Impact of the West Africa-EU Economic Partnership Agreement on cereals

Jacques Berthelot (jacques.berthelot4@wanadoo.fr),

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PLAN

Summary

If the majority of West Africa's (WA) agricultural products were excluded from liberalization in the almost finalized EPA (Economic Partnership Agreement) with the EU, milk powder and cereals except rice would be liberalized, their already minimal tariff of 5% dropping to zero as of January 1 of the year 6.

Reducing to zero the customs duty (CD) on cereals, mainly wheat, would jump the share of EU exports to ECOWAS (88% coming from France), which has averaged 22% of ECOWAS imports from 2010 to 2013, because Nigeria, which makes ¾ of the total wheat imports value of ECOWAS, mainly from the US, is already planning to source them in the EU, given the depreciation of the euro to the dollar. This reduction to zero of CDs on wheat would result in a minimal loss of €28.4 million (M) in customs revenues from the start in the 6th year, which could reach €179 M in 2030 because of the potential increase in wheat imports due to the sharp rise in WA population and if the wheat consumption per capita observed from 2000-02 to 2010-12 would continue at the same pace.

Reducing the CD on wheat from 5% to 0% would not be anachronistic since the vast majority of WTO member countries import wheat at 0%. But China and India, which are the 2nd and 3rd world producers, have applied tariffs of 60% and 50%. Japan, 6th importer, has a CD of

468 €/t and Norway of 250 €/t. If the EU, which is the leading producer, has reduced to 0% its wheat CD in recent years, following the sharp rise in world prices to avoid penalizing cattle farmers, it will return to its normal duties if the recent decline in world prices persists, which is 95 €/t for wheat of medium and low quality.

But it is almost sure that the long-term world price of wheat will rise as yields have reached a plateau in major exporting countries and as demand will increase in line with the population, especially among the main importers of North Africa and West Asia, which have more purchasing power than Sub-Saharan Africa (SSA) and whose climate does not allow to promote tropical cereals and tubers. Indeed the potential increase of WA wheat imports, which would reach 47 million tonnes (Mt) in 2050 by extending the trends of 2000-02 to 2010-12, would be impossible to finance and would greatly reduce the production of local cereals, roots and tubers, and the corresponding jobs.

WA must learn the lessons of the pricing policy on wheat of South Africa, the Andean countries, Kenya and the EU.

South Africa uses a variable levy (VL) on wheat, as well as the EU on high quality wheat, from a "national reference price" and includes a safeguard measure of 10.27% to neutralize the impact of subsidies in exporting countries. Similarly, the Andean countries use a system of "price bands" close to VL, one of the objectives being also to offset the subsidies of exporting countries. Kenya has also applied a VL until 2000, at an ad valorem equivalent of 50%. Then Kenya adopted the Common External Tariff of 35% on wheat of the Eastern Africa Community, before lowering the CD at 10% in 2010 because of soaring world prices.

The EU subsidies to its cereals exports to WA increased from €186.3 M in 2012 to €208.6 M in 2013 but slowed down to €198.1 M in 2014. Therefore ECOWAS should add to its CD on cereals imported from the EU a countervailing duty which, for 2014, would have been of 66.75 €/t which, related to the CIF price of about 265 €/t in WA, would have represented an ad valorem equivalent CD of 25%.

Despite the importance of imports of wheat and rice, 81% of the calories and 78% of the protein consumed in WA in 2011 were sourced from WA cereals, tubers and roots.

The production of WA cereals (excluding rice) rose by 2.70% a year, the same rate as the population, from 2000-02 to 2010-12. But there exists a strong potential for higher yields, provided that the products are effectively protected from the dumping of exporting countries. The consumption of local cereals per capita (excluding rice) could more than double, from 116 kg in 2011-13 to 246 kg in 2050, with a significant part to feed livestock. And WA production of tubers and roots grew faster, 3.6% a year, and significant increases in cassava yield exist when compared to Indonesia or Thailand.

WA has the most favorable conditions to rebuild existing agricultural production systems on agro-ecology in every sense of the concept: that of agricultural production practices as of all factors of a socially and environmentally sustainable development and of food consumption patterns. In any case WA has no choice because, despite the pressures of international agribusiness corporations to impose "modern" farms of a large size and very inputs intensive, they have little chance to materialize in the long run, despite the provision by governments of land confiscated from the village communities. The World Bank has demonstrated the higher competitiveness of family farms than that of large "modern" farms for the cost of production,

let alone to absorb employment in rural areas while the rural population of WA would increase by 1% per year from 2010 to 2050.

Since WA has a significant potential to produce food crops able to feed its growing population, it is essential to quickly improve processing technologies for local cereals, tubers and roots to facilitate their consumption while making significant savings to consumers in relation to products processed from imported wheat. Latin America offers very interesting models of processed maize and cassava, beyond the incorporation of local cereals and other starchy products in bread, cakes, biscuits and pasta, which is being developed in Senegal, although these new products imply to continue importing a lot of wheat.

WA consumers should imitate Mexicans whose consumption of 90 kilos of "nixtamalised" maize tortillas (prepared with calcium hydroxide) per capita remains 2.7 times higher than bread consumption although Mexico produces wheat. FAO recommends the consumption of such tortillas because of their nutritional value, being rich in calcium, magnesium, potassium, phosphorus, niacin and fiber. A kg of maize gives about 1.8 kg of nixtamal dough that gives 1.4 kg of tortillas or 42 tortillas of 33.3 g.

To assess the possible competitiveness of WA maize tortillas in order to promote their production, we have compared the prices of wheat bread and maize (not maize flour because tortillas are prepared from the grain). At WA level the price of a kg of bread turns out to be in April 2015 at least 3 times the wholesale price (per 100 kg) of maize.

The document outlines the estimated operating account of a small producer of tortillas on the basis of a modest daily production of 6 kg of tortillas per woman, for a limited investment of 125,000 CFAF (€190) to generate a monthly income of 41,000 FCFA, buying maize at 150 CFAF per kg and selling tortillas at 500 CFAF per kg, a price lower 25% to 33% than the price per kg of "baguettes". However with a sale price of 600 CFAF – which would still be 15% to 25% lower than the price of bread – the monthly income would rise to 57,480 CFAF.

Brazil is also rich in cassava processing technologies. Thus in the Nordeste "tapioqueiras" are similar to Italian pizzerias or Mexican "tortilleras", apart from the fact that the basic pancake – on which we add sweet or savory fillings – is 100% cassava instead of being 100% durum wheat or maize.

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If the majority of WA agricultural products would be excluded from liberalization under the Economic Partnership Agreement (EPA) with the EU, two major products for food security and the long-term future of regional production, have not excluded: milk powder dairy and cereals excluding rice, their already very low customs duty (CD), at 5% ad valorem, falling to zero from January 1 of the 6th year, that is to say from the beginning of the opening of the WA market to EU exports. The present document will focus only on cereals excluding rice.

Even if rice is excluded from liberalization its CD is itself very low (10%) and therefore keeps the possibility to be increased, along the example of the Eastern Africa Community (EAC), so as to reduce its uncontrolled rise in imports. Besides the EU exports virtually no rice to WA (802 tonnes in 2014) even if it exported 308,000 tonnes (t) in 2014 but remained a net importer of 1.330 million tonnes (Mt). We know that, if significant funding were available, particularly in Mali, WA could be largely self-sufficient in rice in the long run.

1 – Origin of wheat imports in West Africa

Reducing to zero the CD on cereal imports, mainly wheat, would hike ECOWAS imports from the EU, which has averaged 22% from 2010 to 2013 in euros[1]. These wheat imports from the EU were mainly due to Francophone countries (WAEMU, West African Economic and Monetary Union) as Nigeria, which accounted for 74.4% of total wheat imports (in euros) of ECOWAS on average from 2010 to 2013, sourced only 3.7% of its imports in euros and 5.3% in tonnage from the EU, while its share of imports from the United States (US) was on average, from 2010 to 2012, of 65% in euros and 81% in tonnage. But the Nigerian Minister of Agriculture said on 25 March 2015 that his country could change of supplier if the depreciation of the euro vis-à-vis the dollar continues, given that the naira has lost 28% of its value in November 2014 to the dollar and that its oil revenues have collapsed with the fall of crude prices[2]. Nigeria would also like to reduce its dependence on wheat imports and tried to promote the incorporation of cassava in bread but without much success, largely due to lack of technical expertise. For Ghana 20% of its wheat imports came from the EU on average between 2010 and 2013 (in tonnes). To the contrary 76.6% of Senegal wheat imports came from the EU on average from 2010 to 2013 (361,000 t out of 471,000 t); and 95% of the Ivory Coast (IC) imports (490,000 t out of 518, 000 t); as well as 87.9% of Mali imports (154,650 t out of 176,000 t) from 2010 to 2012; and 67.8% of those of Burkina Faso from 2010 to 2014 (47,100 t out of 70,000 t). The EU28 total wheat exports to WA rose from 1 Mt in 2000 to 2.1 Mt in 2014.

France has obviously everything to lose at first if WA would increase its CD on wheat since it has made 88% on average of the EU28 exports to WA from 2000 to 2014, in quantity (1.034 Mt out of 1.178 Mt) as in value (€338 M out of €373 M), French exports having increased by 6.36% per year in volume against 6.54% for the EU28 (Table 1). Similarly France made 64.3% of the EU28 flour exports to WA, even though the tonnage fell sharply from 2000 to 2014. The decrease of 5% to 0% of the wheat CD in the EPA and the non-liberalization of the CD of 20% on flour, was obviously promoted by the large mills ("Grands Moulins"), including those of Dakar and Abidjan (and Chad) of their French owner Jean-Claude Mimran. However the reduction at 0% of the CD on wheat is unlikely to reduce the price of bread, the more so as the price of wheat should increase over time.

Table 1 – The EU28 and France exports of wheat and flour to West Africa: 2000-14

1000 t	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Wheat															
EU28	690	817	932	1056	634	1029	1291	921	962	1417	1606	1246	1595	1694	1784
France	638	676	807	854	584	984	1131	893	868	1072	1442	1173	1363	1416	1608
France/EU	92,5%	82,7%	86,6%	80,9%	92,1%	95,6%	87,6%	97%	90,2%	75,7%	89,8%	94,1%	85,5%	83,6%	90,1%
Wheat flour															
EU28	321	263	293	272	222	244	156	122	149	114	156	120	98	44	44
France	242	179	170	183	134	130	86	82	118	71	93	63	70	33	30
France/EU	75,4%	68,1%	58%	67,3%	60,4%	53,3%	55,1%	67,2%	79,2%	62,3%	59,6%	52,5%	71,4%	75%	68,2%

Source: Eurostat

Still, the drop of the CD from 5% to 0% would not be negligible in losses of custom revenues given than WA imported from the EU on average 2.038 Mt of wheat in 2013 and 2014 at an

[1] As the FAOSTAT trade data were only available up to 2011 and do not allow to identify the trade partner we have used the TradeMap data but which are available in quantity only for bilateral trade between individual countries and not between regional entities such as the EU or ECOWAS. We must then rely only on data in euros. And data are not available for all countries up to 2014.

[2] http://www.agpb.fr/cotations-a-depeches/depeches-du-jour?start=45

average EU FOB[3] price 224.1 €/t. However, as seen below in table 9, the difference between the EU FOB price and the WA CIF price is of about 55 €/t, going from a low 30 €/t in Senegal to a high 85 €/t on average in Mali and Burkina Faso, through 55 €/t in the Gulf of Guinea countries. Based on an average WA CIF price of 279 €/t, the €28.4 M of CDs of 5% on wheat imports from the EU on average from 2013 to 2014 will be lost if the EPA is implemented and it will be at least one-third more (€37.9 M) due to the diversion of traffic. Actually it will be much more important if Nigeria would imports in the future from the EU is 2.962 Mt of wheat it has imported from the US in 2013 against 299,348 t only from the EU, corresponding to an additional loss of €43.5 M in CDs. In fact the loss of CD will be higher because the VAT (value added tax) levied on imports is based on the CIF price + CDs.

