

Impacts of national agricultural trade policies on food self-sufficiency: Case of selected products in Niger

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Abstract

Most of Sub-Saharan African agricultural studies are focused on rainfall variability, low use of technologies and inputs in agriculture to explain the recurrence of food insecurity and famine in these regions. However, agriculture sector relies on other sectors such as trade. So, an evaluation of the efficiency of trade tools on main foodstuffs could very helpful for policymaker in stabilizing their countries agricultural product prices. Additionally, the evaluation of self-sufficiency and import dependency is a significant step in estimating the country resources capacity in satisfying its domestic demand especially for main foodstuffs. Hence, this article aims at evaluating the impacts of National Agricultural Trade Policies on Food Self-Sufficiency of main agricultural foodstuffs (cowpea, maize, millet, and sorghum) in Niger during 1990-2015. The findings revealed that Niger national resources can satisfy the countrywide demand for the main foodstuffs except for maize. In conclusion Niger policy makers should review the country agricultural trade policy by applying efficient trade's tools and measures to stabilize the inter-annual price volatility of main agricultural foodstuffs.

Keywords Agricultural trade; Food security; Niger; Self-sufficiency; Sub-Saharan countries

Ulusal tarım ticareti politikalarının gıda yeterliliğine etkileri: Nijer'de seçilmiş ürünler örneği

Öz

Çoğu Sahraaltı Afrika tarımsal çalışmaları bu bölgelerde yinelenen gıda krizlerinin ve kıtlığın başlıca nedenleri olarak, yağış değişkenliği, düşük teknoloji kullanımı ve tarımsal girdilerin düşük kullanımı üzerine odaklanmıştır. Ancak, tarım sektörü ticaret gibi diğer sektörlerle dayanmaktadır. Bu nedenle, ticaret araçlarının ana gıda maddeleri üzerindeki etkinliğinin değerlendirilmesi, politikacılar için ülkelerinin tarımsal ürün fiyatlarının dengelenmesinde çok kullanışlı olmaktadır. Ek olarak, kendi kendine yeterlilik ve ithalat bağımlılığının değerlendirilmesi, özellikle ana gıda maddeleri için iç talebin karşılanması konusunda ülke kaynakları kapasitesinin tahmin edilmesinde önemli bir adımdır. Bu nedenle, bu makale, ulusal tarım ticareti politikalarının, Nijer'deki 1990-2015 döneminde başlıca tarımsal gıda maddelerinin (börülce, mısır, darı ve sorgum) gıda öz yeterliliğine etkilerini değerlendirmeyi amaçlamaktadır. Bulgular, Nijer ulusal kaynaklarının, ülke genelinde ana gıda maddelerine yönelik talebi, mısır hariç karşılayabildiğini ortaya koymaktadır. Sonuç olarak, Nijer politika belirleyicileri, ana tarımsal gıda maddelerinin yıllar arası fiyat dalgalanmasını dengelemek için etkili ticaret araçlarını ve önlemlerini uygulayarak ülke tarımsal ticaret politikasını gözden geçirmelidir.

Anahtar Kelimeler: Tarımsal ticaret; Gıda güvenliği; Niger; Kendine yeterlilik; Sahra altı ülkeler

1. Introduction

Commonly, rainfall variability, low use of technology, and land degradation have been considered as the main causes hindering Sub African countries' agriculture to satisfy these countries' food needs. Therefore, in these countries, most policies focus on the adoption of new technologies, new cultivars, the change of tree-planting periods and water management practices to enhance their agriculture and consequently to reduce cyclic food crises and

famines. Furthermore, Niger is one of Sub African countries which agriculture sector focuses on low technology use while the country challenges climate instability, including rainfall deficit and land degradation.

Accordingly, [Asfaw and Lipper \(2015\)](#) emphasized that the increase in crop failure and repeated severe events represent key obstacles to reaching food security and poverty decline in Niger. More, the desertification is considered acceptable scenarios constraining

the country agriculture sector as approximately 15% of land is arable (Kandji et al., 2006). However, beyond the diversification of cultivated crops, the improvement of agricultural technologies, the adaptation of new cultivars, and land management practices agricultural policy embraces agricultural trade based on various tools and measures targeting at improving the productivity of rural small-scale farmers. In fact, during 1986-1990 the negotiation through the Agreement on Agriculture (AoA) of the General Agreement on Agriculture on Tariffs and Trade (GATT) has liberalized the agriculture sector. So, most developing countries have liberalized their agriculture sector under the implementation of structural adjustment policies. Consequently, the import dependency of many African countries has increased especially for main foodstuffs (Clapp, 1997; Rakotoarisoa et al., 2011).

