way, without preliminary analysis on the nature of series. Improvements of econometric approaches allow from now on more dynamic and more rigorous analyses, while considering the general trend of the statistical series of prices and / or the production and transactions costs. Certain empirical works integrate into econometric estimations of variables such as the distances between various markets, the various agricultural policies and especially the defective condition of rural tracks. Autoregressive vectorial models (AR), the bivariate linear cointegration are used for a more dynamic analysis which takes into account the trend of time series (Dercon, 1995) and the Multivariate cointegration (Gonzalez-Rivera and Helfand, 2001; Ghosh, 2003). Econometric methods of cointegration study the trend of the non-stationary of prices series and the determination of the prices general trend. The limits of these methods are centered on the non-linearity and the ignorance of transaction and prohibitive costs which weaken the

integration and the functioning of agricultural markets. According to Barrett (1996), there is integration between two distant markets in the space when the prices on both markets evolve in the same direction and/or when the exchanges are really between the two markets. It means that changes of prices in one of the markets are reflected in those of the other one. For Baulch(1997), two markets committed in the business link are said integrated into the space when the difference of prices between these two markets is equal to the cost of transfer. The integration of markets is used to define the frontier of the market under antitrust policies and international trade conflicts (Horowitz, 1981; Slade, 1986; Asche and al, 2001). Baulch (1997) shows that a bigger degree of integration leads to a transmission of the valuable shocks which, in turn, incites producers to specialize according to the comparative advantages. Prices constitute the best mechanism of road marking of the relative scarcity which motivate producers to produce in appropriate way and in an optimal use of the production factors. Recent empirical works use models with threshold to estimate the integration of agricultural markets. The users of these threshold models identify level due to transaction costs. The determination of these thresholds allows to show the existence of deviation. This deviation can infer adjustments of equilibrium price which lead to the agricultural markets integration ,Tong et Lim (1980).The first applications of these models of threshold are those of Enders and Siklos (1999); (Goodwin and Piggott, 1999; Goodwin and Harper, 2000; Abdulahi, 2002; Sephton, 2003; Meyer, 2004; Araujo and al, 2005; Subervie, 2007). The markets integration can be adequately tested, if we are held in the definition suggested by the model of standard spatial balance. However, the degree of prices transmission is an intrinsically ambiguous concept. The applications of time series are very precious in the identification of possible markets failure and contribute to estimate and to indicate the direction, the scale of the prices transmission of the farm product on the farm households' well-being. In this situation, the analysis of the marketing of maize on the internal markets in Africa can give some explanation for several reasons: i) farmers are sensitive to the prices signals and make the allowance of their productive resources considering comparative advantages they can withdraw from markets; ii) in the context of the African economies, a system integrated by rural and urban markets is a deviceable to guarantee the households' food security in the overdrawn rural areas in food-producing products and in those where dominate export crops; It is also one of the conditions necessary for the acquisition and for the implementation of new more productive technologies since producers must be able to sell their surpluses (Delgado,1985); iii) the success of the voluntarist food security policies of African governments supposes the existence of a system of effective marketing which assures a good adjustment of flows in the time and space; therefore, it is necessary for planners to know the functioning of distribution networks of products and especially the respective behavior of actors who produce,