In reality the loss will be much greater in the future as wheat imports could be multiplied by 3 by 2030, taking into account not only the population growth but also the annual 2.82% rise of per capita wheat consumption observed from 2000-02 to 2010-12 (table 4 below), wheat imports from all origins jumping from 5.979 Mt to 17.145 Mt. Assuming that ¾ of WA imports would come from the EU in 2030, or 12.859 Mt, the loss of 5% of CDs, based on the CIF price of wheat in 2013 (279 €/t) would reach €179 M. This amount would exceed the €164 M of the GSP (Generalized System of Preferences) CDs that Ivory Coast (IC), Ghana and Nigeria would pay each year to the EU on the basis of their exports in 2014 is the EPA is not implemented.

2 – The vast majority of countries have a zero tariff on wheat but not major producers and consumers

At first sight, reducing the CD on wheat from 5% to 0% would not be anachronistic since the vast majority of the WTO Member Countries, those for whom the information is available, import wheat at a zero CD, as shown in table 12 in the Appendix. Yet China and India, which are the 2nd and 3rd world producers, have applied tariffs among the highest (60% and 50%). Japan, 6th importer, has a prohibitive CD of around 468 €/t and Norway, a small country, a CD of 250 €/t. If the EU is the leading producer, it has reduced to 0% its CD on wheat in recent years following the sharp rise in world prices to avoid penalizing farmers who use a lot of feed wheat, but it will surely return to the normal level if the recent decline in the world price persists, that is at 95 €/t for wheat of medium and low quality, beyond a tariff quota of 3 Mt (including 572,000 t for the US and 38,353 t for Canada, the rest for other third countries) with a CD limited at 12 €/t.

3 – The price of wheat will only increase in the long term

Yet there are good reasons not to follow the majority of countries in the long term perspective of the population explosion expected in Sub-Saharan Africa (SSA), from 924 M in 2014 to 2.074 billion in 2050, including from 340 M to 815 M in WA.

The first reason is that the world price of basic cereals – wheat, rice, maize – will surely increase in the medium and long terms because, as shown by agronomists of the University of Nebraska in an article of the journal Nature of 2013, the yields of these cereals, especially wheat and rice, have reached a plateau in the last 10 to 20 years in countries non-limited by the level of inputs (seeds, irrigation, fertilizers, pesticides) and which are the world's leading

[3] The FOB (free on board) price is the price of a good taken on board of a cargo (airplane, train, truck) before export. It is the opposite of the CIF (cost-insurances-freight) price of the good still on board upon arrival in the importing country before customs clearance.

exporters[4]. Faostat data on some EU15 countries confirm this plateau from 1996-98 to 2011-13 in the countries of northern EU15 (Netherlands, UK, Germany, France) although the yields increased by 19% in Italy and Spain. We should obviously refine the analysis by distinguishing soft wheat and durum wheat, which is not possible on Faostat and Eurostat does not give all the yields up to 2013.

In this context of a sharp rise in world prices of wheat in the long run, the main importers will be the countries of North Africa and the oil-producing countries of West Asia (Middle East including Iran), not only because they will have more purchasing power than the SSA but also because their dry climate and low irrigation capacity do not allow them to promote the production of roots and tubers as in SSA, of which in WA.

Table 2 - Evolution of the wheat yield in the EU15 from 1996-98 to 2011-13

Kg/ha	1996-98	1999-01	2002-04	2005-07	2008-10	2011-13	11-13/96-98
Netherlands	8129	8212	8491	8086	8977	8362	102,9%
United Kingdom	7693	7713	7852	7741	7962	7262	94,4%
Germany	7255	7569	7192	7209	7736	7449	102,7%
France	7121	6992	7091	6661	6997	7011	98,5%
Italy	3251	3086	3181	3593	3732	3892	119,7%
Spain	2698	2500	3007	2738	3003	3224	119,5%

Source: Faostat

Taking the average of 3 years to cushion the inter-annual variations due to climate vagaries and since Faostat's trade data are not available for 2013, table 3 below shows that net imports of wheat increased 2.4 times faster than production from 2000-02 to 2010-12 for the 3 regions of Northern Africa, SSA and West Asia + Iran. The increase has been three times faster for SSA but a comparison is not relevant for WA since production is very small and highly fluctuating because incompatible with a climate without a cool season.

Adding to net imports of wheat those of wheat flour in wheat equivalent, the WA net imported tonnage was higher than that of rice from 2009 to 2011 (6.414 Mt against 5.994 Mt) although it was lower from 2010 to 2012 (6.505 Mt against 7.010 Mt) as net rice imports surged in 2012 to 1.4 Mt against 0.6 Mt for wheat and flour. But net imports of wheat are much higher than those of rice once added the wheat equivalent of more processed products such as pasta, couscous, cookies and pastries.

Table 3 - Production and net imports of wheat from Africa and West Asia: 2000-13

1000 t	2000-02	2010-12	2013	TC 2000-02/2010-12	2010-12/2000-02	2013/2000-02
Wheat production						
Northern Africa	11 774	17 729	21 134	4,18%	+50,6%	+ 79,5%
SSA	4 678	5 994	7 152	2,51%	+28,1%	+52,9%
West Asia+Iran	39 820	43 652	46 857	0,92%	+9,6%	+17,7%
Total	56 272	67 375	75 139	1,82%	+ 19,7%	+33,5%
Western Africa	73	166	116	8,56%	+ 127,3%	+58,9%
Net imports of wheat						
Northern Africa	16 537	24 790		4,13%	+43,8%	
SSA	7 182	14 830		7,52%	+98,3%	
West Asia+Iran	15 642	21 080		3,03%	+26,2%	
Total	39 361	60 700		4,43%	+46,7%	
Western Africa	3 467	5 979		5,60%	+68,7%	

[4] Patricio Grassini, Kent M. Eskridge & Kenneth G. Cassman, *Distinguishing between yield advances and yield plateaus in historical crop production trends*, Nature, 17 December 2013, http://www.nature.com/ncomms/2013/131217/ncomms3918/pdf/ncomms3918.pdf

Source: Faostat

The outlook for wheat consumption – equal to production plus net imports of wheat (it does not include flour as these imports are weak and tend to fall), and in fact net imports for WA given the insignificant level of production – is to be compared according to the fact that per capita consumption will stabilize at the 2010-12 level, or will continue to increase by 2.82% per year as it did from 2000-02 to 2010-12, from 14.44 kg to 19.07 kg (table 4). In the first case imports would increase in line with the population from 5.979 Mt in 2010-12 to 15.912 Mt in 2050. In the second case per capita consumption would increase per year from 19.07 kg in 2010-12 to 58 kg in 2050 and imports would jump from 5.979 Mt to 47.244 Mt, or by 5.30% on average per year. Since it is virtually certain that wheat production will not follow world demand, its world price will increase in the long run as well as would the WA import bill. This would pose enormous problems of financing and greatly reduce local grain production and related jobs needed both at the production level as upstream and especially downstream production levels.

Table 4 – WA wheat Imports from 2010 to 2050 according to per capita consumption

1000 inhabitants, 1000 tonnes	2000-02	2010-12	2020	2030	2040	2050	TC 2010-50
Population	240022	313539	399562	515626	655453	814552	11,53%
GR of population in decades		2,70%	2,73%	2,58%	2,43%	2,20%	2,49%
Import au TC de la population		5979	7804	10068	12800	15912	15991
Hausse conso/hb de 2,82%/an	14,44	19,07	25,18	33,25	43,91	58,00	2,32%
Imports avec TC conso/hb		5979	10061	17145	28781	47244	5,30%

GR: annual growth rate during each decade

4 – The lessons of the customs duties on wheat in South Africa, Andean countries, Kenya and the EU

To what extent is it necessary to increase protection on wheat imports in SSA? The answer depends on whether climate conditions permit some countries to increase production and on the extent to which others or the same will promote the consumption of substitutable products to wheat: tropical dry cereals (millet, sorghum, maize, fonio) and roots, tubers and plantains. Only this alternative is open to WA. But we can also learn from the policy followed in South Africa, Andean countries, Kenya and the EU.

4.1 – The customs duties on wheat in South Africa

In South Africa, wheat is the second most important crop after maize but production fell by 13% from 1994-96 to 2011-13 although the yield has doubled since the area fell by 54% and is expected to decline by 10% more from 2013-14 (505,500 ha) to 2015-16 (450,000 ha)[5]. As consumption is increasing the gap between imports and production continues to widen: 1.9 Mt of imports for 1,665 Mt of expected production in 2015-16 against 1.8 Mt of imports and 1.775 Mt of production in 2014-15. Actually wheat consumption is relatively substitutable to maize based on their relative prices, corn being cheaper in general, and the country does not produce rice.

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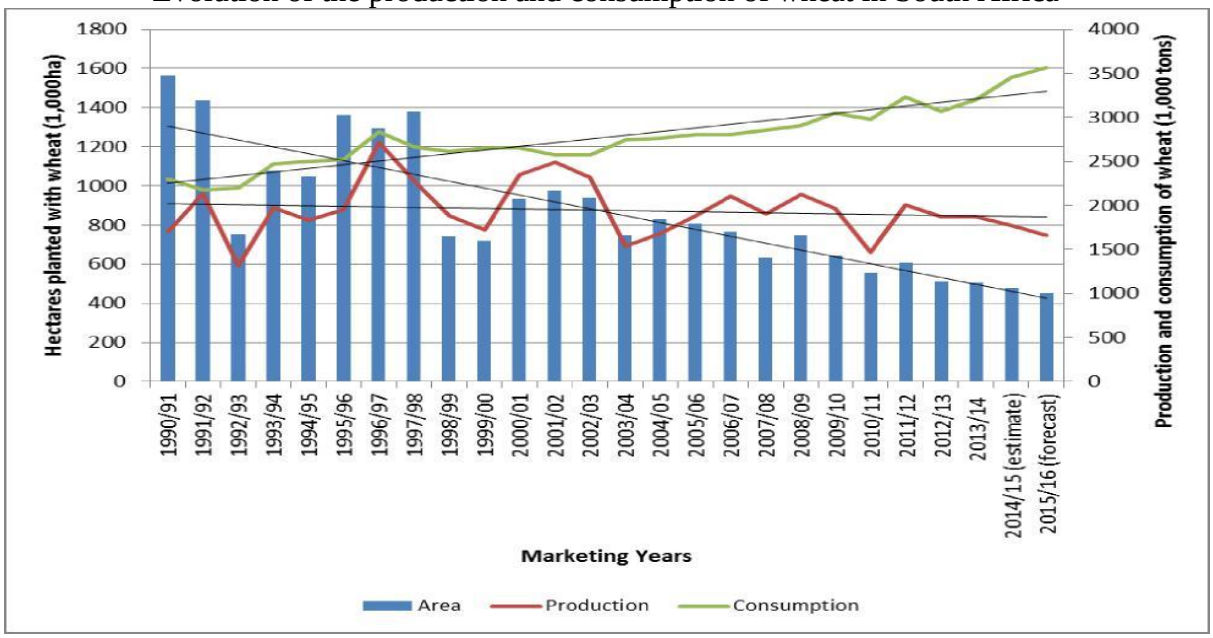
http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Pretoria_South%20Africa%20-%20Republic%20of_3-17-2015.pdf

What is very interesting in the example of South Africa is that its wheat CD is a variable levy (as for maize[6] and sugar), as is the case for the EU cereals with the exception of wheat of medium and low quality and barley where CDs are fixed specific duties (95 €/t and 93 €/t respectively). In fact South Africa actually handles also the CET (Common External Tariff) of SACU (Southern African Customs Union) which, apart from South Africa, includes Botswana, Lesotho, Namibia and Swaziland (grouped under the name BNLS), Namibia being the only other member of SACU to produce wheat but covering only 20% of its needs.

