FARM

Fondation pour l'agriculture
et la ruralité dans le monde

Agricultural Potential of West Africa

(ECOWAS)

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Introduction

The agricultural sector plays a decisive role in the national economies, trade balance, employment, rural incomes and food security of the nations and populations of the Economic Community of West African States (ECOWAS)

In economic terms, agriculture accounts for around 35% of the gross regional domestic product, just slightly less than the service sector (37%), which has grown considerably throughout ECOWAS due to expansion of the tertiary sector in the world economy. The agricultural sector is also a cornerstone for developing export capacities of ECOWAS member states, including those with high energy deposits (oil, natural gas) such as Nigeria. Agriculture contributes to servicing debt and financing imports of consumer goods, capital goods and semi-finished goods for industry.

The first challenge facing the agricultural sector is to provide this economic function more efficiently by increasing productivity and supplying raw materials to both small-scale and agro-food industries. Meeting this challenge is crucial for ECOWAS countries to reduce food dependency on the rest of the world and improve the current unfavourable terms of trade, by processing products and increasing value-added.

In terms of employment, the agricultural sector is still the number one supplier of labour. More than 60% of the working population in the region works in agriculture, despite low remuneration compared to other sectors of the economy. Another challenge facing ECOWAS agriculture is therefore to increase remuneration of agricultural workers, notably by improving productivity.

Agriculture plays a key role in ensuring food security of households, especially given the importance of on-farm consumption and the role of local markets in feeding urban populations. Around 80% of the region's food needs are already met by regional production. A third challenge is to transition from guaranteeing food security to guaranteeing food sovereignty at a regional level.

But at all these levels there are major differences among ECOWAS member states; this heterogeneity is both a strength and weakness

when it comes to promoting efficient regional agriculture. The strength lies in the complementarity of ecosystems and agro-ecological regions in terms of agricultural production. The weakness has to do with constraints on natural and human resources. Promoting regional agriculture therefore depends on identifying the region's potentialities, to determine how ECOWAS states can effectively confront economic globalisation and reap its benefits.

Regional decision-makers and peasant organisations have formulated a vision of agricultural development based on the concept of food sovereignty. The key question underlying this study is to determine whether the region indeed has sufficient production potential to meet the growth in demand between now and 2030.

This question is analyzed from four perspectives: i) the principal supply and demand trends over the last twenty-five years; ii) the potential for regional production in terms of land availability, water resources, climate change, and access to capital; iii) projections of agricultural demand based on major global trends and their impact on the ECOWAS region, food demand and export demand; and finally iv) projections of agricultural supply based on capacities to intensify production, expand surface areas, pursue research & development and define the terms of competitiveness for agriculture in ECOWAS states.

1 Approach and methodological limits

This study aims to define the terms of debate of a vast and complex subject. It does not attempt to give definitive answers to the key question, but rather give guidelines and illustrate the issue's magnitude by looking at global dynamics.

The approach, based essentially on production data from FAO databases (surface areas, production, yields), has two main limits. The first concerns the quantitative data itself. The data reflects the weaknesses of national and regional information systems – the availability and reliability of information.

The second limit concerns the choice of scenarios and their characterisation. The authors opted to explore the factors influencing the realization of the region's potential, the underlying assumption being that there is consensus regarding this great physical potential. The question is then, what is the impact of the physical, political, economic and trade environment – both international and regional – on achieving it.

The scenarios deliberately do not take into consideration a large number of variables. Instead, they limit the hypotheses so as to allow the stakeholders of regional agriculture – first and foremost West African decision-makers and leaders of professional organisations, but also research and aid agencies – to grasp the debate and add to it, in order to form their own analyses.

2 Main supply and demand trends over the past 20 years

2.1. Regional supply and demand trends

Agricultural production in the ECOWAS region is composed of many production systems but based mainly on very small-scale family-owned farms (of less than 10 hectares). Contrary to popular belief, it appears to be relatively diversified. The oft-assumed lack of diversification actually stems from two characteristics of the region's agriculture:

II) The high degree of specialisation of selected exports, when each country is considered individually. Analysis of the national structure of agricultural exports shows that each country has a strong dependency on just one to three products. This dependency, generally inherited from colonial days, is considered a vulnerability in agricultural economies;

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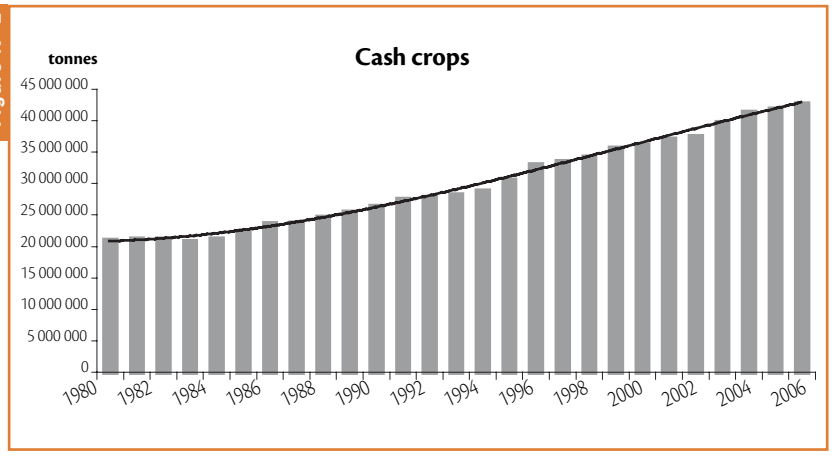
II) The low level of diversification within a particular eco-system or agro-ecological region: for example, specialisation of dry cereals in areas with little water, cotton in the Sudanian belt and coffee, cacao, etc. plantations in subequatorial or humid tropical regions.

Despite the characterisation that agriculture is in crisis, agricultural production has experienced strong growth over the past 25 years. This growth varies according to crops:

I) Cash crops sold almost exclusively on the international market (cotton, coffee, cacao, groundnut, palm, cashew, etc.) have seen their production volumes double (see Figure 1), rising from 19 million tonnes in 1980 to almost 38 tonnes in 2006.

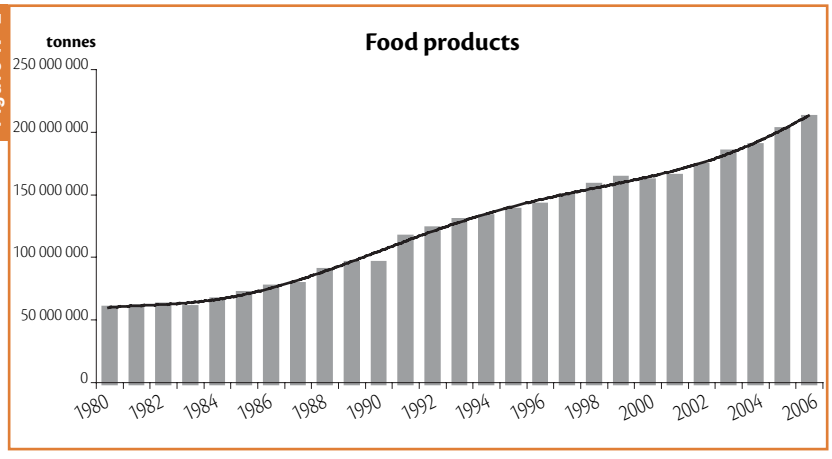
b) Growth is even sharper (see Figure 2) for food crops that are not traded with the rest of the world, whose production went from 59 million tonnes in 1980 to 212 million tonnes in 2006.

Figure N° 1



Évolution des productions de rente

Figure N° 2



Évolution des productions vivrières

Overall, the rise in production volumes exceeds growth in the regional population. However, trajectories differ considerably from country to country. Countries which have experienced persistent political instabilities have seen their agricultural production decrease over the period, even though this decline did not bring down total production trends for the region as a whole.

2.1.1. The boom in plant production

Production of all cereals rose from 16 million tonnes in 1980 to almost 50 million tonnes in 2006. Growth rates of roots and tubers were even sharper, increasing almost fivefold over the same period, from 27 million tonnes in 1980 to 124 million in 2006.

THE RISE IN PRODUCTION VOLUMES EXCEEDS GROWTH IN THE REGIONAL POPULATION.

Cash crops have undergone a similar trend. Cacao production rose from 880,000 tonnes to more than 2.7 million tonnes. (Cote d'Ivoire is the world's number one producer.) Cotton grew even more sharply from 470,000 tonnes to almost 2.6 million tonnes, making the region a leading world producer, its production growing much faster than the worldwide trend.

The same applies to the production of fruit and vegetables for export. Production volumes of bananas and pineapples rose from 1.3 to 2.1 million tonnes. Coffee has seen much slower growth in volume. Production rose from 300,000 tonnes in 1980 to 398,000 tonnes in 2000, falling to 219,000 tonnes in 2006. Sugar cane production increased only slightly over the past 25 years, not enough to keep up with the rise in demand for sugar in the region. The figure rose from around 4 million tonnes in 1980 to 4.7 million tonnes in 2006. This is primarily due to the low price of sugar on international markets and the absence of a production and processing strategy for the majority of countries in the region.

The market gardening sector also saw major production increases. Tomato production, for example, rose from 510,000 tonnes in 1980 to 1.5 million tonnes in 2006, onions from 684,000 tonnes to 1.3 million tonnes. However, these figures should be viewed with caution, given the quality of data available on this sector. Information systems have serious difficulties providing reliable information on surface areas and production volumes of large-scale crops, even cash crops such as cotton. Moreover, these systems are not appropriate for collecting data on multiple production systems occupying a multitude of very small plots. Nonetheless, this precaution does not alter the general trend, namely that there has been very rapid growth in vegetable production, thus responding, at least partly, to sharp increases in urban demand and the diversification of diets.

Table N° 1

Growth in main crops

Year	1980 Tonnes	2006 Tonnes	Average growth rate (%)
Grains			
Maize	2 129 165	11 778 726	4,5
Sorghum	5 425 024	13 899 135	1,6
Millet	5 183 641	14 477 496	1,8
Paddy rice	3 199 964	9 091 018	1,8
Roots and tubers			
Yams	9 274 308	48 095 312	4,2
Cassava	16 460 082	63 261 251	2,8
Sweet potatoes	314 127	4 124 120	12,1
Potatoes	50 400	927 197	17,4
Legumes			
Beans, cow peas, peas	1 191 194	4 787 657	3,0
Spices, fruits and vegetables			
Spices	98 150	326 930	2,3
Fruit	9 050 819	18 099 001	1,0
Vegetables	5 352 215	14 569 681	1,7
Oils			
Walnuts	243 952	1 090 117	3,5
Groundnut/shell	1 815 571	6 095 746	2,4
Palm nut	9 352 260	14 061 355	0,5
Palm kernel	492 049	1 517 900	2,1
Other export or agro-industrial crops			
Cotton	470 549	2 577 407	4,5
Cacao	879 928	2 728 040	2,1
Green coffee	302 644	219 126	-0,3
Leaf tobacco	21 839	33 430	0,5
Sugar cane	3 985 800	4 740 766	0,2
ECOWAS + Mauritania	75 293 681	236 501 411	2,1

Source : FAOSTAT.

Growth in vegetable production has been spectacular in the periphery of towns. But it has also taken place in numerous villages, including in arid Sahelian areas, thanks to the introduction of systems to collect surface water and access groundwater thus enabling irrigation of a few hectares. Such systems also provide households with water and any surplus is sold in local markets (an opportunity to diversify activities and generate income for women).

2.1.2. Slower growth in regional livestock

Animal production experienced a lower growth rate than vegetable production, both in terms of heads of livestock and dairy and meat production.

Herds of livestock in Sahelian regions were largely renewed following the slaughters resulting from droughts in the early 1970s and 1980s. However, given the availability and cost of young breeding stock, some of the decimated bovine livestock has been replaced by small ruminants – sheep and goats – which produce more quickly. This "transfer" from big to small ruminants accentuates problems of overgrazing, which damages the forest cover in dry areas (less selective species). According to FAO statistics, the number of bovine cattle rose from 31 million in 1980 to 45 million in 2005, then fell to 39 million in 2006 (see box below). Bovine livestock therefore recorded a rise of 25% compared with 65.6% for sheep and goats, whose numbers rose from 63 million in 1980 to 119 million in 2006. Pig herds grew 127.7% whilst poultry grew by 69.7%.

Based on these figures, beef production is estimated at 631,000 tonnes per annum. Total annual production of ruminant meat accounts for 1.26 million tonnes or 4.75 kg per inhabitant. Total meat produced in the region amounted to 2.35 million tonnes, equal to 8.7 kg per inhabitant. Milk production is estimated at 2.05 tonnes, or around 7.7 litres per inhabitant, a very low level of consumption.

Table N° 2

Animal and meat production

Year	1980	2006	Cumulative growth rate
Cows (number)	31 310 056	39 419 736	26 %
Sheep (number)	28 115 221	57 949 656	106 %
Goats (number)	34 894 893	6 116 734	75 %
Pigs (number)	3 271 901	11 228 756	243 %
Poultry (number)	176 254 000	346 597 000	97 %
Meat production (tonnes)	1 357 957	2 353 794	73 %
Milk production (tonnes)	1 253 668	2 050 512	64 %
Egg production (tonnes)	272 850	729 390	167 %

Source: FAOSTAT and authors' calculations

Box N° 1

Quantitative surveys of agriculture and livestock farming: rare, costly and the source of many surprises…

The lack of African agricultural statistics is the result of two problems. The first is the lack of regular, general surveys that both provide a baseline for future studies and establish a sample group that is representative of the diversity of agriculture, farms and production in each region or province. The second is the way annual studies, generally referred to as continuous agricultural surveys, are conducted and financed. The Sahelian countries are the only ones to have a standardised survey methodology put in place by the Permanent Interstate Committee for Drought Control in the Sahel (Comité permanent Inter Etats de lutte contre la Sècheresse au Sahel – CILSS), which covers nine countries. Introduced to improve production data in view of improving prevention and management of food crises, these annual surveys give preference to large food crops, particularly grains.

Niger has just produced a survey of agriculture and livestock farming with the support of the FAO and the European Union. The previous one was in 1980, when the agricultural popula-

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tion was half that of today and the 1984-1985 drought, which decimated a portion of livestock and severely damaged grazing systems, had yet to occur. Assessing livestock numbers has been particularly complex, due to the large expanse of pastoral and agro-pastoral areas, herd movement, "seasonal clearance" of animals and... the mistrust of herdsmen who fear the introduction of new taxes or duties!
Four years, €8.8 million and 125,000 questionnaires later (completed in a country with slightly more than 13 million inhabitants, i.e. 5% of the regional population), the results were surprising. An unsuspected herd of livestock! A total of 30 million head of cattle were recorded throughout the country, 30% above the estimated figure!
These figures alone show the difficulty of enacting public policies (which, in the case of livestock rearing, address issues from planning vaccination campaigns to defining transhumance corridors, setting health standards and formulating external trade policy on animal products) without reliable and regularly updated databases. They also illustrate the importance of supporting statistics with primary data.
The availability and quality of this data impacts all the systems supporting national, regional and international decision-making. The production of information, as a tool for directing and implementing policies, is a common good and an essential regional public asset.

Livestock farming contributes considerably to regional integration dynamics. The three landlocked Sahel countries – Burkina Faso, Mali and Niger – are the three largest bovine, sheep and goat producers. They are net exporters to the coastal countries – mainly Nigeria, Ghana and Côte d'Ivoire. The latter are net importers of meat products.
The main livestock systems in West Africa fall into three categories [1] (see figure 3):

- Pastoral systems: In these systems, the animals' diet is based on natural resources (pasture and bush) found in arid and semi-arid areas of landlocked Sahelian regions. Often, livestock is the only way of using these non-arable pastoral areas, by transforming natural biomass that is high in cellulose into animal products for human consumption. These are very extensive systems. Herds are moved regularly (short or long transhumance) so that fodder is always available. Pastoral livestock systems contribute significantly to the national economy of Sahelian countries. They account for 35%, 28% and 30% of the GDP of the agricultural sector in Burkina Faso, Mali and Niger respectively (the primary sector accounts for 31%, 36% and 35% of total GDP).
- Off-soil systems are mainly found in urban and peri-urban production, which has grown sharply, boosted by urban sprawl and urban food diets that include more animal products. These production systems use feed bought outside the farmer's production unit (fodder, cereals, complementary AGRO-INDUSTRIAL CROP BY-PRODUCTs). They are used for the production of eggs, poultry and pigs, as well as goats and cows for dairy production. Off-soil systems have not evolved uniformly. Chicken production underwent rapid expansion, but is now jeopardised by imports of cut by-products of European poultry and Brazilian chicken. The dairy chain

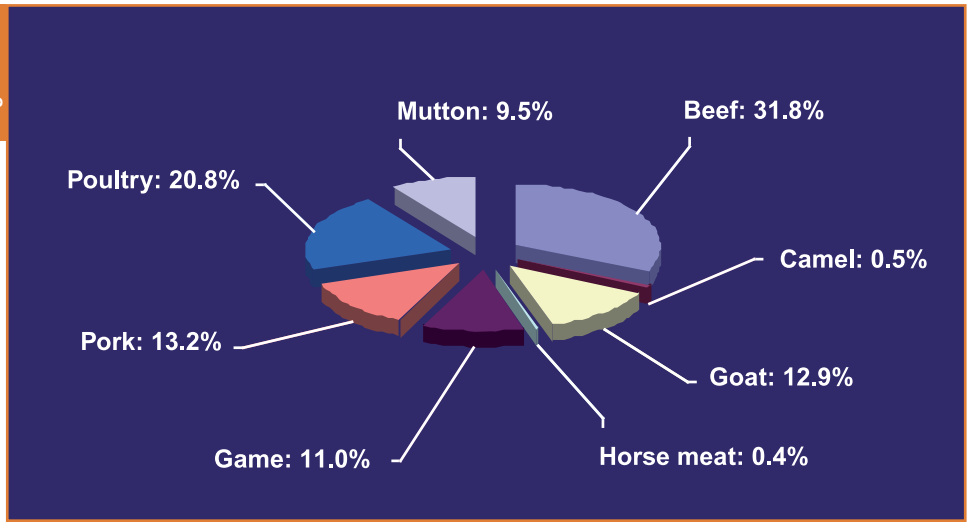
1. *See "The Future of Livestock in the Sahel and West Africa: Potentials and Challenges for Strengthening the Regional Market"; SWAC; March 2007.*

has been seriously affected by powdered milk imports, subsidised by the European Union, and used to supply semi-industrial units for reconstituted milk and yoghurt. The inadequate supply of milk on the world market and the ensuing rise in prices is likely to continue due to the low level of supply elasticity. This situation provides a new opportunity for local suppliers of fresh milk. Initiatives are emerging in most countries but they are not coming from the off-soil systems, which have high production costs. Rather, they involve the organisation and rationalisation of supply to milk processors, relying on production from dairy herds situated close to urban centres.

- Agro-pastoral systems combine grazing on uncultivated land and the consumption of cultivated fodder and agro-industrial by-products in polyculture-livestock farms. These systems are common among many nomadic herdsmen who have had to settle and diversify their activities by introducing crop cultivation (thus moving from highland grazing areas to lowland cultivable areas). They also concern a large proportion of farmers who have introduced livestock to diversify, as well as improve their technical systems (soil fertility, animal traction, capital to cover certain risks) and productivity.

The forecasting work conducted by the Sahel Club projects that demand for products of animal origin will grow 4% per annum, a rate exceeding demographic growth. Based on this projection, demand would increase 250% by 2025 and 270-280% by 2030.

Figure N° 3



Analysis of meat production species

2.1.3. A positive agriculture and food trade balance

The importance of agriculture can be seen in the growing share of agricultural exports in external trade from West Africa. All countries combined, agricultural exports represent almost USD 6 billion or 16.3% of the region's total exports of products and services. In return, the region imports USD 5.4 billion in food products. Not counting Nigeria, whose export structure is atypical due to oil, regional agricultural exports are greater than imports, representing 30% and 10% respectively.

Côte d'Ivoire alone accounts for 53% of the region's exports. The three non LDCs (2) – Côte d'Ivoire, Nigeria and Ghana (3) – account for 78% of the region's food exports, mainly in the form of cotton, coffee, cacao, bananas, pineapples and fishery products. Imports are distributed more equally across the region. The three non-LDC countries account for 60% of total imports but represent almost 70% of the regional population. This indicates that non-LDCs are less dependent on imports, calculated on the basis of import ratio per inhabitant. Import demand mainly comes from Nigeria which is both the strongest agricultural economy in region but also the largest importer, accounting for 36% of all food imports. Considering it is home to more than half the region's population, Nigeria's dependency on imports needs to be seen in relative terms. Nevertheless, the country does have the highest food trade deficit, approximately USD 1.5 billion in 2002-2004.

Over the past 20 years, food exports grew by 95% although imports "only" rose by 64%. The region is therefore seeing an improvement in its food trade balance, which rose from a deficit of USD 267 million to a surplus of USD 522 million. Consequently its dependency on imports is falling. Still, the balance for food products alone, excluding commodities exported for non-food purposes, is much less favourable. Goods that compete with local production – cereals, meats, milk, oils, sugar – account for 70-80% of food imports. Cereals, meats and diary imports alone, which are the basic food products, represent around half the regional food imports, doubling in value over the past 20 years. In terms of volume, these strategic products have grown even more (increasing 2.13 fold), given the price erosion on international markets over this period.

The European Union is the main outlet for the region's agricultural products, capturing 56% of its exports. Almost 30% of these EU imports are agricultural and food products. Likewise, West Africa imports a significant portion of food products from the EU, some 34% of worldwide imports. This illustrates the importance of the trade liberalisation debate with the European Union in negotiations of the economic partnership agreement (EPA).

2. *LDC: According to the United Nations, a country is classified as a Least Developed Country if it meets three criteria based on: low-income (three-year average gross national income per capita of less than US $750, which must exceed $900 to leave the list), human resource weakness (based on indicators of nutrition, health, education and adult literacy) and economic vulnerability (based on various indicators).*

3. *Formerly a least developed country, Cape Verde just left this group in 2007 due to the improvement of its development indicators. It is in transition, in that its insular economy is still very vulnerable. ECOWAS now includes 4 non-LDC countries.*

Trends in the trade balance for food products

Table N° 3

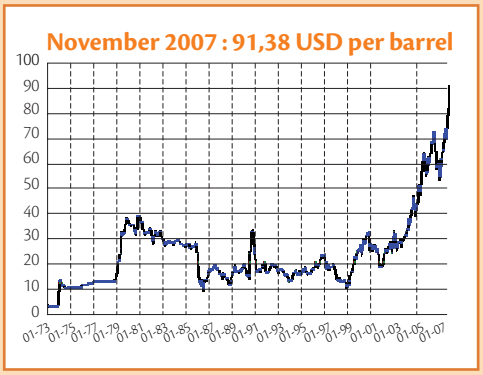
1.000 $	1982-1984			1992-1994			2002-2004		
	Exports	Imports	Balance	Exports	Imports	Balance	Exports	Imports	Balance
Benin	43 141	112 903	-69 763	103 670	172 797	-69 127	223 316	259 699	-36 382
Burkina Faso	57 535	81 680	-24 145	89 147	119 337	-30 190	265 040	139 228	125 812
Cape Verde	586	26 058	-25 473	748	63 476	-62 728	271	96 443	-96 172
Côte d'Ivoire	1 520 044	386 014	1 134 030	1 532 210	383 381	1 148 828	3 135 503	574 717	2 560 786
Gambia	28 708	40 871	-12 163	19 736	88 407	-68 672	19 954	101 849	-81 895
Ghana	357 756	101 173	256 583	326 617	211 483	115 134	984 230	685 732	298 498
Guinea	27 524	46 318	-18 794	39 129	168 645	-129 516	40 336	194 079	-153 743
Guinea-Bissau	8 571	11 377	-2 806	16 773	33 261	-16 488	52 659	44 051	8 608
Liberia	108 465	98 375	10 090	21 355	87 893	-66 538	85 630	95 216	-9 587
Mali	191 757	75 722	116 034	251 815	109 021	142 794	298 399	159 981	138 418
Niger	68 805	84 120	-15 315	27 232	72 871	-45 639	64 259	147 265	-83 006
Nigeria	381 299	1 840 323	-1 459 024	259 112	860 583	-601 471	502 982	1 990 305	-1 487 323
Senegal	170 148	268 000	-97 852	114 612	358 746	-244 134	161 773	705 918	-544 144
Sierra Leone	32 574	60 961	-28 387	13 804	108 077	-94 274	11 335	152 102	-140 767
Togo	61 348	91 845	-30 497	93 063	60 959	32 104	116 569	93 393	23 175
ECOWAS	*3 058 261*	*3 325 744*	*-267 483*	*2 909 022*	*2 898 939*	*10 084*	*5 962 255*	*5 439 978*	*522 276*

Authors' calculations, based on FAO data.

It should be noted that the region's trade structure is undergoing rapid transformation due to the rise in oil prices, Nigeria being an exporter of crude but an importer of refined products. The majority of the other countries are net importers and are currently experiencing significant difficulties. The following figure shows the recent evolution of regional imports and exports for all products combined. The rise in oil prices will be a determining factor of the region's agricultural growth capacities with positive impacts, but will also engender negative consequences particularly for the LDCs.

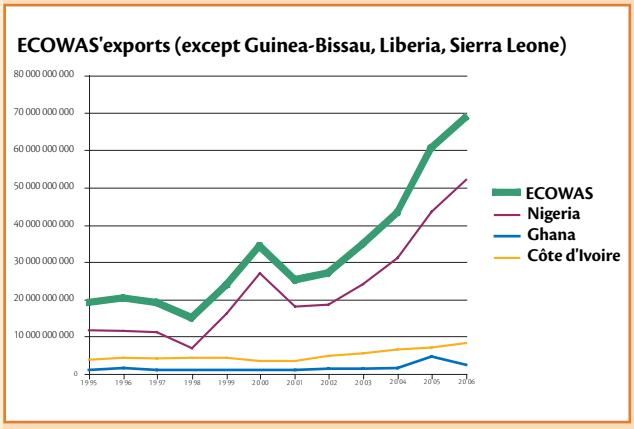
Impact of oil prices on the region's external trade

Figure N° 4

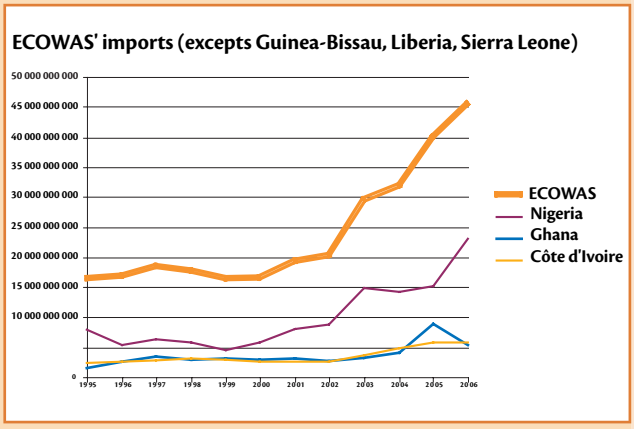


A leap in oil prices...

...boosts the region's exports



...and makes imports considerably more expensive!



Source: Commission and ECOWAS external trade.

2.2. Principal trends in the agro-ecological regions

In order to compare data, which is aggregated by country, the authors analysed information according to two clearly marked agro-ecological zones that characterise the region: (i) the Sahelian fringes and (ii) forest and Sudanian coastal areas. There are two reasons for this methodological choice. The first is that the main crops in forest areas, particularly roots, tubers and maize, are moving towards the Sudanian areas where more land is available and the climate good. Likewise, products formerly considered Sahelian, like legumes, millet and livestock, are moving down into Sudanian areas due to aridification (the isohyets are moving southwards). The second reason is that the northern arid fringe of the Sahel is increasingly specialised in livestock farming rather than agricultural production.

Production trends differ slightly in each zone. The dry-zone countries saw a 6% rise in cereal production. The Sudanian, sub-equatorial and humid tropical zone experienced only a 5% rise, but nonetheless account for 75% of regional cereal supply and 99% of roots and tubers. In the latter zone, production of roots and tubers has risen by 163% over the past 25 years.

Sahelian countries currently own around 14 million head of bovine livestock whilst Nigeria alone has a herd of 16 million head concentrated in the northern part of the country where there is a Sahelian-type climate. The predominance of Nigeria means that the coastal countries own 59% of ECOWAS bovine livestock, 56% of the goats, 54% of sheep and 72% of poultry. This gap is not a surprise since successive droughts in the 70s and 80s resulted in significant migrations of Sahelian farmers towards coastal countries. This has expanded bovine and sheep-goat livestock populations in these areas despite unfavourable hygrometric conditions for the species .

The Sudanian zone has remained the main destination for these displaced animals and is the leading animal production area of the coastal countries. This growth in animal production has led to an increase of harnessed traction and improved work productivity, particularly in cotton-growing areas. It has also made it possible to introduce livestock farming into agricultural systems and to develop agricultural complementarities that are important in agronomic (organic manure) and economic (diversification of sources of revenues and reduction of household vulnerability) terms.

2.3.Main lessons

The first lesson emerging from these trends is that zones with humid and semi-humid climates are playing a decisive role in regional agricultural dynamics. This is notably the case for the cross-border areas that traverse northern coastal countries and southern Sahelian countries. This zone is dynamic both in terms of production and trade. As a result, population density is rising quickly and is accompanied by more frequent and violent land-related problems.

This is the primary food production zone, contributing largely to the food security of ECOWAS populations. The rapid changes to the agricultural sector in this zone, which is also characterised by high levels of immigration from arid areas of the Sahel and increased urbanisation of secondary towns, need to be better understood and anticipated (by introducing cross-border observatories of socio-economic and demographic dynamics, for example).

4. *The Central African Republic has now created a large herd of livestock by accommodating these Sahelian farmers.*

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➔➔ The second lesson relates to the scale of agricultural production. Despite reservations regarding the reliability of the FAO statistics due poor quality information systems, the data shows that the ECOWAS region is improving its production capacities. This is reflected by a production increase that is higher than the growth rate of the regional population. Therefore, the real challenge for the region is speed up this production growth in light of increasing anthropic pressure on natural resources, the main (but unsustainable) driving force behind the present dynamic.

A PRODUCTION INCREASE HIGHER THAN THE GROWTH RATE OF THE REGIONAL POPULATION. BUT GROWTH OF CEREAL PRODUCTION IS DUE SOLELY TO THE INCREASE IN CULTIVATED SURFACE AREA (NOT AN IMPROVEMENT IN PRODUCTION SYSTEMS).

The third lesson is that the proportion of the food supply originating from the rest of the world is low. Food imports account for less than 5% of domestic production volume and 10% of the value of all imports. Despite population growth in landlocked Sahelian countries, rate of self-provision of cereals has not fallen. Granted, rainfall levels have been relatively good for the last 20 years, but it is also the result of evolving production systems (ECOWAP 2004) notably in the Sudanian and Sudano-Sahelian zones. Producers have managed to step up cereal production based on efficient (in agronomic terms) rotations (reverse effect of cotton fertilisers, for example) and crop association or alternation. The development of traction-based farming in cotton systems has also increased the surface area cultivated per farm. This expansion has been possible by cultivating deforested land. Rich in organic matter, these lands have initially produced good yields without massive use of fertilisers. On the other hand, in drier areas (less than 500 millimetres of rainfall), growth of cereal production is due solely to the increase in cultivated surface area (not an improvement in production systems). Expansion was made possible by reducing long fallow periods which, in a dry environment, is the main method for restoring and maintaining soil fertility. Consequently, soil fertility has deteriorated significantly (desiccation and erosion). This expansion of the surface areas was necessary to increase the availability of cereals for households and possible due to growth in the labour force (because of increased household size), but is not sustainable.