intermediaries and consumers (Sherman, 1985); Iv) In developing countries generally and sub-Saharan in particular, it prevails a widely shared point of view according to which the trade would be an activity which organizers due to their semi-monopolistic behavior would play on the seasonal variations of prices to exploit the rest of the community; such a point of view serves to justify the public interventions which are not always happy in the trade of the food-producing products; this is assertions which the economic research has to clarify in every agricultural region otherwise, it often happens that remedies are the worse than the evil (Lele,1967). Certain empirical works of (Fackler and Goodwin, 2001; Mabaya,2004; Araujo-Bonjean and Coombs, 2010) show that markets integration increases the income of producers thanks to a better exploitation of economies of scale and comparative advantages and it stabilizes agricultural prices so by protecting the domestic markets against shocks. The importance of the agricultural markets integration were proved true, it is not surprising that these last years are marked by a greater attention of the role of markets integration of food security of households in developing countries (Dercon, 1995; Fafchamps and Gavian, 1996; Fackler and Goodwin, 2001; Abdulahi, 2002; Araujo and al, 2005; Araujo and al, 2005; Araujo and al, 2010). In the absence of a spatial integration of markets, prices signals will not be transmitted from excess regions to the adverse regions. The prices will be more volatile. The agricultural producers cannot thus specialize according to the theory of the long-term comparative advantage and the trade profit will be hardly practicable. (Dembélé,1988) explain ,markets integration by prices is one of the necessary conditions to assure the non-segmentation of markets, as far as the prices move in a similar way on the integrated markets and any price difference reflects only the costs of approach. Tomek and al (1981) shows that the prices' spatial integration explains price differences between two regions (or market) which make trade equal to the marketing costs on one hand and price differences between two regions (or market) which do not realize trade lower or more equal to the costs of marketing on the other hand. Several theories study prices transmission within the framework of the exceptional price (Andeni, 1989; Slaps, 1991) or in the context of the markets integration (Ravallion, 1986; Sexton and al., 1991; Palaskas and al., 1993; zalias, 1993; Gardner and al., 1994; Baulch, 1997). The integration of markets and the analytical techniques are also used to estimate the reform of the policies, in particular the ex-post evaluation of markets integration in context of implementation of programs of structural adjustment (Goletti and Babu, 1994; Alexander and al., 1994; Dercon, 1995). Sharma (2002) shows that in countries as Pakistan, India, Sri Lanka and Indonesia, where the government intervenes on the internal market by means of various instruments of commercial policy, the coefficients of error correction would be between 0, 01 and 0, 07, what indicated a slow adjustment to the relation of long-term balance. The inefficient behavior, such as that envisaged by the models of price fixation according to the

market (Dornbush, 1987; Froot and Klempeter, 1989; Krugman, 1986) can be market integration. The models of price fixation according to the market assume that the agricultural companies can absorb a part of the exchange movements by modifying export prices measured in national currency to preserve their market's share. It can also happen a behavior oligopolistique and an agreement between business partners in the internal level maintain the differences between international prices and internal prices at superior levels to those determined by the costs of transfer. According to the characteristics of markets, or the distortions to which these are subjected, both prices series can behave of multiple manners and to present very complex relations, the prices transmitted in incomplete way, slowly and not immediately, according to diverse dynamic structures or in a no linear way. Considering the range of relations which can exist between the prices, we can consider the concept of prices transmission articulates around three notions, or components (Prakash, 1998; Balcombe and Morisson, 2002). Aryeetey and Nyanteng(2006) shows in Ghana, the small producers represent the immense majority of farmers of the country and their production is essentially intended for the domestic market. the most consumed Products at the national level are the maize, the rice, the manioc and the yam; exchanges between production zones and consumption zones are realized by " long distance " traders .The latter buy with local traders or directly with producers, to supply then in the urban areas. The long distance traders are supposed to be well informed about

prices of the main wholesale markets. They realize a spatial arbitrage guaranteeing markets balancing. SIM is set up to solve these problems. They are supposed to improve the transparency of the market for all the actors and particularly the small farmers (Tollens, 2002; 2006). The answer to these problems of inadequacy and asymmetry information is in the core of SIM agricultural objectives (Shepherd, 1997): It conditions the configuration of devices (it is necessary to broadcast quickly information which allows the spatial and temporal arbitrage of actors on the market), at the same time as it fixes a level of ambition difficult to achieve.

IV. EMPIRICAL RESULTS and ANALYSIS

This section analyzes the test of cointegration according to Johansen approach and the Granger causality test; In addition a model with error correction is formulated to estimate the dynamics and the speed of adjustment. The asymmetric adjustment is then tested according to the method of Granger and Lee (1989). For the six markets, we determine the duration of lags at the level of the vectorial autoregression (VAR) and of the error correction model by means of the Akaike criterion information.

Evolution of the maize's prices on the six markets: prices'trend

The following table gives the synthesis of the monthly maize's prices trends between January 2011 and July 2014 on the six studied markets of the districts of Collines.