Evolution of the production and consumption of wheat in South Africa



Although variable levies are strictly prohibited by Article 4 of the WTO Agreement on Agriculture (AoA), the EU had notified them to the GATT in 1993, at the end of the Uruguay Round, on cereals and some fresh fruits and vegetables, which went unnoticed by the other Members ("contracting parties") of the era and are therefore legal vis-à-vis the WTO. The wheat CD in South Africa (and in the SACU CET) is the difference between the average of the last 3 weeks FOB price, Gulf of Mexico, of the US Hard Red Winter (HRW) wheat No. 2 and the "national reference price" fixed at 215 $/t since 17 May 2010[7] (it was at 157 $/t from 2000-01 to 2004-05[8]). The national reference price is the difference between the price of the US HRW No. 2 US FOB Gulf of Mexico of the last 5 years (2005-06 to 2009-10), which was of 236 $/t, plus a safeguard measure of 10, 27% to offset the "Producer Support Estimate" (PSE) of the EU agricultural sector to neutralize the impact of subsidies to wheat exports, less the average cost of freight of 45 $/t over the past 5 years between the Gulf of Mexico and a South African Port: national reference price = world price (FOB US) + distortion (10.27%) - transport costs between the South Africa's CIF price and the US FOB price, or 215 $ = 236 $ + 24 $ - 45 $.

However, since the US FOB price in recent years (2010-11 to 2014-15) was above the national reference price the CD was negative, hence of 0%. This is why South Africa decided in 2013 to raise the national reference price from 215 $/t to 294 $/t, or by 36.7%, allowing a positive CD when the price of the US HRW N° 2 wheat FOB Gulf of the last 3 weeks (plus

[6] http://www.tips.org.za/files/Poverty_and_Maize_Final_Document.pdf
[7] http://www.grainsa.co.za/adjustment-of-the-wheat-import-tariff-and-the-effect-on-the-local-market
[8] http://landbou.com/wp-content/uploads/2014/05/8a4498df-f5bc-459f-9e9d-0589c6e97425.pdf

the anti-subsidy levy less the freight cost) is lower than the new national reference price. Indeed, while the wheat CD remained at zero for many years the new national reference price combined with the recent drop in the FOB Gulf price has allowed an average positive CD of 5.3% of the CIF price in tariff equivalent for the soft wheat imported from October 2014 to February 2015[9]. Note that, although the calculation of the CD is based on the FOB price of US HRW wheat, it applies to all imported types of soft wheat whatever the country of origin, which in 2014 came mainly from Russia and Ukraine and to a lesser extent from Germany, or whatever the wheat protein content. With the new national reference price of 294 $/t, it was estimated that the producer prices would increase by 4% per year and the production by 2 to 3% per year[10]. If the FOB Gulf wheat price falls well below 294 $/t, as provided in the futures markets at least for the rest of 2015, the CD in "ad valorem equivalent" will increase more. The argument to raise the national reference price was that "*Low international wheat prices, caused by tariffs and subsidies in developed countries, have been blamed for causing financial difficulty for South African wheat producers. This could be one of the reasons why the wheat area planted over the past decade has decreased. Wheat production was seen as being uncompetitive at the low international wheat price rates*"[11].

WA could learn from this example of South Africa (and SACU) to rebuild its CET on variable levies, but with calculation methods that provide a higher safeguard than the current 5.3% in South Africa, actually insufficient to promote South Africa's wheat production, the more so as it is very intensive in inputs and suffers of increasing production costs while the US FOB price of wheat declines (from an average of 303 $/t in 2014 to 253 $/t on 15 April 2015). According to an agronomist of the University of Pretoria "*If the area planted remained unchanged for the past 20 years, the South African wheat industry would have been able to produce 5,83 million tons of wheat compared to the current 1,91 million tons*"[12], hence much greater than domestic consumption.

WA must also learn from South Africa that introduced in the national reference price a compensating element of the subsidy in the exporting countries even if one must question the reference made by ECOWAS to the OECD PSE indicator of the EU agricultural sector as a wheat subsidy indicator. First, because the PSE is not a reliable indicator of subsidy since, alongside government expenditure, it incorporates as a subsidy the "market price support" – difference between the domestic price and the agricultural world price at farm level – even though the world price of cereals is the US dumped price, being lower than its cost of production without subsidy. Indeed the US is the "price maker" of the world prices of cereals except rice. Taking into account the subsidies of the main wheat exporters to South Africa could have been more accurate but they are more difficult to assess. In this case in the $496,528 of wheat imports by South Africa in 2014 the US share was only 2.6% against 54.9% for Russia, 21.3% for the EU, 12.2% for Ukraine and 5.5% for Canada. For 2013 I have estimated the US export subsidies on wheat at 39.3 $/t[13] after an average of 48.5 $/t from 2010 to 2012. For WA it would be more appropriate to take into account the EU subsidy to wheat in the same proportion as the share of wheat imports coming from the EU, a share

[9] http://tradestats.thedti.gov.za/TableViewer/tableView.aspx;
http://tradestats.thedti.gov.za/TableViewer/downloadPrompt.aspx
[10] http://www.itac.org.za/upload/Import-tariffs-setting-for-agricultural-products-The-Star-23-May-2013.pdf
[11] http://www.grainsa.co.za/adjustment-of-the-wheat-import-tariff-and-the-effect-on-the-local-market
[12] http://www.grainsa.co.za/adjustment-of-the-wheat-import-tariff-and-the-effect-on-the-local-market
[13] *Why the US rejects the agricultural modalities of December 2008*, Solidarité, February 15, 2015, http://www.solidarite.asso.fr/Papers-2015

which will rise if the EPA would be implemented since the CD will fall from 5% to 0% from the 6th year, making imported cereals from the EU cheaper than from other origins.

4.2 – The customs duties on wheat in the Andean countries

Another reason to change the protection of wheat in WA – and of other basic foodstuffs – to rebuild it on variable levies (VLs), is the example of the Andean countries. Article 30 of the Free Trade Agreement (FTA) concluded in December 2012 between the EU and Colombia and Peru allows the two countries to maintain their system of "price band" for many agricultural products, but unfortunately not for wheat because their production is very low. Now this price band has the same effects as a VL, and the EU agreement to the Andean price band makes sense since Article 31 of the FTA provides that the EU will maintain his own VLs on fruits and vegetables (Article 31 does not mention the EU VL on wheat because Colombia and Peru do not protect wheat):
"*ARTICLE 30 Price Band System. Unless otherwise provided in this Agreement:*
(a) Colombia may apply the Andean Price Band System established in Decision 371 of the Andean Community and its modifications, or subsequent systems for agricultural goods covered by such Decision;
(b) Peru may apply the Price Band System established in the Supreme Decree 115-2001-EF and its modifications, or subsequent systems for agricultural goods covered by such Decree.
ARTICLE 31 System of Entry Prices
Unless otherwise provided in this Agreement, the EU Party may apply the Entry Price System established by Commission Regulation (EC) No 1580/2007 of 21 December 2007 laying down implementing rules of Council Regulations (EC) No 2200/96, (EC) No 2201/96 and (EC) No 1182/2007 in the fruit and vegetable sector and its modifications or subsequent systems"[14].

The price band system – the Agreement refers also to "prices stabilization mechanism" – applied in the 5 Andean countries since 1995, including Bolivia and Ecuador (Venezuela applied it also but has now joined Mercosur), includes both a fixed ad valorem component, established in December for the following year, and a variable component that is added to, or removed from, the reference price according to the level of world prices. One of the objectives of the system is to offset subsidies of exporting countries, beyond the purpose of stabilizing the entrance price. The minimum price (lower brand) corresponds in principle to the cost of production in the Andean Community. In the FTA with the EU this concerns 47 tariff lines in Peru and 81 lines in Colombia for which the fixed component will be phased out but not the variable component.

The funniest is that this information on price bands is quoted in a WTO Secretariat's document[15] even though the WTO prohibits VLs and minimum import prices, prohibition confirmed by the ruling of the WTO Appellate Body of 23 October 2002 which sentenced the price band system applied by Chile to imports of wheat and wheat flour from Argentina:
"(i) upholds the Panel's finding, in paragraphs 7.47 and 7.65 of the Panel Report, that Chile's price band system is a border measure that is similar to variable import levies and minimum

[14] http://trade.ec.europa.eu/doclib/docs/2011/march/tradoc_147704.pdf
[15] https://www.google.fr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=21&ved=0CCIQFjAAOBQ&url=https%3A%2F%2Fdocs.wto.org%2Fdol2fe%2FPages%2FFE_Search%2FDDFDocuments%2F129774%2Fq%2FWT%2FREG%2F333-1.pdf&ei=8KfDVIa6NYP4UNW6gogC&usg=AFQjCNF6xGRsjPh3lCMdTANEtD13Ih7OLg&sig2=Gy0VzUwoEQot5UbInn2VWA

import prices… (iii) upholds the Panel's finding, in paragraphs 7.102 and 8.1(a) of the Panel Report, that Chile's price band system is inconsistent with Article 4.2 of the Agreement on Agriculture"[16]. And, as Chile did not comply with the ruling, Argentina launched a new panel that has led to a new call from Chile and the Appellate Body has again condemned Chile on 20 April 2007. In the Andean countries this system protects particularly wheat, corn, rice, soybeans, pork, poultry cuts, milk powder and cheese. Note that the price band system was abolished on imports from the US in the FTA between the US and Colombia and Peru, as well as in the FTA with Canada, probably because, unlike the EU, US and Canada have no VLs on cereals and fruit and vegetables[17].

4.3 – The customs duties on wheat in Kenya and the Eastern Africa Community (EAC)

Wheat policy is also interesting to study in Kenya. One discovers that, contrary to the WTO database on applied tariffs and to table 12 in the annex below, Kenya's applied CD on wheat is not 0% but 10% even though it is 35% according to the Common External Tariff (CET) of the EAC but each Member State was free to modulate the CET in recent years due to high world prices (Tanzania has lowered its wheat CD to 0%). Wheat production in Kenya – which nevertheless increased by 2.70% annually from 1994-1997 to 2010-13 – represents only 22% of consumption which increased at an annual rate of 5%[18] and imports increased accordingly.

The customs procedure has evolved a lot since Kenya applied also a VL in 2000 for an ad valorem equivalent of about 50%. Then, in the COMESA (Common Market for Eastern and Southern Africa) – to which belong also three other EAC countries: Burundi, Rwanda and Uganda – Kenya adopted the CET of 35% for wheat and 60% for flour. Then, with the wheat price spike in 2007-08, Kenya reduced the CD from 35% to 25% and then to 10% in 2010[19]. However, since maize is more widely consumed by the majority of Kenyans, because cheaper, let alone in other EAC States that do not produce wheat (only Tanzania produces very little), it makes more sense to promote the consumption of maize or tubers and other starchy foods (plantains), enriching the range of their processed foods. The expected rise in the world price of wheat in the medium and long terms should confirm this change in diet and at least bring Kenya to produce rather than import for its wheat consumption.

4.4 – The customs duties on wheat in the EU and its subsidies to cereals exports

Variable levies (VLs) on the EU soft wheat of high quality, durum wheat, maize, rye and sorghum are calculated in a way close to those of South Africa[20], except that there is no levy added to offset the US subsidies to cereals: the VL is equal to the difference between the intervention price for cereals (101.31 €/t, which has not changed since 2001) multiplied by 1.55: a coefficient calculated then so that the US representative price delivered in Rotterdam remains lower than the domestic price delivered in Rotterdam of the remotest EU production

[16] https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=%28@Symbol=%20wt/ds207/ab/r*%20not%20rw*%29&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true#

[17] https://www.fas.org/sgp/crs/row/RL34470.pdf; http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=TAD/TC%282014%294&docLanguage=En

[18] http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Nairobi_Kenya_3-30-2015.pdf

[19] http://www.fao.org/3/a-at561e.pdf

[20] http://ec.europa.eu/agriculture/cereals/factsheet-cereals_en.pdf

areas given the transport costs to Rotterdam. This US representative price is that of high quality soft wheat, which is also used to calculate the VP of durum wheat and it is the US price of maize which is used to calculate the VL on maize, rye and sorghum. The US representative price is that of the Minneapolis Grain Exchange for high quality wheat and that of the Chicago Mercantile Exchange for maize. To these representative prices in Minneapolis and Chicago are added the freight to the Gulf of Mexico or Great Lakes port (Duluth) plus the freight to Rotterdam. The total is converted into euros at the exchange rate of the day of arrival in Rotterdam.