The fourth lesson concerns the role of women in the region's agricultural workforce. The rise in the number of female agricultural workers is partly explained by the growing number of women amongst the poorest populations, as able-bodied men increasingly migrate (seasonally or permanently) from the Sahel to coastal countries, to Arab countries or to Europe. But it also illustrates that a family farming model centred on promoting women-owned microenterprises, a growing trend in most of the ECOWAS countries, can be an effective way of accelerating agricultural growth in the region.

Proportion of male and female workers as a percentage of total agricultural workers

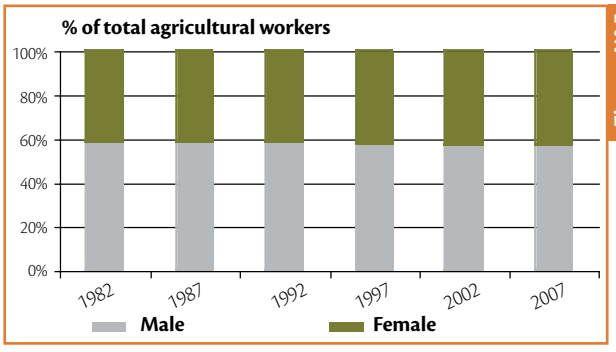


Figure N° 5

The fifth lesson is that rehabilitating herds and strengthening pastoral and agro-pastoral systems in the Sahel, combined with continued progress in animal production systems in the humid and semi-humid zones and better organisation of the milk and meat chains, would increase supply of animal products on the regional market.

Lastly, we can wager that the region has still not sufficiently exploited its internal potential to accelerate agricultural growth. The trends identified in this analysis have occurred within a particularly difficult regional and international context: poorly structured regional markets and growing distortion and failures of the international market.

The growth experienced by the agricultural sector is intimately tied to a combination of three factors:

- The management of current demographic trends. The growth of tuber and root vegetable production, particularly noticeable in densely populated areas (Nigeria, Ghana and Côte d'Ivoire), supports this theory. Like many other parts of the world, notably Europe in the 19th century, West Africa has spontaneously focussed on the promotion of roots and wwve prices, secured commercialisation channels), results have been considerable, on both cash crops (cotton and cacao, for example) and food crops (rice in the Office de Niger area, tomatoes in Senegal, etc.).

3 Regional production potential

The ECOWAS region has immense potential that is still under-exploited. This potential is based both on the highly diversified ecosystems favourable to a large variety of crop production, livestock farming, and flora as well as the abundance of natural resources – land suitable for farming, surface and subterranean water resources.

THE ECOWAS REGION HAS IMMENSE POTENTIAL THAT IS STILL UNDER-EXPLOITED.

3.1. Diversity of ecosystems

More than anywhere else, West Africa is home to a diversity of ecosystems. From the humid coastal zone to the dry and arid northern areas of the Sahel, from the desert to the central Sudanian and semi-humid zones – these ecosystems create a strong production base for a range of crops and encourage complementarity between major production areas. They are the driving force behind the integration of regional agricultural economies and trade.

The forest areas with sub-tropical climate are excellent for production of roots (cassava) and tubers (yams), making West Africa one of the world's major repositories of these crops. In addition, these areas pro-

duce perennial cash crops such as cacao (leading world producer), coffee, rubber and oil palm as well as cereals (including, increasingly, maize) and legumes.

THE AGRICULTURE OF THE SUDANIAN AREA DEPENDS ON THE ABILITY TO MANAGE WATER RESOURCES OVER THE NEXT 25 YEARS

The Sudanian area, considered the middle belt, produces dry cereals such as millet and sorghum, maize for food, oilseeds (sesame, shea tree, groundnut), cashew nuts and cotton as a cash crop. Over the past twenty years, this area has become the "helpful agricultural region" of West Africa due to the reduction of onchocerciasis. It is where the majority of rural migrants go when seeking new farming and pasture lands. The relative availability of cultivable land and pasture explains the strong appeal of this area, which is, however, ecologically fragile. The viability of agriculture and livestock farming in this region mainly depends on its ability to manage water resources over the next 25 years.

The Sahelian-desert fringes of the North are excellent for livestock and early or hardy crops. Over the past thirty years, major efforts to manage water by adjusting reservoirs to collect surface water have made it possible for farmers to settle the zone and, more importantly, diversify off-season production with vegetable crops. The effects of climate change are noticeable in this fragile area. Traditional pastoral systems based on herd mobility are widely criticized due to the increasing number of farmers settling in the area. The practice of opening fields to transhumant herds post harvest and during the dry season is increasingly called into question. Conflicts between farmers and pastoralists are on the rise. At the same time, livestock farming is growing quickly on the edges of the Sudanian zone in production systems that associate agriculture and animal husbandry.

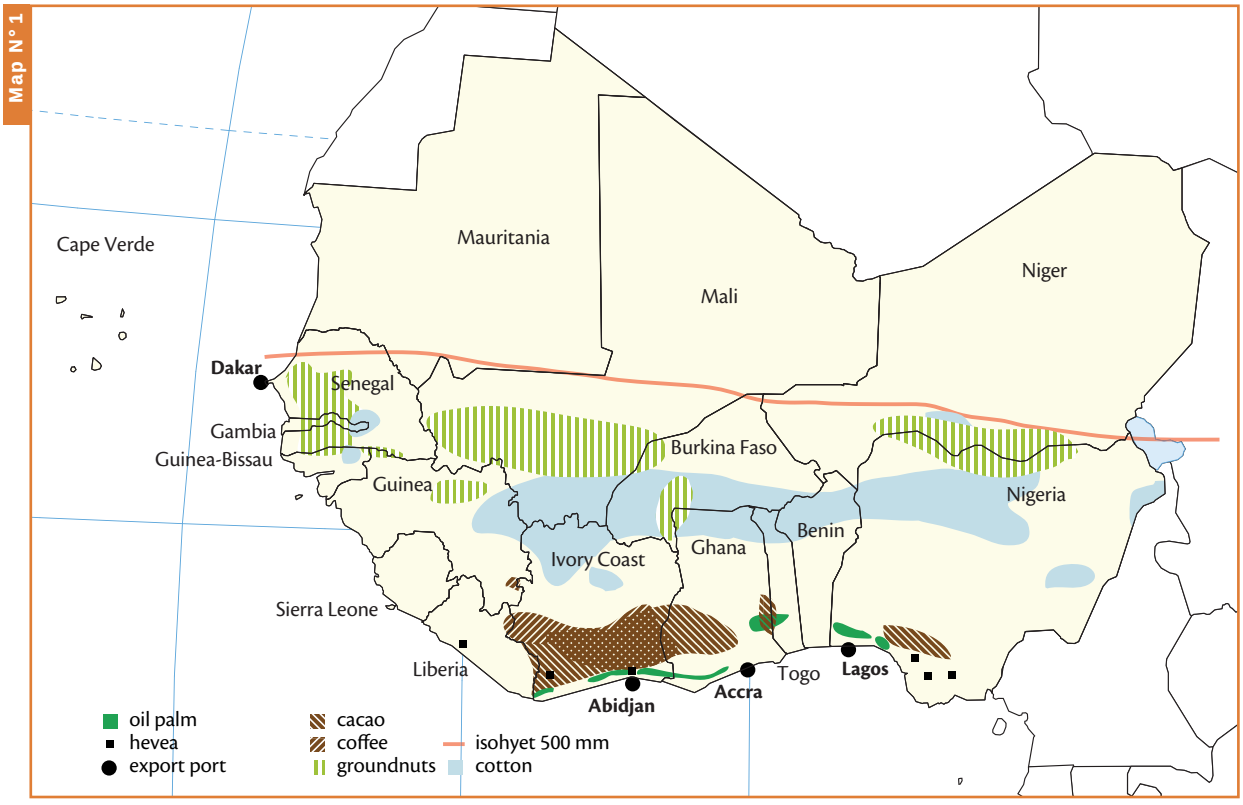
The region also has potential for fishery production, which is an economic cornerstone for countries like Senegal, mainly in the form of maritime sea fishing. Expanding the fishing sector, however, requires the region to meet a number of challenges. The first is overexploitation of fishing resources by foreign trawlers often without the agreement of national authorities. The second is the scarcity of inland fresh water fish due to both over-exploitation by humans and the silting of lakes.

The diversity of ecosystems also offers opportunities for trading products with agro-ecological complementarities, the premise for an integrated regional market which will cover 290 million consumers in 2008. Until now, the population was primarily rural, but it is becoming increasingly urban (see Figure 6). The large rural population offers a sizeable workforce for agriculture, with a growing number of women active in the sector (Figure 5). ECOWAS therefore has considerable human potential for agricultural production. Yet productivity is still low. The "calculated production" is an average of 2,033 kg of roots and

5. *Although West Africa is comprised of 16 states of which only 15 are members of ECOWAS, the terms West Africa, ECOWAS and ECOWAS region will be used interchangeably in this text.*

Principal production and cash crop locations

Map N° 1



Source : Bureau Issala, JL Chaléard and SWAC.

tubers and 675 kg of cereals per agricultural worker in the humid and semi-humid areas versus 37 and 490 kg respectively in the Sahelian zone. This explains why so little agricultural produce marketed (for example, it is estimated that only 10-15% of cereals produced are commercialised). It also explains the volatility of food markets, since producers only market surplus production after meeting household consumption needs (although a family may deprive itself, selling food in order to meet financial needs). Drops in production thus result in even sharper decreases in volumes marketed (see box on price of cereals).

To account for this diversity in ecosystems, the region's production potential is analysed here according to the following four aspects: land availability, water resources, the impact of climatic change and the conditions for mobilising capital. In addition, countries in the dry zone have 59% of the potential for milk production while the countries in the humid and semi-humid regions account for 57% of the meat potential.

6. *The average consumption in the region is 192 net kg of cereals and 310 net kg of roots and tubers per inhabitant, all usages combined.* .

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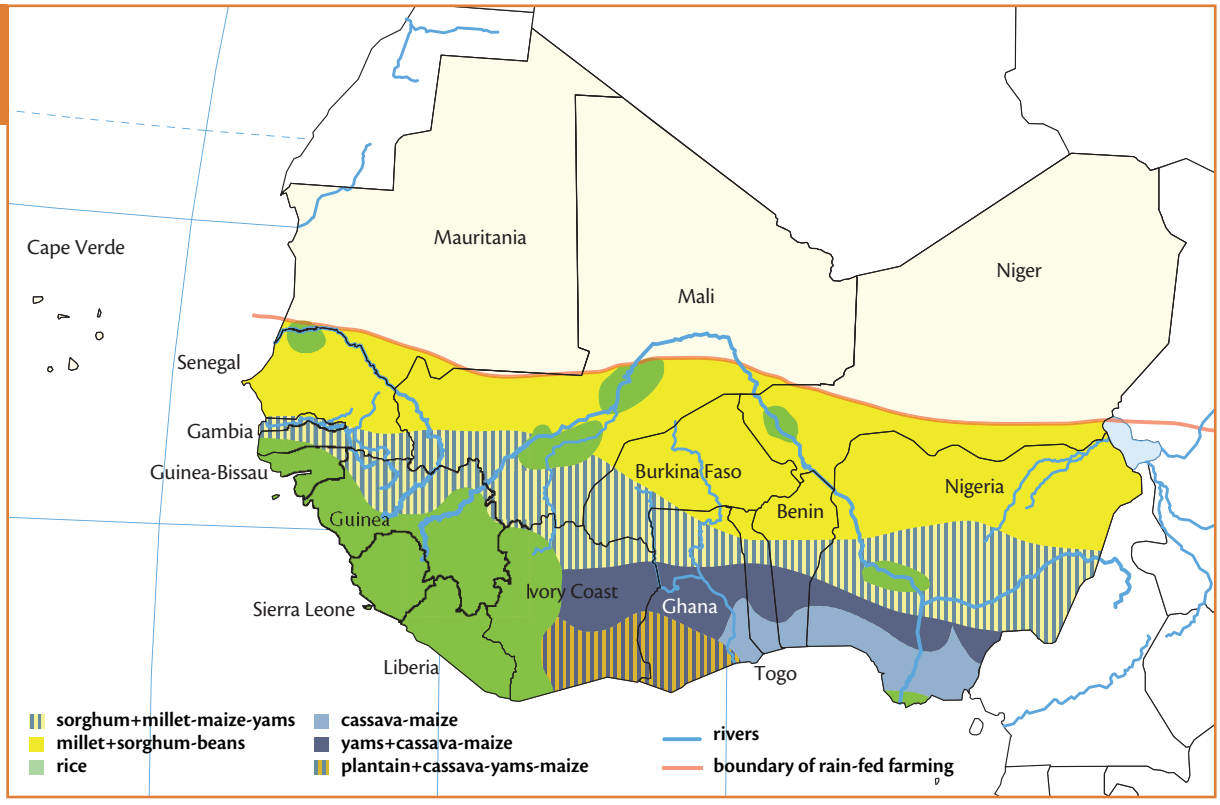
Carte N° 2

Principal production and food crop locations



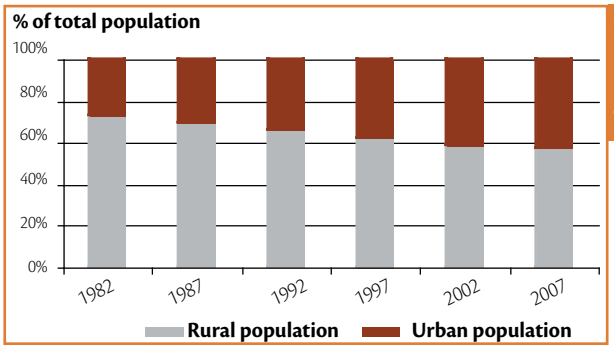
Source : Bureau Issala, JL Chaléard and SWAC.

3.2. Land availability by major agro-ecological area

The potential of agricultural lands in West Africa is still very high. According to FAO statistics, the region has around 236 million hectares of cultivable land, which, based on 2005 population data, breaks down into 0.9 hectare per inhabitant, 1.5 hectare per rural inhabitant or 1.04 hectares per agricultural worker. Around 55 million hectares are cultivated each year, i.e.: 24% of the overall potential. In addition, there are 119 million hectares of pasture with the potential for livestock rearing. Pastoral operations are practically the only way of developing arid and semi-arid areas and represent a considerable resource for the countries concerned. Provided they are adapted somewhat, pastoral systems offer great potential for animal production with low production costs.

The spatial distribution of land availability points to major potential in the forest fringes of three countries

Figure N° 6



Ratio of rural and urban population to total population

(Nigeria, Côte d'Ivoire and Ghana). Despite being well endowed, these three countries account for no less than 37% of unexploited land in the region. They are also the three most-populated countries in ECOWAS, with more than 64% of the total population. The quality of land and its suitability for both food and export crops presents a real opportunity.

Next come the Sahelian fringes of Mali, where less than 10% of the cultivable land is developed, Niger (28%), Senegal (29%), and Mauritania (11.6%). These four countries account for 40% of the region's unexploited land. Although the largest reserves of cultivable land are located in the Sahelian areas, production potential must be seen in relative terms. Poor soil quality makes the land unsuitable to diversified production and requires significant nutritive supplements to guarantee yields that are barely enough to cover the remuneration of agricultural workers. Insufficient and variable rainfall is also a constraint. The future viability of this land depends on the region's ability to manage water resources for irrigation and feeding livestock.

Growing alongside this cultivable land (see Figure 5), forests and wooded areas in ECOWAS covered 74 million hectares in 2005 compared with 88.7 million in 1980. This 16.5% drop over the past 25 years (see Figure 6) is mainly due to deforestation for agricultural purposes and the expansion of pasture lands, which rose by 5% between 1985 and 2005.

Cultivated land has developed more rapidly, testifying to the strong grip producers have over land resources. Development has been made possible by a rise in agricultural workers and increased mechanisation (see Table 8). The impact of tractor use on the expansion of cultivated land needs to be seen in relative terms, however, since 90% of production comes from small family farms that still have little access to cooperative forms of investment or options for renting tractors.

Land availability varies according to the major agro-climatic areas, which correspond to the above-mentioned ecosystems. Little land is available in the humid coastal area where population density is high (sometimes exceeding 200 inhabitants/km2)) and nearly inexistent in arid and desert areas. The semi-humid Sudanian region of ECOWAS has the highest concentration of agricultural potential. As such, the major production systems correspond to the main agro-climatic areas (which correspond to the the major agro-ecological zones of the

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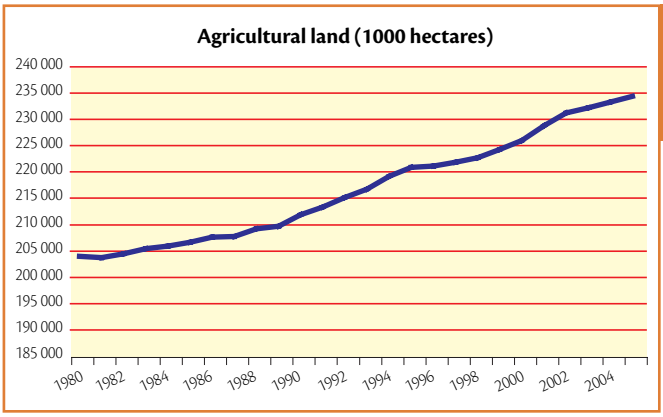
7. *The cumulative cultivated areas by production type give a much higher figure. This difference is due in part to inconsistent data but because crops are often planted in association.*

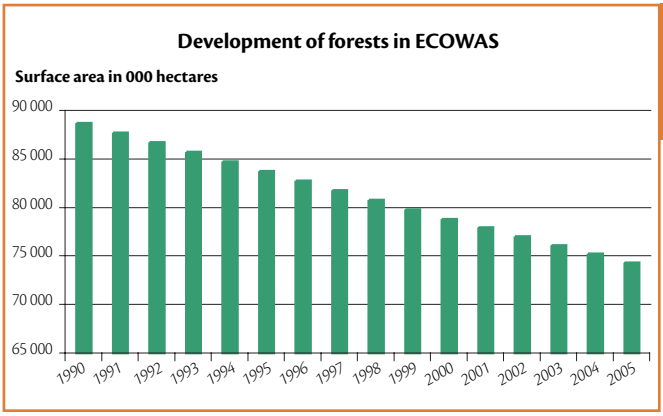
Development of agricultural land

Figure N° 7



Development of forests and wooded areas

Figure N° 8



region). Generally speaking, the coastal and Sudanian zones have the most available land in ECOWAS (see Table 5), despite high levels of urbanisation. They account for 43.8% of cultivable lands compared with 15.1% for the Sahelian zone.

Overall, pressure on land resources in ECOWAS is still moderate since uncultivated land accounts for 71% of the cultivable potential. The humid area has 37% of ECOWAS land reserves compared with 34% for the Sahelian zone. It uses 36% of its cultivable surface areas versus 20% in the Sahelian zone. The land reserves of the humid area represent 53% of total ECOWAS reserves compared with 47% for the Sahelian area. In two countries - Benin and Cape Verde - land reserves represent less than 50% of cultivable land area, 47.8% and 10% respectively.

Table N° 4

Land availability in West Africa

Country	Cultivable land	Cultivated land (hectares)	% cultivable land farmed in 2005	Pasture (1,000 hectares	Forest (1,000 hectares)
Benin	2 710 000	1 900 000	70	550	N/A
Burkina Faso	9 487 000	3 487 000	36,7	6 000	7 668
Cape Verde	67 000	42 000	62,6	25	1
Côte d'Ivoire	20 350 000	2 950 000	14,4	13 000	N/A
Gambia	378 000	185 000	49	194	53
Ghana	13 950 000	3 600 000	26	8 350	N/A
Guinea	12 185 000	885 000	72,6	10 700	N/A
Guinea Bissau	1 424 000	344 000	24	1 080	594
Liberia	2 595 000	380 000	14,6	2 000	N/A
Mali	33 275 000	3 341 000	10	3 000	6 601
Mauritania	39 714 000	464 000	11,6	39 250	2 453
Niger	15 529 000	4 368 000	28	11 160	1 396
Nigeria	70 000 000	28 200 000	40	39 200	N/A
Senegal	8 002 000	2 314 000	29	5 688	4 184
Sierra Leone	2 740 000	484 000	17,6	2 200	N/A
Togo	3 630 000	2 510 000	69	1 000	N/A
Total ECOWAS	***236 036 000***	***55 454 000***	***23,4***	***119 987***	***N/A***

Source : FAO/AQUASTAT.

Cultivable areas not used for crops in ECOWAS (in hectares)

Table N° 5

Pays	Cultivable land A	Cultivated land B	Unfarmed cultivable land C	C / A (%)	C / Total ECOWAS A (%)	C / Total ECOWAS C (%)
Benin	3 567 000	1 863 205	1 703 795	47,8	0,7	1,0
Burkina Faso	10 900 000	4 082 723	6 817 277	62,5	2,9	4,1
Cape Verde	74 000	66 434	7 566	10,2	0,0	0,0
Côte d'Ivoire	20 300 000	5 861 809	14 438 191	71,1	6,2	8,7
Gambia	814 000	226 251	587 749	72,2	0,3	0,4
Ghana	14 735 000	4 307 105	10 427 895	70,8	4,5	6,3
Guinea	12 570 000	1 977 600	10 592 400	84,3	4,5	6,4
Guinea Bissau	1 630 000	337 313	1 292 687	79,3	0,6	0,8
Liberia	2 602 000	348 876	2 253 124	86,6	1,0	1,4
Mali	39 479 000	3 511 934	35 967 066	91,1	15,4	21,7
Niger	38 500 000	9 298 227	29 201 773	75,8	12,5	17,6
Nigeria	74 000 000	32 037 382	41 962 618	56,7	17,9	25,3
Senegal	8 248 000	2 340 004	5 907 996	71,6	2,5	3,6
Sierra Leone	2 880 000	678 813	2 201 187	76,4	0,9	1,3
Togo	3 630 000	1 306 987	2 323 013	64,0	1,0	1,4
ECOWAS	***233 929 000***	***68 244 663***	***165 684 337***	***70,8***	***70,8***	***100,0***
Humid area	***135 914 000***	***48 719 091***	***87 194 909***	***64,2***	***37,3***	***52,6***
Sahelian area	***98 015 000***	***19 525 573***	***78 489 427***	***80,1***	***33,6***	***47,4***

Source : FAOSTAT.

3.2.1. Characteristics of the major production systems

The rainfall gradient of the ECOWAS region ranges between less than 150 millimetres in the Saharan region in the North and almost 3,000 millimetres in the southern part of coastal countries along the Gulf of Guinea. The result is highly diverse production systems, depending on the opportunities for growing potentially profitable crops. The low degree of "artificialisation" of the environment (water management, use of fertilizers and pesticides, etc.) means that natural factors play a decisive role in yields. In this context, climate dictates the variation in production levels and the choice of crops, especially in areas receiving less than 900 millimetres of rain per year.

THE CROP SYSTEMS ARE EXTENSIVE AND MAINLY RAIN-FED.

Although we have reliable information on crop systems, in terms of the types of crops cultivated and how they are grown, there is little information on the overall production units, except that it is generally accepted that 80-90% of the farms in the region are family-owned. Lack of knowledge about the structure and level of mechanisation of farms means that there is no typology of production systems for the region, like the one that exists in Mali. Data on level of input use or farm equipment for the various agro-ecological areas is also unavailable. This analysis is therefore essentially based on a typology of crop systems and the general trends in production systems.

Three major production systems, corresponding to the major agro-ecological areas, dominate West Africa. In all these areas, the crop systems are extensive and mainly rain-fed.

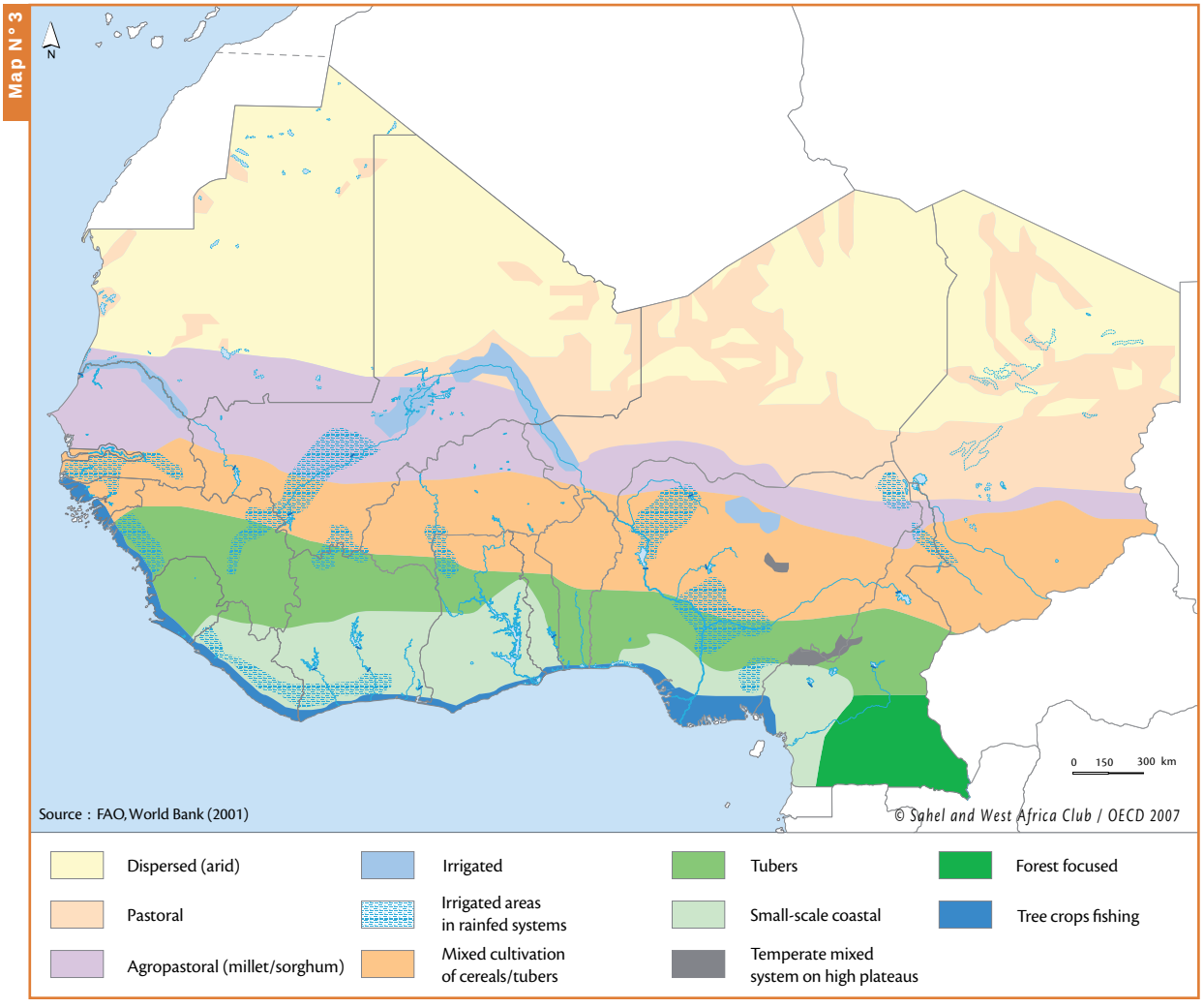
In the humid sub-equatorial, the characteristic system is dominated by roots and tubers (cassava, taro and sweet potato), plantain bananas, rice and maize. In addition, there are timber, oil palm, pineapple, coconut, cacao, coffee, kola trees and hevea plantations. Genuine agro-industrial units operate in this area, processing crops such as cacao, coffee, hevea and pineapple, notably in Nigeria, Ghana, Côte d'Ivoire and Liberia.

The central semi-humid area is characterised by greater diversity due to its climatic and agro-pedological features. The main crops in this area are yams, cassava, maize, rice, sorghum, millet, beans, legumes, mango, citrus fruits, cacao, coffee, cashew plantations and natural species such as shea and monkey cutlass trees. Less populated and vaster than the coastal area, this zone possesses the greatest agricultural potential in the ECOWAS region. Its northern limit extends from Gambia to the Yola latitude on the left bank of the Benue to the east of Nigeria. The southern limit extends from southern Senegal/northern Guinea Bissau, to the southern part of the Taraba state in Nigeria on the left bank of the river Katsina-Ala and passes through the centre of Côte d'Ivoire. This area is suitable for agricultural mechanisation. In some countries

such as Benin, traction-based farming is still most common, while in others such as Nigeria, Ghana and Côte d'Ivoire, mechanisation is becoming widespread.

Small family-owned farms predominate in this area. However, there are also large-scale livestock and poultry rearing operations, as well as cereal and legume production, notably cow peas. The Nigerian middle belt has an abundance of these large farms, many which emerged during the green revolution and out of the "Agricultural Development Projects". Land concessions made recently to Zimbabwean settlers in Kwara state are restoring this type of farming, which lost its momentum during the 1990s. These new large-scale farms are emerging primarily around cereal production, mainly maize and rice.

Major production systems in West Africa



The dry area is where cereal crops predominate, including rain-fed sorghum and millet, irrigated and/or rain-fed rice and wheat (albeit marginal), legumes (peas), onions and groundnuts. It roughly corresponds to the Sahelian and sub-Sahelian zone, whose northern limit goes from the North of Senegal to the northern bank of Lake Chad. This is where regional livestock farming is concentrated. Traditional farming systems alternating crops and long fallow periods are being called into question even though there are no obvious alternatives or at least none that are accessible by producers. This is leading to the impoverishment of rural households, greater vulnerability and the temporary or permanent migration of able-bodied men to regions where they can sell their labour. These arid and semi-arid areas are often ignored by public policjy since they account for little in economic terms due to the absence of cash crops. However, evolving agricultural techniques (involving land development, irrigation, water and soil conservation, etc.) and linkages to profitable markets are increasingly making these areas more viable. The development of market gardening crops in northern Burkina, onions in Mali and Niger, sweet potatoes and tomatoes in the Senegal River Valley, bears witness to what is possible when producers operate in a somewhat dynamic and secure environment.

Generally speaking, farmers have developed crop systems which are based first and foremost on the development of natural resources, rather than any real intensification. Unable to invest in mechanisation, farmers rely on available labour. Therefore, access to natural resources and availability of labour are the principal factors that limit the development of production systems. They are also the key elements of the agrarian reforms needed to better exploit the agricultural potential of the ECOWAS region.

Very low use of inputs

When looking at to what extent production systems are intensified, it becomes clear that there is little use of the three biggest production factors: selected seeds, fertilisers and agricultural machinery.

Use of improved seeds is marginal. Most producers continue to use their own seeds from the previous year's production. This is almost systematically the case for food crops. Only rice farmers in irrigated areas such as the Office de Niger in Mali use selected varieties on a large scale, which has resulted in a significant increase in yields. This is also the case to a lesser extent in Niger and Senegal. It explains why growth in rice yields is much higher in Sahelian countries (where they have doubled in 25 years) than in the coastal countries. Technical packages have been adopted more readily and systematically in the irrigated areas than those with traditional rice production systems.

The total consumption of fertiliser is 1.5 million tonnes of finished products, which is equal to 463,000 tonnes of active N, P and K materials.