Niger is one of African country which had implemented these programs of structural adjustment. However, during the last decades the high volatility of the prices of agricultural products increases the difficulty of the poor to satisfy their main foodstuffs through the market (Byerlee et al., 2006; Gilbert and Morgan, 2010; Michiels et al., 2012). Accordingly, Swinnen and Squicciarini (2012) highlight that food prices can be a big determinant of food consumption in developing countries. Moreover, Matthews (2010) emphasized that the problematic of agricultural price volatility include all the actors of the food supply and it requires good understanding for the future evolution. For instance, the small farmers in developing countries face various risks that are mainly due to market functioning and price support policies.

However, within the liberalization of agricultural trade, evaluating the impact of national trade policy on food self-sufficiency in Sub Sahara African countries is very significant the policymakers to implement adequate agricultural trade tools and measures to reduce their population food insecurity. In addition, particularly important for Niger policymakers to examine other likely causes of recurrent food crisis and famine because the food self-sufficiency becomes increasingly debates within political objectives. With an annual growth rate estimated at 4,9% Niger economy is mainly based secondary sector, particularly oil

production from which future annual economy growth is estimated to reach 5,4% by 2018. Otherwise with a population growth rate of 3,9% and an average of 7.1 children per woman Niger has the highest population growth in the world (INS, 2018). In addition, the Niger GDP was estimated at US \$ 8.59 billion in 2017 and its economy, mainly based on agriculture and livestock which provide roughly 43.4% of national GDP with 75.60% of the workforce from a rural population (INS, 2018).

Niger is signatory of many supranational conventions and treaties related to trade. Consequently, Niger is member of the trade liberalization pattern of the Economic Community of West African States (ECOWAS) since 1975, of the Organization for Harmonization in Africa of Business Law since 1993, of the West African Economic and Monetary Union (WAEMU) since 1994 and recently member of the World Trade Organization in 1996. Accordingly, Niger trade policy is trapped up in the regulations of trade organizations to which it is member so the implementation of national commercial policy taking into consideration its agricultural sector although the country faces recurrent food crises and famines. Otherwise, firstly the main issue in Niger trade policy began during the liberalization period with the Structural Adjustment Program (De La Renaudie and Martin, 2008). So, all trade tools and measures such as temporary quantitative restrictions on imports, import quotas, and temporary restrictions or bans on exports have been dismantled. More, since 2003 Niger's national trade policy is regulated by WAEMU procedures but till now the newly adopted public markets code promoting the National Treasury for Public Procurement Policy adopted in 2002 to safeguard national firms and companies is not applied (Anonymous, 2003). Consequently, market imperfections cause asymmetric information on the qualities and quantities of traded products as well as the volatility of their prices. More the weaknesses of certified storage structures and the degradation of transport infrastructures thwart the distribution of the products in all the country regions.

In Niger the results of National Survey of households' food security indicated approximately 2.6% of rural population lives in

severe food insecurity, 11.9% are moderately food insecurity. Additionally, almost 32.4% of population faces fragile food security as well as only 53.1% of total rural populations are food secure. However, the department of Dosso in the region of Diffa was excluded in this survey due to the insecurity (Anonymous, 2017). Otherwise in Niger annual capita consumptions estimated on the standard of human consumption per year are 207 kg per inhabitant for millet, sorghum, maize and fonio while rice annual capita consumption is estimated at 18 kg inhabitant and wheat has approximately 6 kg per inhabitant.

Furthermore, in 2015, the country total cereal need was being approximately 4 349 652 tonnes with respectively 3 897 740 tons for dry cereals (millet, sorghum, maize and fonio), 338 934 tons for rice and 112 978 tons for wheat. Despite a national surplus of cereals estimated to 88 000 tons about 160 rural areas would face food insecurity in 2015 (OCHA, 2015).