The EU subsidies to its cereals exports to West Africa from 2012 to 2014[21]

The EU repeats forcefully that it no longer subsidizes its cereals exports ("export refunds") since 2006 (and 2007 for those incorporated in processed products), but the exported cereals naturally enjoy the same domestic subsidies as those sold on the internal market or self-consumed on-farm for livestock feed. These domestic subsidies take now mainly the form of "decoupled" direct payments, which were included in the "Single Farm Payment" (SFP, also called the "Single Payment Scheme", SPS) in 2005 or 2006 and which have been transformed in 2015 for the new CAP in 4 types of decoupled aid: "Basic Payment Scheme" (BPS), green payment, redistributive payment and additional payments for young farmers, at least in France because the redistributive payment does not exist in most EU28 Member States.

Besides the direct payments to cereals, which constitute the bulk of EU subsidies, other subsidies are not negligible, which fall within the WTO "amber box" (concerning domestic "trade distorting" subsidies) even if some are notified unduly in the "green box" as supposedly not trade distorting and therefore allowed without limit. While export refunds and storage aid for cereals have disappeared since 2007, we must charge them a part of the non-product-specific subsidies of these two boxes for the share that represents the cereals production value in the production value of all agricultural goods. These other subsidies, largely under-notified to the WTO, concern mainly farm investments, marketing and promotion, agricultural fuels and irrigation. All these sub-notifications to the WTO appear when compared to those published by OECD[22], except for irrigation for which we rely on a specific report for Spain.

Table 5 summarizes the EU28 subsidies to cereals exports to WA from 2012 to 2014, based on previous estimates for the EU15 these three years[23].

Since the EU15 has achieved 95.9% of the EU28 cereals exports to WA in 2012, 90.9% in 2013 and 96.1% in 2014, we assume that the estimate of the total subsidy per tonne for the EU15 can be extended to the EU28.

To avoid overloading table 5 the FOB value of exports or the tonnage of exported products were not retyped but only the tonnage of cereals included in these products in accordance with an equivalent rate of cereals in the processed cereals. The dumping rate is the ratio

[21] This section summarizes the paper "*Reappraisal of the UE dumping on cereals to West Africa from 2006 to 2013*, May 28, 2015, http://www.solidarite.asso.fr/Papers-2015

[22] http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm#country

[23] *The EU dumping on cereals, dairy and meats in 2012, total and to ACP countries*, Solidarité, March 5, 2014, http://www.solidarite.asso.fr/Papers-2014?debut_documents_joints=30#pagination_documents_joints; *Les subventions de l'UE28 en 2013 aux exportations de céréales, viandes et produits laitiers extra-EU28, vers les pays ACP et l'Afrique de l'Ouest*, Solidarité, le 9 juillet 2014, http://www.solidarite.asso.fr/Articles-de-2014,684?debut_documents_joints=30#pagination_documents_joints; Detailed data for 2014 are not published but you can ask for them.

between the amount of subsidies and the FOB value of products and it is therefore all the more low that there are little cereals in the processed product. The most significant dumping rate is obviously that of the exported unprocessed cereals, which increased from 28.6% in 2012 to 30.7% in 2013 and 31.8% in 2014. However, as the subsidy per tonne fell sharply in 2014 (largely due to a bumper crop), while it increased from 2012 to 2013, total subsidies to cereals exported to WA rose from €186.3 million in 2012 to €208.6 million in 2013 and retreated to 198.1 million in 2014.

The tonnage of exported cereals includes, beyond those exported in their grain state, the cereals equivalent of those incorporated into processed products for which was estimated he rate of grain cereals. The dumping rates concern only the cereal component of the processed products.

The EU claims that the full decoupling of direct payments to cereals (as to other agricultural products) since 2005 and even more since 2010[24] does not allow to know if the payments have not been transferred to other productions because the EU farmers are not required to produce the products, of which cereals, for which they received the direct payments from 2000 to 2002. The statistics belie this assertion: the area of cereals in the total utilized agricultural area remained stable from 2000-02 to 2010-13 and the share of wheat has increased by 0.33% per year in the cereals area (excluding rice) and 2.92% per year in the cereals production. This is understandable because since 2007 the high cereals prices prompted farmers to abandon other productions and even to return grassland to grow more cereals.

Table 5 – The EU28 subsidies to cereals products exported to West Africa from 2012 to 2014

1000 euros	Rate of	2012 (subsidy of 72.56 €/t)			2013 (subsidy of 73.12 €/t)			2014 (subsidy of 66.75 €/t)		
	cereals	1000 t	€ 1000	Dumping	1000 t	€ 1000	Dumping	1000 t	€ 1000	Dumping
1001 wheat	1	1683530	122156,9	28,6%	2000587	146282,9	30,6%	2075062	138510,4	31,9%
1002 rye	1	0	0		1,3	0,1	10,1%		0	
1003 barley	1	6413	465,3	25,1%	1537	112,4	26%	0,3	#0	3,6%
1004 oats	1	3	0,2	22,2%	15	1,1	2,8%	101	6,7	5,8%
1005 maize	1	29730	2157,2	31,8%	36616	2677,4	43,8%	14752	984,7	34,6%
1006 rice	1	403	29,2	9,3%	668	48,8	6,2%	808	53,9	6,2%
1007 grain sorghum	1	40	2,9	3,2%		0	0	0,4	#0	#0
1008 other cereals	1	9	0,7	3,4%	10	0,7	5,1%	12	0,8	6,1%
Total raw cereals	1	1720128	124812,5	28,6%	2039434	149123,4	30,7%	2090736	139556,6	31,8%
1101 wheat flour	1,33	129867	9423,1	28,8%	58739	4295	28,5%	58993	3937,8	26,9%
1102 other flours	1,33	3163	229,5	22,3%	3657	267,4	20,3%	2447	163,3	19%
1103 gruaux, pellets	1,02	76307	5536,8	17,1%	91379	6681,6	18,5%	68963	4603,3	16,7%
1104 autres transf°	1,15	12740	924,4	8,8%	12947	946,7	8,9%	12162	811,8	8,6%
1107 malt céréales	1,43	293876	21323,6	24%	302770	22138,5	23,5%	319817	21347,8	23,3%
1108 amidon céréal	1,18	7239	525,3	21,3%	7062	516,4	21,1%	13061	871,8	23,8%
1109 gluten de blé	10	12406	900,2	58,8%	7080	517,7	49,6%	21846	1458,2	46,9%
19 prépar° céréales	1,25	290595	21085,6	4,4%	305194	22315,8	3,9%	353866	23620,6	3,5%
2203 bière de malt	0,17	9554	693,2	1,8%	11601	848,3	1,8%	13158	878,3	1,7%
220830 whisky	1,12	5335	387,1	1,4%	6188	452,5	1,4%	5710	381,1	1,3%
220850 gin&genièvre	1,12	4641	336,8	5,4%	4892	357,7	5,4%	4863	324,6	4,5%
220860 vodka	1,12	1616	117,3	2,6%	1720	125,8	3%	1485	99,1	2,3%
Total		2567467	186295,4	16,1%	2852663	208587	15,9%	296710	198054	14,6%

Source: Eurostat

Practical conclusion: ECOWAS should add to the CD of the CET a countervailing duty to the cereals imported from the EU, which would be currently of 66.75 €/t, which, for an EU FOB price of 210 €/t in 2014, would represent an ad valorem equivalent CD of 31.8% and, for a WA CIF price of about 279 €/t in 2013, represented an ad valorem equivalent CD of 25%.

[24] From 2006 to 2010 25% of direct payments to cereals of France and Spain were still "coupled" that is received only if farmers were actually growing cereals.

5 – The need to promote the regional production of wheat substitutes

Despite the importance of WA imports of wheat and rice, Faostat's tables on the origin of calories, proteins and fats brought by the different foods consumed in 2011 show that 81% of calories (kcal) or 1,416 kcal per capita per day over 1,749 were brought by cereals, tubers and roots from WA, while 160 kcal came from imported wheat and 173 kcal came from imported rice (local rice providing 217 kcal).

All the same 77.9% of the proteins derived from cereals, roots and tubers were of local origin (28 g/head/day) against 22.1% (8 g) from imported cereals.

Table 6 - Calories and protein per head per day of WA cereals, roots and tubers in 2011

Kcal from local cereals						Kcal from roots and tubers				Kcal from imported cereals		
Millet	Sorghum	Maize	Rice	Fonio	Total	Cassava	Yam	Others	Total	Wheat	Rice	Total
188	211	250	217	7	656	211	228	104	543	160	173	333
Proteins from local cereals						Proteins from roots and tubers				Proteins from imported cereals		
4.40	6.50	6.60	4.34	0.20	22.04	1.60	3.60	0.80	6	4.50	3.46	7.96

Source: Faostat

Table 7 shows that the production of WA cereals except rice has increased by an average of 2.69% per year from 2000-02 to 2011-13, virtually at the same rate as the population (2.70%). If the production of millet has stagnated and that of sorghum has increased 1/3 less quickly than the population, that of maize increased 2.5 times faster (6.67% per year), but a part of it has been used to feed poultry. Maize imports remained low and fell from 2.6% of the production in 2000-02 (225,132 t over 8.8 Mt) to 1.5% (237,540 t over 15.5 Mt) in 2009-11.

Table 7 – West Africa's production of cereals except rice from 2000 to 2014

1000 t	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	TC01/12
Millet	10393	10824	11151	12709	11626	13542	14287	14023	16756	11561	13135	7630	13051	11531	-0.04%
Sorghum	10603	10568	11131	12163	12146	13355	14113	13266	14612	10205	12885	11343	12363	11775	0.86%
Maize	8073	8815	9580	10449	10626	11603	12604	11880	14049	14729	15311	16510	18287	19081	6.67%
Fonio	318	313	316	328	336	370	367	373	483	505	570	585	587	588	5.80%
Total	29387	30520	32178	35649	34734	38870	41371	39542	45900	37000	41901	36068	44288	42975	2.69%

Source: Faostat

Assuming for simplicity that all the 2011 wheat imports were converted into flour (conversion factor of 75%), or 4,811 Mt, and all local cereals (excluding rice) were converted into flour (conversion factor of 65%), or 26.7 Mt on average from 2011 to 2013, their food availability have been 5.6 times higher on average than that of wheat.

There is much to do to increase the yields of local cereals in WA. Taking quadrennial averages to smooth the strong inter-annual variations, we see that the yield of millet fell by 0.7% per year from 2000-03 (781 kg/ha) to 2009-13 (728 kg) for a production level then of 10.7 Mt, while sorghum yields increased by 1% per year (from 888 kg to 978 kg) with a production then of 11.8 Mt, that of maize increased by 1.8% per year (from 1,415 kg to 1,691 kg) for a production then of 18 Mt as maize received a minimum of fertilizers, and that of fonio increase by 2.4% per year (from 798 kg to 1,008 kg, but its production is low). On the other hand the millet yield has increased by 2.03% per year in China (from 1,774 kg to 2,213 kg) for a production of 1.6 Mt in 2011-13. And the millet yield increased by 4.04%/year in India (from 767 kg to 1,184 kg), which is the world's largest producer (11.4 Mt in 2011-13), even if he had the same level as WA in 2000-03. In Ethiopia the millet yield increased by 5.31%/year, from 962 kg to 1,699 kg. Similarly sorghum yield is much higher than in WA in China where it has increased by 0.92%/year from 3,439 kg to 3,802 kg, with an average production of 2 Mt in 2011-13. Sorghum yields increased by 5.3%/year in Ethiopia, from 1,267 kg to 2,169 kg, for a production of 4 Mt in 2011-13. India's yield of sorghum has

evolved similarly to WA, from 765 kg to 920 kg, for a production of 6.1 Mt in 2011-13. Maize yield increased by 5.3%/year in Ethiopia (from 1,746 kg to 3,079 kg) and by 3.6% in South Africa (from 2,713 kg to 3,979 kg).