This is a very low level of usage, corresponding to an average of 9 kg per hectare cultivated in the region. Compared to average consumption for the whole of Africa (around 23 kg), Asia (159 kg) and the world (101 kg), this figure gives an idea of the accumulated deficit in the intensification of crop systems. It is estimated that 80% of fertiliser is used in cotton-growing areas. Outside these areas, use is highest in Nigeria and Côte d'Ivoire, mainly for the production of maize, cacao and rice. Burkina, Mali, Nigeria and Côte d'Ivoire consume 75% of fertiliser used in the region. Ghana and Benin consume 13%.

Most fertilisers are imported, although some factories manufacture mixtures from imported raw materials (known as bulk blending). Senegal and Togo have factories for extracting natural phosphate. Phosphate deposits in the region are estimated at 2.26 billion tonnes. Togo alone exports 1.7 million tonnes each year outside the region.

The prices of fertilisers are strongly correlated to the price of energy, notably for nitrogen fertilisers made from natural gas. Their prices rose by 2.5 over the past five years. Nigeria is likely to open new production units shortly.

Table N° 6

Production, trade and consumption of fertilisers (active ingredient)

In tonnes	Nitrogen	Phospho-rus	Potassium	Total NPK
Production	33 900	28 800	0	62 700
Imports	240 310	136 623	148 035	524 968
Exports	34 300	11 300	29 300	74 900
Net imports	206 010	125 323	118 735	450 068
Consumption	239 771	120 950	102 357	463 078

Source: IFDC, based on FAO data

Table N° 7

Consumption of fertilisers per hectare

In kg/hectare	1980	1990	2001-02
Benin	1	7	20,5
Burkina Faso	2	7	nd
Cape Verde	3	nd	6
Ivory Coast	29	16	30
Gambia	13	4	3,5
Ghana	7	5	9
Guinea	0	2	4
Guinea Bissau	1	2	8
Liberia	8	1	nd
Mali	8	7	9
Niger	1	1	1
Nigeria	6	14	7
Senegal	8	5	13,5
Sierra Leone	4	3	1
Togo	1	6	7,5
ECOWAS	***6***	***6***	***8,5***

Source: IFDC (2005), based on FAO data

The level of mechanisation is still low. The use of harnessing and animal traction for cotton and dry cereal (millet – sorghum) and some rice production is widespread in Sudanian areas. This harnessing is supplemented by power-driven pumps and small motorised cultivators in the irrigated rice and onion areas. No information is available on the exact evolution of this equipment in terms of numbers. After having experienced a relative boom over the 1980s, growth seems to have slowed. Although numerous countries have equipped themselves with units for manufacturing basic agricultural equipment, the selling prices of products are less and less accessible to small producers. Acquiring products is all the more difficult since there are no suitable financing mechanisms except for credit lines set up by microfinance institutions which generally offer short-term finance for activities with a high turnover rather than longer term loans for equipment, which by necessity are paid off over several harvests.

Box N° 2

Adopting innovations – improved seeds

The adoption of improved varieties by producers depends on numerous factors. Within the framework of analysing the profitability of the varietal research in West Africa, impact studies have been conducted to measure to what extent and under what conditions selected seeds are adopted and the impact in rural areas.

The first study relates to sorghum in Burkina Faso and was designed to assess the economic impact of research and dissemination of improved varieties in the central plateau from 1985-1996. The surveys assessed the adoption rate of improved varieties by comparing the proportion of lands sowed using selected seeds with the total surface areas cultivated with sorghum. The rate is 1% of the surface area. Producer surveys identified the main constraints to adopting selected seeds: the non-availability of seeds, or the producers' lack of awareness of them, the high cost of other inputs and the cost of improved seeds.

Main constraints identified by the producers for the adoption of improved sorghum seeds

Contstraints	Frequency (%)
Seeds not available	15,5
High cost of inputs other than seeds	14,1
Insufficient rainfall	11,3
High cost of seeds	11,3
Taste unpopular	8,5
Animal and bird attacks	7
Long cycle	5,6

Due to low usage of the selected varieties, the profitability of investments made in the course of the varietal research and dissemination efforts over the 1986-1997 period is very low, with an internal profitability rate of 1.37%. To justify their choice not to use the seeds, producers refer to problems directly related to the seeds but also to all the other factors which interfere with the improved performance of improved varieties, such as climatic uncertainties and the cost of other inputs.

The second survey relates to rice varieties in Mali . Its conclusions are radically different. The authors mention the

8. *L. Illy and S. Ouedraog: Assessment of the Economic Impact of the Improved Varieties of Sorghum in the Central Plateau in Burkina Faso, January 2000.*

9. *B.S. Coulibaly and A.O. Kergna – Economic Impact of the Development of Varieties of Short-Grained Rice in the Office de Niger in Mali, January 2000.*

impact of the devaluation of the CFA Franc as a factor that has allowed Malian rice to achieve a good level of competitiveness compared with its Asian competitors. They also encouraged the producers in the Office de Niger to develop their production. The survey covered two varieties – BG 90-2 and KOGONI 91-1 – for which the research at experimental stations and on small farms started in 1979 and 1980 respectively. The dissemination of these varieties started 10 years later (1989 and 1990 respectively for the two varieties). In 1998, the adoption rates had reached more than 80%. The average yield obtained over the 1990-1998 period by the former variety was 2.35 tonnes per hectare, while the yield of the BG 90-2 variety was 3.34 tonnes and Kogoni 91-1 was 4.27 tonnes. The internal rate of profitability amounted to 87% over the whole period – excluding the costs of dissemination, deemed equivalent regardless of the varieties distributed. In this case, the benefits of the research are undeniable both from the point of view of the producers and the national economy.

These two examples illustrate the challenges of varietal research, the difficulty of isolating technical elements from the rest of the economic and physical context, and the need to reinvest in regional research to provide answers to the users' needs.

From the ex-post evaluation report of the regional research programmes of the 7th EDF – Blein et al. 2002.

When considered on a regional scale, tractor use is still marginal but has shown marked growth over the past 25 years. The fleet of tractors in the region more than doubled between 1980 and 2003 according to FAO statistics. Three countries clearly stand out: Mali and Burkina Faso saw their number of tractors rise from 115 to 2,000 and 900 to 2,600 respectively over the period. Nigeria alone accounts for more than half of ECOWAS's agricultural machinery. This is due to the size of the country as well as recent agricultural policy which favours the establishment of big agro-industrial farms. It is practically the only country in the region with large-scale farms: 1,000, 2,000 or 3,000 hectares belonging initially to the government then granted to cooperatives or private economic operators. On average, the fleet of ECOWAS tractors is estimated at one tractor per 5,300 hectares, clearly illustrating the low level of equipment use by the regions' farms. Harvesters and threshing machines are even rarer.

However, there are two developments which may in eventually revolutionise the use of agricultural machinery in West Africa.

The first is the emergence of agricultural equipment cooperatives which permit members to pool resources and share communally purchased machines. Sharing investment and maintenance facilitates access to equipment, especially for small farmers.

The second has to do the increased presence of China and India in the region and their growing interest in the agricultural sector. This interest is reflected by wide-ranging donations of equipment and projects to set up manufacturing plants to assemble robust tractors and other agricultural motors suitable for the region's agriculture at more accessible prices than western manufacturers.

Table N° 8

Year	1980-1982	1989-1991	2001-2003
Benin	109	154	185
Burkina Faso	118	840	1 998
Cape Verde	14	16	16
Côte d'Ivoire	3 100	3 550	3 800
Gambia	44	43	45
Ghana	3 800	4 097	3 600
Guinea	170	340	560
Guinea Bissau	16	19	19
Liberia	302	329	325
Mali	1 000	2 067	2 600
Niger	107	170	128
Nigeria	10 333	23 000	30 000
Senegal	460	490	700
Sierra Leone	347	277	82
Togo	83	99	80
ECOWAS	***20 006***	***35 491***	***44 138***

Source : FAOSTAT.

Growth in the number of tractors by country

3.2.2. Soil characteristics

The land in West Africa is generally fragile and unfertile, as is often the case with African soils. The siliceous rocks (granite, sandstone, sand) from the alteration of the primary substratum, the vacillation between high humidity and intense drought aggravated by the dehydrating effects of sunshine, the desiccation of water in high temperatures, the mechanical erosion caused by the violent rains (run-off) and the winds are all factors which make the soil fragile and relatively poor.

The humid coastal region has red/yellow ferralitic soils, like those found in humid and equatorial tropical regions. Alluvial and red-brown soils from the lowlands, marl-chalk or black clays from depressions and mangrove soils make for great pedological diversity in this region. The soils are essentially made up of soft, red or purplish, yellow or black clays. They are generally acidic as a result of the rapid decomposition of organic matter that does not have time to transform into humus. Humus forms to give black clay soils only where water stagnates – valleys, estuary regions and coastal lagoons (Nigeria, Benin, Côte d'Ivoire, Sierra Leone notably). The run-off areas are subject to leached soils where the concentration of aluminium hydroxides and iron give the clay its red or yellow colour. These leached soils are where forests and commercial plantations of coffee, cacao, hevea and kola thrive. Vegetable crops, maize and rice are cultivated with little or no fertilisers in lowlands and depressions.

Mangroves and coconut tree plantations thrive in the mangrove soils along the coastal zones.

In the semi-humid Sudanian zone, the soil modification process is extreme. The alteration of the underlying crystalline rocks leads to the formation of laterites composed of aluminium hydroxide, which are made red by the iron oxide that characterises soils in this agro-ecological area. During the dry season, evaporation causes iron and aluminium salt to rise to the surface where they concentrate and form a hard crust or ferruginous plating, making the soils sterile in places. The fluctuation between humidity and drought results in laterisation of soil, worsened by slash-and-burn farming. Crusts and platings therefore cover vast regions in the zone, notably in Upper Guinea, the South of Burkina Faso and Niger.

The Sahelian zone, which is subject to an even drier season, is characterised by a light, powdery soil with very low clay content. This soil is easy to work but is particularly unfertile and fragile. It is only suitable for groundnuts although wheat and rice are cultivated when irrigation is possible, such as in northern Nigeria.

Ultimately, rainfall and soil quality are the two decisive factors influencing agro-economic potential in the ECOWAS region. Due to generally poor soil that is very sensitive to erosion in the Sahelian and Sudano-Sahelian zones, around two-thirds of the region's surface area is considered vulnerable. Moreover, the soils do not respond well to chemical fertilisers. On the other hand, soils in the sub-equatorial and Sudanian zones that receive more water are richer in nitrogen and phosphorus and benefit from a tropical climate that is more favourable to the formation of aerial and root biomass than the Sahel. Such soils are better able to renew their organic base and, consequently, fertility.

The sub-equatorial and Sudanian zones are at a considerable advantage when it comes to renewing the organic base of their soils thanks to the high population of livestock in these areas. The association of agriculture and livestock offers considerable opportunities for reducing consumption of artificial inputs. Inputs are costly and their undesirable impacts on the fauna and flora are increasingly understood and feared. Agriculture and livestock are gradually becoming more integrated in the Sudanian region but this production system is not yet widespread. It could be encouraged and developed in coastal areas where the size of farms is less than 1 hectare. However, when farms are several hectares in size, integrating agriculture and livestock be difficult due to the critical mass of livestock needed. Balancing the two systems is not easy, given the space needed to produce fodder to feed animals over the whole year, the space needed for crop production and the size of the herd needed to cover the organic material production requirements. Moreover, in order to make the most of the organic material, it is important to create fertiliser pits, collect manure, install pens to keep

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the animals at night and transport the collected organic matter to the fields. These are production methods that require changes that appear trivial, but which constitute a fundamental transformation of production systems, know-how and organisational methods. The growing availability of agro-industrial by-products has helped intensify animal production (number of animals per hectare) and consequently improved the technical and economic performance of these systems, which present considerable potential for the future.

3.2.3. Land density and reserves

Considering only 23-30% of arable land is cultivated (the number varies depending on how dual crops and associated crops are accounted for), land reserves do not yet appear to be an obstacle to agricultural development in West Africa. Nonetheless, land degradation due to desertification is a serious concern, particularly – but not only – in the Sahelian areas. Degradation of forest cover in the whole region has worsened land degradation, including in the sub-humid areas. In addition, deteriorating resources in the semi-arid zones has led herds to move South, increasing land pressure wherever they settle, whether it is temporary (in the case of long transhumance) or permanent.

Growth in cultivated areas is taking place out through vast breaks connected with the loose nature of the farm settlements, which makes the available land reserves more fragile by creating dry microclimates that are harmful to the naturally fragile soils of the region.

With an estimated population of more than 265 million inhabitants in 2005 and a total surface area of 6,114,670 km2, West Africa is one of the least densely populated regions of the world, with around 42 inhabitants/km2. But the region has pockets of high density, with more than 1,000 inhabitants/ km2 in some areas. When comparing the estimated 52.7 million people working in agriculture in 2007 to the cultivable area, land density is 22.5 agricultural workers/ km2. In other words, each agricultural worker could theoretically have 4.4 hectares to carry out their activities.

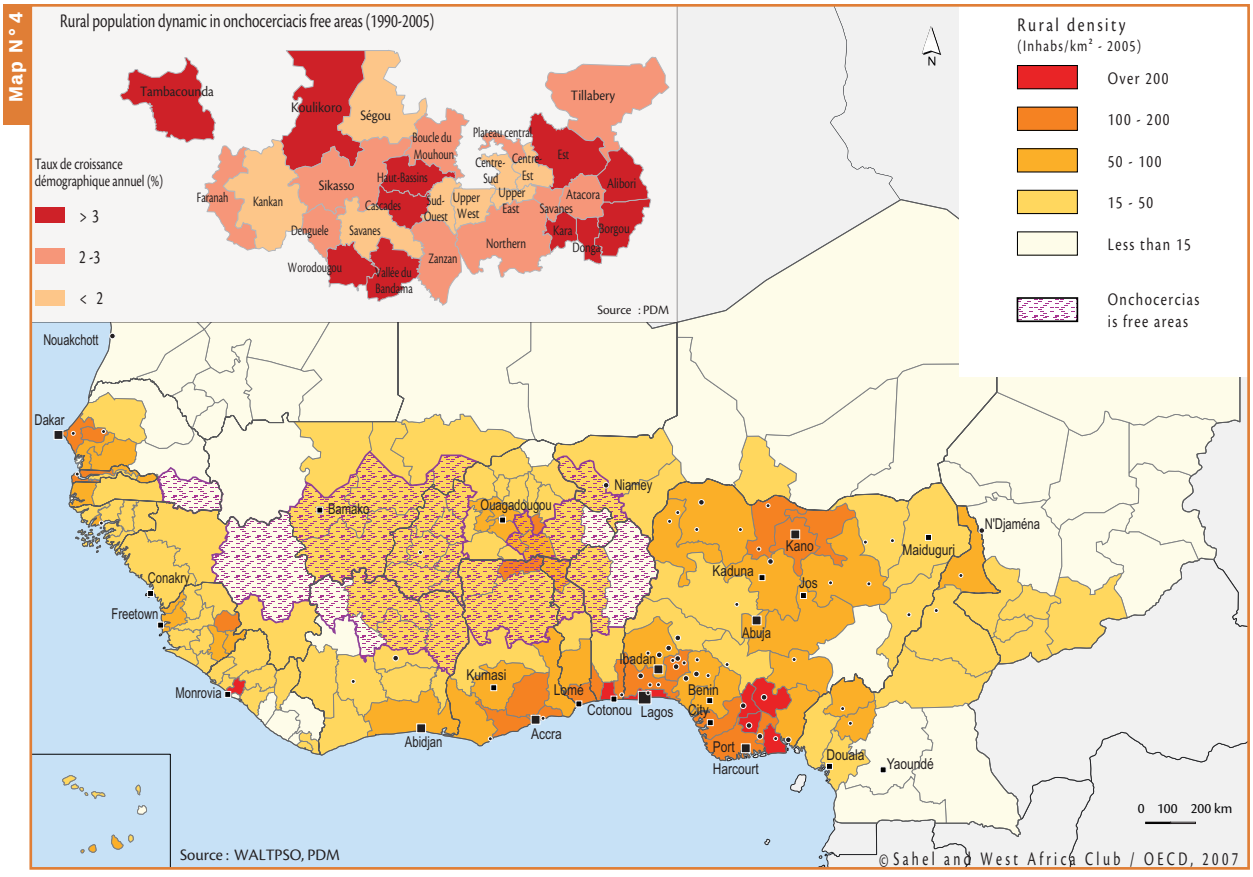
Assuming there are 55 million hectares of cultivated land, each agricultural worker farms an average of the 1.04 hectares. Considering that land reserves are made up of unused cultivable surface area, each agricultural worker can have a further 3.4 hectares. These figures obviously mask major inter-regional disparities. Land availability is under 0.25 hectares in many of areas of the coastal zone due to high population density (500-1,000 or more inhabitants/km2). This is also the case in the Kano region in northern Nigeria, which has consequently undergone strong intensification.

Considering the current number of agricultural workers, land availability is low even though there are more reserves than cultivated land. It

would be feasible to scale up mechanisation to increase the usage rate of land by reducing the number of agricultural workers. But in order to better exploit the potential of the land reserves, two questions must first be answered: which sectors are capable of recycling the agricultural labourers made obsolete as a result of increased mechanisation of West African agriculture? And what are the alternatives to fallowing for renewing of soil fertility?

Rural population dynamics

Map N° 4



3.2.4. Productivity levels

Agricultural yields in the ECOWAS region are generally low and differ according to crop systems. Yields for secondary cereals such as maize, sorghum and millet (600 kg/ha - one tonne/ha) are very low and average yields for rice and wheat are relatively low, despite good performances in irrigated areas, like the Office de Niger in Mali. Average yields for roots and tubers are moderate to high, despite these crops having benefited very little from technical assistance or research and development. Productivity is average for legumes and vegetables, as it is for irrigated rice crops, but could rise quickly provided efforts were made to offer sustained organisational and technical assistance.

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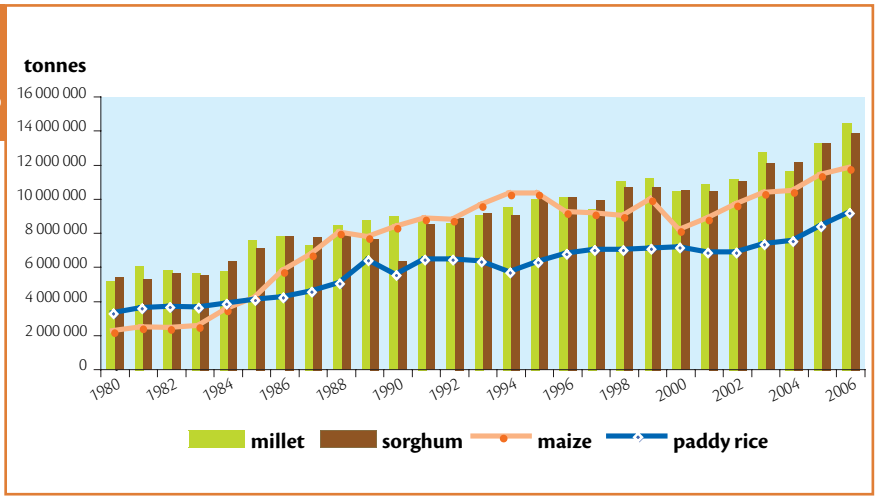
➔➔ *Cereal performances*

Yields for the four main cereals (maize, sorghum, paddy rice and millet) produced in the ECOWAS region are very low at 1,179 kg per hectare on average compared with 6 – 12+ tonnes in Asia and Europe for wheat, maize and rice. Figure 9 illustrates the evolution of production and Figures 8-11 show the evolution of yields by type of cereal.

Evolution of cereal production in ECOWAS

Figure N° 9



The real level of productivity is still lower if we consider other production factors such as labour and capital. But these two factors are not taken into account here given the difficulty of assessing domestic production, labour and capital at prices equivalent to those of the regional market. One approach is to assume that prices of domestic products are the same as those of imported products (cost, insurance, freight - CIF) plus taxes, transportation and direct marketing costs. But this approach, although technically possible at a country level, confronts difficulties defining the amount of taxes on a regional scale, in view of disparities between countries.

However, using the CIF price as the minimum price level, it is possible to define an indicative level of productivity. Still, the issue of cost of labour and capital remains, given there are no real capital and agricultural employment markets at a regional level. Given these difficulties, using yields to measure apparent productivity is justified. On the basis of the value added by production, it is possible to estimate the level of agricultural productivity according to the country (Table 9 below).

Table N° 9

Level of agricultural productivity in ECOWAS

Country	Added value per employee in $	Use of fertilisers (kg per hectare)
Benin	627	15,6
Burkina Faso	185	8,2
Cape Verde	2 370	2,6
Ivory Coast	1 085	20,2
Gambia	326	3,2
Ghana	574	2,8
Guinea	274	3,6
Guinea Bissau	323	8,0
Liberia	523	-
Mali	265	9,0
Niger	208	1,1
Nigeria	732	7,8
Senegal	354	16,2
Sierra Leone	360	0,6
Togo	528	7,6
ECOWAS	***523***	***8,2***

Source : FAO.

Rice is the cereal crop that presents the greatest potential for growth in productivity that could be tapped into quickly, due to existing irrigation potential and the emergence of NERICA varieties developed by WARDA . These varieties adapt to several types of land and give good yields without significant use of inputs. NERICA therefore represents considerable potential for productivity gains particularly if irrigation potentialities are exploited. Good water management can raise rice yields from the current average of 2 tonnes to more than 10 tonnes, with two crops a year on the plots.

Sorghum and millet have lowest cereal yields over a long period although they are still the main cereals produced in the region both in terms of surface areas and production volume. These species are best suited to an arid environment and weak, variable rains, although the consequences on yields are high. For a long time there has been very little varietal research to improve their performances. Research has mainly focussed on reducing the duration of the vegetative cycle to adapt to reduced rainfall. Conversely, maize has benefited much more from research and development in genetics, notably through the crossbreeding of varieties. Maize in particular benefited from its introduction into cotton systems, with effective rotations and the "diversion" of some of the fertilisers, bought for cotton and then spread over cereal crops. Generally speaking, the performances of the new varieties are

10. *West African Rice Development Association.*

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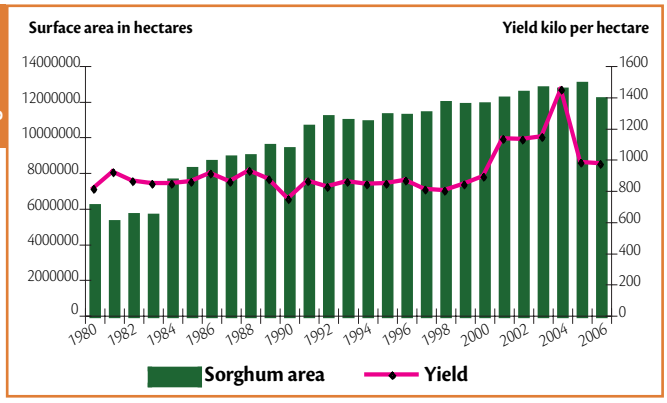
still under-exploited. Innovations are not widely disseminated, cropping methods are not very effective (in the absence of inputs, yields do not reach full potential) and food value chains are still inefficiently organised (lack of access to production factors, absence of technical assistance to producers and lack of commercial channels). Overall, cereal production is growing thanks to an increase in surface areas under cultivation rather than from higher yields (see Figures 10 to 13 and the summary in part 6).). The average annual growth rates of sorghum, maize, millet and rice yields over the past 25 years were 1.4%, 2.9%, 3.5% and 1.8%.

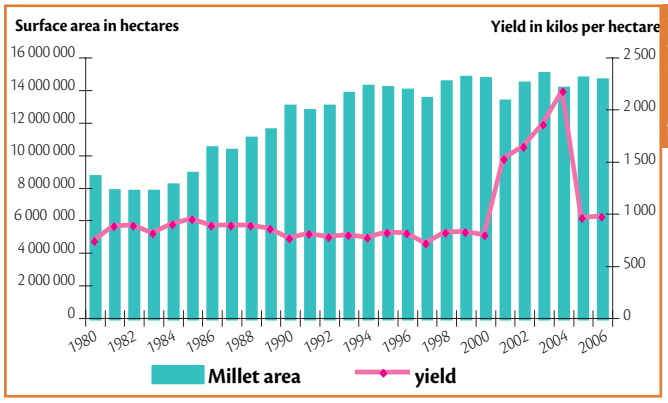
Development of cultivated land and sorghum yields

Figure N° 10



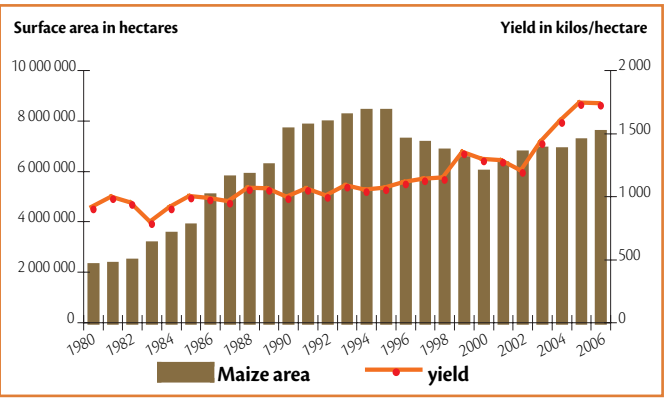
Development in cultivated land and millet yields

Figure N° 11



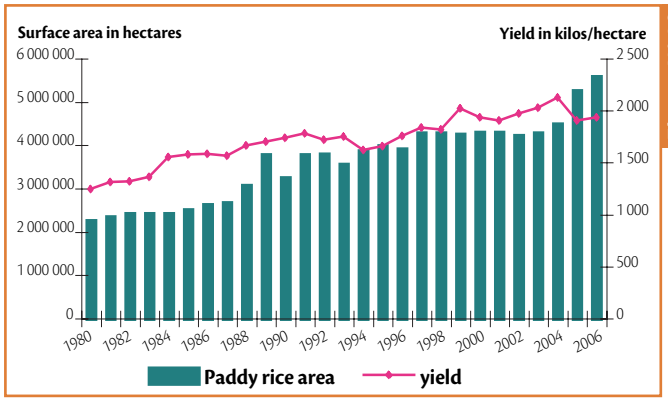
Development of cultivated land and maize yields

Figure N° 12



Development of cultivated land and paddy rice yields

Figure N° 13

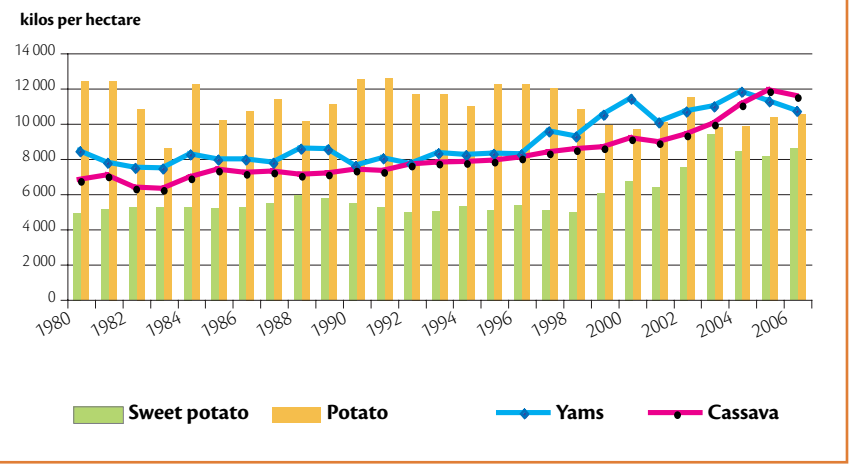


Performances of roots and tubers

The highest gross yields are for roots and tubers (see Figure 12). All roots and tubers combined, the average is 7.4 tonnes/ha. The average is 8.9 tonnes/ha for yams, 8 tonnes/ha for cassava, 6 tonnes/ha for sweet potato and 11 tonnes/ha. But once again, there is considerable room for improvement given the International Institute of Tropical

Agriculture (IITA) has developed cultivars, notably for cassava and yam, which produce respective yields of 75 tonnes/ha and 40 tonnes/ha (Yerima, 1996). There is room for progress in potato production, where yields are erratic from one season to the next. The potential for sweet potato is under-exploited, despite the fact that this tuber could rival the potato, which it closely resembles.

Figure N° 14

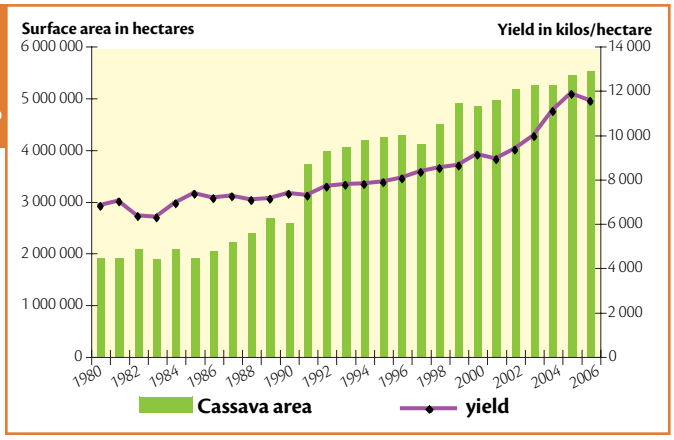


Development of yields of the principal roots and tubers in the ECOWAS region

The annual growth in yields of the four principal roots and tubers, i.e. yams, cassava, sweet potato and potato, grew by 1.2%, 2.2%, 2.5% and 0.1% respectively over the past 25 years. As is the case with the growth rates for cereal yields, they are not sufficient to match population growth of 3.6% p.a. The following graphs illustrate the growth in surface areas and the yields for each of the four main tubers.

Development of cultivated land and cassava yields

Figure N° 15



Development of cultivated land and yam yields

Figure N° 16

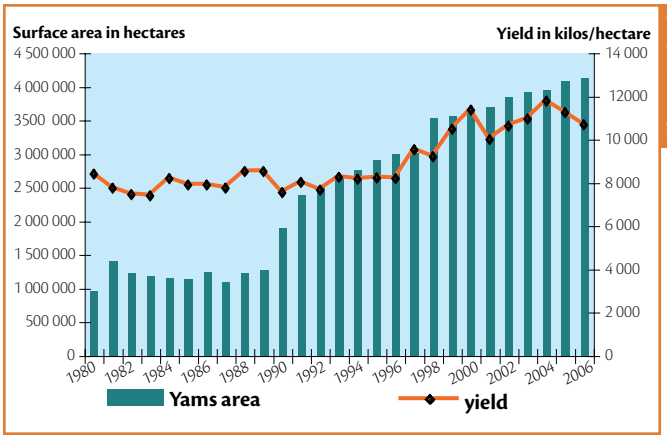


Figure N° 17

Development of cultivated land and sweet potato yields

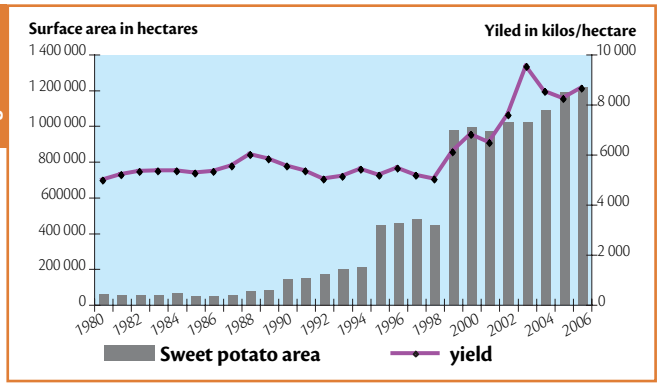
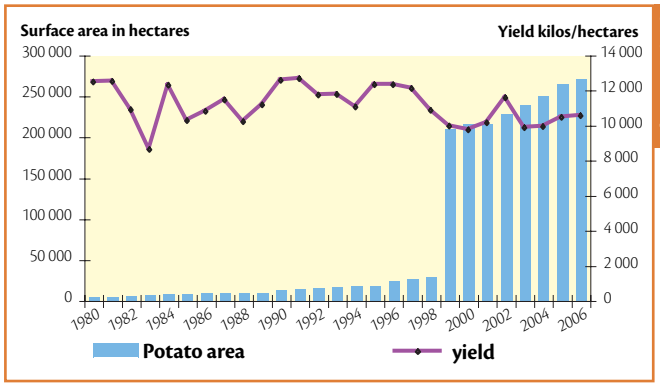


Figure N° 18

Évolution des surfaces cultivées et des rendements de pomme de terre



In short, one of the principal characteristics of agricultural productivity over the past 25 years in the region is that production increases were achieved primarily based on an increase in surface areas both for cereals and for tubers.