Table1: trends of the monthly prices of maize between January, 2011 and July, 2014 on the six studied markets

Market	Average Price	Maximal Price	minimal Price	Standard deviation
Dassa	184	250	125	31
Savè	165	250	123	27
Glazoué	180	250	125	33
Savalou	162	250	100	31
Ouèssè	135	200	80	30
Bantè	139	175	90	23

Source: Author, under Eviews3, October 2014

The analysis of this table indicates during the selected period, the highest price of maize(250 F / kg) was observed on four markets (Dassa, Savé, Glazoué, Savalou) while the lowest price (80 F / KG) was observed on the market of Ouèssè. The highest variation (33 F / KG) is the one of the market of Glazoué and the lowest(23 F / KG) was noticed on the market of Bantè. The analysis of

prices' trends is done through the evaluation of the correlation coefficients. Analysis of correlations coefficients of the maize's prices in network of the six markets in Centre of Benin The prices correlation coefficients at level between the six markets of our study are recorded in the following table:

Table2: Correlation coefficients betweenpricesseries.

	Dassa (P1)	Savé (P2)	Glazoué (P3)	Savalou (P4)	Ouessé (P5)	Bantè (P6)
Dassa (P1)	1	0.3622	0.5317*	0.2109	0.6266	0.2510
Savé (P2)		1	0.5379*	0.5925	0.6860	0.4052
Glazoué (P3)			1	0.5710*	0.5029*	0.5095*
Savalou(P4)				1	0.6024	0.5388
Ouessé (P5)					1	0.3660
Bantè (P6)						1

Source: Author, under Eviews3, October, 2014

The prices correlation coefficients at level vary from 0.21 to 0.68 suggesting thus the low levels of markets integration. However, these coefficients can offer false appearances of the really integrated markets because of the time effect, galloping inflation of consumer prices and especially non-stationary of prices series. Besides, it is interesting to notice this correlation (indicated by *) between the maize's price on the market of Glazoué and the maize's price on all other markets. We can expect thus logically a good integration between the market of Glazoué and the other considered markets (Dassa, Savé, Savalou, Ouèssè, and Bantè). The reluctance we have on some reliability of information the correlation coefficients brings us to indicate that, for this study, the approach based on the integration and the co-integration of prices series would be better than the ones of correlation coefficients.

Integration and co-integration of the maize's prices series onthe six markets

Before using the Johansen's procedure to determine the number of relation of cointegration of prices series between the various markets, it is necessary to proceed in first to unit root test or non-stationary test of prices series.

Unit Root Tests

The rank of prices series integration of the six maize's markets indistricts of Collinesis determined with the tests of Augmented Dickey-Fuller (ADF),(Dickey and Fuller, 1979) and the Zt and Zrtests of Phillips (1987) and Phillips and Perron (1988). Results are recorded in the table3.

Table 3: Results of unit root tests of maize's prices of the six markets

tests on the maize's price of the six markets	Level		First Difference
	Intercept	Trend and Intercept	
	Maize's market of Dassa (P1)		
ADF test	-3.3367 (3)	-3.207(3)	-4.577 (1)
Zt test of Phillips &Perron	-3,7157 (2)	-3.561(4)	-5.081(1)
Zr test de Phillips & Perron	-4,015 (5)	-3.990(4)	-5.002(1)
Maize's market of Savé(P2)			
ADF test	-3.740 (4)	-3.451(4)	-5.690 (1)
Zt test of Phillips &Perron	-3.987 (5)	-3.781(6)	-6.010(1)
Zr test of Phillips &Perron	-4.569(3)	-4.015(6)	-7.457(1)
Maize's market of Glazoué (P3)			
ADF test	-1.1963 (4)	-1.071(4)	-6.331 (1)
Zt test of Phillips &Perron	-1.2346(4)	-1.110(5)	-7.981(1)

Zr test of Phillips & Perron	-2.3458 (3)	-2.087(4)	-7.003(1)	
Maize's market of Savalou (P4)				
ADF test	-3.573 (10)	-3.342(4)	-4.969 (1)	
Zt test of Phillips & Perron	-3.761(7)	-3.642(5)	-5.013(1)	
Zr test of Phillips & Perron	-4.689(9)	-4.561(6)	-6.654(1)	
Maize's market of Ouesse (P5)				
ADF test	-2.2786 (1)	-2.126 (8)	-4.765(1)	
Zt test of Phillips & Perron	-2.126(1)	-2.005(7)	-4.025(1)	
Zr test of Phillips & Perron	-3.542(1)	-3.332(6)	-5.841(1)	
Maize's market of Bantè (P6)				
ADF test	-3.800 (2)	-3.601(7)	-4.320 (1)	
Zt test of Phillips & Perron	-3.561(1)	-3.345(9)	-5.652(1)	
Zr test of Phillips & Perron	-5.985(12)	-5.135(7)	-7.012(1)	
Critical value at level			Critical value at difference	
ADF test and	5 %	10%	5 %	10 %
Zt test of Phillips & Perron	-6,98	-5,80	-5,67	-5,45
Zr test of Phillips & Perron	-38,56	-52,5	-38,95	-29,7