In short, there is a strong potential for higher yields of local cereals in WA, although one should avoid promoting production systems intensive in chemical inputs and rather focus on agro-ecological systems (see below). Especially since funding of those systems is lacking, and would not occur as long as local production will not be protected when world prices are low because artificially reduced by subsidies in exporting countries, particularly the EU.

One might think that the yields of WA millet, sorghum and maize could join by 2030, in 15 years, the current ones (in 2011-13) of Ethiopia which are respectively of 1,699 kg, 2,169 kg and 3,079 kg, corresponding to annual growth rates of respectively 5.81%, 5.45% and 4.08% from 2000-02 to 2011-13. But it is more prudent to expect a 4% increase per year for the 3 crops. Their WA areas increased by 0.66%/year from 2000-02 to 2011-13 for millet, that of sorghum stagnated (in fact -0.08%/year) and that of maize jumped by 4.80%/year. Assuming that with the best expected yields, the areas would increase by an average of 1% per year for millet and sorghum and by 2% for maize, they would reached in 2030 respectively 17.713 M ha, 14.238 M ha and 14.358 M ha, giving respective productions of 22.460 Mt, 24.717 Mt and 43.519 Mt.

Table 8 – Possible forecasts of production, consumption and employments for local cereals: 2015-50

	2015	2030	2050	TC 2015-30	TC 2030-50	TC 2015-50
M inhabitants	349783	515626	814552	2,62%	2,31%	2,44%
Evolution of areas in 1000 ha						
Millet	15257	17713	21613	1%	1%	1%
Sorghum	12264	14238	17373	1%	1%	1%
Maize	10668	14358	21335	2%	2%	2%
Total	38189	46309	60321	1,29%	1,29%	1,29%
Evolution of yields in kg/ha						
Millet	704	1268	2525	4%	2,5%	2,78%
Sorghum	964	1736	3223	4%	2,5%	2,78%
Maize	1683	3031	4575	4%	2,5%	2,78%
Total	1077	1959	3321	4%	2,5%	2,78%
Evolution of production in 1000 tonnes						
Millet	10737	22460	53573	5,04%	3,53%	4,17%
Sorghum	11827	24717	55993	5,04%	3,53%	4,17%
Maize	17959	43519	97608	6,08%	4,55%	5,20%
Total	40523	90693	207174	5,52%	4,04%	4,67%
Evolution of agricultural employments in full time equivalents (80 days/ha and 250 days/year) in 1000						
Millet	4882	5668	6916	1%	1%	1%
Sorghum	3924	4556	5559	1%	1%	1%
Maize	3414	4595	6827	2%	2%	2%
Total	12220	14819	19303	1,29%	1,29%	1,29%
Consumption of local cereals (except rice and fonio) in kg/year/inhabitant						
Millet	30,70	43,56	55,14	2,36%	1,19%	1,69%
Sorghum	33,81	47,94	60,68	2,36%	1,19%	1,69%
Maize	51,34	84,40	130,10	3,37%	2,19%	2,69%
Total	115,85	175,89	245,91	2,82%	1,69%	2,17%

Source: Faostat

If we assume 80 working days per ha of local cereals in manual culture[25], the 38.189 M ha of cultivated land in sorghum + millet + maize in 2009-11 have required on average 3.055 billion workdays and, for 250 working days per active full-time equivalent, 12.330 M full time employments. With the area of these three crops at 46.309 M ha in 2030, the required full-time jobs would be 14.819 M. But very many additional jobs would be created upstream and even more downstream production.

Assuming acreages would increase from 2030 to 2050 at the same rate as from 2015 to 2030, they would reach 21.613 M ha for millet, 17.373 M ha for sorghum and 21.335 M ha for maize, or 60.321 M ha in total, requiring 19.303 M full time agricultural jobs. Assuming a rise in yields that would continue on average at 2.5%/year for the 3 crops, they would increase to 2,525 kg/ha for millet, 3,223 kg for sorghum and 4,575 kg for maize. This would bring the WA production at 54.573 Mt for millet, 55.993 Mt for sorghum and 97.608 Mt for maize, or a total of 207.174 Mt.

Dividing the production by the expected population, the consumption per head of local cereals would more than double, from 115.9 kg in 2011-13 to 245.9 kg in 2050. Of course a significant part of the increase would go to livestock feed, particularly poultry. However this projection is probably excessive as we could not expect to eliminate any consumption (hence imports) of wheat and as tubers and roots will continue to satisfy a significant portion of the diet.

Actually the WA production of tubers and roots increased by 3.6% a year from 2000-03 (99.2 Mt) to 2010-13 (140.7 Mt), of which from 50.8 Mt to 77.4 Mt for cassava (4.3% per year), due to the increased area by 1.7% and the yield by 2.5% (from 9.9 t/ha to 12.7 t/ha). Cassava accounted for 51.1% of regional production of roots and tubers in the first period and 55% in the second. WA represented 54% of world cassava production that increased from 184 Mt to 263 Mt in both periods, up 3.65%/year. And Nigeria is the world's largest cassava producer, with increased output by 4.2% between the two periods (from 33.6 Mt to 50.7 Mt, or 2/3 of the WA production of AO in both periods), the increase being attributable to a 0.95%/year for area and 3.20%/year for yields (from 9.9 t/ha to 13.6 t/ha). But it is Ghana which has increased the most its yield from 12.4 t/ha to 16.2 t/ha, or by 2,74%/year. On the other hand, despite Ivory Coast is well known for its attiéké, its already low yield of 7.75 t/ha fell to 6.73 t/ha (-1.39%/year), probably due to its internal conflicts.

Cassava yield increases exist for WA when compared to Indonesia where it rose from 13.4 t/ha to 21.1 t/ha between the two periods (+ 4.64%/year) or Thailand where it rose from 17.7 t/ha to 20.5 t/ha (+ 1.47%/year). Despite Brazil is the birthplace of cassava from where it has spread throughout the world, its production hardly increased (+ 0.39%/year) as it is the case for the yield (13.6 t/ha to 14 t/ha or by 0.33%/year), probably because more than 40% comes from the Northeast with a dry and highly variable climate.

6 – Rebuilding WA agricultural production systems on agroecology

WA has the most favorable conditions to rebuild existing agricultural production systems on agro-ecology in every sense of the concept: not only that of agricultural production practices –

[25] Jean-Yves Marchal (*En Afrique soudano-sahélienne : la course contre le temps. Rythmes des averses et forces de travail disponibles*, in Michel Eldin et Pierre Milleville, Le risque en agriculture, Orstom, 1989) proposes to retain from 70 to 90 working days for one hectare of cereals in manual cultivation in Sudano-Sahelian Africa.

which are already largely agro-ecological – but also at the levels of all factors of a socially and environmentally sustainable development, including food consumption patterns. Olivier De Schutter, the former UN Special Rapporteur on the right to food has greatly developed this need, particularly in its end of mandate report of January 2014: "*A shift to agroecological modes of production is urgently called for (see A/HRC/16/49). As a way to improve the resilience and sustainability of food systems, agroecology is now supported by an increasingly broad part of the scientific community. It features prominently in the International Assessment of Agricultural Knowledge, Science and Technology for Development and in recommendations from the United Nations Environment Programme as well as other international agencies*"[26].

Besides, WA has little choice since the current pressures of the international agribusiness corporations to impose "modern" large farms highly intensive in inputs (chemical fertilizers, seeds and possibly GMOs) – including when they claim to grow food crops for the domestic market – have little chance to materialize and less to sustain, despite the provision by governments of land confiscated from the village communities, in the context of:
- High volatility of world agricultural prices, exacerbated by the volatility of the exchange rate, which affects domestic prices given the low import protection;
- Low capacity of governments to provide subsidies and tax rebates claimed by these potential investors;
- Inadequacy of transport infrastructure which increases the costs of marketing and that private investors are not willing to fund themselves;
- High cost of agricultural loans;
- Low capacity of these "modern" production systems to adapt to the strong climate vagaries in WA through ignorance of the reality of the agronomic constraints of each plot including the decline in soil fertility, the erosion risks due to an excessive motorization on fragile soils, etc.

Thus, the results of the installation in Nigeria of farmers of European origin expelled from Zimbabwe were mixed: an apparent success in Kwara State[27] but a failure in the state of Nazawara: "*SEVEN years after 18 white Zimbabwean farmers settled on a chunk of land in Nasawara state at the invitation of the then governor, only one family is still there. All the others have given up in despair*"[28]. "*The white Zimbabwean farmers earned their reputation for farming prowess over a long period of time under a special set of conditions. Remove enough critical parts of those conditions for success (political commitment over the long term, security of land tenure, access to affordable and long-term finance, infrastructure in place, access to inputs and markets, etc, etc) and it doesn't matter how knowledgeable or committed those farmers are; you end up with failure. Both the Zimbabwean and Nigerian governments in their different ways seem to stubbornly refuse to learn these basic lessons in order to create viable indigenous commercial farming sector*"[29]. Indeed the success of 13 Zimbabwean white farmers in Kwara State is largely due to the huge financial benefits received: every farmer has received 1,000 hectares of rented land, an interest free loan of $250,000 and the guarantee of the State for a bank loan of the same amount. Each received a bungalow of 232 m^2 plus a generator, storage sheds, fences for the land and the state of Kwara has spent $2.6 M for 600 km of rural roads, 16 power transformers for the network, many drilling and the federal government added $5.8 M for irrigation and $6.8 M for electrification. To appease critics of

[26] http://www.srfood.org/images/stories/pdf/officialreports/20140310_finalreport_en.pdf
[27] http://en.wikipedia.org/wiki/Shonga_Farms; http://www.ilorin.info/fullnews.php?id=8967;
[28] http://www.economist.com/news/middle-east-and-africa/21576140-why-commercial-farming-nigeria-so-hard-nothing-chicken-feed
[29] http://www.nairaland.com/1254369/nigerias-zimbabwean-farmers-nothing-like

the 1,289 small farmers deprived of part of their lands, each received a compensation of $398[30]. Another researcher wonders: "*Why is the red carpet that is being rolled out for the Zimbabweans not created many times over for an identified core of aspiring Nigerian commercial farmers?... Without the crucial state, banking and other support, such as in Nassarawa state, Mozambique, Zambia or elsewhere, the experiment is floundering*"[31].

An appreciation confirmed at the forum of 29 and 30 April 2010 in Ouagadougou on the theme "Accelerating growth: the place and role of agricultural entrepreneurship." If the agriculture minister Laurent Sédogo "*did not underestimated the benefits of small family farms, he believes that agribusiness is an alternative to eradicate food insecurity and rural poverty*", one of the 100 national agricultural entrepreneurs present, Bicaba Kani, a farmer from the Mouhoun region, said: "*Agriculture is not like trade. We need plenty of means to invest. Most agrobusinessmen solicit support from the Authorities to solve the problem of access to credit*"[32].

The findings of the "RuralStruc" programme of the World Bank have shown:
- The superior competitiveness of family farms over that of "modern" large farms for the cost of production. And their clear superiority to absorb jobs in rural areas when the second use more capital intensive production methods, despite that the WA rural population would increase at an annual rate of 1% from 2010 to 2050.
- The impact of agricultural growth on the poorest people is 2 to 4 times higher than that of non-agricultural growth.