In the case of cereals, the cultivated surface area grew by 76% (2.9% p.a.), although yields grew by only 51% (2% p.a.). In the case of roots and tubers, cultivated areas grew by 143.1% (5.5% p.a.), whilst yields grew by 27.7% (1.1% p.a.). The resulting rise in production is 162.1%, or 6.2% p.a.

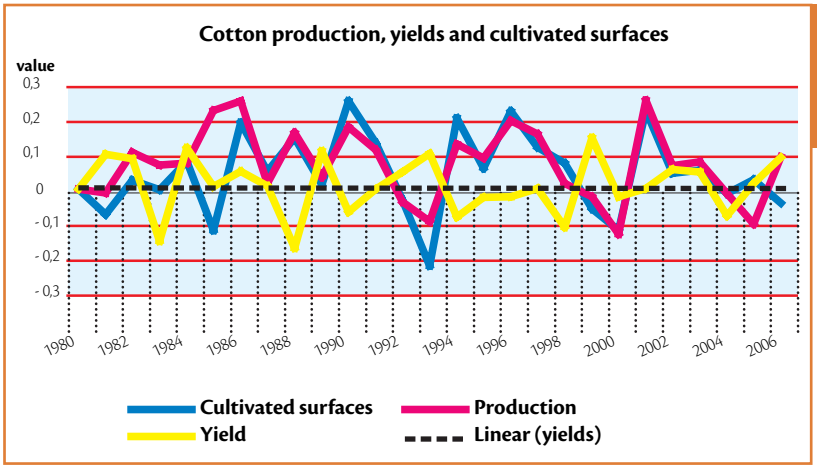
The growth in production volume is therefore explained by the 2.43 increase in surface areas given over to roots and tubers, a rise that is 5 times greater than yields.

Performances of major export productions

Similar trends are noted for most other crops, notably cash crops. Take cotton, for example. The areas cultivated for this crop grew by 4.8% p.a. between 1980 and 2006, resulting in an annual production increase of 7.3% compared with a rise of just 1% p.a in yields. The Figure 19 shows that production only rises when cultivated areas increase despite efforts to improve varieties and techniques.

Development in cotton performances

Figure N° 19



Despite the fact that cottons systems are relatively intensive, growth in yields has had little effect on production growth. The low cotton yields ostensibly suggest failure of intensification policies, and call into question the long-term viability of cotton-based development models, notably in Burkina Faso and Mali. However, it is noteworthy that in the absence of an effective intensification policy for food crops, fertilisers meant for cotton plants are often diverted to these crops.

The situation for cacao and coffee is different. Cacao yields rose faster than cultivated surface areas. The pace of growth in yields was 3.8% p.a. or 98% overall compared with 2.4% p.a. or 63% for surface areas cultivated over the same period of 1980-2006. On the other hand, coffee yields grew or 0.6% p.a. or 15% overall whilst cultivated surface area fell by 33.2% or 1.3% p.a. This disparity is due to maturing coffee orchards and growth in demand and price of robusta coffee.

3.3. Water resources and irrigation potential

The ECOWAS region's capacity to increase agricultural performances depends on its ability to manage the parameters of production, the foremost being consequences of climate. In particular, the availability of water resources (see Table 11) and the region's irrigation potential are decisive factors for the future. The renewable fresh water supply of all the countries in the region, apart from Cape Verde and Burkina Faso, exceeds the international definition of water scarcity of 1,700 m3 per person per year.

The average annual rainfall in West Africa is 3,765 billion m3 with a unequal distribution between regions. The subequatorial and semi-humid areas concentrate 77% of this water whilst the arid - dry zone (Burkina-Faso, Cape Verde, Mali, Niger, Senegal) only receives 23% over an area accounting for roughly 60% of the whole region. The irrigation potential of the dry zone currently accounts for 16% of regional potential. Nigeria and Ghana have the highest potential irrigation rates in the region, accounting for 26% and 21% respectively (Table 10).

Irrigation potential of the ECOWAS region in thousands of hectares

Table N° 10

Country	Surface area (1 000 hectares)	Portion of regional potential (%)
Benin	322	4
Burkina Faso	165	2
Cape Verde	3,11	0
Ivory Coast	475	5
Gambia	80	1
Ghana	1 900	21
Guinea	520	6
Guinea Bissau	281	3
Liberia	600	7
Mali	566	6
Niger	270	3
Nigeria	2 331	26
Senegal	409	5
Sierra Leone	807	9
Togo	180	2
ECOWAS	8 909	100
Humid and semi-humid area	7 496	84
Dry- arid area	1 413	16

Source : FAO/Aquastat.

Table N°11

Water resources in the ECOWAS region

Period	2003-2007
Average precipitation level (mm/p.a.)	1 131
Average precipitation in volume (10^9 m^3/p.a.)	3 765
Dependency ratio (%)	39,9
Groundwater water (10^9 m^3/p.a.)	316,7
Overlapping of surface and groundwater water (10^9 m^3/p.a.)	271,5
Surface water (10^9 m^3/p.a.)	1 011,8
Total capacity of dams (km^3)	0
Total (external) renewable resources (10^9 m^3/p.a.)	246,9
Exploitable water resources (10^9 m^3/p.a.)	209
Total (internal) renewable resources (10^9 m^3/p.a.)	1 057,5
Renewable water resources per capita (m^3/per inhabitant/ p.a.)	9 545
Total (internal) renewable water resources (10^9 m^3/p.a.)	1 302,5
Total renewable water resources per capita (m^3/per inhabitant/p.a.)	11 719
Average rainfall in humid and semi-humid areas (10^9 m^3/p.a.)	2 883 (77 %)
Average rainfall in dry areas (10^9 m^3/p.a.)	882 (23 %)

Source: FAO/Aquastat.

Inland valley bottoms offer considerable potential for agricultural development. They account for an estimated 2-5% of land in West Africa, amounting to 11-16 million hectares, half of which are in Nigeria. Lowlands subject to flooding, which are difficult to cultivate, have been under-exploited for a long time. However, land pressure and the need to find new cultivable spaces to develop off-season production or raise commercialised production have piqued interest in lowlands potential.

3.3.1. River water

One of the three biggest rivers in Africa, the Niger River, runs through the ECOWAS region. Starting in Guinea, the Niger River empties into the Gulf of Guinea in Nigeria through a delta river mouth of 25,000 km2. Running 4,200 km2 and crossing five countries (Guinea, Mali, Niger, Benin and Nigeria), the Niger River flows 7,000 m3 per second in the low-water period and reaches 30,000 m3 during flood periods.

But it is not the only one. Other rivers of lesser importance supplement the regional network and play a major role in mobilising surface water: the Senegal River in Senegal and Mali; the Volta in Ghana; the Gambia in Gambia; the Mongo, the Jong, the Makona in Sierra Leone; the Mano, the Loffa, the Saint Paul, the Saint John, the Nipoue in Liberia; the Sassandra, the Bandama, the Komoé in Côte d'Ivoire; the Mono in Togo and Benin and the Ouémé in Benin.

Although these water resources could be used for irrigation and thus limit dependency on rain-fed crops (vulnerable to climatic uncertainties), the water from these rivers and their tributaries is not being optimally used. The hydro-agricultural planning in ECOWAS is still derisory considering the region's potential and the need to ensure food security. FAO estimates surface water at 1,011.8 billion m3/p.a. in ECOWAS. It represents the majority of renewable water resources in the region, estimated at 1,057.5 billion m3. But although hundreds of billions of cubic meters of this water are usable, only 19.6 billion m3 are drained for agricultural purposes. For example, less than 2% of surface water is used annually for agricultural purposes.

Even the creation of the 11 River Basin Development Authorities in Nigeria in 1977 have not met expectations. This enormous hydro-agricultural scheme (in Mali, in Senegal and in Niger) was intended to promote irrigation and facilitate access to agricultural resources. The infrastructure is turning out to be costly to create, maintain and manage. The scheme was designed primarily for rice production and, to a lesser extent sugar cane. However the deteriorating prices over the last 20 years in global cereal markets have made it difficult for these low value-added crops to render irrigation investments profitable. The current tensions on agricultural markets and notably the outlook for rice are changing things considerably, and there is a need to rethink the scheme's long-term strategy. This requires the following steps, already foreseen under ECOWAS agricultural policy:

- mobilisation of long-term financial resources to invest in dams;
- an improved and more secure economic and trade environment for producers via price regulation to secure the investments in irrigation schemes, equipment and the charges inherent to each harvest (at the level of CET and using other instruments for regulating);
- development of financial services that address the diverse needs of producer groups or associations (equipment loans, harvest loans);
- providing support to producers' organisations to facilitate financial and social management of shared assets (irrigation schemes, water distribution networks, etc.) and, more broadly speaking, organising value chains;

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- last, and by no means least, an investment boost in these areas requires clarification of land tenure, research into environmental impacts and in-depth dialogue on the use of shared resources among the various countries affected by the different watersheds.

3.3.2. Groundwater

Groundwater in the ECOWAS region is estimated to amount to 316.7 billion cubic metres. The amount overlapping with surface water is estimated at 271.5 billion cubic meters. These water resources are barely used for either irrigation or rural drinking water supply. Pumping systems to exploit groundwater are insufficient, including in regions such as Niger where the water table is very close to the surface (a few meters) and does not require deep drilling, as is the case in northern Burkina, where boreholes must be 100 meters or more.

Generally speaking, groundwater and surface water resources must be tapped into more effectively, in order for ECOWAS agriculture to successfully face global competition.

3.4. Impact of climatic change on production potential

Climate change, resulting from global and local changes, is partly responsible for recent developments in the region's agriculture. It is creating new disruptions, and the uncertainty – of both weather patterns and its future impact – is preoccupying. This uncertainty is all the more justified since the ECOWAS's agricultural performance is mainly determined by rainfall levels, even for cacao and coffee plantations, given that irrigation is financially out of reach for the vast majority of producers. Aridification and irregular rains directly influence the mobilisation of production potential.

3.4.1. Thirty years characterised aridification

The most obvious result of climatic change in the region is less rainfall. In 20 years, the isohyets have moved 200-300 kilometres southwards. The semi-humid Sudanian region is experiencing increasingly long dry seasons. In the sub-equatorial zone, which has four seasons (2 dry and 2 rainy), the second rainy season is disappearing (between 7° N and 8° N) and the dry season is becoming longer in the northern part. A few decades ago, the maximum isohyet in the Gulf of Guinea exceeded 2,500 millimetres. Today only the edges of Guinea, Sierra Leone, Liberia and South East Nigeria have precipitation exceeding 2,000 millimetres (between 2,200 and 3,200 millimetres). The sub-equatorial or humid tropical area that had between 1,400 millimetres and 1,800 millimetres is seeing its rainfall gradient move up towards the seventh parallel. Rainfall levels in the semi-humid and dry areas are experien-

cing the same downward trend. The 800-1,000 millimetres of rain in the Sudanian area is diminishing and the isohyets are only 700-1,000 millimetres. In the dry Sahelian region, the average 150 millimetres of rainfall comes in infrequent spurts over the year. In addition to these temporal reductions of rainfall, their spatial distribution is a major constraint to tapping into regional production potential. Parts of the Sahelian region are also experiencing demographic pressure and gradual climate degradation, resulting in diminishing rainfall due to the southerly movement of isohyets, as has been the case in humid and semi-humid areas. Deforestation in the humid areas of the Gulf of Guinea is largely responsible for the decreased precipitation that forms over the ocean before moving inland and contributing to the evapotranspiration that occurs in humid tropical areas.

The growing desertification of semi-humid and dry areas is also due to agricultural deforestation, deteriorating vegetation cover and strong urban growth in the humid area. Deforestation has been accelerated by strong growth in wood energy. These changes are among the local factors of climatic changes in the ECOWAS region.

Land reserves are suffering from the onslaught of crop and livestock expansion due to the random nature of the rains, their diminished levels as well as the absence of alternatives in terms of the modernisation and sustainable intensification of production systems. Cultivable surface areas are increasingly sought after as demonstrated by the growth in cultivated surface areas at a time when environmental protection is becoming vital for the planet.

3.4.2. Future climatic changes

The experts are now unanimous about global warming and its causes. Only its magnitude and consequences remain uncertain. Projections for West Africa are still unreliable. According to Intergovernmental Panel on Climate Change (IPCC) models, the rise in regional temperatures is likely to be higher than the worldwide rate. Precipitation results are mixed. The impact of global warming on extreme climatic phenomena (droughts, foods) is probable but undefined for the region. Little is known about the impact of climate change on water resources but experts estimate that this is leading populations to manage resources more cautiously and strive for regional and integrated water use. Lastly, the coastal areas are more vulnerable to the rise in ocean levels. Ten metropolitan areas of more than one million inhabitants are affected as well as some extremely rich ecosystems such as mangroves.

3.5. Conditions for mobilising production capital

The main bottleneck in ECOWAS agriculture stems from low levels and inefficient use of production capital. The most glaring example concerns

financial capital, which is still derisory compared with the real growth needs of the agricultural sector. Loans granted to small producers who generate almost 90% of production are often insignificant and difficult to access (most of the time, producers must cultivate cash crops in order to qualify). Banks and lending cooperatives grant loans to producer groups that offer joint guarantees, thereby refusing to allow the individual producer to unilaterally assume the risks.

However, the definition and implementation of the national agricultural polices, coupled with a regional agricultural policy (ECOWAP), could help remove these obstacles. In a spirit of subsidiarity, national policies are better able to confront issues relating to structures (land policies) and services (credit, risk insurance, advisory services, etc.). A regional policy could standardise these national policies and create an institutional, economic and trade framework favourable to investment, improving competitiveness and productivity.

3.5.1. Structural policies

The agricultural and land policies of the last fifty years have not laid a solid foundation for agricultural development in West Africa. In terms of agricultural finance, only a minority of producers currently have access to credit that is well-adapted to the needs of modernising family-owned farms. Investment in traction-based farming or small-scale mechanisation, land development and small-scale irrigation, for example, are all fundamental aspects of transforming production systems. The same applies to cash loans to pre-finance a harvest. Only the highly integrated export-oriented sectors offer financial services that are relatively appropriate to producers' needs.

In most cases, non-bank financial institutions like savings and loans, cooperatives, etc. work alongside banks to provide smallholders agricultural finance. In Nigeria, large sums of money have been invested through River Basin Development Authorities in order to promote direct production in the river basins. Nigeria also has a national agricultural bank, the Nigerian Agricultural Cooperative and Rural Development Bank, that replaced the Nigerian Agricultural Cooperative Bank, and facilitates access to agricultural loans, including for small producers who are not part of a cooperative system.

But overall, agricultural finance is the main bottleneck for farmers. Social adjustment policies that eliminated agricultural development banks have contributed to depriving West African agriculture of suitable financing options. Agricultural producers have no choice but to make do with microfinance mechanisms which not only offer small loan sizes, but often have high interest rates due to the intermediation and management costs.

Land policy, meanwhile, varies widely across the region. Some countries such as Côte d'Ivoire have made progress with land reform, coming up with a rural land policy that offers greater security to farmers, thus improving investment in the agricultural sector. Others, such as Benin, struggle to implement a land tenure policy that can offer security to individual and collective properties. Reforms are underway in Benin and Mali and soon will be in Burkina Faso. Niger has already begun its reforms. These land reforms are all complex. They attempt to combine traditional practices and «modern» law and often come in the wake of land rights based on the misconceived notion that "the land is owned by the state". They all result in granting ownership titles that help secure economic activities. These reforms also generally provide mechanisms for settling land ownership and use conflicts. Some countries like Nigeria, have encouraged large, private, highly mechanised farms, ever since President Shehu Shagari's Green Revolution in 1980. These farms have emerged in the centre and the North of the country, often through disguised expropriation from small-scale owners or local governments who receive derisory compensation. In the main river valleys, notably the Niger, collective use of land by rice farmers is common due to the high cost of developing land, a task formerly carried out by public authorities.

3.5.2. Value chain organisation and trade policies

Most agricultural chains in the ECOWAS region are still structured like cash crops. With the exception of Nigeria, which adopted a different approach after the first Structural Adjustment Programme in 1986 (an approach ultimately weakened by the trade policies of its immediate neighbours), value chains in other ECOWAS countries are still organised around the exportation of so-called industrial production – and approach inherited from the colonial system. The value chains for well-financed export products like cotton, coffee, cacao and groundnuts have benefited and continue to benefit from technical support, advisory services, research and dissemination, improved seeds and commercialisation efforts by public authorities. National and international agricultural research institutions have obtained interesting results on products destined for regional markets. But lack of effective communication with users of the research combined with poor dissemination techniques and weak organisation of value chains compromise the use of these research results.

Box N° 3

Research in West Africa

The region's agricultural research comes out of national agronomic research institutions, international institutions such as the International Institute for Tropical Agriculture (IITA) or regional institutions such as WARDA and the AGRHYMET/CILSS Centre. Several coordination mechanisms exist to boost regional knowledge generation and management. This is the role of WECARD (West and Central African Council for Agricultural Research and Development) and CILSS (Permanent Inter-State Committee for Drought Control in the Sahel) on issues relating to natural resources management and food safety in dry areas. Agricultural research in West Africa was significantly reorganised during the period of structural adjustments and state withdrawal. It nevertheless has led to a certain number of innovations and, occasionally, suitable technological packages. The IITA has developed cassava cultivars whose yields can exceed 40 tonnes per hectare. There are also varieties of improved maize and cowpeas with yields four times higher than current average yields. But WARDA – the West African Rice Development Association - has had the most success, with the development of 18 varieties of NERICA (New Rice for Africa) by crossing African and Asian rice. The particular feature of the NERICA varieties is that they make it possible to cultivate rice across all agro-ecological types found in Africa, ranging from the lowlands (lowland NERICA) to the plateaux (plateau NERICA). NERICA is an effective method of reducing food insecurity in many parts of Africa, including ECOWAS, on a cyclical or periodic basis by increasing productivity and production of rice, of which the continent is a net importer.

The NERICAs also have 25% higher protein content than some types of rice imported on a massive scale from the rest of the world, notably Asia. Their ability to resist parasites, their tolerance of drought and of acidic and ferrous soils, their short growth cycle of 90-120 days and their low need for fertilisers are all factors that lead to increased yields of NERICA varieties, a major advantage for their dissemination and development in West Africa.

Regional research is conducted via collaborative networks involving research institutions and universities in northern and emerging countries. It rarely uses a system-based approach or examines issues through the lens of the agricultural economy. Although research institutions often deny it, most regional research is dominated by a production-based technical approach.

Agricultural research faces three major problems. The first has to do with its dependency on external finance, which limits researchers' ability to define research protocols, programmes or priorities. The second is the insufficient number of researchers - there are three times fewer agricultural researchers in West Africa than in Brazil. The last problem relates to dissemination and outreach.

The development of producers' organisations offers a fresh perspective in the way the value chains are organised. These organisations are increasingly involved in the negotiation and implementation of the "rules of the game", drawn up on a contractual basis with other socio-professional and government stakeholders. The organisation of value chains now takes place at the national level in all countries, and a strict vertical approach has given way to a broader approach to develop and diversify national production, particularly production aimed at the regional market. Consensus-building frameworks and joint trade organisations cohabit on the national level and frameworks exist at the sub-regional level. Many countries are encouraging exchange between stakeholders in different value chains. But beyond this first aspect of value chain organisation, i.e. an institutional framework, there is the need to address a second dimension, i.e. the implementation of genuine chains, that is, a set of related activities with a vertical interest in a single product whose purpose is to satisfy the consumer. This technical dimension involves agro-industrial processing, which can add value to the region's agricultural products and end the unprofitable practice of exporting raw or only slightly processed products.

Box N°4

Promotion of national and regional joint trade organisations and other forms of value chain organisation

Joint trade organisations have prospered in strategic segments in recent years in West Africa. The result of structural reforms in the agricultural sector during the 1990s, joint trade organisations serve to facilitate dialogue between the three principal stakeholders in agricultural value chains: producers, intermediaries (distributors of inputs and traders) and government. They are mostly found in export segments: cotton, cacao, coffee and bananas, and food products, notably rice. Although they have not replaced the price stabilisation mechanisms that used to exist, these organisations provide a framework in which to negotiate services formally provided by the government such as technical advice, supply and distribution of inputs and basic maintenance of rural roads. Joint trade organisations are far from being a panacea to developing West African agricultural chains, although their emergence has made the various players in these chains genuine partners along side public authorities and development actors.

Some organisational forms are less formal and structured around direct contract between producers and private processors (as is the case of cotton in Ghana) or between public, public-private or private companies and cooperative producers (as is the case of cotton in Burkina and Mali).

Regardless of the value chain's degree of structure, producers still face three major problems: timely access to good quality inputs, access to harvest loans and lucrative prices.

The trade policies currently in place in West Africa reflect its fragmented markets. In order to remedy this situation, two of the three priorities laid out in the regional agricultural policy adopted in 2005 focus on trade. The policy makes provisions for:

- implementation of an intra-community trade regime based on a free trade zone. The goal is to promote a regional market that will encourage West African agro-food production through the:
  - facilitation of regional transport and transit: development of transport infrastructure, standardisation and simplification of transport regulations and communications;
  - effective removal of trade barriers, like improper practices by customs authorities and police or untimely bans of imports or exports within regional area etc.
  - harmonisation of internal taxation and promotion of incentive taxation measures;
  - harmonisation of investment codes and business law, reduction of distortions in competition within ECOWAS;
  - conflict settlement, eradication of the «criminal» economy, etc.

- adaptation of an external trade regime based on the specificities of the agricultural sector. The goal is to facilitate access to international markets in order to commercialise increased supply of produce resulting from modernised production systems. The policy document specifies that in «the absence of a viable agreement on the trading of agricultural products within the WTO which would

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reduce or eliminate such subsidies, a unilateral protective action on a regional level is justified as a method of compensating for the distortions on the world market. A similar differentiated form of protection is justified for the uncertainties arising from market fluctuations affecting vulnerable populations. Lastly it is justified in view of protecting investments for certain segments for which the region benefits from potential comparative advantages».

In order to be operational, these two priorities need to be translated into trade policies under the current ECOWAS Customs Union through an appropriate level of protection provided by a Common External Tariff (CET). Some professional organisations and member countries deem the fee-structure (modelled after the West African Economic and Monetary Union CET) too low. The idea of introducing an additional level of Customs duty, often referred to as the fifth band, is still under discussion. At the end of December, Nigeria suspended the application of the CET in reaction to the lack of progress on the matter. In February, ECOWAS and UEMOA Commissions offered to investigate the introduction of this fifth tariff by June 2008, in order to respect commitments made by WTO-member countries and to determine the products affected by the market access aspect of the economic partnership agreement. The proposed decision to modify the CET is likely to be submitted to the Heads of States in June 2008.

Box N° 5

Adoption of the ECOWAS CET

Until recently, the region has operated with several different external trade systems. UEMOA countries (there are 8 Franc area countries amongst the 15 ECOWAS member countries) had a common external tariff based on four levels of customs duties applied to imports on an ad valorem basis:

a. Category 0 (0%): essential social needs;
b. Category 1 (5%): essentials, basic raw materials, capital goods, specific inputs;
c. Category 2 (10%): semi-finished goods;
d. Category 3 (20%): final consumer goods.

Other countries had variable tariff structures. Some countries such as Guinea and Gambia had a liberal tariff structure, while others, such as Nigeria, had a protectionist policy with duties exceeding 100% for products considered strategic. Until recently, it was prohibitive to import some products. Ghana, meanwhile, had tariffs close to those in the UEMOA area.

The prospect of negotiating a free trade area with the European Union under the economic partnership agreement has speeded up the formation of the Customs Union under consideration since the foundation of ECOWAS. This resulted in the formation of the ECOWAS Common External Tariff at the Heads of State Summit in January 2006. The CET was based on the structure of the UEMOA CET.

The CET was set up for a transitional period of two years to allow the non-member UEMOA countries to adapt to a new tariff policy (type A exception), and to pursue negotiations in view of reaching agreement on the re-categorisation of certain products wanted by non-member UEMOA countries (type B exceptions). This new categorisation came into effect at the end of the transition phase on 1 January 2008.
ECOWAS also stipulates various additional instruments for trade defence which have not yet been fully defined, let alone implemented:

- the ECOWAS Degressive Protection Tax (EDPT) is a duty applied temporarily to transition between the former level of protection and the level of the ECOWAS CET. It aims to correct competition differentials when the level of protection provided by the ECOWAS Common External Tariff is not deemed satisfactory to protect local production against competition from imported products.
- the ECOWAS Import Safeguard Tax (IST) is a temporary surcharge applied to products from countries outside ECOWAS. The purpose is to protect local production against price fluctuations on the international market and a strong rise in imports.
- the ECOWAS Countervailing Duty (CVD), is a transparent mechanism to alleviate the harmful effects of subsidies that competing exporter countries give their producers. Set up in response to unfair practices, it is proposed to set the amount based on the Producer Subsidy Equivalent (PSE) calculated for each product by the OECD. This Duty does not exist in the UEMOA, unlike the EDPT and IST.

Reactions of peasant organisations to the CET:

"The social-professional organisations do not defend a wholesale protectionist policy but a differentiated trade policy which is able to protect when needed and liberalise when necessary. They argue in favour of setting up a fifth level of excise duty for several reasons:

- *The need to rebalance the levels of protection between the region and its principal competitors*
- *the need to protect sensitive or strategic products for economic development, the promotion of regional integration of markets, the reduction of poverty and food sovereignty.*

This concern to create a fifth tariff (excise duty) is justified in view of several considerations:

- *Providing the region with a "precautionary trade policy" just before finalising the economic partnership agreement negotiations. As already mentioned, the CET is the starting point, the reference point to start up the removal of tariffs. It is easier to disarm subsequently than to rearm (GATT Article 24).*
- *Express the consistency between trade policies, the fiscal challenges and sector policies in the region.*
- *Improve the region's negotiation capacity in international enclosures (Doha cycle) by showing, as all other countries do, that Africa does not base its trade policy only on international negotiations.*
- *Lastly and this is certainly the essential point – it is important to overcome the current void in common trade policy by giving the region clear instruments, the purpose of which and whose operational methods are transparent and appropriate to the needs of the region".*

From the note on ECOWAS Common External Tariff (ROPPA, with support from Oxfam International – 16 January 2008).

4 Demand Forecasts

The above analysis of agricultural performances and utilisable land and hydraulic resources makes it possible to formulate hypotheses regarding the growth in supply. The other fundamental parameter has to do with demand.

4.1. Major global trends and their impacts on West Africa

4.1.1. Growth in Asian demand

West African supply is sensitive to two major trends: world demand trends, which determine market vitality and the price levels, and European demand trends. In 2025 it is estimated that the world population will be between 7.6 and 9.4 billion or 1.15-1.4 times the current population. Population growth is strongest in two regions: Asia and Africa.

Africa still has a very small share of Asian markets. This is changing somewhat, thanks to China's new strategy in Africa, but it essentially only involves exports of oil and raw materials for industrial purposes. The US market is still a complex market to break into, despite the Africa Growth and Opportunity Act (AGOA), which ostensibly facilitates access. Once again, this initiative has mainly allowed the United States to secure oil supplies. But it also gives companies an opportunity to learn about the US market (with regard to standards, etc.), including how to market handicraft and some agro-food products (juice, organic sesame seeds, etc). The European market will consequently remain the preferred market for African exports. It lacks dynamism, as Europe will undoubtedly experience one of the lowest growth rates in the world over the next 20 years, but EU expansion to 27 members will increase potential demand thanks to favourable trading arrangements with the ACP countries (a free trade zone with access to the European market without any duties or quotas). However, tapping into this demand requires significant prospecting to understand these new markets on the part of West African exporters. Lastly, North African and Middle Eastern countries have the potential to be dynamic importers of certain goods, such as livestock products from the Sahel.

4.1.2. Technical progress, environmental preservation and rises in yields

The prices of cereal, sugar and dairy products have followed the same upward trend currently experienced by many mining and industrial commodities. The increase is due to several factors, the first and foremost being ecological concerns: climate change, soil erosion, aridifi-

11. *World Population Prospects, Nations Unies, 1988.*
12. *African Growth and Opportunity Act.*

cation, pollution of groundwater and river water, land pollution by organochlorine pesticides, etc. The agricultural revolution characterised by the artificialisation of production processes (chemical fertilisers, improved seed pesticides), irrigation and mechanisation appears to be an unsustainable model. The majority of responsible farmers around the world are being forced to revise their production methods, not least because consumers are increasingly demanding about product quality. It is likely that we will see a worldwide downturn in technical progress, expressed in terms of physical productivity, in response to this demand for environmental protection.

MASSIVE REFOCUSING OF RESEARCH IS NEEDED TO IDENTIFY TECHNICAL PACKAGES AND INTENSIFICATION ALTERNATIVES COMPATIBLE WITH NATURAL RESOURCE PROTECTION

These new constraints are slowing down production growth and will likely fuel tensions over market prices. This also means that West Africa, which only experienced the green revolution in localised areas, needs to invent its own conversion/modernisation model for agriculture. This involves massive refocusing of research at the global or regional level, to identify technical packages and intensification alternatives compatible with natural resource protection. The structural crisis experienced by the majority of African agronomic research institutions is thus a major problem, as there is a pressing need to identify appropriate innovations that meet the needs of West African farmers.

4.1.3. Competition for land use and impact on prices

A downturn in production and rising demand are likely to fuel persistent tensions over worldwide agricultural prices. This does not mean that prices will not experience a certain degree of volatility, but many observers expect they will go up. One of the major changes is greater competition for use of agricultural lands; traditional use for feeding purposes is increasingly vying with energy and industrial uses. This is already the case some parts of the world: 20% of US corn is used to produce ethanol, as is a considerable amount of Brazilian sugar cane. Some West African countries, like Senegal, are also showing interest in producing bio-fuels.

This issue needs to be considered in conjunction with the debate on economic accessibility of basic food products. The present study uses a quantitative rationale to make supply and demand forecasts. But it does not take into consideration the standard of living of West African populations and their purchasing power. There is a high risk of seeing insolvent consumers in developing countries purchase vehicles. A SYFIA International publication has already compared the consumption of a 4x4 vehicle running on pure ethanol, for which a full tank requires 200 kilograms of maize, to the food consumption of one per-

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son per year. Massive use of fuel for energy purposes would increase the cost of food products, reducing food access for the poor and even middle income populations. Now that the euphoria regarding bio-fuels has subsided, there are doubts about the overall effect on energy and the economy - namely the energy costs required to produce and process the biomass. Undoubtedly more interesting prospects will emerge from the second generation of bio-fuels made from residues rich in cellulose and seaweed.