This study contributes to evaluate agricultural trade policy measures and tools in Niger one of Sub-Saharan African countries which repeatedly face many food crises and famine within the era of trade's liberalization. Additionally, it estimates the country resources' capacity in satisfying the national demand of most consumed main foodstuffs.

2. Material and Method

2.1. Materials

Niger is a landlocked West African country covering a total area of 1 267 000 square kilometers and is divided into eight administrative regions; Agadez, Diffa, Dosso, Maradi, Tahoua, Zinder, Tillabery, and Niamey. The country's agriculture is low technology use and it is practiced by small scale farmers who mostly focused on household foods' need in a context of climate change and variability. Accordingly, the most produced and consumed main foodstuffs are millet, sorghum, maize and cowpea. In addition, in some region small scale farmers produce groundnuts, wandzou but also cowpea as cash products. Therefore, secondary data of the country's eight regions of the annual national production, annual import

quantity and annual average of prices the above main foodstuffs obtained from the national institute of statistics of Niger and FAO site have been used.

2.2. Methodology

Niger national resource capacity in producing the most consumed foodstuffs has been estimated by self-sufficiency ratio (SSR) while the country demand dependency on external imports has been determined through the import dependency ratio (IDR) as well as inter-annual price fluctuations have been evaluated by their volatility. These parameters were calculated as shown by section (2.2.1). To calculate some variables from data, the following formulas were used.

2.2.1. Price volatility

Volatility refers to temporal variations of economic variables so that price volatility expresses the extent to which the market prices fluctuate over the time. Additionally this volatility can be expressed by one of the statistical indicators that a measure varies from one period to another (IMF and UNCTAD, 2011). Consequently, the market price volatility is calculated by the equation:

$$V = \frac{\sum_{i=0}^n (pn - p0)}{p0} \quad (1)$$

Where V refers to inter-annual volatility, P_n equals average annual price of national foodstuffs during the year n and P₀ their prices before the year n.

2.2.2. Import dependency ratio (IDR)

The IDR measures the ratio of import to the total consumption at a country level and the counterpart of this ratio to 100 expresses the part of domestic supply produced in the country itself (FAO, 2012). It is calculated by the equation as follows:

$$IDR = \frac{I}{(P+I)-E} \times 100 \quad (2)$$

With I; annual imported quantity, E; annual exported quantity and P is the annual quantity produced of a given commodity. However, IDR

ratios are hold only if imports are mainly used for domestic utilization and are not re-exported. Additionally, the IDR value can score a value higher than 100% demonstrating that the export of a given commodity is higher than its produced quantity. Such a figure occurs when even the imported quantity of this crop is exported (FAO, 2012).

2.2.3. Self-sufficiency ratio (SSR)

SSR is generally calculated for individual or groups of commodities and it indicates in the context of food security the extent to which a country relies on its own production resources. So, the higher the SSR, the greater the self-sufficiency comes (FAO, 2012). However, FAO (2012) highlights that even SSR is useful tool to evaluate the supply for individual commodities, some caution should be observed while it is used for overall food situation as well as its value can be high value while the country might still rely on imports to satisfy its national demand for a product or commodity. It determined by the Equation 3. Where; P is annual quantity produced, I is annual quantity imported, E annual quantity exported of the commodity at national level.

$$SSR = \frac{P}{(P+I)-E} \times 100 \quad (3)$$

3. Results and Discussion

3.1. Price Volatility

Agricultural market risk at national level of four main foodstuffs has been estimated from their

annual average price by the price volatility from 1990-2015 in all the region of the country.

3.1.1. Millet inter-annual average price volatility

Millet inter-annual average price volatility is illustrated in Figure 1. Figure 1 shows similar price volatility for millet in all the regions. More the millet price volatility has been higher during 1995-1996 with an increase 335.85% in Maradi, 264.475 in Tahoua, 241.27% in Zinder and 180.72% in Dosso on the millet kilogram price. However, during 1996-1997 millet's kilogram price volatility has decreased by 44.59% in Maradi, 44.12% in Tillabery and 41.88% in Tahoua. Globally the price volatility of millet has fluctuated during 1990-2015.