Seminars on agro-ecology have multiplied recently in WA, of which by NGOs such as Earth and Humanism and AVSF (Agronomists and Veterinarians without Borders):
- The International Forum on Agroecology of 24 to 27 February 2015 at the initiative of Mali CNOP (National Coordination of Peasant Organizations of Mali)[33].
- Earth and Humanism has organized a seminar in Beta in Burkina Faso from 16 to 19 February 2015[34] and training sessions in North Togo from September 2014 to March 2015[35].
- FAO organized an international symposium in Rome on 18 and 19 September 2014 on Agroecology for food security and nutrition and has scheduled three regional seminars in 2015, including that for Sub-Saharan Africa in Senegal in September or October[36].

Let us add that refounding the agricultural production systems of WA on agro-ecology implies also to reduce international imports, of agricultural as of non-agricultural products in order to develop regional industrialization. That is why the WA governments should not have initialed the Trade Facilitation Agreement that will force them to devote a significant share of their limited budgetary resources to facilitate imports and thus make them more competitive than regional products, so that the resources available to improve regional transport infrastructure will be reduced accordingly.

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[30] http://westafricainsight.org/articles/PDF/85
[31] file:///C:/Users/Jacques/Documents/PED-UEMOA-/The%20African%20Executive%20_%20Are%20Zimbabwean%20Farmers%20Revolutionizing%20Nigeria_.html
[32] http://www.lefaso.net/spip.php?article36542
[33] http://www.cnop-mali.org/spip.php?article190#
[34] http://www.epargne-en-conscience.fr/cms/uploads/fichiers/2015/DOSSIER%20DE%20PRESSE%20INTEGRAL%20TH%20BURKINA%20TOGO.pdf
[35] http://terre-humanisme.org/wp-content/uploads/2014/08/Fomation-animateurs-Togo-2014.pdf
[36] http://www.fao.org/about/meetings/afns/fr/

7 - The need to improve the local cereal processing technologies and other local starchy products

Since WA has a significant potential to produce food crops able to feed its growing population, it is essential to quickly develop the processing technologies for local cereal, tubers and roots to facilitate their consumption while making significant savings to consumers in relation to the consumption of processed products from wheat imports (bread, biscuits, cakes, pasta) or in relation to rice imports. However the identification of new technologies for products more attractive to consumers will not be enough if the domestic market is not effectively protect. Thus in the 1980s the CIRAD team of Jacques Faure in Montpellier had developed a semi-industrial process for the production of pasta made from 66% maize of a quality comparable to that of pasta made from 100% durum wheat[37], but the contacted Senegalese industrialist replied: "*This is actually very interesting, but you can imagine that if I start, I will do with imported maize, cheaper than the Senegalese maize*".

There are already many culinary recipes and processing technologies available in the different countries of SSA for the cereals and tubers of local origin but it would be wrong to neglect the experience of Asia and even more of Latin America, particularly for maize and cassava.

7.1 – The incorporation of local cereals and other starchy products in bread, cakes, biscuits and pasta

Examples of incorporation of local cereals in bread are old and date back for example in Senegal in the 1970s when the Pamiblé (bread with 15% of millet flour) received an award at the Agricultural Fair in Paris in 1972. However the production and consumption of Pamiblé remained confidential until recently with the launch in 2011 of a programme financed by the World Bank, now in its second phase and which gathers together ASPRODEB (Senegalese Association for the Promotion of Development at the Base), which works closely with the CNCR (National Council of Coordination of Rural people) and which will mobilize 7,800 farmers to deliver a clean and quality millet), the Federation of Bakers of Senegal (of which 250 bakeries will be involved to deliver an average of 1,590 "baguettes" each day), 15 small mills and ITA (the Food Technology Institute in Dakar)[38].

For its part the NGO Solidarité has been promoting bread with 30% of millet or maize flour in Senegal since 2011 by training bakers, particularly in rural areas, which is possible with leavened bread, allowing at the same time to reduce costs because it requires very little yeast and no improvers at all[39]. Training has also been held in Benin in 2015.

However it is possible to incorporate much higher percentages of local cereals flour in cookies, cakes and pasta. Nevertheless all these products require to continue wheat imports and it is therefore essential to promote at the same time the processed products from local cereals and tubers not requiring any wheat.

[37] http://pmb.sicac.org/opac_css/doc_num.php?explnum_id=575

[38] http://yveslebelge.skynetblogs.be/archives/category/consommation/index-1.html/

[39] http://www.solidarite.asso.fr/SENEGAL-Valoriser-les-cereales. A DVD ("Mil et une solutions") is available at Solidarité on the training of six bakers in Dakar in early February 2011.

7. 2 – The major interest of promoting maize tortillas

For maize it is the experience of Central America, and Mexico first, which should inspire WA consumers, given the wide consumption of tortillas.

Although per capita consumption of maize tortillas in Mexico has dropped from 120 kg in 1998[40] to 90 kg in 2014 (with a total consumption of 8.4 Mt), it remains 2.7 times greater than the 33 kg of bread[41] for which Mexico produced 44% of its wheat consumption in 2012. Contrary to the propaganda of the wheat sector agribusiness that consumption of maize tortillas is responsible for the sharp rise in obesity, the National Survey of Health and Nutrition in 2012 noted that despite that the per capita consumption of tortillas in Mexico fell nearly 20% in the last decade, the prevalence of overweight and obesity has tripled: 70% of adults are overweight, and 40% of children from 5 to 11 years[42]. The "nixtamalized" tortilla[43] is indeed rich in calcium (four times more than the non nixtamalized maize), magnesium, potassium, phosphorus, niacin (vitamin PP, anti-pellagra) and fiber[44,45]. That is why FAO recommends increasing the consumption of corn tortillas[46]. As Jean-Michel Poirson of the Division of Nutrition and FAO consumer protection wrote to me on 8 November 2012: "*In permitting usage of Calcium Hydroxide for the production of corn based tortillas, in addition to reducing dependency to wheat imports while addressing food security needs, the Government of Senegal may consider the many health and nutritional benefits of nixtamalization of corn for consumption among which:*

- *Calcium content increase with improved calcium-phosphorus ratio contributing to improve calcium bioavailability in food for populations that may not consume diets containing enough of this essential mineral;*
- *Improved digestibility of essential amino acids (even if the cooking process do reduce amino acid bioavailability);*
- *Increased bioavailability of niacin;*
- *Increased dietary fibers, although it may reduce the bioavailability of iron and zinc*".

65% of Mexican tortillas are made from nixtamalized maize and 35% from industrial flour, nixtamalized or not. A kg of maize yields about 1.8 kg of nixtamal dough which, after baking,

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[40] http://www.jornada.unam.mx/2008/03/05/index.php?section=economia&article=022n1eco

[41] http://www.industriaalimenticia.com/articles/87404-informe-anual-de-mexico

[42] http://www.manufactura.mx/industria/2013/09/06/consumimos-25-veces-mas-tortilla-que-pan

[43] The production of maize tortillas is not made from flour, but from grain, the "nixtamalization" allowing to remove by hand the pericarp and the germ without the need of a huller. Traditionally, the nixtamal dough and tortilla are thus prepared: mix twice more water than the maize weight plus 1% of the maize weight in slaked lime (calcium hydroxide or food lime, used in particular to turn brown sugar into white sugar) or a little more if the pericarp is particularly hard; mount the whole slowly to boiling, allow to boil for 2 minutes and then allow to warm to a temperature close to 90° for 20 to 40 minutes, more or less depending on the hardness of the maize, and allow to stand a minimum of 12 hours and up to 24 hours. Then wash the maize several times, eliminating the pericarp and germ by rubbing hands. It is the presence of slaked lime, alkaline solution, which enables this while milling without lime (without nixtamalization) requires a huller and a mill. Cooking tortilla is extremely fast: placing the tortilla – usually 12 to 18 cm in diameter and 1.5 mm thick, each weighing 20 to 30 g, which makes 30 to 50 tortillas per kg of tortillas – on a metal pan (preferably steel) at 280 ° C (± 10° C) for 30 seconds on the first side and 25 seconds on the other side, and start again and allowed a few moments, until the tortilla inflates.

[44] http://www.unomasuno.com.mx/se-incrementa-consumo-de-tortilla-en-mexico-y-el-mundo/

[45] FAO, *Le maïs dans la nutrition humaine*, 1993, http://www.fao.org/docrep/T0395F/T0395F07.htm#Disponibilit%C3%A9%20des%20%C3%A9l%C3%A9ments%20nutritifs

[46] hjttp://www.fao.org/docrep/t0395s/T0395S06.HTM

gives 1.4 kg of tortillas[47] or 42 tortillas of 33.3 g. Consumption is highest in the poorest households because it is the cheapest staple that, combined with beans, provide a balanced diet. The average daily per capita consumption in 2010 was 218 g in rural areas (for an average weight of 27 g per tortilla this corresponds to 8 tortillas) and 155 g in urban areas (6 tortillas)[48]. A 10% increase in the price of bread increases by 2.3% the consumption of corn tortilla in the third poorest stratum of the population against by 1.8% in the medium stratum and only by 0.2 % in the third stratum of the richest population[49]. Conversely, if the tortilla price increases by 10% the demand for tortillas fall by only 3.6% in the poorest stratum against by 5.3% in the average stratum and by 6.6% in the richest stratum.

To assess the potential competitiveness of WA maize tortillas in order to promote their production, we compare the prices of maize and wheat bread, made from wheat imports processed in WA large mills ("Grands Moulins") because imports of wheat flour are very low, and come mainly from France, Benin having imported ¾ of the total from 2012 to 2014 for a FOB France price higher by 37% in 2012 than the FOB price of wheat and 51% higher in 2013. But as the custom duty (CD) of ECOWAS on flour is 20% (against 5% on wheat), to which we must add a value added tax (VAT) of 18%, the retail price (or per 25 kg) of flour of WA large mills should be close to the price of imported flour that is at least 70% higher than the CIF price of wheat, though probably less in Dakar where the gap between FOB France and CIF Dakar is much lower than in the rest of WA.

Table 9 shows the gap between the price of wheat FOB France (departure) and CIF WA (destination) in 2012 and 2013 for countries for which import data are available[50]. Despite the observed variations of the FOB-CIF gap between 2012 and 2013 for Benin and Togo, it is clear that the gap is smallest for Senegal, the highest for the landlocked Sahelian countries (Burkina Faso and Mali) and intermediary for the Gulf of Guinea (IC and Ghana).

Table 9 – From the FOB price of soft wheat in France to the CIF price in WA, 2012 and 2013

Euros/tonne	Benin	Burkina Faso	Ivory Coast	Ghana	Mali	Senegal	Togo
2013							
FOB France	222,46	234,81	242,05	227,89		239,65	228,00
CIF WA	296,64	328,82	295,75	281,47		270,08	287,30
CIF-FOB	74,18	94	53,70	53,58		30,43	59,30
(CIF-FOB)/CIF	25%	28,6%	18,2%	19%		11,3%	20,6%
2012							
FOB France	249,62	248,55	248,60	240,58	236,35	258,32	231,27
CIF WA	290,92	330,49	303,29	298,59	318,21	287,45	258,87
CIF-FOB	41,30	81,94	54,69	58,01	75,21	29,13	27,60
(CIF-FOB)/CIF	14,2%	24,8%	18%	19,4%	23,6%	10,1%	10,7%

Source: Eurostat for exports and ITC TradeMap for FOB and CIF prices

On the Senegalese market, a kilo of wheat flour was at 453 CFAF in February 2015, corresponding to 691 €/t, 155% higher than the CIF price of wheat from France and which does not depend on the price of the imported flour since Senegal's imports of flour from France are almost zero (3.5 t in February 2015 and 42 t in 2014) and even for those from all origins (3,081 t in 2013), but we do not have data for other countries.

It is more useful to compare the price of bread to the price of maize to assess the potential

[47] http://www.unomasuno.com.mx/se-incrementa-consumo-de-tortilla-en-mexico-y-el-mundo/

[48] http://www.biblio.colpos.mx:8080/jspui/bitstream/handle/10521/1821/Espejel_Garcia_MV_MC_Economia_2012.pdf?sequence=1

[49] http://www.scielo.org.mx/scielo.php?pid=S0188-45572014000100002&script=sci_arttext

[50] http://www.trademap.org/Bilateral_TS.aspx

competitiveness of maize tortillas. The sources are primarily the monthly statements of Afrique Verte per bag of 100 kg for Burkina Faso, Mali and Niger, the West Africa FewsNet Bulletin, the Monthly Bulletin on the evolution of commodity prices from the Ministry of Senegal's economy and Numbeo, a site on the comparative cost of living per country, these other sites giving the retail price per kg.