4.2. Regional food demand

4.2.1. Demographic trends and their impact on demand

The region has seen two major developments:

- Rising population, which averages over 2.6% p.a., with some countries experiencing demographic growth of more than 3%. At this rate, the population will double every 25 years. In 1960, the region had 78 million inhabitants. It had 265 million in 2005 and, according to currently accepted projections, should reach 353 million in 2020 and 455 million in 2030 (source: SWAC-OECD)

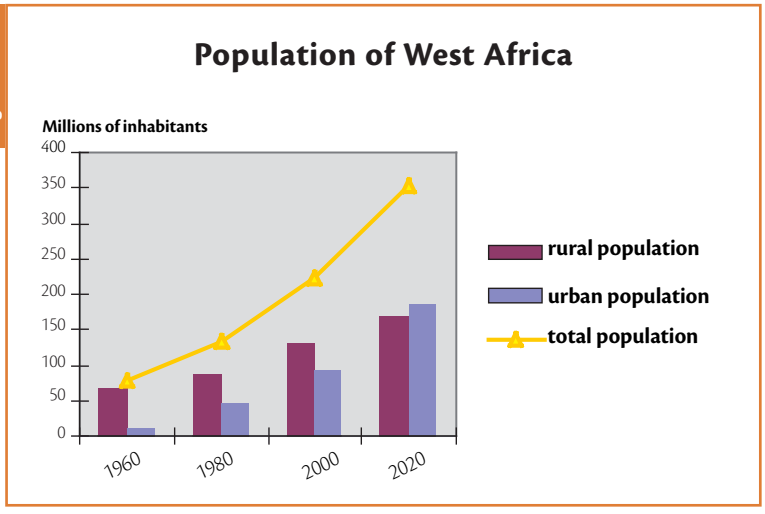
A POPULATION DOUBLING EVERY 25 YEARS.

- The urbanisation of this population. This is a dramatic change. The urban population for the first time exceeds the rural population. In 1960, only 14% of West Africans lived in a town. In 2000, the figure was 42%. Depending on the dynamics, the urban population should be between 57% and 60% in 2030 – i.e. in less than a generation.

IN 2007, THE URBAN POPULATION EXCEEDS THE RURAL POPULATION

This outlook may change. The population could grow even quicker if life expectancy rates improve and child mortality drops as a result of the universal health care policies propagated in current poverty reduction strategies. Moreover, since reducing birth and fertility rates depends on households experiencing overall economic and social improvement, they may take time to appear.

Figure N° 20



Growth in regional population

Growth in West African population and outlook based on two scenarios

Table N° 12

	Total population			Growth in population over 20 years		
Year	Total	Rural	Urban	Total	Rural	Urban
1960	77.6	66.37	11.23			
1980	132.3	86.6	45.7	170.5%	130.5%	406.9%
2000	223.482	129.6	93.88	168.9%	149.7%	205.4%
2020	353.368	169	184.33	158.1%	130.4%	196.3%
2030 A1	455.84	194.69	261.15	158.1%	130.4%	183.4%
2030 A2	455.84	182.76	273.08	158.1%	116.2%	196.3%

Authors' calculations, based on SWAC-OECD data.

Assumptions :

the overall population is growing at the same rate as the last 20 years, but in scenario

– A1: the rural population grows at the same pace as during the past 20 years and consequently urban growth is less.

– A2: the urban population grows at the same pace as during the past 20 years and consequently rural growth is less.

This demographic growth places West Africa in an unprecedented situation. Until recently, the regional market for family agriculture – the dominant production form – was limited. The market for each farming family was smaller in size than an average urban family. Outside the export-oriented production areas (animal products sent to Central and North Africa; growing industrial products - coffee, cacao, cotton, fruit, oil - for the markets outside Africa), farmers targeting food markets only had limited market channels for their production. Urbanisation and the doubling of the population over the next generation is an historic opportunity for agriculture to develop on more economically viable foundations than in the past.

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➔➔ It is evident that market size does not just depend on the increasing number of non-producing consumers compared with the number of producers. It also depends on the purchasing power of populations and the competitiveness of regional producers in relation to imports and external trade policies.

Agricultural policies are formulated based on a timeframe of at least 10 years. In other words, policy reforms start to produce structural changes only after 10 to 15 years, or even longer depending on how long it takes to bridge the gap between the policies themselves and amassing human and financial resources to implement them.

Therefore, the key question is «What agricultural policies are necessary and what productive levels are needed, for West Africa to meet the food demand of its 455 million inhabitants, some 261-273 million of which are urban and poor, by 2030 ?».

The demographic change represents a historic opportunity. The market and new market channels can create the economic conditions for agricultural development (although other conditions are still necessary). Yet urbanisation is such a challenge that it may divert public resources from the agricultural sector. It is already the poor relation in budget allocations, despite its need for strong public investment (see conclusions of 2007 World Bank report) to prepare for and manage current changes. But, once again, agriculture will have to compete with urban policy and economic development policies of non-agricultural sectors, given the inherent need for urban developments and investments. Indeed, some economists consider the best way to support the rural sector is to direct public resources towards urban areas, given the urban-rural economic relationship. There will also be budget competition from health and education sectors, which will entail particularly high expenditure. The agricultural sector itself needs these investments; healthy and trained human resources are also needed for it to meet its own challenges.

THE DEMOGRAPHIC CHANGE REPRESENTS A HISTORIC OPPORTUNITY FOR AGRICULTURE IN THE ECOWAS

4.2.2. Evolving incomes, lifestyles and food habits and their impact on demand

Regional agriculture provides basic products. Most foodstuffs are processed inside households during meal preparation. Small-scale processing has begun to develop with urbanisation, but as a whole, processing, packaging and preservation of products remain marginal. Imported products have found their way into eating habits for several reasons :

- they meet the demands of urban women, who have less time and family labour to prepare daily meals;
- they have a more modern, Western image that is attractive to urban (as well as rural) populations;
- they are sometimes cheaper and their quality is more dependable.

Nevertheless, as the above analysis shows, regional production has until now satisfied growth in demand. The atypical case of Senegalese rice imports – Senegal now imports around 800,000 tonnes of mainly broken rice per year –- and growth in bread consumption (and, consequently wheat and wheat flour imports) have led observers to hastily conclude that food habits have irreversibly changed and dependency on imports is inevitable. Regional agriculture has in reality fared better than people thought.

However, if food value chains are not adapted to the sociological and economic changes in West Africa, there is a genuine risk that the gap between supply and demand will increase. The penetration of rice in rural Sahelian societies that were previously unfamiliar with the product is evidence. Adapting value chains requires not only improving competitiveness of the production sector; the whole chain, from producer to consumer, must be addressed.

A large informal food sector has developed, especially in urban areas, due to strong growth in "street consumption" in response to urban poverty. A small-scale, processing sector has also emerged in many Sahelian capitals. These women-run initiatives process cereals for local markets and occasionally for regional and international markets where there are purchased by diasporas. The quantities involved are still nominal and there are many obstacles. These include consistent quality, access to raw materials, availability of technologies and equipment suited to processing small volumes, efficient management of the transformation process, availability of inputs (packaging), labelling, staff training, lack of technical advisory services, appropriate financing and consumers unprepared to pay for a high-quality product.

Food suppliers must prepare for significant changes:

- Population growth that will lead to growth in demand (see above);
- Massive urbanisation that will increase tension between supply and demand as well as modify the nature of demand, due to changing food habits;

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- Market segmentation resulting from extremely disparate income levels:
  - Persistent poverty on a massive scale: Given population growth and the sluggishness of industry and services, it is unlikely the 7% growth rates needed to trigger a significant reduction in poverty will be attained. The cost of basic foodstuffs will be a crucial issue. Because urbanisation will make it increasingly difficult to protect borders, national and regional agro-food chains must improve competitiveness to secure the domestic market;
  - The poorest of the poor will be tempted to nourish themselves with the "sale items of the world market" (low grade, cut-price products);
  - At the same time, a real middle-class with high purchasing power could emerge, which would create a dynamic market for high-quality or even quality-assured products;
- • Strong growth in demand for ready-to-eat processed products of high sanitary and organopleptic standards. This should lead to more diversified products: increased incomes result in improved diets and more use of fruit and vegetables.

Product processing, storage-preservation and distribution are essential for ECOWAS agriculture to secure regional markets. Agricultural production alone will no longer meet urban demand. This is not a question of quantity, but rather the ability to offer products that meet new demand. The downstream sector is therefore at the interface of demand and supply. It is also likely to play a major role in market regulation. The seasonal nature of production (notably for perishable products) and variable yields create a gap between relatively stable demand and unstable supply. The result is high price variation, both throughout the year and from one year to the next (see box below). There is also high product loss. Under these conditions, production increases often result in selling at a loss and destroyed products, which is discouraging for producers. This instability is reinforced in small markets; bigger markets would play a larger role in regulation.

Encadré N° 6

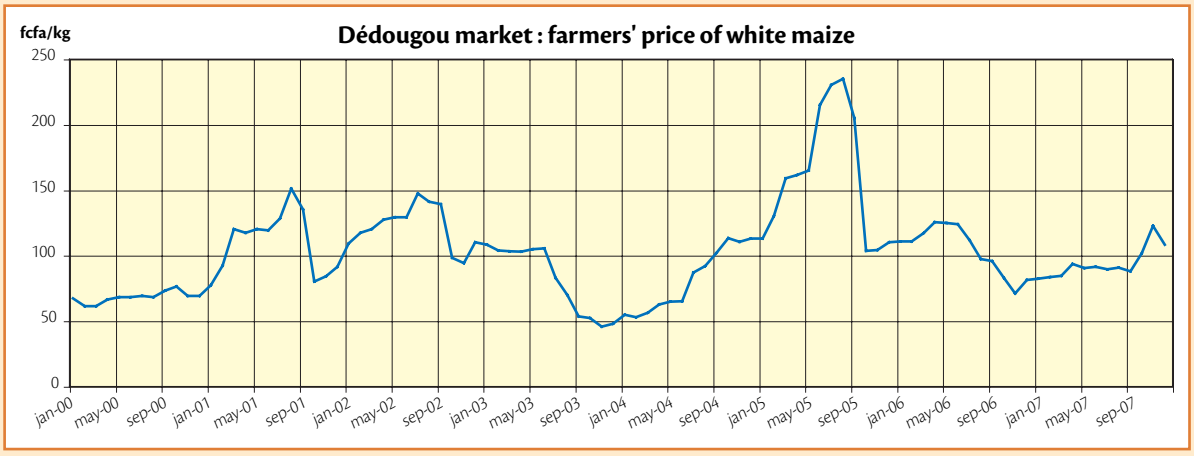
Unstable food markets: slowing down productive investments

Price instability is one of the main reasons used to explain the low level of intensification of food crops. It is currently accepted that cereal prices fall at harvest time due to market saturation, then rise during the lean period due to lack of supply. The facts do not support this rationale, which makes regulating markets through intervention even more complex and costly. Analysis of regional markets shows that price levels can vary but markets are relatively interconnected and price vacillations can be observed throughout the region. The graph below traces the evolution of producer prices in a production area of maize, sorghum and cotton in the Boucle du Mouhoun (Dédougou, southwestern Burkina Faso). It is representative of the regional dynamic.

The 2000-2001 harvest was characterised by low prices at harvest time, around CFA 70-75/kg, after a lean period without a significant price rise. Prices remained low until March 2001. Then they rose in accordance with theoretical predictions, reaching CFA 150 in August just after harvests. This was followed by a "normal" harvest: prices falling at harvest time, then rising from January 2002, to peak in July-August. Another harvest pattern also appeared to be "normal": a drop at harvest time, followed by a rise between December and June. The normal decline then ensued, with the exception of 2003. At harvest time, prices were low (CFA 50-55, 47% lower than the previous year). Although prices did not drop post-harvest they remained low until June 2004, after which point, in anticipation of a poor harvest, prices rose. This rise continued, until peaking in August 2005 (CFA 234, a rise of 114%). At the end of the 2005 harvest, prices were halved, returning to CFA 102 in October, similar to the price from the previous October. But around harvest time, prices again began to rise, although modestly. The fall in pre-harvest prices was low–around 10%. Prices did not collapse at the end of the 2006 harvests. The price curve continued to defy understanding, with prices remaining virtually stable until the next harvest. Instead of falling in October 2007, they increased. This example illustrates to what extent price dynamics are difficult to anticipate and require a high degree of producer responsiveness to take advantage of the market while at the same time limiting risk. It is not surprising that farmers' organisations face difficulties to consolidate, store and market produce in a way that increases their power of negotiation.

Conclusion. Markets are becoming more regional and price evolution is the result of a complex set of determinants: production levels over several years, the proportion of products marketed vs. production volume (estimated at 10-20% in the case of cereals), the cattle feed sector, public policies (notably the inflationary impact of efforts to secure stocks), the food and agriculture situation in neighbouring countries, evolution of purchasing power, international market prices, etc.

Implication. Clearly such variability in prices within a season and from one season to the next is not good for productive investment. But regulation of imperfect markets involving a multitude of actors requires organisational forms that are hard to create. Contracts, joint trade organisations, frameworks for discussion and information systems are all gateways. The food sector has not received the intellectual and institutional investments channelled into the export sector. Given its importance, there is an urgent need to address this imbalance.



In sum, merely investing in agricultural production without paying attention to the downstream sector and the organisation of value chains and markets is a recipe for failure.
Given demographic projections, and assuming that changes in food consumption will be qualitative (concerning processing, presentation, packaging), we can estimate that demand for agricultural and livestock products will grow by 50% between now and 2025 and by 70% between now and 2030. Urban demand will grow by 70% between now and 2025 and double by 2030. This urban demand represents the size of the market for regional farmers—but could also be met by imports.

Growth in internal demand

Table N° 13

Population	Total		Urban		Rural	
	No. of inhabitants	Growth / 2006	No. of inhabitants (millions)	Growth / 2006	No. of inhabitants	Growth / 2006
Population 2006	266		133		133	
Population 2020	353	+ 33%	184	+ 38%	169	+ 27%
Population 2025 (a)	**400**	**+ 50%**	**225**	**+ 69%**	**175**	**+ 32%**
Population 2030 (a)	**455**	**+ 69%**	**266**	**+ 100%**	**187**	**+ 40%**

(a) Scenario chosen: average of scenarios A1 and A2.

According to the FAO, imports currently account for 16% of the calories consumed in the region. This portion was 9-10% between 1990 and 1995. The average dietary allowance per person per day is currently 2,340 kcal and 58 grams of protein for the whole of ECOWAS (FAO data – 2002-2004). This is considered sufficient to cover nutritional needs. But this average conceals a high degree of disparity amongst populations. Cases of under-nourishment and malnutrition are not uncommon, and are worsened by vitamin and trace element deficiencies.

4.3. Export demand

The region's primary non-African exports are cotton, cacao, coffee, rubber, pineapple, banana, vegetable oils and cashew nuts. Inherited from colonial times, these specialisations have been reinforced by the trade preferences regime of EU-ACP agreements. The region is effectively boxed into the export of minimally processed agricultural raw materials, which deprives it of the value added and jobs at the upstream end of production.

THE REGION'S PRIMARY NON-AFRICAN EXPORTS ARE COTTON, CACAO, COFFEE, RUBBER, PINEAPPLE, BANANA, VEGETABLE OILS AND CASHEW NUTS

Depending on the value chain, the region is likely to confront difficulties in future. The coffee and cacao chains in Côte d'Ivoire are facing maturing plantations. Pegging the CFA to the euro has had a negative effect on competitiveness. In addition, the political situation in recent years has made it impossible to structurally reform the way chains are organised. Nonetheless, as the dominant player in world cacao markets, Côte d'Ivoire can risk a dip in market shares. The situation is more complex for coffee. The country produces a robusta bean and is competing fiercely with producers who rely on quantity rather than quality, as is the case in Vietnam.

Cotton is the reference product used to illustrate the agricultural potential of West Africa, an example of what can be achieved when the region implements coherent and effective segmental policies. It is nonetheless facing difficulties. Firstly, American, Chinese and, to a lesser extent European subsidy policies are driving world prices down and damaging the region's exports. In addition, CFA countries are confronted with a rising exchange rate against the dollar. Lastly, the market for local processing has practically disappeared. The region's own fabric and textiles market is now almost completely supplied by imports. The competitiveness of these imports is strengthened by public subsidies, which affects the price of cotton. In sum, the policies of competitor countries in the region are penalising West African producers and encouraging textile imports into the region . The United States has just been reprimanded by the WTO.

Cotton is practically the only export production in the landlocked Sahelian countries. It therefore plays a central role in the rural economy of southern Mali and southwestern Burkina Faso. It is also a major crop in Benin, Côte d'Ivoire and Senegal. The future of cotton will largely depend on international negotiations at the WTO and large producers reforming policies vis à vis cotton farmers. China is already a major market for West African textiles, and growing Chinese demand will have a decisive effect on prices, possibly giving West African producers a second wind. Until then, producers are juggling crop rotations and prioritising cash cereals (maize) to mitigate risk. In response to this crisis, several countries have gone into Bt cotton to reduce production costs, improve productivity and economic performance.

13. *In addition, the market is supplied by second-hand clothes, which impacts prices and makes it even more difficult to boost the regional textile industry.*

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➔➔ The risk is that their cotton, which has traditionally fetched a good price on the international markets, is devalued on certain markets. For the time being, however, the principal US and Asian markets are not sensitive to the change.

The banana sector is also facing uncertainty. West African bananas are mainly sold on the European market, and still benefit from a preferential margin compared with Central American competitors (banana dollar). This preferential system was recently condemned by the WTO after Ecuador filed a legal case against the USA. Europe will once again be required to reform its Common Market Organisation for Bananas (CMOB) and undoubtedly remove the ACP banana quota that is exempt from customs duties. Côte d'Ivoire and especially Ghana have greatly benefited from this preference. t compensates for their production cost differential compared with their competitors. Revising the preferential system will require these countries to address elements affecting competitiveness. This includes the exchange rate, in the case of Côte d'Ivoire. The partial EPAs drawn up hastily in December 2007 between the EU and the two countries to keep "banana preferences" are not enough to retain the level of current preferences compared with other exporters on the European market.

The world pineapple market, also important for Ghana and Côte d'Ivoire, has doubled since 2000. The market (fresh and juices) is likely to remain dynamic and attract West African producers. It also benefits from privileged access to Europe, which will be reinforced upon conclusion of the EPA.

In the oil sector, the region has already lost a number of markets to Asia. It could, however, recapture some of its domestic market.

There is a need to reflect on how the region could position itself on fast-growing markets with high value-added: organic products, fair trade and quality-assured products. The essentially organic production methods in West Africa make this a real possibility.

5 Forecasts of Regional Agricultural Production

5.1. Key lessons from forecasting, 1980-2005

Forecasting was based on an analysis of changes in terms of land area, production and yields for primary farming activities for local consumption or export over a 25-year period. However, the period used as a basis for the 2005-2030 forecasts was limited to the past 15

years (1990-2005). This decision was made with the intent of referring to a relatively homogeneous period as concerns public policy and the agro-climate. All countries in the region launched macroeconomic and financial adjustment policies during the 1980s. This context of budgetary rigour and economic and trade liberalisation considerably influenced changes over the last 15 years and is intended to last. There were no major climatic events from 1990-2005 such as those experienced in the region during the 1970s and early 1980s when severe droughts hit the Sahelian and Sudano-Sahelian areas, reducing production to virtually nil. The forecasts – based on fairly positive expectations – are rather optimistic.

5.1.1. Production performance

The graphs below show the evolution in performance of the main value chains for the period from 1979/81 to 2004-06. The following lessons emerged:

Production responded to growth in demand…

- Regional population doubled over 25 years, expanding from 132 to 265 million inhabitants between 1980 and 2005;
- Regional plant production grew by 322%;
- Overall, regional production responded to growth in demand for foodstuffs:
  - Production of dry cereals was increased by 2.9: maize underwent spectacular growth (multiplied by 5.3), while traditional cereals (millet and sorghum) grew more slowly (up 247%). The latter are the favoured grain crops in dry areas, whereas maize grows in regions with rainfall over 700 mm;
  - Rice production more than doubled (multiplied by 2.5), with progress in productivity in irrigated areas such as the Office de Niger;
  - Tuber production rose by nearly 430%, primarily in the "Eastern sub-space" of the region, where food systems rely heavily on roots and tubers;
  - Legume production grew by 345% and was traded widely in the region (cowpeas);
  - Fruit and vegetable production for local consumption increased by more than 230%, signalling a diversification of food systems and improved nutrition. This trend boosted the development of market gardens in urban and peri-urban zones;

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- The increase in regional production leads to qualitative and quantitative improvements in diets. Average calorie intake rose noticeably in the region;
- Animal production did not stagnate, although growth rates were lower. Production was unable to keep up with population growth, at equivalent levels of consumption. This is due to a number of factors: the considerable timeframe required to reconstitute breeding livestock following the droughts in pastoral areas; the crisis experienced by traditional pastoral farming coupled with degradation of pasture land and desertification; and brisk competition from subsidised imports of milk and meat:
  - Estimated milk production increased by 1.6, implying a decline in milk supply;
  - Ruminant meat production (cattle, sheep and goats) grew 158%;
- The drop in animal production per head was not fully offset by growth in imports of dairy products and meat. The economic decline of households resulted in reduced meat and milk consumption;
- A shift is underway from red meat production to white meat and egg production, although this trend has been curbed since 2000 by competition from subsidised EU poultry imports and especially from (unsubsidised) low-price poultry from Latin America (primarily Brazil):
  - Egg production rose by 266%;
  - Poultry meat production increased by 215%;
- Production for export also experienced strong growth:
  - Coffee, cacao, cotton and rubber combined increased production by 270%, boosted by cotton growth (up 520%) and, to a lesser extent, cacao (up 300%);
  - Banana and pineapple exports showed modest increased, growing by a factor of 1.6.

2. But this growth in production was primarily achieved through an increase in cultivated lands...

- Cultivated surface areas grew by 229%, and are the source of 70% of growth in regional production;
- Areas devoted to food crops grew the most, particularly areas devoted to legumes, roots and tubers;
- Lands dedicated to export crops increased less, despite the cotton boom, with surface areas growing by a factor of 3.3;

- Although large areas of arable land remain available, the surface areas cultivated are increasingly the marginal, lower quality lands located at greater distances from villages (resulting in a lower supply in organic matter);
- Growth in cultivated surface areas has reduced fallow periods and lands are cultivated more quickly. Soils are compromised by the drop in levels of organic matter and are unable to fully recover. Alternatives to long fallow, such as using green manure, remain unused and costly;

3. And a slight increase in the productivity of farming systems:

- Over the period, yields grew by an average of 42%, making West Africa one of the least productive agricultural regions;
- Yields grew far less than surface areas. They were the source of just 30% of the increase in agricultural and food production obtained over a 25-year period;
- On average, most traditional crops saw increased yields of less than 30%.
- Yields from export crops, which generally benefit from better support and access to inputs and financing via value chain organisations, did not achieve much higher productivity: banana yields grew by 29%, and pineapples by 10%. The technical performance of cotton saw a more substantial increase, with fibre yields up 75%; likewise for cacao, which grew by 73%.

Box N° 7

Overview of performances recorded for the 1980-2005 period

In conclusion: between 1980 and 2005...

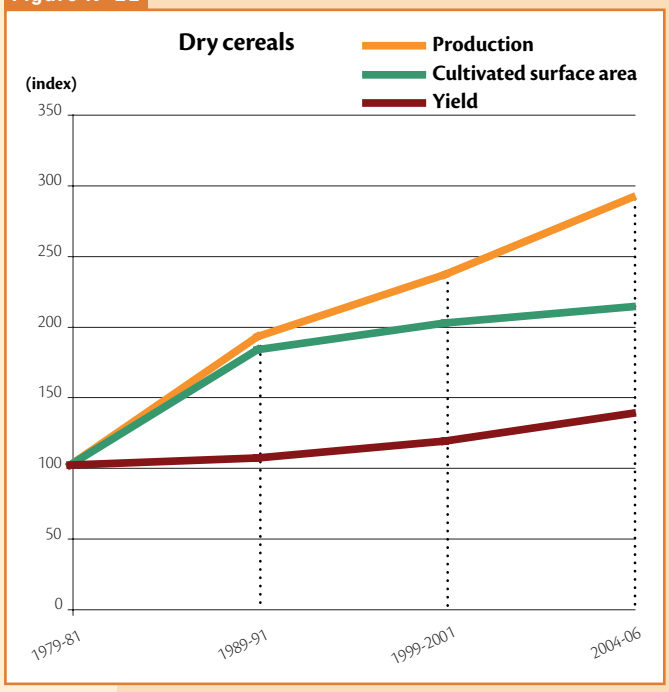
– Overall gross plant production went from: 100 to 322% (from 67 to 216 million tonnes)
– Cultivated land area went from: 100 to 229% (from 35 to 79 million hectares)
– Gross yields went from: 100 to 142% (from 1,930 to 2,745 kg/ha)

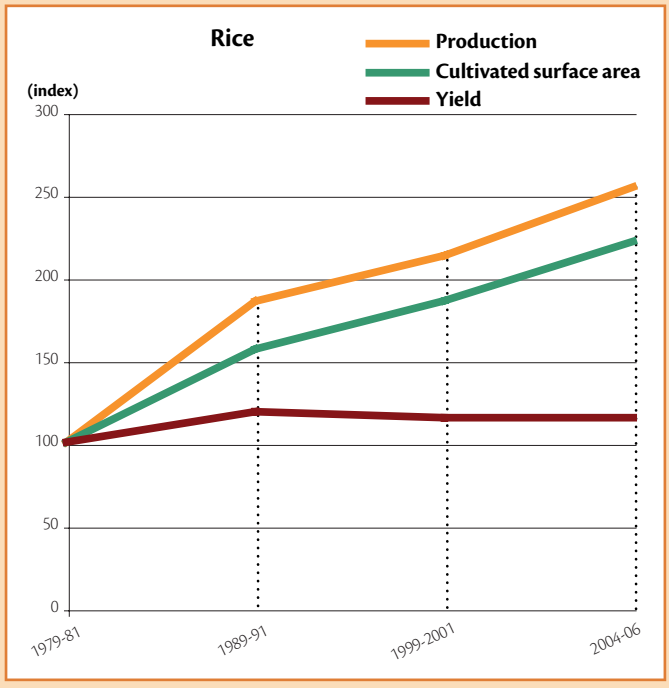
Surplus production achieved in 2005, as compared with 1980, stemmed from:

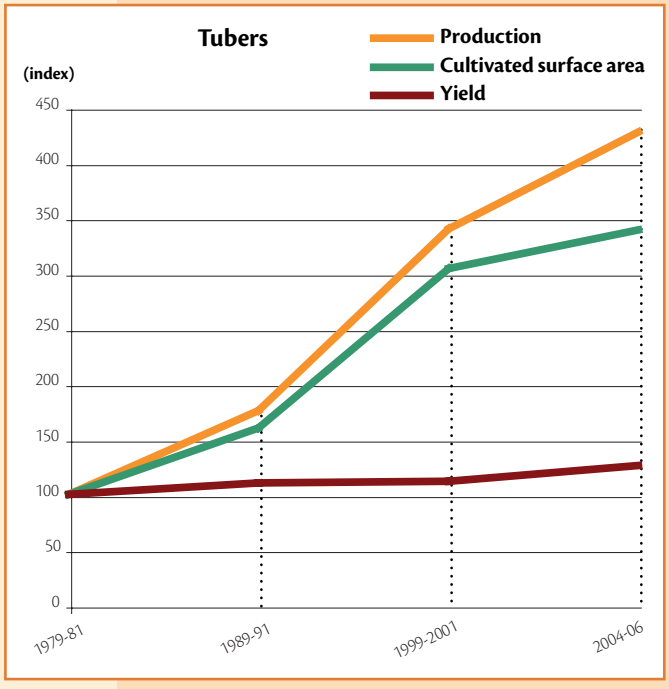
– Increased yields on original surface areas, accounting for: 19%
– Growth in surface areas at original yield, accounting for: 57%
– Improved yields on new surface areas, accounting for: 24%.

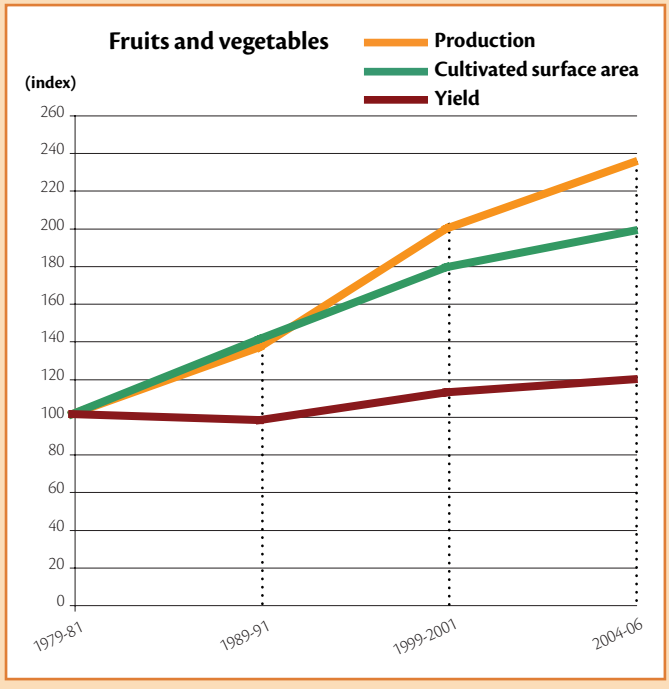
Evolution of surface areas, production and yields for each product group (1980 = index 100)

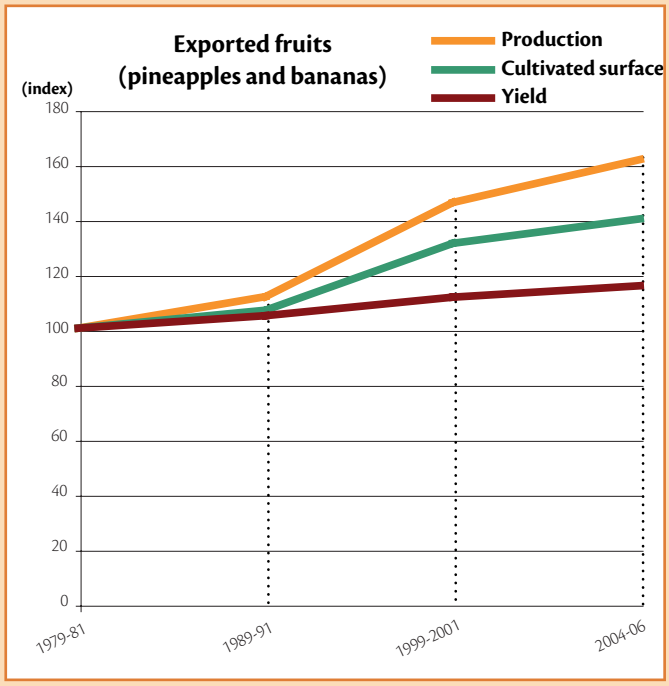
Figure N° 21

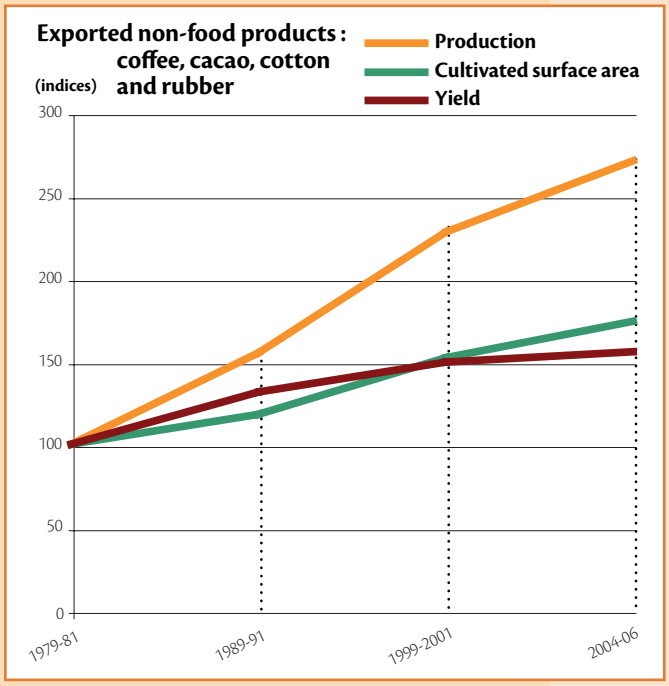


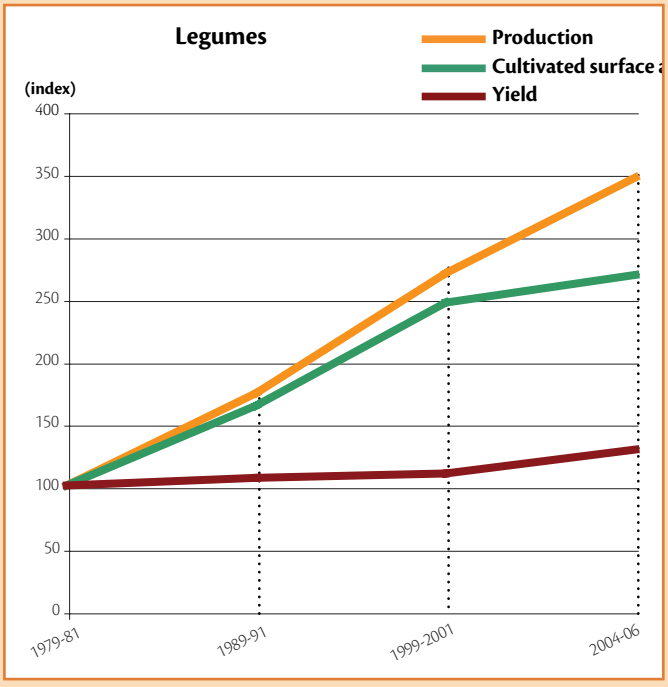












Source : Issala/LARES/ IRAM from FAOStat.