3.1.2. Sorghum inter-annual average price volatility

Sorghum inter-annual price volatility at national level is depicted on the followed Figure 2. For sorghum, the kilogram price volatility shows brutal fluctuations inter the years. More during 2011-2012 the region of Tillabery showed a highest price volatility (104.09) whereas the price volatilities were 84.05% in Diffa, 74.43% in Agadez while the lowest price volatility was 39.22% in Dosso. Hence, nationwide the price of the kilogram of sorghum has strongly fluctuated between during 1990 and 2015.

3.1.3. Maize inter-annual average price volatility

During the period 1990-2015, the inter-annual average price volatility of maize in the main different regions is depicted in Figure 3.

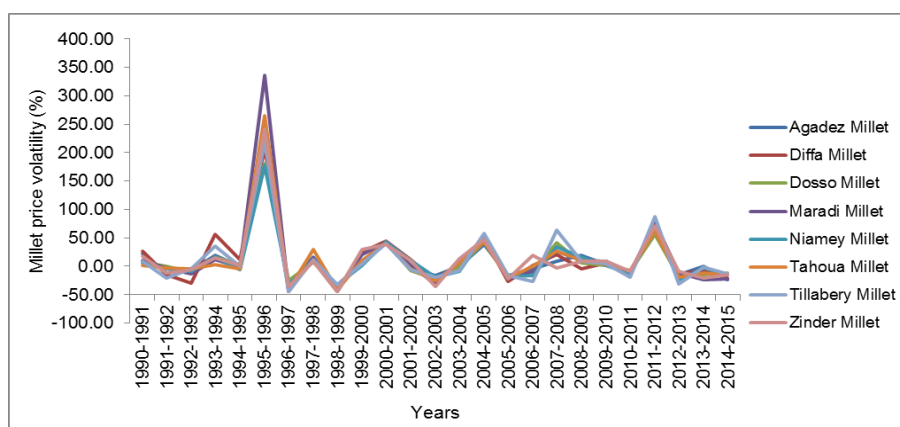


Figure 1. Millet inter-annual average price's volatility (%)
Source: Author compilation from INS (2010). All market annual average prices are in CFA per kilogram (FCFA kg⁻¹).

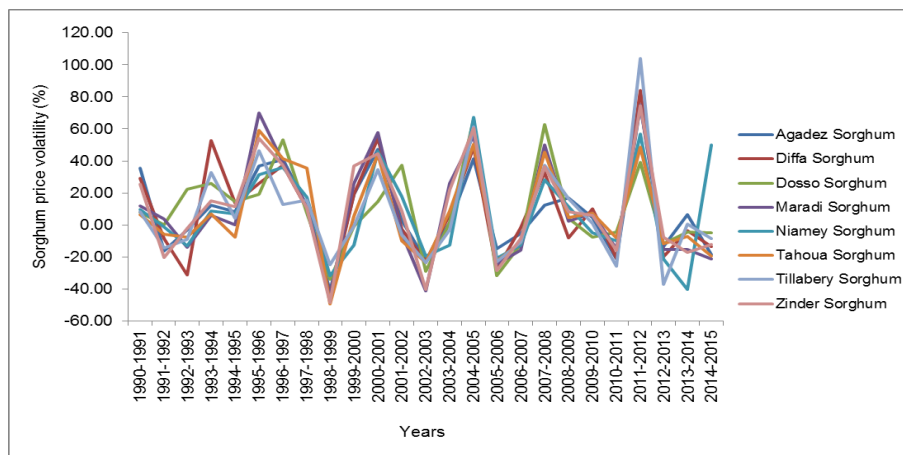


Figure 2. Sorghum inter-annual average price volatility (%)
 Source: Author compilation from [INS \(2010\)](#). All market annual average prices are in CFA per kilogram (FCFA kg⁻¹).