Thus the retail maize price was at 253 CFAF in March 2015 in Dakar[51]. In early April 2015, the price per bag of 100 kg was 145 CFAF in Niamey, 130 CFAF in Bamako and 125 CFAF in Ouagadougou[52] because the 2014 harvest was higher than in 2013 while it declined in Senegal, Gambia and Guinea-Bissau. In IC the wholesale price ranged from 100 CFAF in Korhogo to 120-130 in Abidjan while the retail price was at 110 CFAF in Korhogo and between 200 and 250 CFAF in Abidjan[53]. If we wanted to compare the price of maize with that of wheat flour we should divide the first by 0.65 (conversion rate for local cereal flour), which would make respectively 398 CFAF, 223 CFAF, 200 CFAF, 192 CFAF and 346 CFAF. Note that the price of maize is lower than that of millet and sorghum in all these countries.

As for the price of bread in April 2015 the classic French "baguette" sells for 150 CFAF in Dakar, Bamako and Abidjan but for different weights: 210 g in Dakar[54], 200 g in Abidjan[55] and 150 g only in Bamako[56]. The baguette was at 160 CFAF in Niamey (we don't know the weight). This essentially reflects the difference in CIF wheat prices in those countries: the lowest was in Dakar and the highest in landlocked Sahelian countries. To compare all the prices the simplest way is to bring the price per kg. In Nigeria breads of 500g were selling at 291.35 nairas[57] which, at the official exchange rate of 3,065 CFAF to the naira, corresponded to 237 CFAF for 150 g and 357 CFAF for 200 g. In Accra the bread of 500 g was selling in mid-April at 2.19 $/kg[58] or €4.38 per kg, which, at the official exchange rate of $1.08 for 1 euro or 655.957 CFAF, corresponded to 607.37 CFAF for 1 dollar and therefore to 2660 CFAF per kg of bread or 399 CFAF for a loaf of 150 g and 532 CFA for one of 200 g. Even ignoring the very high prices of Ghana and Nigeria, in other case the price of a kg of bread is at least 3 times higher than the retail price of maize and much more if we take the wholesale price (per 100 kg) that the women making maize tortillas could pay.

Table 10 – Prices of wheat bread and maize early 2015 in some West Africa's countries

FCFA/kg	Dakar	Bamako	Ouagadougou	Niamey	Abidjan	Accra	Ibadan
Bread: CFAF	150	159	125	161	150		
" weight	210 g	150 g	170	200 g ?	200 g	500 g	500 g
" CFAF/kg	714	1060	735	805	750	2660	1785
Maize price (100kg)		130	125	145			
" retail	253		126 (112: Bobo)	193	200-250		159

[51] http://www.dpee.sn/IMG/pdf/evolution_des_cours_des_matieres_premie_res_en_mars_2015_et_perspectives_vf.pdf

[52] http://www.afriqueverte.org/r2_public/media/fck/File/Bulletins/PSA/PSA%20168-04-2015.pdf

[53] http://nouvellesdesprixagricoles.blogspot.fr/2015/03/bulletin-sur-le-marche-du-mais-en-cote_27.html#more

[54] http://www.seneweb.com/news/Economie/consommation-les-nouveaux-prix-du-pain-entrent-en-vigueur-mardi-a-dakar-ministre_n_126255.html

[55] http://www.ivoirnews.net/eco_nat.php?recordID=635

[56] http://mali-web.org/economie/le-marche-du-pain-a-bamako-cest-la-qualite-qui-importe-le-moins

[57] http://www.numbeo.com/cost-of-living/city_result.jsp?country=Nigeria&city=Lagos

[58] http://www.numbeo.com/cost-of-living/city_result.jsp?country=Ghana&city=Accra

Since it is very likely that the price of wheat, hence that of bread, will increase significantly in the medium and long terms while the price of local maize has no reason to raise as much, especially if extension activities are undertaken to increase production, the competitiveness of maize tortillas can only improve vis-à-vis the 100% wheat bread.

Solidarity made in 2011 a profitability study of a cooperative workshop where the production of nixtamal would be collective while the production and sale of tortillas would be individual and concluded that, for a purchase price of 180 CFAF per kg of maize each individual woman making tortillas could get a net income of 80,000 CFAF per month. It was probably too optimistic and involved a rather restrictive cooperative organization. But such a cooperative workshop is not necessary to begin, given the low investment required to install a single maker. If the price of the tortilla per kg was, as in Mexico, three times the price of maize, it would put the price of a kg of tortilla at 450 CFAF for a price of uncleaned maize of 150 CFAF, a price a third lower than the price of a kg of baguette. In fact the price may be lower depending on working time that the women want to devote to this job and the corresponding production.

Table 11 presents the projected operating account of a woman with a very small production of 6 kg of tortillas per day for 30 tortillas 33.3 g per kg of tortilla, requiring 4.285 kg of clean maize per day corn or 180 kg per month and 2,160 kg per year.

Table 11 - Estimated operating account of a tortilla maker in West Africa

CFAF	Price	Per tortilla	Per kg of tortilla	Daily	Monthly	Per year
Number of tortillas			30	180	5,400	64,800
Value of hot tortillas		16,7	500	3,000	90,000	1,080,000
Net sales (10% unsold)		15	450	2,700	81,000	972,000
Investment and amortization						
	Investment	Amortization over 2 years				
Manual mill for nixtamal	45,920					
Manual press for tortillas	32,800					
Small gas stove	20,000					
Small kitchen utensils	26,280					
Total investments	125,000					
Amortization		0,1	2,9	174	5,208	62,500
Variable costs						
Weight of unclean maize		35,1 g	1,053	6,316	189,5	2,274
Weight of clean maize: 95% of unclean		33,3 g	1	6	180	2,160
Price of unclean maize	150					
" clean maize	158	5,27	158	948	28,440	341,280
Cal: 1% of maize weight	300	0,1	3	18	540	6,420
Water	113 FCFA/m3		5,45	32,7	981	11,772
Gaz*	292 FCFA/litre	0,23	6,83	41	1,230	14,760
Transport to buy a bag of maize**	1000	0,04	1,11	66,7	2,000	24,000
Washing-up liquid		0,28	8,33	50	1,500	18,000
Miscellaneous expenses		3,47	10	60	1,800	21,600
Total variable costs		9,39	192,7	1,150	36,491	437,832
Total costs: amortization + variable costs						
		9,49	195,6	1,324	39,720	476,640
Net income						
		5,51	254,4	1,376	41,240	495,360

* The price of a gas bottle of 6 kg varies among countries and has mostly declined last year due to lower oil prices although these prices are often subsidized, the highest price being currently in Mali, at 3,500 CFAF, a price that we retain here. 1 kg of gas makes 2 liters, therefore 1 liter of gas costs 292 CFAF and 0.035 liter costs 10.33 CFAF per kg of maize and 5.74 CFAF per kg of tortilla. ** 2 bags of maize per month.

Amortizing the initial investment of 125,000 CFAF (€230) over 2 years would make an amortization charge of 62,500 CFAF per year, 5,208 CFAF per month, 174 CFAF per day, 2.90 CFAF per kg of tortilla and 0.10 CFAF per tortilla. The investment would include: a manual nixtamal mill (45,920 CFAF or €70), a manual tortilla press (32,800 FCFA or €50)

plus various kitchen utensils that the potential women making tortillas should have already: a stove craft with gas burner (20,000 FCFA or €30), a table, a pot to cook the nixtamal, a pan (griddle) large enough to cook the tortillas and other utensils (pans, pancake shovel, knives, spoons, towels...).

In the simplest case where the woman would produce at home there would be no rent and variable costs other than maize would be limited to the purchase of food lime (calcium hydroxide), gas, water, washing products, transportation costs (to buy 2 bags of maize of 100 kg per month), fine papers to wrap tortillas. Finally the net income would also be limited to 41,249 CFAF per month. However if we raise the price of tortillas to 600 CFAF per kg instead of 500 CFAF would raise the monthly income at 57,480 CFAF and this tortilla price would still be 15% to 25% lower than the price of bread.

This over simplified model of production of tortillas would benefit from being extended to a workshop of 2 women to accelerate the production and distribution of tortillas: the nixtamal having been prepared the night before and cleaned (stripped of the bran and germ) in early morning, one of the women would take care of the manual mill while the other would handle the manual press and baking and saling the tortillas. But we must go further: instead of selling only fresh tortillas women could sell sandwiches, inserting a salty or sweet filling, and could also install a small kiosk. It is clear that profits on sandwiches would exceed that of simply selling unfilled tortillas.

Manual mill for nixtamal	**Manual press for tortillas**
	

7. 3 - The major interest of promoting cassava "pizzas"

Brazil is very rich in terms of processing technologies and consumption of cassava recipes. Thus in the Nordeste "tapioqueiras" are similar to Italian pizzerias or Mexican "tortilleras" apart from the fact thant the basic pancake – on which we add sweet or savory fillings – is 100% cassava instead of being 100% durum wheat or maize.

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Statistical annex on the production, consumption and tariff on wheat per country

Table 12 – Rank of countries producing and importing wheat and customs duty in 2014

Rank	Producing countries	1000 t	Rank	Importing countries	1000 t	Applied tariff
1	EU-27	155,685.00	1	Egypt	10,500.00	0%
2	China	126,000.00	2	Indonesia	7,700.00	0%
3	India	95,910.00	3	Algeria	7,400.00	0%
4	Russia	59,000.00	4	Iran	7,000.00	n.a.
5	United States	55,129.00	5	Brazil	6,700.00	0%
6	Canada	29,300.00	6	Japan	6,000.00	468 €/t
7	Pakistan	25,000.00	7	EU-27	5,500.00	0%
8	Ukraine	24,750.00	8	Turkey	5,500.00	130%
9	Australia	24,000.00	9	Nigeria	4,750.00	5%
10	Turkey	15,250.00	10	Mexico	4,600.00	45%
11	Iran	13,000.00	11	United States	4,354.00	6,5 $/t
12	Kazakhstan	12,996.00	12	Philippines	3,800.00	0%
13	Argentina	12,500.00	13	Korea, Republic	3,800.00	9%
14	Egypt	8,200.00	14	Yemen	3,600.00	0%
15	Uzbekistan	7,150.00	15	Saudi Arabia	3,450.00	0%
16	Brazil	6,300.00	16	Bangladesh	3,300.00	5%
17	Morocco	5,100.00	17	Morocco	3,100.00	2,5%
18	Afghanistan	5,025.00	18	Iraq	3,000.00	n.a.
19	Ethiopia	4,400.00	19	Sudan	2,600.00	n.a.
20	Mexico	3,660.00	20	Uzbekistan	2,100.00	n.a
21	Iraq	3,500.00	21	Viet Nam	2,100.00	5%
22	Belarus	2,600.00	22	Syria	2,000.00	
23	Syria	2,500.00	23	Thailand	2,000.00	0%
24	Serbia	2,400.00	24	Afghanistan	2,000.00	n.a
25	Uruguay	2,010.00	25	Libya	1,850.00	n.a
26	Nepal	1,950.00	26	Israel	1,800.00	
27	Algeria	1,900.00	27	Venezuela	1,800.00	5%
28	South Africa	1,775.00	28	Emirates	1,750.00	
29	Azerbaijan	1,700.00	29	South Africa	1,750.00	0%
30	Chile	1,620.00	30	Peru	1,700.00	0%
31	Tunisia	1,400.00	31	Malaysia	1,600.00	0%
32	Paraguay	1,350.00	32	Kenya	1,600.00	0%
33	Bangladesh	1,300.00	33	Azerbaijan	1,600.00	n.a
34	Turkmenistan	1,200.00	34	Colombia	1,550.00	5%
35	Moldova	1,100.00	35	China	1,500.00	65%
36	Japan	849.00	36	Tunisia	1,500.00	36%
37	Tajikistan	770.00	37	Taiwan	1,350.00	6,5%
38	Kyrgyzstan	675.00	38	Sri Lanka	1,200.00	0%
39	Switzerland	517.00	39	Jordan	1,150.00	0%
40	New Zealand	510.00	40	Tajikistan	1,050.00	n.a
41	Saudi Arabia	500.00	41	Chile	900.00	6%
42	Mongolia	465.00	42	Ethiopia	900.00	n.a.
43	Kenya	450.00	43	Angola	825.00	2%
44	Sudan	350.00	44	Georgia	825.00	0%
45	Armenia	340.00	45	Tanzania	825.00	0%
46	Albania	300.00	46	Cuba	800.00	2%
47	Norway	247.00	47	Mozambique	750.00	2,5%
48	Yemen	240.00	48	Pakistan	750.00	10%
49	Peru	230.00	49	Cameroon	675.00	5%
50	Macedonia	215.00	50	Ecuador	640.00	0%
51	Zambia	202.00	51	Kyrgyzstan	625.00	n.a.
52	Libya	200.00	52	Guatemala	600.00	0%
53	Myanmar	180.00	53	Lebanon	600.00	n.a.
54	Bosnia	175.00	54	Ghana	595.00	5%
55	Lebanon	140.00	55	Senegal	580.00	5%
56	Israel	130.00	56	Côte D'ivoire	560.00	5%
57	North Korea,	120.00	57	Norway	550.00	250€/t
58	Bolivia	119.00	58	Oman	535.00	
59	Tanzania	110.00	59	Hong Kong	510.00	0%
60	Nigeria	70.00	60	Canada	480.00	1,90 CAN $/t
61	Georgia	65.00	61	Bosnia	475.00	n.a
62	Chad	30.00	62	New Zealand	475.00	
63	Eritrea	30.00	63	Dominican Rep	470.00	0%
64	Korea	27.00	64	Switzerland	465.00	119 FS/t
65	Zimbabwe	25.00	65	Mauritania	450.00	5%
66	Jordan	20.00	66	Kazakhstan	400.00	