Source: Author, October, 2014

The test of Dickey and Fuller (1979) in the presence of serial correlation, correct this situation and integrates differentiated terms lagged in the regression. This test presents limits, the size and the performance of Augmented Dickey-Fuller test showed themselves sensitive to the number of terms. The non-parametric test of Phillips and Perron is test of null hypothesis of unit root and is considered as most performant, because it exploits coherent variance estimators. This test is realized by including until 10 differentiated lagged terms in the regression. The Akaike information criterion is used to select the adequate lags by maintaining a good balance between parsimony and reduction of the sum of squares. The statistics of the Augmented Dickey-Fuller tests presented in table 3 correspond to the regression which maximized the Akaike information criterion. On the basis of both Augmented Dickey-Fuller and Phillips-Perron tests, with and without deterministic trend, we conclude there are enough elements to invalidate the null hypothesis of non stationary for all of prices series. When they are applied to the differentiated series, both tests invalidate the null hypothesis indicating the price series are I (1) integrated. Results of table 3 show prices of maize on the six markets of the district of Collines are cointegrated. Johansen test invalidates null hypothesis of non-cointegration without invalidating null hypothesis of a vector of cointegration. The cointegration indicates the prices of maize in the group of the six studied markets are

integrated into the market mechanisms and it exists at least in a direction of Granger causality.

Johansen cointegration Tests.

The concept of cointegration (Granger, 1981) and the methods of estimation of a relation or a system of cointegration (Engel and Granger, 1987; Johansen, 1988, 1991, 1995) enabling the estimation and the application of the long-term's balance relations between the integrated and non stationary price variables of maize. According to literature, this concept of cointegration allows to analyze and to expose explicitly the outreach of studies on markets integration (Maddala and al, 1998). If two prices on different markets in the space (or at various levels of the supply chain), p_{1t} and p_{2t} present stochastic trends and are integrated of the same rank, for example I (d), prices are integrated whether:

$$p_{1t} - \beta p_{2t} = u_t \quad (1)$$

Equal to I (0).

B is the cointegration vector (scalar vector in case of two variables) whereas equation (1) is the cointegration regression. The relation (1) can be estimated with ordinary least squares (Engle and Granger, 1987), or with full information log Likelihood method established by Johansen (1988, 1991). More specifically, p_{1t} and p_{2t} are cointegrated, if there is between them one linear

combination which does not present stochastic trend, even if the individual series presents one (Stock and Watson, 1988), for the representation of the stochastic trend of cointegrated systems. The cointegration implies these prices move with a narrow long-term parallel, even if in the short term they can diverge, what is in accordance with the concept of markets integration. Engle and Granger (1987) examine the null hypothesis of no-cointegration by applying unit roots tests. Johansen has derived the

distribution of two statistical tests to verify the null hypothesis of no-cointegration, called tests of trace and proper value (or characteristic root). As prices series are all I (1) integrated, the following step consists in verifying the existence of a process of long-term integration between the prices series of the various markets. The cointegration tests of prices series of the six markets and the critical values of the likelihood ratio in relation with the tests of the proper value are recorded in the table below.

Table 4: Results of Johansen's cointegration tests

Likelihood ratio	Critical value		Hypothesis on the number of EC
	5%	1%	
103.60**	82.49	90.45	None
68.36**	59.46	66.52	Atmost 1
36.14	39.89	45.58	Atmost 2
12.59	24.31	29.75	Atmost 3
4.74	12.53	16.31	Atmost 4
0.07	3.84	6.51	Atmost 5

Source: Author; under Eviews3, October, 2014 EC: equation of Cointegration.