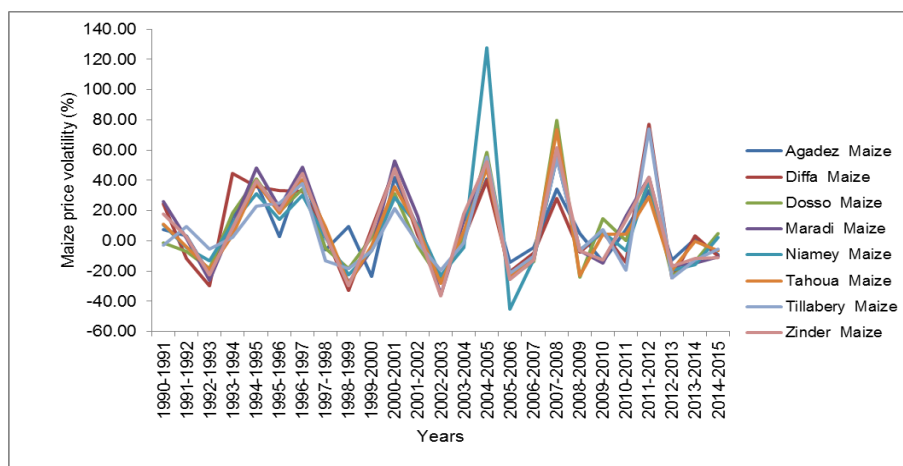


Figure 3. Maize inter-annual average price volatility (%)
 Source: Author compilation from [INS \(2016\)](#). All market annual average prices are in CFA per kilogram (FCFA kg⁻¹).

Figure 3 shows that maize price volatility has fluctuated too over the years in all regions. However, this fluctuation has been higher in 2004-2005 with a highest volatility of 127% in Niamey. More during the same year maize volatility has increased by 55.56% in Tillabery, 52.52% in Zinder and Diffa had a lowest price volatility of 40.12%. Additionally, the Figure shows also important price volatilities during the periods 2007-2008 and 2011-2012. Accordingly, during 2007-2008, maize price volatility increased by 79.56% in Dosso while during 2011-2012 maize price volatility was 76.84% in Diffa.

3.1.4. Cowpea inter-annual average price's volatility

Cowpea inter annual price volatility is showed on Figure 4 as followed. In general cowpea

price has fluctuated following almost the same trend. However, during 1995-1996 this price volatility has been 182.89% in Zinder, 138.14% in Maradi, 113.08% in Diffa and Dosso has the lowest price volatility of 60.69%. More during 2011-2012 the price volatility of cowpea were increased with 149.31% in Tillabery, 139.25% in Maradi, 123.79% in Niamey, 118.60% in Tahoua while the lowest volatility of 63.27% occurred in Diffa.

3.2. Self-Sufficiency Ratio (SSR)

To get a more pragmatic understanding of the country overall self-sufficiency based on its domestic food production during 1990-2015, the Figure 5 is depicted. The self-sufficiency of the country for three main foodstuffs (Millet, Sorghum, Cowpea) has almost same trend during the periods 1990-2015 except for maize.

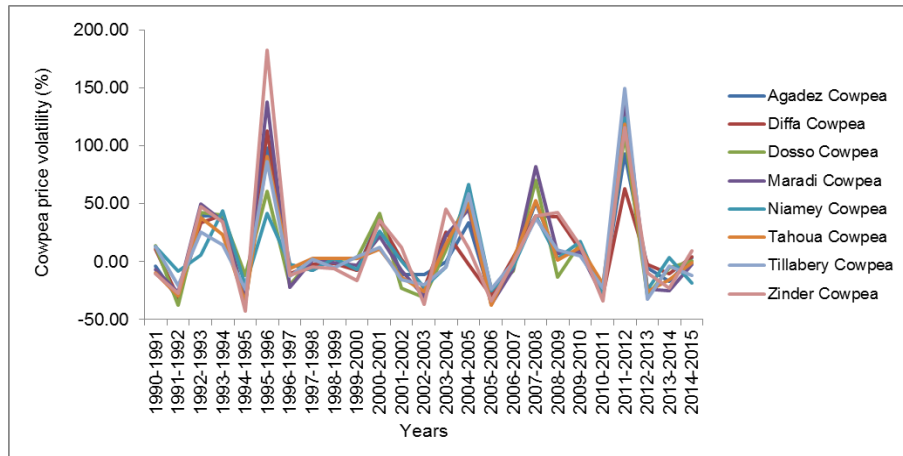


Figure 4. Cowpea inter-annual average price volatility (%)
 Source: Author compilation from [INS \(2015\)](#). All market annual average prices are in CFA per kilogram (FCFA kg⁻¹).