5.1.2. Covering food requirements

Although the region imports significant quantities of foodstuffs (a total value of $5.44 billion for 2002-2004), there is a low level of dependence on imports to meet its food requirements.

The region is self-sufficient in terms of tubers, fruits and vegetables. It is deficient in meats (although exports toward North and Central African countries are not incorporated into meat counts) and, especially, dairy products. It is also short in cereals, importing 56% of rice consumed and 10% of other cereals, primarily wheat and wheat flour.

Identifying the region's supply structure for the early 2000s enables us to determine the region's level of self-sufficiency for the baseline period (average of the years 2004-2006). It is then possible to assess the evolution of this structure according to different scenarios of regional agricultural development.

Food imports: baseline situation, 2002-2004

Table N° 14

Food imports from outside ECOWAS, in tonnes				
Products	**2002**	**2003**	**2004**	**Average 2002-2004**
Cereals and by-products	3 632 014	4 294 128	3 281 800	3 735 981
Rice and by-products	5 431 043	8 138 374	6 714 026	6 761 148
Total grain crops	**9 063 056**	**12 432 502**	**9 995 827**	**10 497 128**
Meat and by-products	403 696	568 201	214 697	395 532
Fish and other aquatic animals and by-products	1 025 659	5 185 982	2 569 934	2 927 192
Milk and dairy products	277 923	302 212	371 833	317 323
Legumes	17 953	24 020	432 232	158 069
Roots/Tubers and by-products	104 261	126 897	122 006	117 722
Total selected products	**10 892 550**	**18 639 816**	**13 706 530**	**14 412 965**
Other food and tobacco products	3 833 258	6 910 560	5 632 015	5 458 611
Total food imports	**14 725 808**	**25 550 375**	**19 338 545**	**19 871 576**

Authors: ECOWAS external trade database.

This assessment of the food situation shows that overall coverage of food requirements is satisfactory and has improved over the past 35 years. According to FAO calculations, average calorie consumption should settle at 2339 kcal per person per day, while protein consumption is expected to settle at 58 g. Countries that have recently undergone periods of conflict have the poorest indicators. Average regional indicators are acceptable, but a significant portion of the population (15-17%, see box below) is still unable to meet its needs. The assumptions applied in the study were based on current forecasts for average consumption, considered sufficient to meet local needs. However, the issue of how food

14. *With the value of agri-foodstuffs exportation at $5.96 billion for the same period, the resulting agri-foodstuffs trade balance was positive, at $522 million.*

is allocated and whether all populations can access it remains unresolved, regardless of the region's capacity to meet theoretical demand.

Regional food supply, 2005

Table N°15

Baseline situation						
Products	Average Imports, 2002-04		Net Production, 2005		2005 availability = Requirements per capita	Coverage rate of demand
	Tonnes	Kg per cap.	Tonnes	Kg per cap.	Kg per cap.	%
Cereals and by-products (excl. rice)	3 735 981	14.9	32 062 033	128	143	90
Rice and by-products	6 761 148	27.0	5 381 860	22	49	44
Total grain crops	10 497 128	42.0	37 443 893	150	192	78
Meat and by-products	395 532	1.6	2 301 409	9	11	85
Milk and dairy products	2 221 261	8.9	2 001 502	8	17	47
Legumes	158 069	0.6	2 631 844	11	11	94
Roots/Tubers and by-products	117 722	0.5	77 337 754	309	310	100
Vegetables	0	0.0	9 220 843	37	37	100
Fruit	0	0.0	11 715 688	47	47	100

Authors: calculations, based on ECOWAS (Trade) and FAO (Production) data.

Daily energy consumption levels and evolution over time

Table N°16

Food energy intake (kcal/person/day)				
Country	1969-1971	1979-1981	1990-1992	2002-2004 (preliminary)
Benin	1990	2040	2330	2590
Burkina Faso	1770	1720	2350	2500
Côte d'Ivoire	2500	2830	2470	2640
Gambia	2160	1770	2370	2240
Ghana	2280	1700	2080	2690
Guinea	2220	2230	2110	2430
Guinea-Bissau	1870	2010	2300	2030
Liberia	2380	2550	2210	1930
Mali	1960	1700	2220	2200
Niger	2040	2140	2020	2150
Nigeria	2220	2050	2540	2720
Senegal	2280	2280	2280	2360
Sierra Leone	2230	2110	1990	1910
Togo	2220	2190	2150	2350
ECOWAS	***2 151***	***2 094***	***2 244***	***2 339***

Authors: FAO.

Table N° 17

Daily protein consumption levels and evolution over time

Food protein consumption (g/person/day)				
Country	1969-1971	1979-1981	1990-1992	2002-2004 (prelimi-nary)
Benin	47	49	55	65
Burkina Faso	55	51	69	78
Côte d'Ivoire	54	59	51	56
Gambia	54	43	52	57
Ghana	50	40	46	58
Guinea	48	50	48	53
Guinea-Bissau	38	42	46	43
Liberia	45	50	39	32
Mali	58	51	63	67
Niger	56	64	53	61
Nigeria	52	48	57	64
Senegal	65	67	66	68
Togo	49	50	51	53
ECOWAS				***58***

Authors : FAO.

Box N° 8

How does the FAO calculate minimum calorie requirements?

An individual's dietary requirements depend on his/her age and gender. Intake is sufficient when it covers all energy requirements for a healthy lifestyle with a limited amount of physical activity. For the population as a whole, minimum calorie requirements represent the weighted average of minimum calorie requirements for the different age and gender groups comprising the population. This value is expressed in kcal, per person, per day.

For example, these requirements are calculated at 1800 Kcal per person, per day in Niger, 1830 in Nigeria, 1850 in Ghana, Senegal and Côte d'Ivoire, and 1800 in Burkina Faso and Mali (2002-2004 period).

According to SOFI, average calorie intake in West Africa was 2580 (compared with 2040 in East Africa and 2080 in Southern Africa).

The same source reports average daily calorie intake for West Africa at 63 g/person per day (58 for East Africa and 51 in Southern Africa).

5.2. Scenarios to predict the evolution of West African agriculture

La formulation de scénarios a pour objectif de nourrir une discussion ouverte sur les perspectives de développement des agricultures ouest-africaines, et d'identifier les principales conditions à réunir pour favoriser une option plutôt qu'une autre, parce qu'elle correspond aux ambitions des sociétés et des décideurs ouest-africains.

The purpose of formulating scenarios was to encourage an open discussion on the outlook of West African agriculture and to identify the main conditions that would allow for one option to predominate because it corresponds to the ambitions of West African societies and decision-makers.

LAND AND WATER POTENTIAL ARE NOT SO MUCH CALLED INTO QUESTION, BUT RATHER THE CONDITIONS THAT WILL ENABLE THE REGION TO TAP INTO ITS POTENTIAL, IN VIEW OF DEVELOPING PRODUCTIVE, SUSTAINABLE AGRICULTURE.

The exercise consisted in isolating the demographic variable, assuming the population will double. The remaining unknowns were (i) time (whether this doubling would occur in 22, 25 or 27 years, in association with the demographic transition) and (ii) the degree of urbanisation. The trend is clear, although there is some uncertainty due to the multiple factors influencing demographic movements. To avoid excessively complex analyses, the rationale used to assess needs was based on the following assumptions, drawn from long-term, forward-looking studies (15) used by the Sahel and West Africa Club:

- Regional population in 2030: 455 million inhabitants;
- Urban population: 266 million (58.5%).

The initial question is whether or not the region has sufficient farming potential to ensure its food sovereignty, an objective of ECOWAS agricultural policy that has garnered strong support from farmers' organisations.

The analysis found that land and water potential are not so much called into question, but rather the conditions that will enable the region to tap into its potential, in view of developing productive, sustainable agriculture.

5.2.1. The main parameters

Three major contextual factors likely to have a significant influence on the evolution and performance of West African agriculture were identified to help build the scenarios:

- The international context
- The regional context
- The environmental context

15. *WALTPS, « Étude des perspectives à long terme de l'Afrique de l'Ouest », CSAO-OCDE.*

a) International context

This context primarily affects changes in demand, in conjunction with demographic growth and the economic evolution of emerging countries, as well as the evolution of pricing (levels and stability) relating to agricultural policy in developed countries.

Two options have been considered:

- a favourable international context
- an unfavourable international context

1. Favourable international context. Under this assumption, the global economy successfully avoids overheating, financial crisis and recession. The largest economies manage to adapt to expensive oil by developing energy alternatives with two positive impacts on agriculture: (x) they are partially based on bio-fuel and, as a result, the energy sector fuels demand growth for agricultural products, drawing raw materials prices upward; and (xx) by successfully adjusting to the new energy situation, national economies continue their development with high growth rates, particularly in emerging countries. Demographic growth, particularly in Asia (and Africa, to a lesser extent), combined with a change in dietary habits (a growing proportion of animal proteins in human nutrition), leads to strong demand for cereals and oilseeds. Supply is slow to catch up with this vigorous demand due to plateauing productivity levels resulting from new environmental constraints. This fuels tensions on markets that are profitable to West African farmers who benefit from substantial land reserves. Their improved economic environment makes it possible to finance agricultural modernisation.

Alongside this global price rise, WTO negotiations – aiming to ensure greater compatibility between agricultural policies – move forward, resulting in a new regulatory trade framework that is favourable to developing countries. This results in the elimination of most public export subsidies, and also concerns internal subsidies for farmers' income, which affect market equilibrium.

Final point: foreign investment flows. Under this favourable assumption, agriculture successfully attracts a significant share of foreign direct investment for two reasons. Firstly, the market for CO^2 emissions rights is stimulated by global growth and the proliferation of greenhouse gases. Humid tropical Africa, with its land reserves and excellent potential for the production of biomass, is able to turn this "polluting rights" market to its advantage. Secondly, healthy agro-foodstuffs markets encourage investment in production, both upstream (for the supply of intermediate consumer goods) and downstream (processing, storage and regional and international marketing of processed goods).

2. Unfavourable international context. This context is similar to the one experienced in West Africa over the past 20 years. It is characterised by depressed markets and unstable prices. The instability associated with unpredictable markets and a gap in supply and demand – inherent to the nature of agricultural markets and activities – does not encourage agricultural investment. In absence of economic security, farmers continue to minimise production risks by limiting use of inputs. Confronted with demand tensions, due to food security risks resulting from bio-fuel (land use competition), agricultural authorities in developed countries are slow in liberalising their policies and wish to maintain financial instruments used to orient and regulate markets. Agricultural policy in larger farming/export countries and regions continues to transfer internal instability to external markets. West Africa has no choice but to absorb this market instability, in absence of effective regulatory and protective systems.

Under this assumption, foreign investment in Africa remains modest; agriculture is still not profitable enough to channel a portion of these cash flows.

b) Regional context

Several regional variables, intimately tied to the integration process, will influence agricultural performance: progress on the Customs Union, the Common External Tariff, the degree of similarity between macroeconomic policies that may or may not reduce regional fragmentation, the level of implementation of ECOWAP and, finally, the degree of political stability.

Two main options were considered:

- a favourable regional context
- an unfavourable regional context

1. Favourable regional context. Under this assumption, regional integration picks up pace, overriding the national interests of all 15 West African countries. Fragmentation is reduced. Free movement of persons and goods gradually becomes a reality. ECOWAS manages effectively coordinate integration initiatives (through ECOWAS-UEMOA dialogue, for example) and regional technical cooperation. The framework for macroeconomic convergence, prerequisite to a common currency, is respected by the countries. Corruption is on the decline, helping to facilitate movement of agro-foodstuffs, improve their competitiveness and reduce the costs of production factors. Investment in transport, communications and energy infrastructures enables the true integration of the national economies, helping to remove the structural handicaps affecting West African farming sectors.

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➔➔ The dynamic nature of the agricultural sector is fostered by a redeployment of agricultural services (financing, support and advice, etc.). Thanks to the Economic Partnership Agreement negotiated with the European Union, ECOWAS is able to create a true Customs Union, equipped with a Common External Tariff (CET). The CET enables genuine differentiation in the protection of various value chains, depending on the issues specific to each (potential, level of competitiveness, importance of its role in food security, employment and revenue, etc.). A fifth tariff band is created to facilitate a regional policy compromise between Nigeria and less protectionist countries. The region institutes trade defence instruments to complement Customs duties, allowing it to react to changes in international markets and to regulate the regional market (duties to offset public subsidies of rival agricultural systems, a safeguard clause, etc.). The CET is not only protects agricultural production, it also helps develop local artisans and industries in agriculture's peripheral sectors: production of fertilisers, veterinary drugs, agricultural tools and machinery, etc. Small-scale and agro-food industries develop, stimulated by growth in regional demand and sustained food product prices, and employ a portion of the labour freed up by the modernisation of agriculture. This is the scenario implicitly preferred by the Regional Agricultural Policy (ECOWAP). West African agricultural policy motivates countries to design complementary national policies to address domestic issues, such as land policy, sectoral financing, rural youth, value chains assistance, agricultural training, support for investment and transfer of technologies to agro-food SMEs, etc. The development of professional education and training creates a generation of young, skilled farmers, capable of bringing about agricultural transformation.

2. Unfavourable regional context. The fragmentation that characterised the region during the 20th century continues. The truce currently in effect in conflict zones does not last. Political transitions and access to resources fuel numerous conflicts, which in turn create a climate of insecurity and impede regional integration. International donors divert a portion of development aid to of humanitarian assistance and rehabilitation. The investment climate is unfavourable. Countries are unable to establish compromises or prioritise regional interests. National self-interests take the upper hand, despite stated political desire for regional integration. This results in divergent external trade policies that continue to be based on national interests. Nigeria pursues a protectionist policy for its agricultural sector while the other countries have trade policies that are more open. Urbanisation highlights the sensitivity of decision-makers and public opinion to the price of food products (urban bias). Decision-makers are inclined toward liberalisation to limit the cost of basic foodstuffs. The status quo is maintained. The CET remains centred on the four existing levels of Customs

duties (0%, 5%, 10% and 20%) and the countries do not apply it in full. The policies applied bear little relation to stated policies. The Customs Union (an ECOWAS objective), reiterated in the EPA, does not come to fruition. Given disparities in foreign policy, international exchanges remain largely based on trade in contraband (or re-exportation). The corruption of "uniformed" agents (Police, Customs) continues, fed by political disparities between the countries. Economic actors fare better by positioning themselves on importation or import/re-export trade markets, rather than operating on national and regional markets for local products. Consequently, the downstream sector of processing, storage and marketing of agricultural products is not particularly dynamic. Cities and towns are increasingly supplied via the global market with by-products and off-specification products, which poor populations access more easily than local products.

Implementation of regional agricultural policy is either limited or incomplete. The countries and the region are unable to create a secure economic and institutional environment for farmers. These producers have low investment capacity and adopt risk-minimisation strategies.

c) Environmental/physical context

This aspect concerns natural agricultural resources and ecosystems, as well as the conditions for developing them. Climate change will have a more or less significant impact on production conditions. The same holds true for natural resource management strategies. Two elements will have a decisive effect on production potential: (i) clarification of land status (or lack thereof), the increased security of production units in terms of with land capital and its transmission; (ii) the ability to define technical systems to maintain soil fertility given the crisis of traditional fertility restoration techniques (based on long or medium fallow periods). Finally, the ability to manage environmental impact will determine the development of water management techniques. The environmental parameter is vital on a number of levels: the sustainability of farming systems, the variability of production due to climate instability and the protection of natural resources.

Two main options were considered:

- a favourable environmental context
- an unfavourable environmental context

1. Favourable environmental context. In this scenario, climate change does not have a profound effect on production conditions and variability. Abnormal weather phenomena remain relatively infrequent or only affect restricted geographic areas. Increased land pressure necessitates a material transformation of farming systems that are facing a rapid decline of soil fertility. Research and support/advisory servi-

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ces are able to adapt and provide technical systems that offer security to farmers. The improved economic environment for the latter allows them to take more risks and to invest in technologies that are more costly but that will foster increased yields. The increase in land security allows farmers to invest in land development (development of lowlands, intensification of agroforestry practices, etc.). Lessons learned from the past in terms of land development result in privileging farmer-controlled systems. Improved economic conditions enable producers to bear the maintenance costs of hydro-agricultural facilities. Governments develop common agricultural water policies at the regional level to account for interdependencies, manage shared and common resources (watersheds, groundwater, etc.) and avoid conflicts over access to water.

2. Unfavourable environmental context. The impacts of climate changes prove significant. The climatic instability leads farmers to opt for extensification strategies that will allow them to minimise economic risk. Torn between ill-suited modern law and traditional laws, decision-makers are unable to provide appropriate solutions to land insecurity. Accentuated pressure on land resources results in a proliferation of conflicts between farmers and stockbreeders, and destruction of forest cover due to the explosion of demand for wood to cover household energy requirements. Natural resource management policies prove incapable of controlling these developments. Finally, public decision-makers abandon the idea of developing a prudent policy for water management and irrigation.

Many other parameters could have been taken into account. But the objective here was not to address all possible scenarios. On the contrary, the intent was to limit assumptions to encourage interest and involvement in the debate. Variations and/or additional parameters can be easily incorporated at the analysis stage.

5.2.2. Scenarios applied

Not all combinations of the three major parameters were investigated in depth. Only the most probable scenarios were analysed. Those not developed further may be considered intermediate situations constituting a transitional phase to the more likely ones.

The hypotheses selected attempt to represent contexts that are sufficiently coherent and plausible, given trends observed in recent years. These are the contexts under which regional agriculture will necessarily see profound change in the next 25 years.

The variables used for the quantitative analysis of production potential have been intentionally restricted (in terms of surface areas and crop yields, animal production, land areas benefiting from water manage-

ment, etc.), according to available information and the intended simplification of this analysis. The objective is to involve socio-professional stakeholders and decision-makers in this debate, so they can push it forward and define the conditions required to meet the goal of regional food sovereignty.

The scenarios applied were as follows:

Scenario A, the current trend scenario:
"Agricultural growth through the expansion of cultivated surface area"

It combines:

- an unfavourable international context;
- an unfavourable regional context;
- an unfavourable environmental context.

This scenario extends the trends that emerged in wake of the structural adjustment of the region's agricultural economies, launched during the late 1980s/early 1990s. It is based on increased production that more or less matches growth in demand, but which relies solely upon the expansion of cultivated land, without any intensification of farming systems.

FOUR SCENARIOS OF AGRICULTURAL GROWTH : THROUGH THE EXPANSION OF CULTIVATED AREA, MASSIVE TRANSFORMATION OF AGRICULTURE, PARTIAL TRANSFORMATION , REGIONAL CRISIS IN A FAVOURABLE INTERNATIONAL CONTEXT

National governments and the region are unable to create a secure economic and institutional environment for farmers. As a result, farmers have low investment capacities and adopt strategies that aim to minimise economic risk.

Agriculture is not a public policy priority. Short-term management takes precedence over the long-term construction of national economies and the organisation of a regional space. The vast majority of public resources are channelled to poverty reduction efforts through education and healthcare, and investments to manage an urban demographic explosion.

Scenario B, the optimistic scenario :
"Agricultural growth through the massive transformation of agriculture".

This scenario combines:

- a favourable international context;
- a favourable regional context;
- a favourable environmental context.

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➔➔ This scenario is based on the idea of a virtuous circle. West African decision-makers consider price rises for agricultural and food products on international markets an opportunity to push agricultural development forward. The region uses it primary sector to build a development strategy and reduce poverty (widespread in rural areas). It becomes increasingly integrated and implements the necessary mechanisms to offer security to farmers and value chains. Agricultural policies respect the specificities and concerns of family farms. They promote family farming based on viable production units. The mechanisms (for increased land security, security of production conditions through water management, access to equipment credit and seasonal credit, access to information, better organisation of food markets, etc.) affect more than half of farmers, enabling the transformation of the agricultural landscape en masse.

Production increases thanks to a moderate increase in cultivated surface areas and, in particular, improvements in yields through the adoption of more productive technical systems.

Scenario C, moderate scenario 1 :

"Agricultural growth through the partial transformation of agriculture"

It combines:

- an unfavourable international context (high levels of instability);
- a favourable regional context;
- an unfavourable environmental context.

This scenario, situated between the "current trend" scenario (Scenario A) and the "massive transformation" scenario (Scenario B), corresponds to an improvement in the current situation, without any major reform capable of structurally affecting agricultural trends. Partial improvement in the international context (high demand for raw agricultural and food materials, price rises, etc., but with significant instability) and the regional context allows a minority of producers to position themselves on the market and invest in productive capacities. Farmers therefore focus on existing export value chains (cotton, cacao, rubber, tropical fruits, etc.), and segments highly responsive to growth of urban markets (market garden produce) and regional demand (cereals, livestock/meat). In this scenario, farmland potential is partially exploited through water management.

The countries develop incomplete agricultural policies that do not settle the issue of production units. They claim to address both family farms and the agri-businesses. In reality, they are based on programme and project strategies that only address entrepreneurial-type production units and farms that already have a place in highly structured value chains, such as exports.

In this scenario, 25% of family production units participate in the development process, driven by a positive economic and trade environment, on both regional and international levels. The other farms are unable to integrate themselves into the market in any significant way, for lack of production means. They retain traditional farming systems based on the use of natural resources and family labour. They are focussed on their own consumption needs and market any surplus production on local markets.

Scenario D, moderate scenario 2:
"Regional crisis in a favourable international context"

This scenario combines:

- a favourable international context (high demand and prices);
- an unfavourable regional context;
- a favourable environmental context.

Under this scenario, the region continues to suffer numerous political conflicts. These conflicts, like those occurring over the past 15 years, thwart efforts for regional integration. Arms trafficking has led to tougher road and Customs inspections, which are opportunities for extortion and block the free circulation of trade. Crime precludes land security and investments by farmers or any other economic agents. The objective to converge macroeconomic policies does not lead to effective reforms of national policies.

National and regional decision-makers are unable to take advantage of the marked improvement in the international economic and trade environment. This encourages an extraversion of the economy. Produce destined for export benefits from growth in external demand, while produce for regional markets is unable to circulate within the region, lacks sufficient protection and price regulating instruments. Export-oriented production areas develop, while food production is stunted.

5.2.3. Technical assumptions

For each of the four major scenarios considered, assumptions were formulated based on expert knowledge, lessons learned from the quantitative analysis of the period 1980-2005, and the evolution of production, surface areas and yields over the smaller, more homogeneous period covering 1990-2005.

Technical assumptions applied to Scenario A:
"Agricultural growth through the expansion of farmland"

- Cultivated farmland: Extension of the AAGR (Average Annual Growth Rate) through 2030, calculated based on the period 1990-2005

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- Yields: Extension of the AAGR through 2030, calculated based on the period 1990-2005
- Animal production: Extension based on the AAGR, 1990-2005
- Increase in irrigated farmland: 15% increase in developed irrigable farmland under cultivation, with total water management
- Verification of technical feasibility by country (available surface area)

Technical assumptions applied to Scenario B:
"Agricultural growth through the massive transformation of agriculture"

- Cultivated farmland: 50% increase in cultivated land
- Yields: yields doubled in 25 years
- Animal production: production doubled in 25 years
- Increase in irrigated farmland:
  - one-half of irrigable farmland developed and under cultivation with total water management
  - one-third of irrigable farmland developed and under cultivation with total water management
- Verification of technical feasibility by country (available surface area)

Technical assumptions applied to Scenario C: :
"Agricultural growth through the partial transformation of agriculture"

- Cultivated farmland: 75% grow by the AAGR applied in Scenario A (current trends), 25% experience growth as applied in Scenario B.
- Yields: as above
- Animal production: as above
- Increase in irrigated farmland:
  - one-half of irrigable farmland developed and under cultivation with total water management
  - one-third of irrigable farmland developed and under cultivation with total water management

Technical assumptions applied to Scenario D:
"Regional crisis in a favourable international context"

- Cultivated farmland: production for export is stimulated by demand: surface areas and yields double (as in Scenario B), whereas food production stagnates; increase in farmland = 50% of AAGR; likewise for yields (50% of AAGR)
- Animal production: Growth based on 50% of AAGR for the baseline period
- Increase in irrigated farmland: no significant change

Table 18 below presents and summarises the assumptions used to build the four scenarios, including the variants for the development of irrigable land under Scenarios B and C.

Table N°18

	Scénario A	Scénario B	Scénario C	Scénario D
Description	**Current trend scenario:** "Agricultural growth through the expansion of farmland"	**Breakaway scenario:** "Agricultural growth through the massive transformation of agriculture"	**Moderate scenario 1:** "Agricultural growth through the partial transformation of agriculture"	**Moderate scenario 2:** "Regional crisis in a favourable international context"
Major contextual factors				
International context	– –	++	– –	++
Regional context	– –	++	++	– –
Environmental context	– –	++	– –	++
Technical assumptions				
Growth in cultivated surface area	Forecast for 2030: increase over 2005 surface areas at AAGR for 1990-2005	Forecast for 2030: surface areas up 50%	Forecast for 2030: – 75% of farmland: at AAGR for 1990-2005 (as in Scen. A) – 25% of farmland: up 50% (as in Scen. B)	Forecast for 2030: – export crops: increase over 2005 surface areas x 2 – crops for regional markets: increase over 2005 surface areas x 50% of AAGR
Improved plant yields	Forecast for 2030: increase over 2005 yields at AAGR for 1990-2005	Forecast for 2030: 100% increase over 2005 yields	Forecast for 2030: – 75% of farmland: at AAGR over 1990-2005 yields (as in Scen. A) – 25% of farmland: 100% increase in yields (as in Scen. B)	Forecast for 2030: – export crops: increase over 2005 yields by 100% – crops for regional markets: increase over 2005 yields at AAGR less 50%
Increased animal production	Forecast for 2030: increase over 2005 livestock at AAGR for 1990-2005	Forecast for 2030: increase over 2005 livestock by 50%	Forecast for 2030: - 75% of livestock: up by 1990-2005 AAGR - 25%: up 50% by 2030	Forecast for 2030: - increase over 2005 livestock at AAGR for 1990-2005, less 50%
Growth in surface areas under water management	15% growth by 2030	Irrigation of one-half of irrigable farmland	Irrigation of one-half of irrigable farmland	No change in surface areas. Only

	Scénario A	Scénario B	Scénario C	Scénario D
Description	**Current trend scenario:** "Agricultural growth through the expansion of farmland"	**Breakaway scenario:** "Agricultural growth through the massive transformation of agriculture"	**Moderate scenario 1:** "Agricultural growth through the partial transformation of agriculture"	**Moderate scenario 2:** "Regional crisis in a favourable international context"
Calculations				
Growth in cultivated surface areas	2005 surface area x 1.96	2005 surface area x 1.5	(2005 surface area x 0.75 x 1.96) + (2005 surface area x 0.25 x 1.50) = 2005 surface area x 1.85	(2005 surface area for export x 2) + (2005 surface area for regional markets x 1.45)
Improved plant yields	2005 yields x 1.64	2005 yields x 2	– 75% of surface area (adjusted for growth): 2005 yields x 1.64 – 25% of surface area (adjusted for growth): 2005 yields x 2	– export crops: 2005 yields x 2 – crops for regional markets: 2005 yields x 1.37
Increases in production, excluding developments	2005 production x 3.2	2005 production x 3	2005 production x 2.66	– Export produce: 2005 production x 4 – Regional market produce: 2005 production x 2
Increased animal production	Number of ruminants in 2005 x 1.63	Number of ruminants in 2005 x 1.5	Number of ruminants in 2005 x 1.5	Number of ruminants in 2005 x 1.31
Increase in ruminant + monogastric meat production	2005 production x 1.86	2005 production x 2.5	2005 production x 1.75	2005 production x 1.43
Increase in milk production	2005 production x 1.98	2005 production x 2.5	2005 production x 1.85	2005 production x 1.5
Growth in surface areas under water management	2005 irrigated surface area x 1.15 (equal to 1,150,000 ha	A1: 2005 irrigated surface area x 0.50 (equal to 5,000,000 ha (a)) A2: 2005 irrigated surface area x 0.33 (equal to 3,300,000 ha)	A1: 2005 irrigated surface area x 0.50 (equal to 5,000,000 ha (a)) A2: 2005 irrigated surface area x 0.33 (equal to 3,300,000 ha)	None

5.3. Results of the different scenarios

The authors conducted two analyses. The first involved calculating growth rates of plant crops (surface area, yields and production volumes) and animal production (numbers and production volumes). The second pertains to the continuation of the trends observed over the past fifteen years throughout the period of 2005-2025.

5.3.1. Baseline situation

Table 19 presents the baseline situation for 2005 and the average annual growth rates calculated over the period of 1990-2005 for the main plant productions, broadly classified into two large, arbitrary categories: (i) produce – primarily foodstuffs – for regional consumption and (ii) export products.

Table 20 presents the same information for animal production.

The yields calculated by product group have no significance other than to form an indexed basis from which to assess evolution over time.

Sugar cane and tobacco, primarily used for domestic consumption, were considered products for the regional market, along with foodstuffs. Palm nuts were classified as export products, although a substantial portion of their production is now sold on domestic markets.