The existence of cointegration relation between two prices series coming from two markets is above all an indication of the presence of interdependence between these two markets. In other words, the cointegration indicates the non-segmentation between two markets. The likelihood ratio test recorded in the table 4 indicates two relations of cointegration at critical level of 1 %. This result suggests that during the selected period of the study, prices series of two markets are strongly cointegrated and converge on a long-term balance. On all the six studied markets, the system of the maize market is then stationary in two directions and not in four other directions. In other words, during this period, the prices of the two markets could be expressed in relation to prices of four other markets. Besides, this result indicates that even if markets are geographically dispersed, price formation in the space shows that these prices are connected. In other words, all these exchange markets of maize are a part of the same economic market. However, the small number of cointegration relations can be justify by the fact that all the district of Collines produce maize. This weak relation of cointegration is also connected to conditions and the distance of roads, enormous physical and administrative barriers, and availability of the information, the very limited access to cash and input credits for maize's producers of the six (6) localities and the non-existence of agricultural entrepreneurship trainings. Barriers between the six localities are very high and no-standardized. They vary with the number of customs checkpoint and / or police on positioned along the trade way. (Savé and Savalou with ten big bags of maize is 70 000 Fcfa;

Glazoué and Bantè with ten big bags of maize is 55 000 Fcfa; Ouèssè and Dassa is 80 000 Fcfa)².

The non-tariff obstacles in the exchanges between the six markets are structural, technical and administrative order. The structural obstacles are connected to the high costs and the maladjustment of roads and transportation means between various markets, the insufficiency and inconvenience of telecommunications network between the six markets (the physical splits related to the mountainous zones), and delicate problem of fraud and informal economy. As far as technical obstacles are concerned, they are among others focused on the weakness of the entrepreneurial capacity of operators and traders, the lack of coordination policy between districts of Collines. The administrative obstacles are considered as the most pernicious. The most important are administrative and customs complications of which operators are victims, the excessive use of import license system and the market price list. All these obstacles weaken and inhibit the perfect integration of the studied six markets of maize. This small level of maize exchange between the various studied markets does not favor the price transmission of maize from a market to another one and justifies consequently this weak observed cointegration. The network of the six studied markets does not show clearly a complete relation between the maize markets. This relation is not however obvious between all studied markets. The road Savé-Bantè and Ouèssè-Savalou confirms this last aspect. The cointegration tests allow to verify this relation between the six markets and the Granger causality tests

² INSAE (2014)

allow to determine and to identify markets which can make object of central markets.

Causality test

The Granger causality test estimates the presence of asymmetric answer by including a nominal variable, as indicated by Prakash and al. (2001) for all the markets of maize. The Granger causality gives thus additional information onto the prices transmission between two series and, if necessary, indicates direction. The hypothesis for which $p_1 \text{ cause } p_2$ according to Granger causality, and inversely can be estimated within the framework of a vectorial autoregression (VAR), by verifying the null hypothesis according to which coefficients of a subset of these variables jointly determined, the lagged term p_1 , are equal to zero. Besides, Granger (1988) proposes a test for the highlighting of a long-term Granger causality in the context of error-correction model or a cointegrated variables system. The presence and the direction of Granger causality at long-term, can be estimated by verifying the null hypothesis according to which coefficients of error-correction a_1 and a_2 of the vectorial error-correction model presented in equation (1) are equal to zero, revealing also a weak exogeneity in the econometric term. It is suitable to note that, even if the cointegration between two prices series mean the existence

of a Granger causality at least in one direction, the opposite is not necessary true. In this case, and as it was indicated above the absence of cointegration between the two trend prices series can indicate the absence of markets integration, as far as other factors such as transaction costs, determine the movements of one of the prices series. However, a Granger causality can exist, indicating, even if the two prices series diverge due to other factors such as non-stationary transaction costs, certain prices signals are transmitted from a market to another one. Besides, the absence of Granger causality does not imply necessarily the transmission, as far as the prices signals can be immediately transmitted in particular circumstances.

Exchange market is the market which "causes" in a unidirectional way all other markets without being "caused" by any of these last (Sexton and al., on 1991). This article uses the Granger causality which explains the prices values on a market contribute significantly to predict the prices on another market. The results of the causality test are recorded in the table below. Inspiring some procedures of Alderman (1993), Lutz (1994) and Goletti (1994), It required a number of six lags to obtain these decisive results.