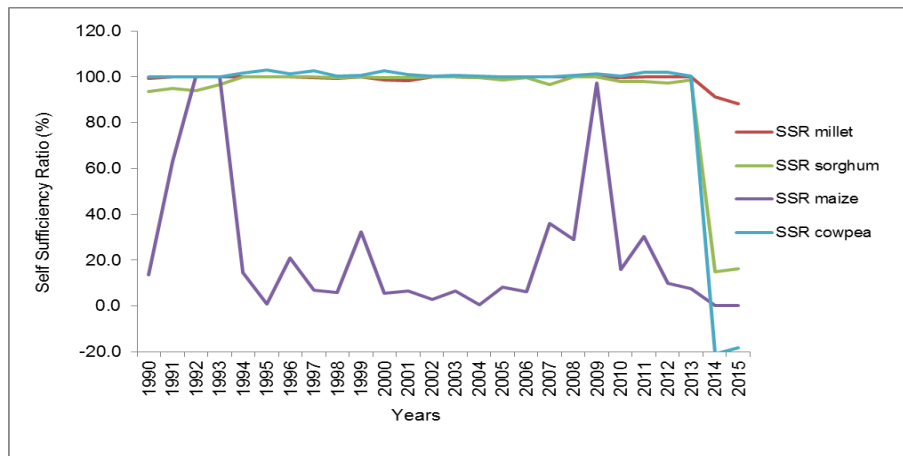


Figure 5. Self-Sufficiency Ratio in percentage
 Source: Author compilation from [INS \(2016\)](#) and [FAOSTAT \(2015\)](#). All import and national production quantities are in tons.

Therefore the figure 7 shows that the domestic resources can fully satisfy the country demand for millet, sorghum and cowpea from 1990 to 2014 where the self sufficiency has decreased dramatically. However, Niger domestic resource capacity for maize is very low except during the years 1992 and 2009 when the self-sufficiency ratios reach respectively 100% and 97.4%. Furthermore the insufficient capacity for producing Maize can be explained by unfavorable soil and climate conditions so that [Lobell et al. \(2011\)](#) highlight in the dry lowlands of Niger the temperature above 30°C could decrease maize yields.

3.3. Import Dependency Ratio (IDR) by product

To estimate the country, inter annual reliance on trade to satisfy its national demand for main

foodstuffs. Figure 6 has been illustrated as followed. Figure 6 shows that Niger presents a weak reliance on trade to satisfy its own need for three main foodstuffs (millet, sorghum, cowpea) but the country relies strongly on trade to satisfy its national demand of maize during 1990-2015 except in 1992 (0%) and in 2009 (2.6%).

3.4. National main foodstuffs SSR and IDR

The country overall Self-Sufficiency and Import Dependency *main foodstuffs in all regions* is represented in Figure 7. The figure 7 shows that during 1990-2015, the country main foodstuffs' demand could be fulfilled by the domestic resource capacity of production for millet, sorghum and cowpea. However, its domestic maize consumption remains depend to import.

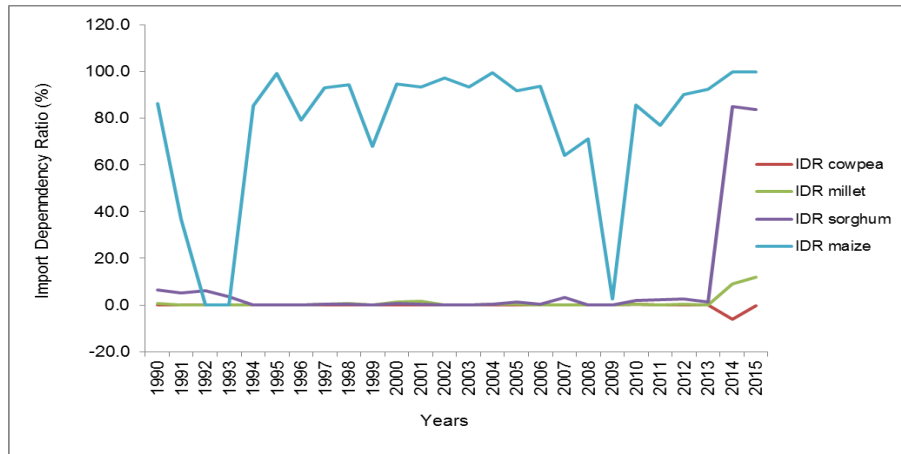


Figure 6. Import Dependency Ratio (IDR) in percentage
 Source: Author compilation from [INS \(2016\)](#) and [FAOSTAT \(2015\)](#). All import and national quantities production are in tonnes