67	Bhutan	20.00	67	North Korea	400.00	n.a
68	Colombia	15.00	68	Congo, Democ	400.00	n.a.
69	Lesotho	15.00	69	Myanmar	400.00	0%
70	Congo Democ	9.00	70	Kuwait	390.00	
71	Ecuador	6.00	71	Bolivia	375.00	5%
72	Angola	4.00	72	Singapore	350.00	
73	Mozambique	3.00	73	Russia	350.00	5%
74	Guatemala	1.00	74	Armenia	325.00	
75	Guinea	0.00	75	Albania	310.00	n.a
76	Guyana	0.00	76	Haiti	310.00	
77	Haiti	0.00	77	Jamaica	300.00	0%
78	Hong Kong	0.00	78	Honduras	300.00	0%
79	Honduras	0.00	79	El Salvador	300.00	0%
80	Indonesia	0.00	80	Congo	280.00	5%
81	Côte D'ivoire	0.00	81	Zimbabwe	275.00	0%
82	Kuwait	0.00	82	Guinea	265.00	5%
83	Ghana	0.00	83	Niger	255.00	5%
84	Jamaica	0.00	84	Costa Rica	250.00	0%
85	Niger	0.00	85	Chad	235.00	5%
86	Malaysia	0.00	86	Nicaragua	215.00	0%
87	Mauritius	0.00	87	Somalia	205.00	
88	Mauritania	0.00	88	Burkina Faso	205.00	5%
89	Oman	0.00	89	Papua	200.00	
90	Liberia	0.00	90	Madagascar	190.00	0%
91	Madagascar	0.00	91	Fiji	170.00	0%
92	Bahrain	0.00	92	Mauritius	165.00	0%
93	Barbados	0.00	93	Togo	165.00	5%
94	Sri Lanka	0.00	94	Panama	155.00	5%
95	Congo	0.00	95	Australia	150.00	0%
96	Cameroon	0.00	96	Trinidad Tobago	135.00	0%
97	El Salvador	0.00	97	Macedonia,	130.00	
98	Fiji	0.00	98	Belarus	125.00	5%
99	Gabon	0.00	99	Gabon	115.00	5%
100	Bulgaria	0.00	100	Nepal	115.00	10%
101	Costa Rica	0.00	101	Turkmenistan	110.00	
102	Cuba	0.00	102	Eritrea	110.00	n.a
103	Dominican Rep	0.00	103	Lesotho	90.00	
104	EU-25	0.00	104	Bahrain	80.00	
105	Nicaragua	0.00	105	Moldova,	75.00	
106	Romania	0.00	106	Mongolia	75.00	
107	Philippines	0.00	107	Uruguay	75.00	0%
108	Panama	0.00	108	Ukraine	50.00	0%
109	Papua	0.00	109	Zambia	50.00	5%
110	Taiwan,	0.00	110	Guyana	50.00	0%
111	Togo	0.00	111	India	45.00	50%
112	United Arab Emirates	0.00	112	Sierra Leone	45.00	5%
113	Trinidad and Tobago	0.00	113	Liberia	40.00	5%
114	Thailand	0.00	114	Argentina	40.00	0%
115	Senegal	0.00	115	Barbados	25.00	
116	Sierra Leone	0.00	116	Serbia	10.00	
117	Singapore	0.00	117	Paraguay	5.00	0%
118	Somalia	0.00	118	Bhutan	5.00	n.a
119	Serbia and Montenegro	0.00	119			
120	Venezuela	0.00	120			
121	Viet Nam	0.00	121			
122	Burkina Faso	0.00	122			

Source: ww.indexmundi.com/agriculture/?commodity=wheat; WTO for the applied tariffs

Table 13 – Wheat consumption per country in 2014: total and per capita direct and indirect*

	Population	Total consumption in 1,000 tonnes		Per capita consumption in kg	
	1000 hb	All uses	Minus feed	All uses	Minus feed
China	1393784	124000	101000	89	72,5
India	1267402	93985	89485	74,2	70,6
EU-28	507239	124500	68500	245,4	135
United States	322583	32221	28139	99,9	87,2
Pakistan	185133	25100	23900	135,6	129,1
Russia	142468	35500	22500	249,2	157,9
Turkey	75837	17500	16800	230,8	221,5
Egypt	83387	18400	16600	220,7	199,1
Iran	78470	18900	16400	240,9	209
Brazil	202034	12000	11300	59,4	55,9
Algeria	39929	10050	10000	251,7	250,4
Morocco	33493	8900	8500	265,7	253,8
Ukraine	44941	12000	8000	267	178
Indonesia	252812	7465	7300	29,5	28,9
Uzbekistan	29325	8900	6700	303,5	228,5
Mexico	123799	6750	6450	54,5	52,1
Afghanistan	31281	7000	6200	223,8	198,2
Argentina	41803	6150	6050	147,1	144,7
Japan	127000	6500	5900	51,2	46,5
Iraq	34769	6500	5600	186,9	161,1
Canada	38845	9830	5330	253,1	137,2
Ethiopia	96506	5400	4900	56	50,8
Kazakhstan	16607	6800	4800	409,5	289
Bangladesh	158513	4700	4700	29,7	29,7
Nigeria	178517	4220	4170	23,6	23,4
Syria	21987	4700	4000	213,8	181,9
Yemen	24969	3800	3800	152,2	152,2
Australia	23630	7000	3400	296,2	143,9
Saudi Arabia	29369	3500	3300	119,2	112,4
South Africa	53140	3265	3225	61,4	60,7
Azerbaijan	9515	3350	2950	352,1	310
Sudan	38764	2925	2900	75,5	74,8
Tunisia	11117	2850	2825	256,4	254,1
Philippines	100096	3750	2350	37,5	23,5
Korea, Republic	49512	3720	2320	75,1	46,9
Chile	17773	2325	2175	130,8	122,4
Libya	6253	2150	2150	343,8	343,8
Nepal		2065	2065		
Peru	30769	1945	1875	63,2	60,9
Venezuela	30851	1800	1800	58,3	58,3
Kenya	45546	1900	1750	41,7	38,4
Colombia	48930	1625	1565	33,2	32
Viet Nam	92548	1950	1550	21,1	16,7
Malaysia	30188	1490	1450	49,4	48
Tajikistan	8409	1825	1350	217	160,5
Taiwan		1330	1270		
Emirates	9446	1350	1250	142,9	132,3
Thailand	67223	1900	1200	28,3	17,9
Belarus	9308	2600	1100	279,3	118,2
Kyrgyzstan	5625	1300	1100	231,1	195,6
Turkmenistan	5307	1400	1000	263,8	188,4
Israel	7822	1865	965	238,4	123,4
Tanzania	50757	950	950	18,7	18,7
Jordan	7505	1040	925	138,6	123,3
Angola	22137	850	850	38,4	38,4
Sri Lanka	21446	810	810	37,8	37,8
Cuba	11259	800	800	71,1	71,1
Mozambique	26473	753	753	28,4	28,4
Lebanon	4966	740	740	149	149
Georgia	4323	725	725	167,7	167,7
Cameroon	22819	675	675	29,6	29,6
Switzerland	8158	1005	655	123,2	80,3
Moldova	3461	855	605	247	174,8
Myanmar		580	580		
Hong Kong		595			
New Zealand	4551	975	575	214,2	126,3
Senegal	14548	560	560	38,5	38,5
Norway	5091	835	535	164	105,1

Mongolia	2881	540	535	187,4	185,7
Guatemala		575	535		
Bosnia	3825	625	525	163,4	137,3
Ghana	26442	595	520	22,5	19,7
Korea, Democ	25027	520	520	20,8	20,8
Ecuador	15983	620	515	38,8	32,2
Bolivia	10848	505	490	46,6	45,2
Armenia		630	480		
Hong Kong		465	465		
Mauritania	3984	450	450	113	113
Congo Dem Rep	69360	425	425	6,1	6,1
Dominican Rep	10529	410	410	38,9	38,9
Côte D'ivoire	20804	410	400	19,7	19,2
Sénégal	14548	560	560	38,5	38,5
Kuwait		390	390		
Uruguay	3419	515	365	150,6	106,8
Paraguay	6918	450	350	65	50,6
Haiti	10461	310	310	29,6	29,6
Macedonia		380	305		
Jamaica		300	300		
Zimbabwe	14599	295	295	20,2	20,2
Congo	4559	280	280	61,4	61,4
Zambia	15021	275	275	18,3	18,3
Singapore		270	270		
Chad	13211	265	265	20,1	20,1
El Salvador	4384	265	265	60,4	60,4
Guinea	12044	265	265	22	22
Niger	18535	255	255	13,8	13,8
Honduras	8261	270	250	32,7	30,3
Costa Rica	4938	215	215	43,5	43,5
Burkina Faso	17420	205	205	11,8	11,8
Nicaragua	6169	190	190	30,8	30,8
Madagascar	23572	190	190	8,1	8,1
Fiji	887	175	175	197,3	197,3
Togo	6993	165	165	23,6	23,6
Panama	3926	155	155	39,4	39,5
Eritrea	6536	140	140	21,4	21,4
Trinidad &Tob	1344	135	135	100,4	100,4
Mauritius	1249	125	125	100,1	100,1
Gabon	1711	115	115	67,2	67,2
Guyana	804	50	50	62,2	62,2
Sierra Leone	6205	45	45	7,3	7,3
Liberia	4397	40	40	9,1	9,1
Barbados	286	25	25	87,4	87,4

Source : http://www.indexmundi.com/agriculture/?commodity=wheat&graph=domestic-consumption;

* all uses consumption adds feedstuffs to other uses: direct food consumption, seeds an other uses (FIS : food, industry, seeds).