Table N°19

Animal production: 2005 baseline situation and development trends, 1990 to 2005

Species	Number of heads		
	1990	2005	AAGR, 1990-2005
Cattle	33 378 304	42 472 292	1.60%
Sheep & goats	86 656 070	118 006 915	2.10%
Pigs	6 437 365	11 307 773	3.80%
Poultry	261 429 000	362 251 000	2.20%
Total ruminants	120 034 374	160 479 207	
Products	**Production - Tonnes**		
	1990	2005	AAGR, 1990-2005
Eggs	425 816	374 133	-0.90%
Milk	1 329 463	2 001 502	2.80%
Meat	1 584 857	2 301 409	2.50%

Authors: calculations, based on FAOSTAT data

Plant production: 2005 baseline situation

Table N° 20

Product group	Surface area	Production	Yields	Surface area	Production
	1990			2005	
	ha	t	kg/ha	ha	t
Products for regional consumption					
Dry cereals	29 798 037	24 744 770	830	34 800 469	37 720 039
Rice	3 607 296	6 032 101	1 672	5 114 294	5 114 294
Roots and tubers	5 012 498	46 126 627	9 202	10 919 329	110 482 506
Vegetables	1 558 251	8 137 954	5 222	2 288 042	14 185 912
Fruit	2 171 716	11 224 706	5 169	3 128 630	18 024 135
Legumes	5 793 143	2 205 602	381	9 841 203	4 386 407
Sugar cane	95 449	4 464 478	46 773	116 792	4 285 059
Tobacco	48 926	22 823	466	59 400	33 791
Sub-total	48 085 316	102 959 061	2 141	66 268 159	197 397 634
Products for export outside West Africa					
Coffee, cacao, tea	4 230 330	1 673 523	396	5 651 426	2 924 318
Cotton	1 397 494	1 282 073	917	2 533 844	2 511 666
Rubber	350 547	276 925	790	561 195	410 260
Palm	2 892 408	9 666 217	3 342	4 246 176	14 257 328
Groundnuts	2 834 488	2 829 461	998	4 878 983	5 898 518
Pineapples/bananas	171 228	1 456 262	8 505	223 180	2 078 058
Walnuts	464 203	307 463	662	1 183 192	1 050 715
Walnuts	12 340 698	17 491 924	1 417	19 277 996	29 130 863
Total	**60 426 014**	**120 450 985**	**1 993**	**85 546 155**	**226 528 497**

5.3.2. Saturation of cultivated land?

One of the key aspects of this study is to formulate projections for cultivated land. Currently, cultivated farmland represents 40% of surface areas considered potentially cultivable. Over the past fifteen years, average annual growth in cultivated land was 2.5% per year.

and development trends, 1990 to 2005

	Yields	Surface area	Production	Yields	Surface area	Production	Yields
		AAGR 1990-2005			Evolution: 2005/1990		
	kg/ha	%	%	%	%	%	%
Products for regional consumption							
	1 084	1,00	2,90	1,80	117	152	131
	1 619	2,40	2,10	0,90	142	137	97
	10 118	5,30	6,00	0,60	218	240	110
	6 200	2,60	3,80	1,20	147	174	119
	5 761	2,50	3,20	0,70	144	161	111
	446	3,30	4,70	1,30	170	199	117
	36 690	1,40	-0,30	-1,60	122	96	78
	569	1,30	2,70	2,30	121	148	122
	2 979				138	192	139
Products for export outside West Africa							
	517	1,90	2,20	1,80	134	175	131
	991	4,00	4,60	0,50	181	196	108
	731	3,20	2,70	-0,50	160	148	96
	3 358	2,60	2,60	0,00	147	147	100
	1 209	3,20	5,00	1,30	172	208	121
	9 311	1,80	2,40	0,60	130	143	109
	888	6,40	8,50	2,00	255	342	134
	1 511				156	167	107
	2 648				**142**	**188**	**133**

All the scenarios are based on the assumption that this trend will continue, although with possible variations. These variations will depend on the regional and environmental contexts, and particularly the conditions for sustainable (in the environmental and social senses) intensi-

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fication, enabling a growing supply of land without depleting natural resources. Table 21 provides a summary of land occupancy rates in 2005 and forecasts for 2020 and 2030.

Based on FAO data, three countries already have a land occupancy rate of over 50%: Cape Verde, Benin and, more seriously, given its weight in the regional agricultural economy, Nigeria. Between 1990 and 2005, cultivated land in Nigeria rose from 29 million ha to 44.5 million (half of all cultivated land in the region). This increase was mainly the natural consequence of expanding food crops: dry cereals, vegetables, legumes and, especially, tubers (+4.5 million ha in 15 years). The average annual growth rate of land dedicated to roots and tubers was 6%. If this growth rate continues over the next 25 years, it will lead to full occupancy of cultivable land area. Obviously, this is an impossible situation. An occupancy rate of 123% – 91 million ha – would be reached in 2030, whereas there are only 74 million ha of cultivable land. The authors opted not to modify the assumptions, insofar as, firstly, there is land available in the region, even if saturation is reached in certain countries and, secondly, saturation in overall land use, including in Nigeria, usually leads to an intensification of farming production (the transformation of agriculture in Kano state, for example). In the event of market saturation, should an increase in supply outstrip demand, the corresponding drop in prices should limit the expansion of production (cf. results of tuber forecasts, Table 22).

THE PRESENT MODEL OF AGRICULTURAL DEVELOPMENT, DEPENDING ON SURFACES EXTENSIONS, LEADS TO THE ACCELERATION OF LANDS' DEGRADATION AND TO THE DECREASE OF YIELDS

At the end of the forecast period in 2030, six countries will have a theoretical land use rate of 75-100% (Burkina Faso, Cape Verde, Gambia, Guinea-Bissau, Sierra Leone and Togo), and three countries (Benin, Ghana and Nigeria) will have theoretical rates of above 100%. Nevertheless, given the land reserves available in Mali, Niger, Côte d'Ivoire, Guinea and, to a lesser extent, in Senegal, the average theoretical occupancy rate would "only" be 73%. Land reserves in Mali and Niger will be difficult to use for two reasons: low population density in these areas and poor quality of the lands in question.

An initial conclusion already emerges: the agricultural growth model that has been used in the region for more than a generation cannot be sustained without land productivity bottoming out and the natural resources deteriorating at a rapid pace. Given increased land pressure and gradual saturation of good-quality land, there will likely be proliferation of conflicts over land use.

Forecasts of cultivated land areas in 2020 and 2030, based on 1990-2005 trends and a comparison with cultivable surface areas

Table N° 21

Forecasts of cultivated land areas in 2020 and 2030 (in 1000 ha)

Country	Cultivable surface area (SP)	Cultivated surface area (SC), 1990	Cultivated surface are (SC), 2005	AAGR 1990-2005 (%)	SC forecast, 2020	SC forecast, 2030	Forecast, SC2020 / SP	Forecast, SC 2030 / SP	Reminder SC 2005/SP
Benin	3 567	1 461	2 767	4,30	5 242	8 024	1,47	2,25	0,8
Burkina Faso	10 900	3 615	5 232	2,50	7 575	9 693	0,69	0,89	0,5
Cape Verde	74	87	75	-0,90	65	60	0,88	0,81	1,0
Côte d'Ivoire	20 300	6 525	6 410	-0,10	6 298	6 224	0,31	0,31	0,3
Gambia	814	212	335	3,10	528	716	0,65	0,88	0,4
Ghana	14 735	2 952	6 377	5,30	13 776	23 021	0,93	1,56	0,4
Guinea	12 570	1 697	2 689	3,10	4 261	5 791	0,34	0,46	0,2
Guinea-Bissau	1 630	260	472	4,10	859	1 279	0,53	0,78	0,3
Liberia	2 602	352	357	0,10	362	366	0,14	0,14	0,1
Mali	39 479	3 476	5 013	2,50	7 231	9 231	0,18	0,23	0,1
Niger	38 500	9 629	12 389	1,70	15 941	18 858	0,41	0,49	0,3
Nigeria	74 000	28 949	44 543	2,90	68 537	91 345	0,93	1,23	0,6
Senegal	8 248	2 357	2 461	0,30	2 571	2 646	0,31	0,32	0,3
Sierra Leone	2 880	742	1 130	2,80	1 722	2 279	0,6	0,79	0,4
Togo	3 630	1 238	1 665	2,00	2 240	2 729	0,62	0,75	0,5
CEDEAO	***233 929***	***63 551***	***91 918***	***2,50***	***132 946***	***170 031***	***0,57***	***0,73***	***0,4***

Cultivable land occupancy rate greater than 1

Cultivable land occupancy rate greater than 0.75

Source: Authors' calculations, based on FAOSTAT data

5.3.3. General conclusions on the scenarios

a) Presentation of results

The two following tables present the results of the current trend scenario, which simply extends the trends observed over 1990-2005, in terms of cultivated surface areas, plant production yields, ruminant livestock and meat production.

Table 22 shows plant production forecasts for 2020 and 2030, while Table 23 presents results for animal production. Table 24 provides

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details on the results of the four scenarios and their variants, listed next to the original situation (2005). It presents the results as absolute values and indexes (measured against the 2005 situation).

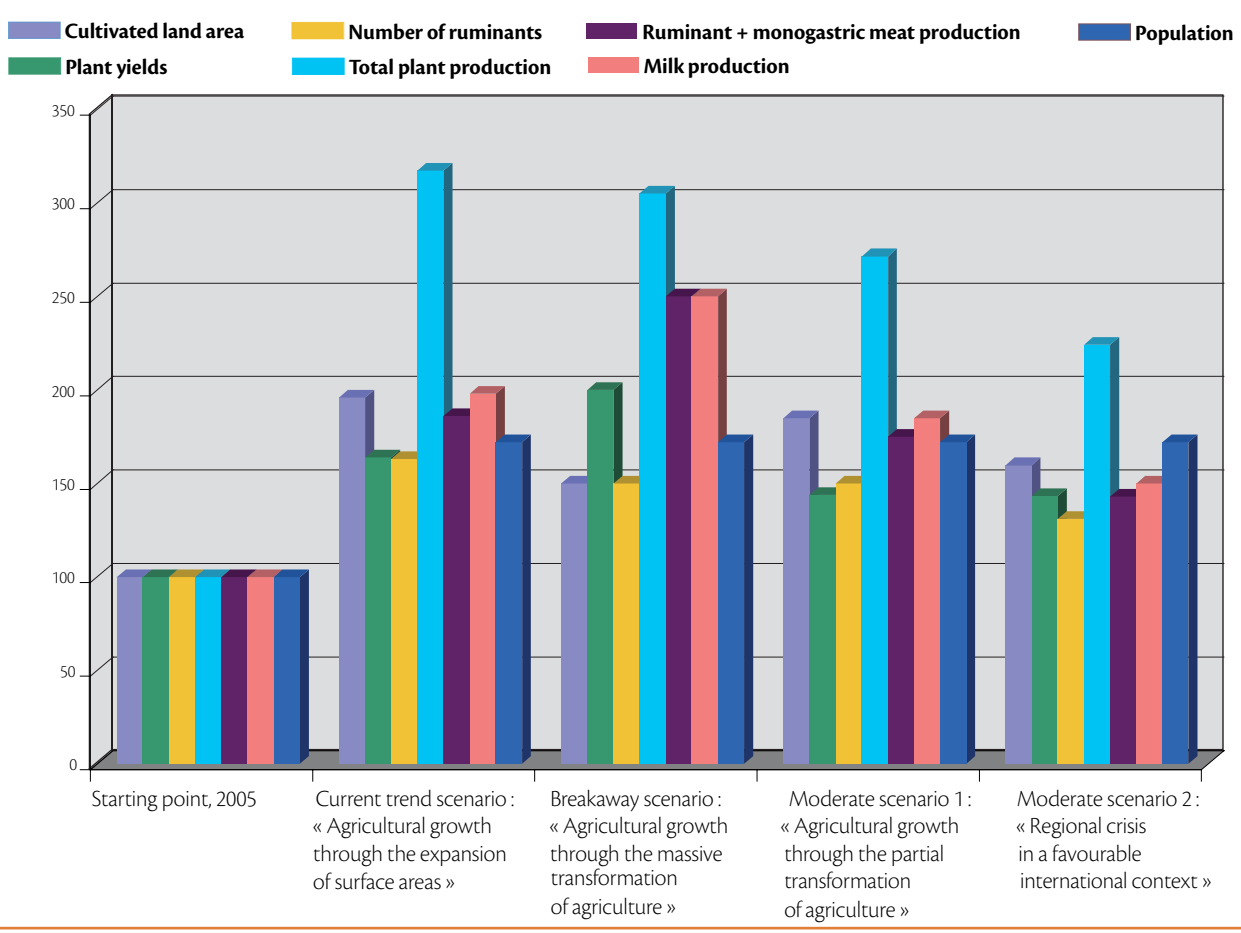
Analyses were based on a population of 455 million in 2030, with estimated demand at 1.7 times that of 2005.

The charts below provide a graphic representation of the results. Table 26 presents food availability data according to major product categories and the evolution of food supply, based on population growth.

Results obtained from the different scenarios, compared with the baseline situation

Index 100: 2005 baseline situation

Figure N° 22



Water management, the key to the future?

All scenarios assume the growth of plant production for human consumption (with the exception of rice) will be higher than growth in demand.

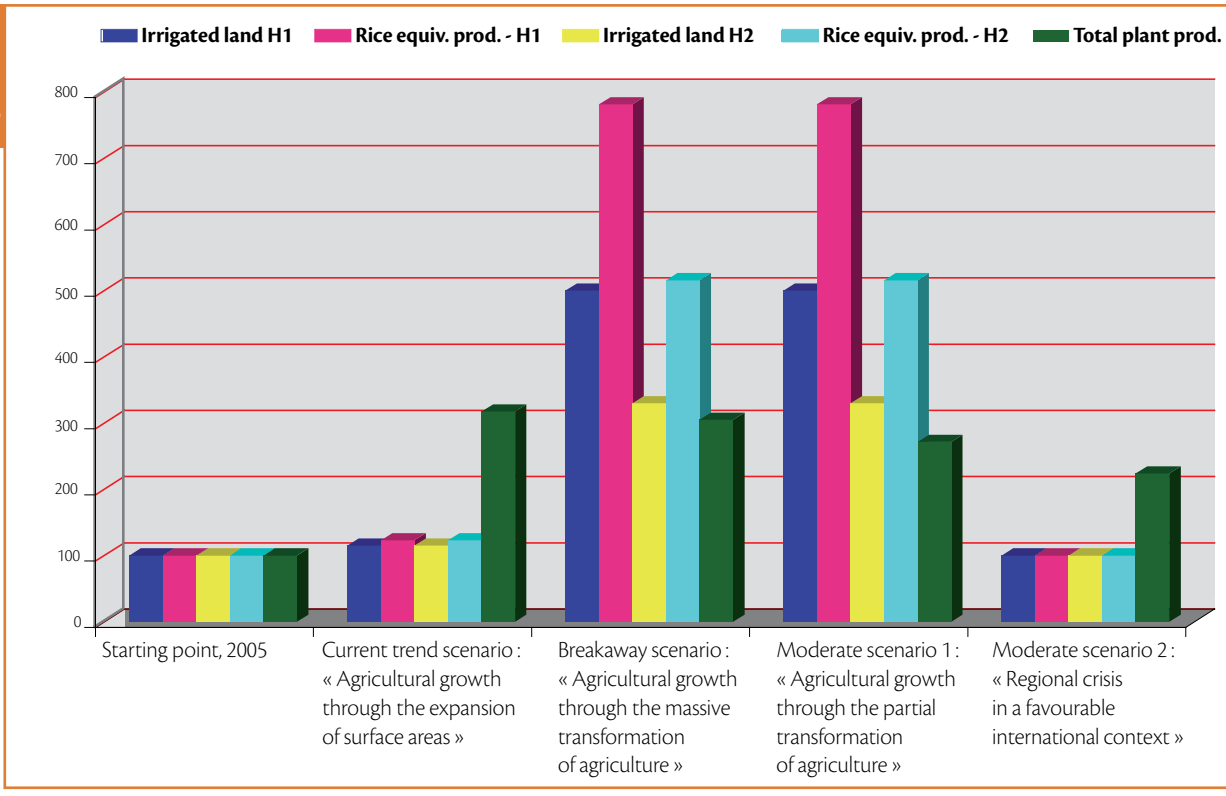
Water management through irrigation schemes located along rivers has a substantial impact on trends in rice production. The scenarios with

a sharp increase in developed surface areas (corresponding to 92,000-160,000 ha developed per year) – never before seen – would cover demand for rice. In the scenarios that follow the current trend, dependence on rice imports would be exacerbated. Rice demand in 2030, for an estimated population of 455 million and with unchanged average consumption, would involve more than 22 million tonnes, equivalent to 6,770,000 hectares with a yield of 5 tonnes of paddy. The current surface area dedicated to rice is 5.11 million ha, but with average yields of no more than 1.67 tonnes of paddy! Reducing dependency on rice imports will necessarily involve water management, the one and only solution to improving yields. The rise in rice prices and the forecasted growth in demand will profoundly change the conditions and advantages surrounding investments in water. The assumptions applied in Scenarios B and C, with the development of one-third or one-half of irrigable land, are extremely aggressive, given current irrigation difficulties (financing investments, technical expertise, social management, maintenance of facilities, profitability, etc.)

Information on developing lowlands was too dispersed and heterogeneous to incorporate into the quantitative analyses. Nonetheless, it is clear they have considerable potential for increasing security of farm production: rice, off-season vegetables, maize, etc. They could be a significant source of productivity and help reduce farmers' vulnerability to climatic hazards.

Impact of water management on production levels, compared with the baseline situation

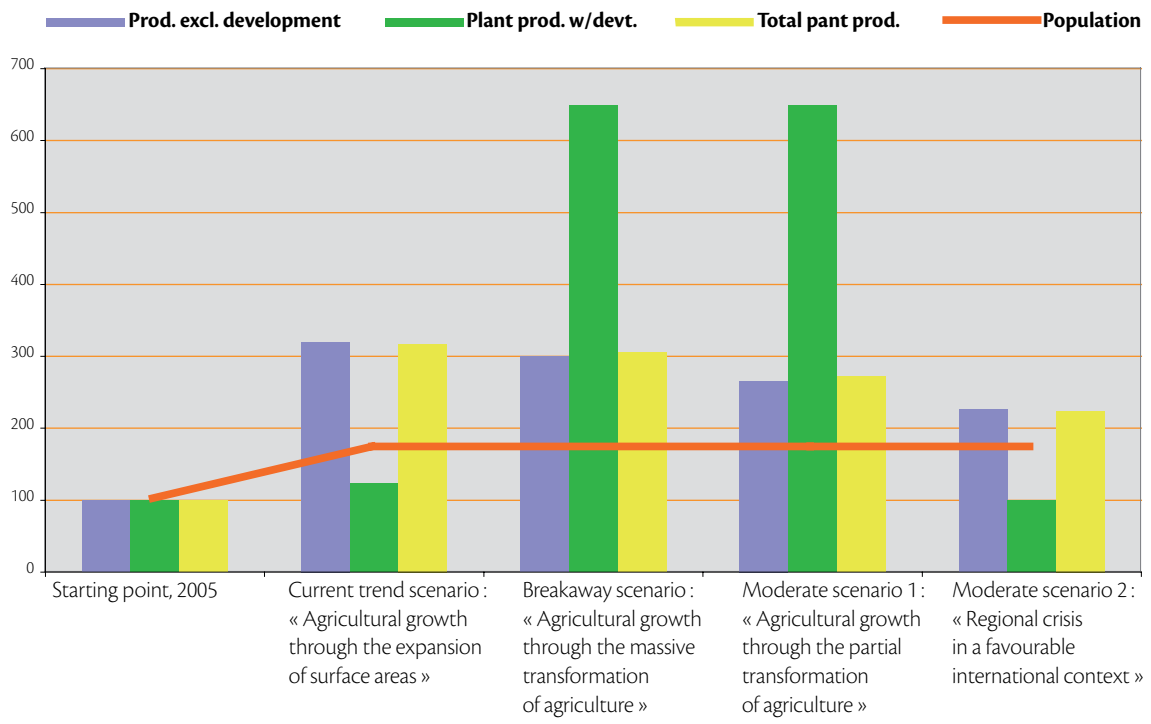
Figure N° 2.3



The figure 24 demonstrates the progress that could be made in irrigated production with the development of 5 million ha, equivalent to half of all irrigable land area (an extremely ambitious objective). Table 26 further shows that the implementation of such an ambitious project would coverall regional rice needs. However, it also shows that the impact on overall plant production would be relatively subdued.

Impact of water management on rice production and overall plant production

Figure N° 24



b) Analysis of results by scenario

Current trend Scenario A:

"Agricultural growth through the expansion of surface areas"

- Under scenario A (a continuation of current trends) the demand for plant products (excluding rice) is met. There are even substantial surpluses. But this scenario is based on doubling cultivated land areas; nearly three-quarters of cultivable land would be used. It would exacerbate the ecological crisis and would not sustain soil fertility. It suggests that the region could pursue its extensive production model without encountering any major obstacles in the short term. However, the pressure on available land would very quickly lead to a proliferation of land-related conflicts, due to expansion of cultivated surface areas and competition for these spaces by livestock herds.

- The crops that saw an increase in surface area during 1990-2005 would see the greatest rise in production volume. This is the case of tubers. Nigeria, a major producer of tubers, is also the country where land availability is very limited.
- Stagnant yields due to a drop in land productivity – failing significant improvement in production techniques – could rapidly overturn these results. The drop in cereal yields observed in recent years in areas such as the Niger's agricultural belt and Senegal, illustrate the fragility of extensive plant production.
- Growth in livestock farming in this scenario is barely sufficient for the region to maintain its meat self-sufficiency rate at current levels, and insufficient to cover dairy product requirements. The latter would plateau at around 50%, with the remainder having to be covered by imports from the global market.

Scenario B:

"Agricultural growth through the massive transformation of agriculture"

- Scenario B is the most optimistic scenario. It turns its back on recent trends, embodying instead the directives set out by governments and regional organisations. It is also in line with the ambitions of farmers' organisations. The current international context suggests that it is realistic to think West African producers may benefit from a less aggressive, more growth-orientated trade environment than the one experienced over the past 20 years.
- This scenario forecasts very high growth in production (triple current rates) but, unlike the current trend scenario, this increase stems from improved yields, which would double in the space of 25 years. In this case, the scenario would allow for "savings" of approximately 40 million hectares.

THE MAXIMUM DESIRABLE LAND USE RATE FOR THE ECOWAS REGION IS 55% OF THE CULTIVABLE POTENTIAL

- The average land use rate for the region is 55% of the cultivable potential, versus nearly 75% under the scenario A. The heterogeneity of national contexts notwithstanding (for example, this moderate growth in farmland would lead to saturation of cultivable land in Nigeria), this land use rate undoubtedly represents the maximum desirable rate for the region, given soil quality and fertility issues.
- The gains in productivity per hectare necessary to fulfil this scenario are attainable for most crops. Positive results have already been achieved using known techniques by groups of farmers in

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the Office de Niger (rice) and the Boucle du Mouhoun (maize). Improving gains does not require major investments in research, although these investments remain crucial. By working with producers to design and manage the dissemination and transfer of innovations, it is possible to achieve conclusive results. The following conditions are necessary:

- Farmers must understand the benefits of changing their production techniques and adopting new technical systems;
- Support and advisory services must be dynamic and easily accessible to the vast majority of farmers.

- The two aggressive options for developing irrigated rice would cover growth in demand. But given the propensity of urban dwellers to increase their rice consumption to the detriment of other traditional cereals, coverage of regional needs would require irrigating over nearly 5 million ha or dramatically improving cultivation rates and yields.
- Meat production would cover demand. Milk production would improve, but not enough to entirely meet demand.
- Surpluses in cereals, tubers and agro-industrial crop by-products such as cottonseed and groundnut oil would make possible a more competitive livestock feed industry. This would stimulate poultry and pork value chains, as well as new forms of cattle and sheep feeding, thus responding to evolving dietary preferences.

Scenario C:

"Agricultural growth through the partial transformation of agriculture"

- This scenario differs from the previous one in the proportion of producers to join "the development bandwagon". Under this scenario, only 15-20% of farmers intensify their production systems (improved techniques, mechanisation, etc.) and see increases in yields. They are the only ones to access finance, join a value chain organisation, or be included in a development programme.
- This scenario is interesting, because the rate of 15-20% corresponds to the rate of European farmers considered to have bought into the European Union's Common Agricultural Policy. It is therefore a realistic situation which often serves as a reference point, notably amongst West African farmers' organisations, certain African government authorities, NGOs and aid agencies, to justify aggressive, somewhat protectionist policies for the promotion of agriculture.

- Land use rate is 67%, making the reproducibility of land use methods more uncertain than in the preceding scenario.
- Plant production rises enough to cover growth in demand, provided consumption is stable.
- Meat production cannot cover demand. The coverage rate for dairy products improves but not enough to close the gap in supply and demand.
- The results for rice cultivation, based on the same assumptions as the previous scenario, are the same.

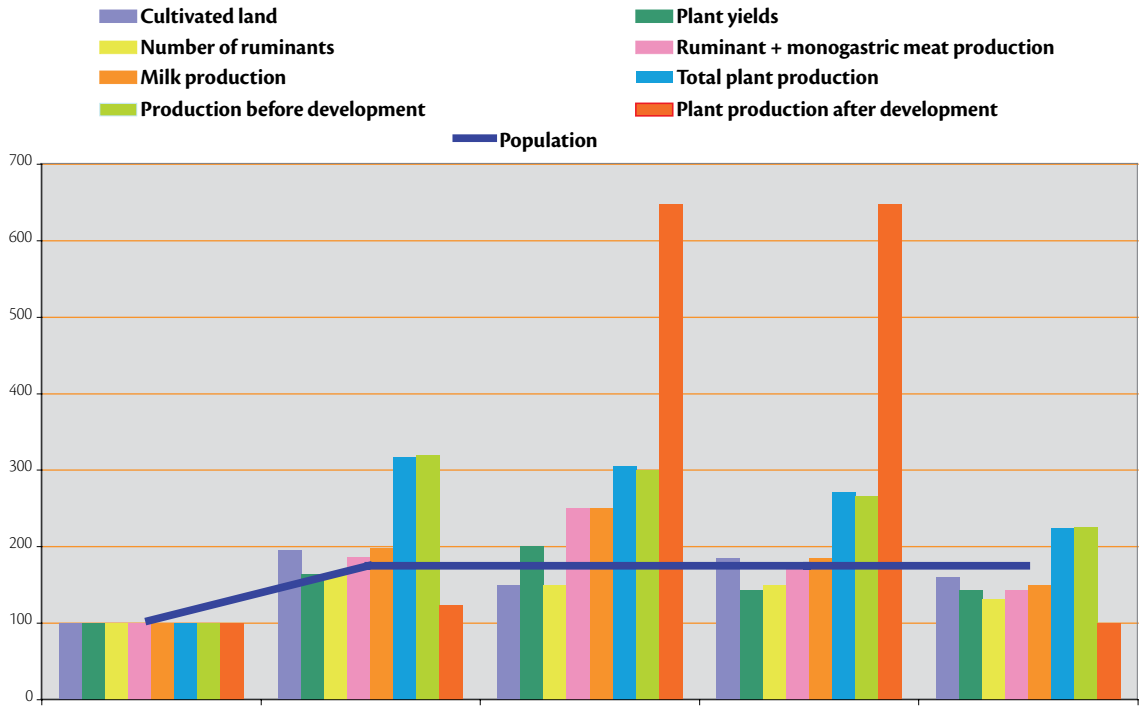
Scenario D:

"Regional crisis in a favourable international context"

- In this scenario, agricultural growth is driven by the international environment, and therefore benefits producers positioned on the export market. Conversely, instable food markets – despite relatively elevated prices – discourage producers. Farmers able to do so move to export crops, which partially take the place of food crops. The latter are neglected in terms of care and inputs. Under this scenario, a two-pronged form of agriculture would emerge: on the one hand, a minority of production units – larger farms with investment capacity – oriented toward exportation; on the other, impoverished subsistence farming in areas of land saturation and semi-arid zones. Under this scenario, producers prioritise home consumption and sell only surplus production (depending on their cash needs).
- Land use rate is 57%, despite the dynamic nature of production for export.
- This scenario has the poorest performance on the production level, despite significant growth in exported goods. It results in a serious deficit in plant and animal production, compared with demand.

Positioning of the different parameters by scenario, as indices

Figure N° 25



Animal production – 2020 and 2030 forecasts based on 1990-2005 trends

Table N° 22

Species	Number of heads					
	1990	2005	AAGR, 1990-2005	Forecast for 2020	Forecast for 2030	2030/2005 %
Cattle	33 378 304	42 472 292	1,60	54 043 955	63 461 171	149
Sheep & goats	86 656 070	118 006 915	2,10	160 700 019	197 433 831	167
Pigs	6 437 365	11 307 773	3,80	19 863 054	28 917 361	256
Poultry	261 429 000	362 251 000	2,20	501 956 000	623 882 000	172
Total ruminants	120 034 374	160 479 207		214 743 974	260 895 002	163
Products	**Products**					
Eggs	425 816	374 133	-0,90	328 724	301 555	81
Milk	1 329 463	2 001 502	2,80	3 013 256	3 958 124	198
Meat	1 584 857	2 301 409	2,50	3 341 930	4 285 482	186

Authors' calculations, based on FAOSTAT data.