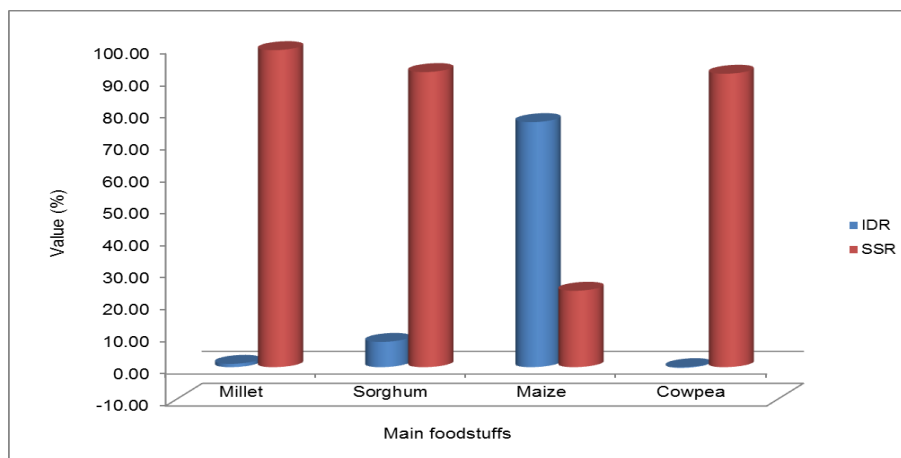


Figure 7. National main foodstuffs SSR and IDR
 Source: Author compilation from [INS \(2016\)](#) and [FAOSTAT \(2015\)](#). All main foodstuffs quantities are in tons

4. Conclusion

Clapp (2017) highlighted that most SSR analyses focus on significant staple, such as cereals and starchy roots to evaluate approximately the country self-sufficiency. Accordingly, the country self-sufficiency ratios of 100.4%-93.6% during 1990-2015s except for maize reveal that domestic resources can satisfy the national demand for these three main foodstuffs (millet, sorghum and cowpea). However, Asche et al. (2015) underscore that even self-sufficiency can be achieved by one importer or exporter country most of net food importer countries are not certainly self-sufficient. In addition, FAO (2012) underlines that a country is considered self-sufficient if the food is available, accessible, nutritious and stable through other three dimensions. On another hand Clapp (2017) emphasizes that in

some countries a high rate of poverty can an obstacle for many consumers to access to the food on the markets. Besides, Byerlee et al. (2006), Gilbert and Morgan (2010), Michiels et al. (2012) underscore that the increase of the prices of cereals reduce the access of the poor to food which is currently expected from the market. Therefore, in Niger the high inter-annual price volatility of the main foodstuffs could significantly reduce the consumers' purchasing power of these products on the markets. Otherwise the price of the main foodstuffs during the country's recurrent food crises and famine (1990-1991; 1993-1994; 2004-2005; 2009-2010) didn't show high volatility from 1990-2015 for the evaluated main foodstuffs except for maize (127%) in 2005 in the region of Niamey. Hence the high inter-annual price volatility observed is not associated to the periods of famine and food

crisis. The findings of the study revealed the capacity of Niger domestic resources to satisfy the national demand for main foodstuffs except for maize. However, the lack of reliable regulatory tools and measures in the country national agricultural trade policy framework undermines the marketing price in all the regions. This corroborates with Weiner (2002) who emphasizes that traders could create information's asymmetry, supply or demand shock by generalizing past trends of market-price rather than the market actual price. Consequently, Niger should review its existing agricultural trade policy tools and measures to improve the access of the population to the main foodstuffs by executing some standard regulatory measures and tools admitted in trade such as, temporary export bans, import quota, anti-speculation and suitable instruments to monitor price volatility.