Table 5: Results of Granger causality test

	Dassa (P1)	Savè (P2)	Glazoué (P3)	Savalou(P4)	Ouèssè (P5)	Bantè (P6)
Dassa (P1)		0.65868	0.60761	0.87932	0.77530	0.07749***
Savè (P2)	0.72304		0.25824	0.16807	0.34500	0.58808
Glazoué (P3)	0.00870*	0.08394***		0.08277***	0.02128**	0.00273*
Savalou (P4)	0.57127	0.07821***	0.67965		0.00108*	0.02095**
Ouessé (P5)	0.72678	0.02282**	0.28957	0.0301**		0.01564**
Bantè (P6)	0.29169	0.41067	0.94993	0.15325	0.77272	

Source: Authors, under Eviews3, October, 2014

The contents of each cell (ij) provide the probability value associated with the test of null hypothesis of no causality. This hypothesis is accepted as soon as the probability is superior to 5 %: Indeed, the market i does not cause the market j. In opposite, the signs *, ** and *** indicate that the market i causes market j at the level of 1 %, 5 % and 10 % respectively. So, results of this causality test reveal that Glazoué play the role of reference market in the network of the studied maize markets. Indeed, the previous prices values of maize of Glazoué are important for predicting the maize's price on all other markets dependent on the level of prices in Glazoué. This result indicates that all other markets are adverse; only that excessive supply of maize in Glazoué which are sometimes strengthened by the ones of the districts of Tchaourou and Parakou surpass those of the other

considered markets. The issue is other markets are dominated with regard to Glazoué even if it is necessary to indicate the very significant contribution for these markets in the blooming of Glazoué (regional market).

On the other hand, this result is due to the fact maize's consumption in Glazoué is very important as the level of prices is relatively high. Let us indicate to finish this result is in accordance with those of the second spatial structure of markets stipulated by Ravallion (1986): the trade with central market influences the price formation on the peripheral markets in relation with this central market. The Granger causality tests show the maize's price of Glazoué cause according to Granger the price of production. Altogether, there is a sufficient number of elements allowing us to conclude that the market of Glazoué is well integrated with the other five (5) maize markets in the

districts of Collines at long-term and the price signals are also well transmitted on short term. It emerges from analyze the supply chain connecting the market of Glazoué to other markets is efficient, on the basis of retail sales system of small shopkeepers and transmission of the maize's prices of other markets with regard to the market of Glazoué does not allow a good quality of control. The producers of maize of Glazoué sell their productions of maize under not organized form, to those who collect them in a private capacity; to certain storekeepers in south of Benin and especially to the manufacturers for the manufacturing of provender.

V. Conclusion

The cointegration, as such, cannot be used to formulate deductions as for direction of the link of cause to effect existing between price variables of the maize, hence the necessity to manage causality tests. Granger (1969) proposed an empirical defini

tion of causality based only on its projected contents: if x_t causes y_t , then y_{t+1} can be the object of more correct prevision if information contained in x_t is used, because the error of forecast will present a lower variance. The maize's markets integration in the district of Collines is far from being completed. Indeed, the existence of price controls systems of maize induced an asymmetric information about the six group of studied markets. Information concerning the maize's price is propagated by people who frequent these six markets in Centre of Benin. The price changes which occur on the central market of Glazoué are not immediately and totally transmitted on the five other dependent markets. Consequently an asymmetric information between markets occurs. For instance, the existence of asymmetric information between sellers and buyers or between producers and consumers of the production of maize implies anti-selection problems and modify the nature of their transactions and therefore, compromise the efficiency of arbitration. So, the efficiency of the maize's trade between the adverse zones in Centre of Benin requires an information network which collects data on conditions of the supply and demand. At results, it would be desirable the commercial authorities of the maize have to be really oriented: the implementation of an Information system on the maize's markets in Centre of Benin in the local languages (SIM). This organ in the districts of Collines will have as major role the weekly collection and distribution of maize's prices on these six markets of the districts of Collines. This supposes a new awareness in favor of better organization of the maize sector, economic operators, reinforcement of their capacity by an adequate training and creation of a convenient environment which is translated by implementation of a system of financing adapted to the inter-district exchanges and the promotion of an appropriate environment to the realization of the various objectives assigned to food security.

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