Summary of results obtained for the various scenarios

Table N° 23

Product group	Surface area	Production	Yields	Surface area	Production	Yields	Surface area	Production	Yields
	Forecast for 2020			Forecast for 2030			Evolution 2030/2005		
	ha	t	kg/ha	ha	t	kg/ha	%	%	%
Products for regional consumption									
Dry cereals	40 642 699	57 499 073	1 415	45 072 761	76 158 180	1 690	130	202	156
Rice	7 250 861	11 365 003	2 267	9 150 796	14 036 858	2 480	179	170	153
Roots and tubers	23 786 888	264 627 723	11 125	39 972 879	473 728 910	11 851	366	429	117
Vegetables	3 359 623	24 728 584	7 361	4 340 185	35 817 389	8 253	190	252	133
Fruit	4 507 185	28 942 356	6 421	5 749 183	39 687 478	6 903	184	220	120
Legumes	15 517 175	8 723 500	562	21 549 909	13 795 751	640	219	315	144
Sugar cane	142 907	4 112 850	28 780	163 486	4 001 906	24 479	140	93	67
Tobacco	72 116	50 030	850	82 072	64 990	1 068	138	192	188
Sub-total	95 279 454	400 049 119	4 199	126 081 271	657 292 062	5 213	190	333	175
Products for export outside West Africa									
Coffee, cacao & tea	7 549 911	4 061 680	677	9 157 937	5 056 226	809	162	173	156
Cotton	4 594 199	4 920 523	1 071	6 831 191	7 703 903	1 128	270	307	114
Rubber	898 426	607 793	677	1 229 498	789 866	642	219	193	88
Palm	6 233 563	21 029 053	3 374	8 051 843	27 248 384	3 384	190	191	101
Groundnuts	7 772 464	12 296 518	1 464	10 601 769	20 066 654	1 664	217	340	138
Pineapples & bananas	290 895	2 965 350	10 194	347 101	3 758 559	10 828	156	181	116
Walnuts	3 015 796	3 590 680	1 191	5 627 297	8 146 505	1 448	476	775	163
Sub-total	30 355 254	49 471 597	1 630	41 846 636	72 770 097	1 739	217	250	115
Total	**125 634 708**	**449 520 716**	**3 578**	**167 927 907**	**730 062 159**	**4 347**	**196**	**322**	**164**

Summary of results obtained for the various scenarios

Table N° 24

Summary of results					
	Baseline	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario D**
Description	**Starting point, 2005**	**Current trend scenario:** "Agricultural growth through the expansion of surface areas"	**Breakaway scenario:** "Agricultural growth through the massive transformation of agriculture"	**Moderate scenario** 1: "Agricultural growth through the partial transformation of agriculture"	**Moderate scenario :** "Regional crisis in a favourable international context"
Main contextual factors					
International context		– –	++	– –	++
Regional context		– –	++	++	– –
Environmental context		– –	++	– –	++
Cultivable surface area	234 million hectares				
Increased plant production					
Increased cultivated area (1000 ha)	85 546	167 670	128 319	158 260	134 645
Change	**100**	**196**	**150**	**185**	**160**
Improved yields (kg/ha)	2 648	4 342	5 296	3 807	3 797
Change	**100**	**164**	**200**	**144**	**143**
Increased production, excl. developments (1000 tonnes)	226 528	724 891	679 585	602 566	511 318
Change	**100**	**320**	**300**	**266**	**226**
Increased animal production					
Number of ruminants (1000 heads)	160 478	261 581	240 719	240 719	210 228
Change	**100**	**163**	**150**	**150**	**131**
Increased ruminant + monogastric meat production (tonnes)	2 301 409	4 280 620	5 753 522	4 027 465	3 291 015
Change	**100**	**186**	**250**	**175**	**143**
Increased milk production (tonnes)	2 001 502	3 962 974	5 003 755	3 702 779	3 002 253
Change	**100**	**198**	**250**	**185**	**150**
Irrigated land					
Increased surface areas under water management (ha) ***A1: 5 million ha developed under Scens B & C***	1 000 000	1 150 000	5 000 000	5 000 000	1 000 000
Change	**100**	**115**	**500**	**500**	**100**
Increased surface areas under water management (ha) ***A2: 3.3 million ha developed under Scens B & C***	1 000 000	1 150 000	3 300 000	3 300 000	1 000 000

Change	**100**	**115**	**330**	**330**	**100**
Increased rice equiv. production (paddy equiv. tonnes) – A1	3 200 000	3 950 000	25 000 000	25 000 000	3 200 000
Change	**100**	**123**	**781**	**781**	**100**
Increased rice equiv. production (paddy equiv. tonnes) – A2	3 200 000	3 950 000	16 500 000	16 500 000	3 200 000
Change	**100**	**123**	**516**	**516**	**100**

Irrigable land: Base = 1 million ha in 2005
Irrigable land: Base = 10 million ha
(a) *for a rate of development of new land at 200,000 ha/year, in addition to the rehabilitation of existing perimeters*
(b) *for a rate of development of new land at 132,000 ha/year, in addition to the rehabilitation of existing perimeters*
(c) *assumption of yields after development: average x 2.5 (5 tonnes of paddy in 2030)*
(d) *yield is a ratio of the volume of all plant production combined, over all cultivated land*
(e) *volume of all plant production*
(f) *cattle, sheep and goats*

Comparison of scenarios against the baseline situation
Index of 100 = 2005 baseline situation

Table N° 25

Summary of results					
	Baseline	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario D**
Description	**Starting point, 2005**	**Current trend scenario:** "Agricultural growth through the expansion of surface areas"	**Breakaway scenario:** "Agricultural growth through the massive transformation of agriculture"	**Moderate scenario 1:** "Agricultural growth through the partial transformation of agriculture"	**Moderate scenario 2:** "Regional crisis in a favourable international context"
Increased plant production					
Cultivated land	100	196	150	185	160
Plant yields	100	164	200	144	143
Production excl. development	100	320	300	266	226
Plant production w/dev.	100	123	648	648	100
Total plant production	100	317	305	271	224
Increased animal production					
Number of ruminants	100	163	150	150	131
Ruminant + monogastric meat production	100	186	250	175	143
Milk production	100	198	250	185	150
Irrigated land					
Irrigated land – A1	100	115	500	500	100
Irrigated land – A2	100	115	330	330	100
Rice equiv. production – A1	100	123	781	781	100
Rice equiv. production – A2	100	123	516	516	100

Impact on coverage of food requirements and import dependency

Food availability per capita in 2005, calculated as the total of net production and imports for each major food product group, constitutes the baseline: the "norm for regional consumption". It is used here to compare each scenario against the region's supply capacity.

In scenario A, there is insufficient supply of a number of important products (cereals, meat and milk). It results in a large surplus in tubers, the result of farmland expansion.

With consumption levels equivalent to the baseline, Scenario B allows for full self-sufficiency of all products other than milk. The region would still need to import its requirements for wheat and wheat flour, only produced in small quantities. Under this scenario, a significant proportion of plant production is converted into animal production, whose consumption is expected to increase along with urban populations and the development of a middle-class with greater purchasing power and increased dietary expectations.

Scenario C is tighter. It allows for self-sufficiency of most products, but with very little room to manoeuvre. It illustrates the limitations of current approaches that do not offer development alternatives for all types

Food availability per capita in 2030,

Table N° 26

Products	Baseline situation			Scenario A	
	Production available in 2005	2005 availability = Needs per cap.	Coverage rate of demand	Net production	Coverage rate of demand
	kg per cap.	kg per cap.	%	kg per cap.	%
Cereals and by-products	128	143	90	142	99
Rice and by-products	22	49	44	21	43
Total cereals	***150***	***192***	***78***	***163***	***85***
Meat and by-products	9	11	85	9	87
Milk and dairy products	8	17	47	9	52
Legumes	11	11	94	18	163
Roots & Tubers and by-products	309	310	100	729	235
Vegetables	37	37	100	51	139
Fruit	47	47	100	57	121

Assumptions applied

– Net production = gross production - losses and seeding
– Loss and seeding rates for roots and tubers: 30%
– Rice milling rate: 65%
– Loss and seeding rates for dry cereals: 15%
– Cereal consumption includes indirect human consumption via animal feed, beer production (Dolo), etc.
– Rate used to convert imported daily products into milk equivalent tonnes: 7
– Loss and seeding rates for legumes: 40%

of producers. Under this scenario, there is no substantial transformation of plant products into animal products. Consequently, there would be significant imbalances if food systems were to move toward greater consumption of milk and meat, which is expected (7 plant calories are required to produce 1 animal calorie).

Scenario D shows what could happen in absence of regional political will, translated into effective negotiations and public policy. Despite a favourable international environment and the absence of any major climatic events, the region would still become heavily dependent on imports for nearly all products.

Scenario A is fairly unrealistic, given the technical limitations (deterioration of soil fertility). For food production, a more "realistic" scenario would be Scenario D. The latter presents the risk of food dependence if the region is unable to achieve integration, dictate its trade relations with the rest of the world and implement its regional and national sectoral policies.

for each scenario

Scenario B	Scenario C		Scenario D		Scénario D	
Irrigation options	Net production	Coverage rate of demand	Net production	Coverage rate of demand	Net production	Coverage rate of demand
kg per cap.	%	kg per cap.	%	kg per cap.	%	%
	211	148	158	110	125	87
H1	72	149	55	113	18	37
H2	60	124	44	90		
H1	***284***	***148***	***213***	***111***	***143***	***75***
H2	***272***	***142***	***202***	***105***		
	13	117	9	82	7	67
	11	65	8	48	7	39
	17	156	18	161	12	108
	510	165	631	204	449	145
	61	165	60	163	35	95
	77	165	54	115	41	87

–Loss rate for fruits and vegetables: 35%
–Irrigation options: A1: 5 million ha equipped; A2: 3.3 million ha
– Average population, 2002-2004: 250 million (estimate)
– Population, 2005 265 million
– Population, 2030 455 million

c) Lessons learned from the scenarios:

This exercise of outlining future scenarios demonstrates that the path is rather narrow:

- The most likely scenario is not the most desirable one (scenario B);
- and yet, this is the scenario that would allow for:
  - sufficient growth in production without excessive use of land;
  - high coverage of needs;
  - corporation of the majority of producers in the development process.

A combination of conditions is required: a growth-driving international environment, genuine political will for regional integration, peace and security and the absence of any major environmental crisis, etc. A successful growth scenario would imply the full and effective implementation of public policies in general, and agricultural policies in particular.

Overall, the region appears capable of producing enough resources to reach self-sufficiency and to supply international markets with traditional products in certain niches, by 2030. The table below provides a summary of general production levels and levels per capita, making it possible to assess the likely evolution of the region's degree of self-sufficiency, its import dependence and its export capacity. Fortunately, population growth is a necessary condition for agricultural transformation, by exerting pressure on resources while forming the first true domestic market.

THE ECOWAS REGION APPEARS CAPABLE OF PRODUCING ENOUGH RESOURCES TO REACH SELF-SUFFICIENCY AND TO SUPPLY INTERNATIONAL MARKETS WITH TRADITIONAL PRODUCTS IN CERTAIN NICHES, BY 2030

Realising this potential will depend on several factors. As in any country in the world, agriculture will only take off if public authorities and agriculture professionals create a number of realistic, simultaneously occurring conditions. West Africa often refers to the EU's CAP to justify the need to protect its own agricultural markets. Indeed, it is rare for any nation's agriculture to develop in a completely open trade environment. However, the European experience is interesting because of the holistic nature of its policy, which affects both market structures and market organisation thanks to specific intervention mechanisms (the EAGGF for financing agricultural market expenditures, including rural development, for instance).

Based on the description of a typical farm (in terms of structure and therefore production potential), the mechanisms that allow farmers and value chains to function are then defined: terms and conditions to access investment and seasonal loans; land development; livestock health monitoring; research and development of technical systems; technical assistance for supply chains (input distribution); support/advisory services; training; assistance to farmers' associations (with public aid channelled via cooperative organisations) and pre-production (marketing assistance, support for cooperatives' investments in storage and processing, consumer subsidies, quality control, etc.). The tariff protection policy and the principle of Community preference stimulated the incredible takeoff of agricultural productivity because the production factors and services needed to modernise were available to producers, allowing them to improve performances and satisfy a rapidly growing market.

In West Africa, farmers face a weak institutional environment and an extremely compartmentalised and volatile market, without any guarantee of market outlets for most production. Research has not produced sufficient results in terms of agronomic alternatives, and all too often privileges vertical approaches – crop by crop – without taking into account the totality of productive and agrarian systems in use. Existing technical packages are not well known and are poorly disseminated. But the main problem, as attested by successful value chains (cotton, cacao, pineapples, bananas, etc.), is that farmers need a secure market to invest in their systems and make these investments pay off. The economic uncertainty facing farmers must be mitigated.

West Africa could continue along its current path of consuming natural resources and labour to produce, but this model is no longer viable. The transformation of agriculture is necessary to ensure a sustainable long-term outlook. The protection of resources must be at the heart of this transformation. The viability of production units is decisive, as there can be no sustainable intensification on land that does not provide a return on investment. Without a structural reform, family units will be condemned to subsistence farming based on systems that survive by overexploiting resources, until an ecological breakdown occurs. The slowdown in rural population growth may hasten this transformation but has not yet made it possible.

6 Overall Conclusions

West African agriculture has reached a turning point. Never before have farmers had access to a genuine market, with the exception of those producing for export value chains (cotton, coffee, cacao and bananas for the most part). Regional markets have been small, fragmented and compartmentalised. The prices of exported goods on international markets have dropped sharply (with the deterioration of terms of trade) as have the prices of the imported foodstuffs that compete with West African produce, due to subsidy allocations in developed countries, where agricultural markets are saturated.

The period ahead is characterised by political, economic, financial and environmental uncertainty. Nonetheless, recent changes could initiate a structural transformation of the environment in which West African farmers and value chains operate.

DESPITE NUMEROUS UNCERTAINTIES, THE CONTEXT COULD BE IMPROVING: EXPANSION OF THE MARKETS, IMPROVEMENT OF THEIR FUNCTIONING, REMUNERATIVE PRICE

a. Changes in West Africa:

- The urban population is now the majority;
- Demographic growth remains high, with the demographic transition yet to come;
- The growth of urban markets has brought increasingly disparate income levels and the emergence of a genuine middle class, whose consumption habits are different. This growth may also bring an unprecedented increase in poverty, urban destitution and growth of shanty towns;
- Markets are bigger and work better thanks to the opening of regional borders;

b. Global changes:

- The circumstances for concluding the Agricultural Agreement at the WTO have improved, thanks to trends in international prices;
- Export subsidies and direct payments to farmers, which distort competition and affect prices, are likely to be reduced, to limit unfair competition against West African food producers;
- Economic growth in Asia is driving global demand for most raw materials, including food;

- The cost of energy has gone up and is impacting the development of renewable energies, including bio-fuel;
- Environmental requirements are increasing, which could hinder crop expansion in ecologically fragile areas (possibly affecting certain humid zones in West Africa) and thwart use of artificial and chemical means in farming systems;
- Climate change is impacting production volumes and exacerbating the element of uncertainty involved in agricultural production.

The way these changes and their consequences are interpreted varies. In particular, there is lack of consensus on whether or not current trends in agricultural and food raw materials (among others) constitute a temporary phenomenon or a structural change.

The present study does not lend itself to an in-depth analysis of this question, and cannot provide an answer. Nevertheless, with the crisis of the West African agricultural growth model, new opportunities on regional and international markets and increasing uncertainties, the conditions are in place to revisit the future of West African agriculture and find ways to identify, foster and accompany the current changes and the transitions they demand.

What this and many other studies have found is that there is an urgent need to undertake fundamental reforms of the conditions under which West African agriculture will develop.

THERE IS AN URGENT NEED TO UNDERTAKE FUNDAMENTAL REFORMS OF THE CONDITIONS UNDER WHICH WEST AFRICAN AGRICULTURE WILL DEVELOP.

An analysis of agricultural policies, both national and regional, highlights the difficulty of designing public policies that clearly orient the agricultural the agri-food sector. Recent guidelines and ECOWAS agricultural policy have begun to outline solutions, focussing on two key ideas: (i) competitive, sustainable agriculture, to ensure decent incomes for farming households and agricultural workers; and (ii) agriculture that guarantees food sovereignty. To achieve these goals, policies will support family farming, without however excluding "entrepreneurial agriculture". Real progress has been made, thanks to dialogue between national and regional public institutions and other stakeholders, including, first and foremost, farmers' organisations.

Gradually defining a vision for agriculture and the production unit

This study shows that West Africa has the necessary resources to achieve food sovereignty over the next 25 years. However, it has not addressed the issue of agricultural income. Although changes in the urban-rural ratio should increase the "theoretical market" of each

agricultural producer, this ratio is still not sufficient to generate enough revenue for millions of farming families. Rural families suffer most from poverty and food insecurity. Negotiating a new vision of agriculture must address the evolution and reform of agricultural systems: what are the minimum and optimal sizes of production units – for the different agro-climatic environments and technical-economic specialties – that are both viable and capable of offering fair remuneration in a typical economic environment? Based on the answer to this question, the region and countries can determine whether "natural" demographic trends will spontaneously fulfil this objective or, as is more likely the case, whether structural and support policies will be needed to pave the way for necessary changes.

Reforming public policy and supporting change.

This is a difficult question, but it is at the very heart of repositioning the region's agricultural strategy. Once answered, policies can be adapted:

- Structural policies: policies supporting young farmers; land policies (land status/tenure, land development); policies supporting the modernisation of production units (for both collective and individual equipment);
- Institutional environment: initial and continuing training strategies for farmers; agricultural finance policy; risk coverage, etc.
- Sub-sector policies that address markets for agricultural and food products and encourage upstream aspects of production, the organisation and regulation of markets and value chains, the creation of and communication between regional markets, small scale enterprises and agro-food industries, etc.

Analysis of dominant trends in the regional agricultural economy makes it clear that agriculture has been neglected in recent years by governments, international institutions and the donor community. Reforms undertaken in the name of structural adjustments have freed up resources by weakening agricultural support mechanisms, which were already condescending, occasionally arbitrary and rarely effective. It was necessary to reform them – but instead they were replaced by a vacuum! West African agriculture became a secondary concern in national and regional development strategies.

The debate on vision is ongoing and can only have real meaning by actively involving all the stakeholders. This study and others like it should help enrich the debate, by outlining major trends and possible options.

Connecting the debate on agriculture to other strategies and policies

The attempt to move closer to Scenario B – i.e.: for regional players to successfully seize opportunities emerging from the international context to transform West African agriculture –requires giving attention to other policies affecting agricultural development. The most crucial points are:

- The consideration of agricultural issues in natural resource conservation strategies and, conversely, incorporation of environmental issues in agricultural investment programmes: developing lowlands and irrigated schemes, management of watersheds and battling land degradation;
- The adaptation of foreign trade policy. Our analysis demonstrates that the region's food sovereignty hinges upon a small number of food products, which are highly competitive on the international level. Whether in terms of WTO negotiations on special products and special safeguard mechanisms, or negotiation of the EPA (strategic products partially or wholly excluded from liberalisation plans), there is a need to be rigorous about setting up protective, dynamic policies that will allow for regulation of internal markets and thus provide a minimum level of security for producers and other players deciding to invest in local and regional value chains.
- Regional integration on the political (crisis and conflict prevention), trade (true liberalisation of the internal market) and economic level, with better development of complementarities between agro-ecological zones and the main production regions.

THE DEBATE ON THE VISION OF AGRICULTURE IN 2030 CAN ONLY HAVE REAL MEANING BY ACTIVELY INVOLVING ALL THE STAKEHOLDERS

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- CIRDES : www.cirdes.org
- IFPRI : www.ifpri.org
- CORAF : www.coraf.org

6.2. Acronyms

AAGR	Average annual growth rate
ACP	Africa-Caribbean-Pacific
AfDB	African Development Bank
AGOA	African Growth and Opportunity Act
Agrhymet	Agro-Hydro-Meteorological Regional Centre
AIBP	Agro-industrial By-products
BCEAO	Central Bank of West African States
CET	Common External Tariff
CFA	Franc, French Community of Africa
CIF	Cost, insurance and freight
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CIRDES	Centre international de recherche-développement sur l'élevage en zone sub-humide (international centre for research & development of livestock farming in sub-humid zones)
CMOB	Common Market Organisation for Bananas
CST	Community Solidarity Tax
CVD	ECOWAS Countervailing Duty
ECOWAP	Regional agricultural policy for West Africa / ECOWAS Agricultural Policy
ECOWAS	Economic Community of West African States

→→

EDF	European Development Fund
EDPT	ECOWAS Degressive Protection Tax
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organisation
FARM	Foundation for World Agriculture and Rural Life
FDI	Foreign Direct Investment
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Indicator
IFDC	International Centre for Soil Fertility and Agricultural Development
IFPRI	International Food Policy Research Institute
IGO	Inter-governmental Organisation
IITA	International Institute of Tropical Agriculture
IRAM	Institut de Recherche et d'Application des Méthodes de Développement (institute for research into and application of development methods)
IST	ECOWAS Import Safeguard Tax
LARES	Laboratoire d'Analyse Régionale et d'Expertise Sociale (centre for regional analysis and social studies)
LDC	Least Developed Country
MFI	Microfinance Institution
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa
OECD	Organisation for Economic Co-operation and Development
PDA	Public Development Aid
PSE	Producer Subsidy Equivalent
PSRP	Poverty Reduction Strategy Papers
ROPPA	Network of Farmers' and Agricultural Producers' Organisations of West Africa
SDT	Special and Differential Treatment
SFPR	Strategic Framework for Poverty Reduction
SPS	Sanitary and phytosanitary measures
SWAC	Sahel and West Africa Club
TCI	Short-term import tax
UAP	UEMOA's Agricultural Policy
UEMOA	West African Economic and Monetary Union
UNDP	United Nations Development Programme
WALTPS	West African Long-Term Perspective Study
WARDA	West Africa Rice Development Association
WB	World Bank

WECARD West and Central African Council for Agricultural Research and Development

WTO World Trade Organization

6.3. Statistical annex

Evolution of farmland by ECOWAS country, in thousands of hectares

Tableau N° 27

Year	Benin	Burkina Faso	Cape-Verde	Côte d'Ivoire	Gambia	Ghana	Guinea	Guinea-Bissau	Liberia	Mali	Niger	Nigeria	Senegal	Sierra Leone	Togo	ECOWAS
1980	2 027	8 785	65	17 255	559	12 000	11 842	1 383	2 576	32 050	30 720	70 385	8 050	2 703	3 035	**203 435**
1981	2 057	8 835	65	17 370	559	12 000	11 857	1 390	2 576	32 053	30 280	70 385	8 050	2 709	3 035	**203 243**
1982	2 090	8 885	65	17 490	581	12 200	11 863	1 403	2 580	32 053	30 360	70 548	8 050	2 715	3 035	**203 939**
1983	2 100	8 935	65	17 584	602	12 200	11 869	1 413	2 585	32 053	31 010	70 710	8 050	2 722	3 035	**204 914**
1984	2 110	8 985	65	17 901	583	12 300	11 875	1 440	2 586	32 053	30 780	70 873	8 050	2 727	3 085	**205 399**
1985	2 130	9 035	65	18 180	569	12 400	11 895	1 448	2 588	32 073	30 780	71 035	8 050	2 732	3 090	**206 120**
1986	2 190	9 085	65	18 280	619	12 400	11 896	1 465	2 597	32 076	31 280	71 360	8 050	2 738	3 090	**207 199**
1987	2 200	9 140	65	18 400	627	12 400	11 896	1 470	2 603	32 076	31 012	71 482	8 050	2 743	3 110	**207 281**
1988	2 210	9 564	67	18 720	634	12 500	11 896	1 470	2 613	32 093	31 300	71 712	8 050	2 744	3 140	**208 728**
1989	2 220	9 600	67	18 820	649	12 500	11 918	1 497	2 615	32 093	31 405	71 888	8 050	2 744	3 140	**209 188**
1990	2 270	9 575	68	18 930	631	12 605	12 016	1 497	2 608	32 093	33 047	72 074	8 094	2 744	3 190	**211 448**
1991	2 280	9 550	68	18 950	637	12 720	11 985	1 497	2 605	32 103	34 105	72 335	8 050	2 744	3 195	**212 833**
1992	2 295	9 525	69	19 200	646	12 720	12 055	1 497	2 605	32 203	35 500	72 457	8 050	2 744	3 195	**214 727**
1993	2 320	9 500	69	19 502	612	12 800	12 085	1 497	2 585	33 100	35 500	72 579	8 050	2 740	3 300	**216 238**
1994	2 400	9 431	69	19 555	611	12 900	12 130	1 497	2 585	35 200	35 500	72 700	8 065	2 741	3 300	**218 703**
1995	2 520	9 450	70	19 620	630	13 100	12 193	1 506	2 585	35 419	36 500	72 830	7 965	2 741	3 300	**220 434**
1996	2 710	9 550	70	19 630	635	13 300	12 215	1 522	2 585	36 650	36 500	71 159	7 937	2 741	3 400	**220 609**
1997	2 890	9 800	72	19 700	640	13 628	12 230	1 567	2 585	37 650	36 500	69 938	7 943	2 740	3 450	**221 362**
1998	3 050	9 950	72	19 700	669	14 030	12 265	1 577	2 595	37 650	36 500	69 938	7 955	2 740	3 580	**222 236**
1999	3 110	10 000	72	19 750	684	14 200	12 285	1 608	2 595	37 650	37 500	70 000	8 008	2 740	3 630	**223 857**
2000	3 195	10 100	72	19 800	709	14 450	12 300	1 628	2 595	38 674	37 500	70 050	8 050	2 750	3 630	**225 543**
2001	3 265	10 600	72	19 700	749	14 560	12 333	1 628	2 600	39 339	38 500	70 400	8 155	2 764	3 630	**228 325**
2002	3 365	10 700	74	19 900	779	14 681	12 400	1 628	2 600	39 379	38 500	72 200	8 156	2 800	3 630	**230 792**
2003	3 467	10 900	74	19 900	779	14 735	12 460	1 630	2 602	39 479	38 500	72 600	8 158	2 845	3 630	**231 774**
2004	3 567	10 900	74	20 300	794	14 735	12 565	1 630	2 602	39 479	38 500	73 000	8 198	2 880	3 630	**232 874**
2005	3 567	10 900	74	20 300	814	14 735	12 570	1 630	2 602	39 479	38 500	74 000	8 248	2 880	3 630	**233 929**

Source : FAOSTAT.

Evolution of production, surface area and yield by major product group

Tableau N°28

ECOWAS	Production quantity (tonnes)				Cultivated land (ha)				Yield (kg/ha)			
Product category	1979-1981	1989-1991	1999-2001	2004-2006	1979-1981	1989-1991	1999-2001	2004-2006	1979-1981	1989-1991	1999-2001	2004-2006
Fruits and vegetables	13 230 528	17 934 570	26 254 129	30 932 776	3 135 801	4 388 352	5 582 630	6 188 794	4 219	4 087	4 703	4 998
Export fruit: bananas, pineapples	1 307 251	1 456 262	1 904 460	2 110 103	168 331	179 445	220 165	235 423	7 766	8 115	8 650	8 963
Dry cereals	13 515 159	25 831 961	31 766 373	39 139 038	16 615 430	30 206 155	33 322 585	35 227 514	813	855	953	1 111
Cereals: rice	3 258 050	6 032 101	6 934 877	8 279 785	2 309 225	3 607 296	4 281 462	5 114 294	1 411	1 672	1 620	1 619
All cereals	16 773 210	31 864 061	38 701 250	47 418 824	18 924 656	33 813 451	37 604 047	40 341 808	886	942	1 029	1 175
Non-food export crops: coffee, cacao, cotton, rubber	1 581 993	2 455 008	3 603 707	4 285 136	5 061 247	5 980 822	7 706 001	8 805 918	313	410	468	487
Sugar cane	3 818 427	4 464 478	4 316 244	4 654 898	80 553	95 449	99 916	120 774	47 402	46 774	43 199	38 542
Leaf tobacco	21 069	22 823	40 900	33 791	39 220	48 926	70 351	59 142	537	466	581	571
Legumes	1 268 425	2 207 649	3 423 408	4 392 823	3 530 713	5 794 731	8 701 936	9 483 911	359	381	393	463
Vegetable oil	1 523 305	2 283 603	2 929 320	3 541 116								
Tubers	27 547 201	48 428 212	93 626 206	117 771 246	3 585 110	5 724 306	10 892 764	12 153 480	7 684	8 460	8 595	9 690
Other exports	87 005	140 216	784 849	1 049 078	266 108	363 952	1 113 651	1 353 896	327	385	705	775

Source: FAO.

6.4. Methodological annex: Detailed presentation of working assumptions for forecasting

a) Baseline period for growth in land area and yields: 1990-2005

b) Baseline data: loose average to mitigate the impact of interannual variability on longer term trends:

- 1990 marker = average of 1989-1991
- 2005 marker = average of 2004-2006

c) Source: FAO data

d) Data groups:

- animal production: by major species: number of heads and meat/milk/egg production
- plant production:
  - cereals:
  – dry cereal production: millet, sorghum, maize and young maize, fonio
  – rice production
  - tubers: cassavas, sweet potatoes, potatoes, yams
  - legumes: cowpeas, peas, dried beans
  - fruit and vegetables: aubergines, avocados, carrots, cabbage, lemons, ginger, okra, cantaloupe, soya, French beans, lettuce, shea, kola, onions and shallots, oranges, papaya, watermelons, plantains, peppers, tomatoes
  - vegetable oils: groundnut, palm, palm kernel
  - commercial export production
- fruit: bananas, pineapples
- non-food crops: cotton, coffee, cacao, hevea (rubber)
- other: cashew nuts, sesame seeds
  - other production: sugar cane, tobacco

e) Calculation of average annual growth rates

- Land areas over the period indicated above for each product, then each product group
- Yields (production / surface area): as above
- Livestock / species (camels, cattle, sheep/goats, pigs, poultry)
- Production: meat, milk, eggs

f) Rationale applied to irrigated land:

- Three assumptions were applied, based on irrigable potential:
- 15% increase over current irrigated surface areas
- development of 33% of irrigable land by 2030
- development of 50% of irrigable land by 2030
- no growth assumptions concerning lowlands, whose development consequently constitutes a reserve for production increases
- The assumption was based on sowing of irrigated land limited to rice

g) Choice of dates: the baseline situation is that of 2005 (average of 2004-2006), for a period of 25 years through 2030

h) Yield levels applied for developed land areas:

- • current average rice yield under irrigation (5 tonnes of paddy)

i) Calculation of forecasts:

i. Scenario A:

1. Crops:
   a. 2020 and 2030 surface area forecasts for each crop and product group based on the average annual growth rate (AAGR) for 1990-2005
   b. 2020 and 2030 yield forecasts based on the AAGR for 1990-2005
2. Livestock forecasts:
   a. 2020 and 2030 forecasts for number of heads based on the AAGR for 1990-2005
   b. Production forecasts for 2020 and 2030 based on the AAGR, 1990-2005
3. Increase in irrigated surface area:
   a. Forecast of a 15% increase in terms of developed irrigated areas, by 2030

ii. Scenario B

1. Crops:
   a. 50% increase in cultivated land area for each product group by 2030, as compared with 2005

b. 100% increase in yields by 2030, as compared with 2005 (still an average of 2004-2006 period)

2. Livestock forecasts:

a. 50% increase in livestock numbers by 2030, as compared with number of heads in 2005

b. 100% increase in animal production by 2030, as compared with 2005 tonnage

3. Increase in irrigated/developed surface area:

a. Assumption 1: one-half of land suitable for development (near rivers) are irrigated in 2030

b. Assumption 2: one-third of land suitable for development (near rivers) are irrigated in 2030

iii. Scenario C

1. Crops:

Starting with surface area by crop and by crop group, the following calculations were applied regarding increases in land used:

a. 75% of the 2005 land base undergoes "current trend" type evolution (Scenario A), in other words increases in surface areas and yields are based on the AAGR for 1990-2005;

b. 25% of the 2005 land base undergoes evolution as set out in Scenario B:

– 50% increase in cultivated land area for each product group by 2030, as compared with 2005 land;

– 100% increase in yields by 2030, as compared with 2005 (avg of 2004-2006)

2. Livestock forecasts:

1. Numbers: starting with the number of heads in 2005, the same logic is applied as for crops:

a. 75% of livestock increases at the AAGR observed between 1990 and 2005, through 2030;

b. 25% of livestock undergoes more limited growth (up 50% by 2030)

2. Production: 75% of 2005 production increases at the AAGR for 1990-2005, and 25% of production grows 100% between now and 2030

III. Increase in irrigated/developed surface area: as in Scenario B

a. Assumption 1: one-half of land suitable for development (near rivers) are irrigated in 2030

b. Assumption 2: one-third of land suitable for development (near rivers) are irrigated in 2030

IV. Scenario D:

1. Crops:

Land used for major export crops is considered separately from land used for regional markets (food-producing crops)

a. Export production: land areas double by 2030, with doubling of yields

b. Food production: increase in surface areas = 50% of the AAGR; same was applied for yields (50% of AAGR)

2. Livestock forecasts:

a. Numbers: starting with the number of heads in 2005, a growth rate of 50% of the AAGR was applied

b. Production: as above (50% of AAGR)

3. Increase in irrigated/developed surface area: none

j) Calculation of the region's level of food dependency:

Analysis based on the main agro-food products:
FAO database

Average over 2004-2006
Product correspondence

Local products	Imported products
Millet, sorghum, maize, fonio (gross production less 15% for seeding and losses)	Wheat, flour, maize
Rice (Paddy x 0.65)	Rice and broken rice
Tubers (tonnes - less x% loss rate)	
Meats (tonnes)	Meats (tonnes)
Milk (tonnes)	Dairy products in milk equiv. tonnes
Legumes (tonnes - less x% loss rate)	Beans (tonnes)