References

- Anonymous, (2003). Niger trade policy review. https://www.wto.org/english/tratop_e/tp217_e.htm. Date accessed: May 11, 2018.
- Anonymous, (2017). Enquête nationale sur la vulnérabilité a l'insécurité alimentaire des ménages en milieu rural au Niger. http://www.stat-niger.org/statistique/file/Vulnerabilite/RESULTATS_PRELIMINAIRES_EVIAM_2017.pdf. Date accessed: October 29, 2018.
- Asche, F., Bellemare, M., Roheim, C., Smith, M.D., & Tveteras, S. (2015). Fair enough? Food security and the international trade of seafood. *World Development*, 67:151-160.
- Asfaw, S., & Lipper, L. (2015). Adaptation to climate change and its impacts on food security: Evidence from Niger. *International Conference of Agricultural Economists 29th*, Milan, Italy.
- Byerlee, D., Jayne, T.S., & Myers, R.J. (2006). Managing food price risks and instability in a liberalizing market environment: Overview and policy options. *Food Policy*, 31(4):275-287.
- Clapp, J. (1997). Adjustment and agriculture in Africa. pp: 12-35. New York: St. Martin's Press.
- Clapp, J. (2017). Food self-sufficiency: Making sense of it, and when it makes sense. *Food Policy*, 66(2017):88-96.
- De La Renaudie, V., & Martin, O. (2008). Souveraineté alimentaire : un agenda pour agir, Bruxelles : CNC, CSA, Oxfam-Sol, SOS Faim, pp: 42-27.
- FAO (2012). FAO Statistical Pocketbook 2012. <http://www.fao.org/3/i2493e/i2493e00.htm>.
- FAOSTAT 2015. Food and Agriculture Data Network, "Commodity Balances and Crop for All Data", <http://www.fao.org/faostat/en/#home> and <http://www.fao.org/faostat/en/?#data/QC>.
- Gilbert, C., & Morgan W. (2010). Food price volatility, *Philosophical Transactions of the Royal Society B*, 365:3023-3034.
- IMF, O., & UNCTAD, W. (2011). Price volatility in food and agricultural markets: Policy responses. Food and Agricultural Organization, 1-10. https://www.alimenterre.org/system/files/ressources/pdf/86_g20_foodpricevolatility_en.pdf Date accessed: August 09, 2018.
- INS (2010). Annuaire statistique des cinquante ans d'indépendance du Niger. pp: 177-178, Edition Spéciale INS-Niger http://www.stat-niger.org/statistique/file/Vulnerabilite/Rapport_vulnerabilite_2010.pdf. Date accessed February 18, 2019.
- INS (2016). Le Niger en chiffres http://www.stat-niger.org/statistique/file/Affiches_Depliant/NigerEnChiffres2016.pdf. Date accessed: May 26, 2018.
- INS (2018). Comptes économiques de la nation, rapides 2017 provisoires 2016 définitifs 2013 – 2015. http://www.stat-niger.org/statistique/file/compte/COMPTE_RAPIDES_2017.pdf. Date accessed: October 30, 2018.
- Kandji, S.T., Verchot, L., & Meckensen, J. (2006). Climate change and variability in the Sahel Region: Impacts and adaptation strategies in the agricultural sector. <http://www.worldagroforestry.org/downloads/Publications/PDFS/B14549.pdf>
- Lobell, D.B., Bänziger, M., Magorokosho, C., & Vivek, B. (2011). Nonlinear heat effects on African maize as evidenced by historical yield trials. *Nature climate change*, 1(1):42.
- Matthews, A. (2010). Perspectives on addressing market instability and income risk for farmers. http://www.agripress.nl/_STUDIOEMMA_UPLOADS/downloads/201_paper.pdf.
- Michiels, D., Egg, J., & Blein, R. (2012). La répétition des crises alimentaires et nutritionnelles au Niger: la rénovation urgente des politiques de sécurité alimentaire. *Cahiers agricultures*, 21(5):302-310.
- OCHA (2015). Bulletin humanitaire Niger. <https://reliefweb.int/sites/reliefweb.int/files/resources/OCHA%20Niger%20Bulletin%20Humanitaire%20Janvier%202016.pdf>. Date accessed February 18, 2019.
- Rakotoarisoa, M., Lafrate, M., & Paschali, M. (2011). Why has Africa become a net food importer? Explaining Africa agricultural and food trade deficits. pp: 5-11, FAO. Rome.
- Swinnen, J., & Squicciarini, P. (2012). Mixed messages on prices and food security. *Science*, 335 (6067):405-406.
- Weiner, R.J. (2002). Sheep in wolves' clothing? Speculators and price volatility in petroleum futures. *The Quarterly Review of Economics and Finance*, 42(2):391-400.