Atlas on Regional Integration in West Africa

environment series

THE ECOLOGICALLY VULNERABLE ZONE OF SAHELIAN COUNTRIES

Introduction

Work carried out on the ecologically vulnerable zone of sahelian countries (specified in the text as the Sahel's vulnerable zone) is based on close collaboration with the CILSS[1] and its Agrhymet Regional Centre (CRA)[2] to capitalise on their expertise and knowledge. This series of the Atlas examines the Sahel's vulnerable zone in a West African regional context. CILSS member-countries often have to grapple with food shortages although the zone also defined as "agropastoral" undoubtedly suffers the most and its inhabitants are usually considered the region's poorest and its children the most vulnerable. Based on available data, this survey describes from a macro regional perspective this zone, its people and how they live. It shows how structurally vulnerable their pastoralists and agropastoralists are. We hope that this series will encourage strategic thinking on structural regional solutions to this vulnerability, quite apart from the emergency aid this area frequently requires.

The Atlas on Regional Integration is an ECOWAS — SWAC/OECD initiative, financed by the development co-operation agencies of France, Switzerland and Luxembourg. Divided into four series (population, land, economy, environment), the Atlas chapters are being produced during 2006-2007 and will be available on-line on the site www.atlas-westafrica.org

I. The Sahel and its countries

Climatically the Sahel is defined as the area between the 200 and 600 mm isohyets (sometimes 150-500 mm) stretching through six continental West African countries (Mauritania, Senegal, Mali, Burkina Faso, Niger and Chad) and brushing northern Nigeria and northern Cameroon.

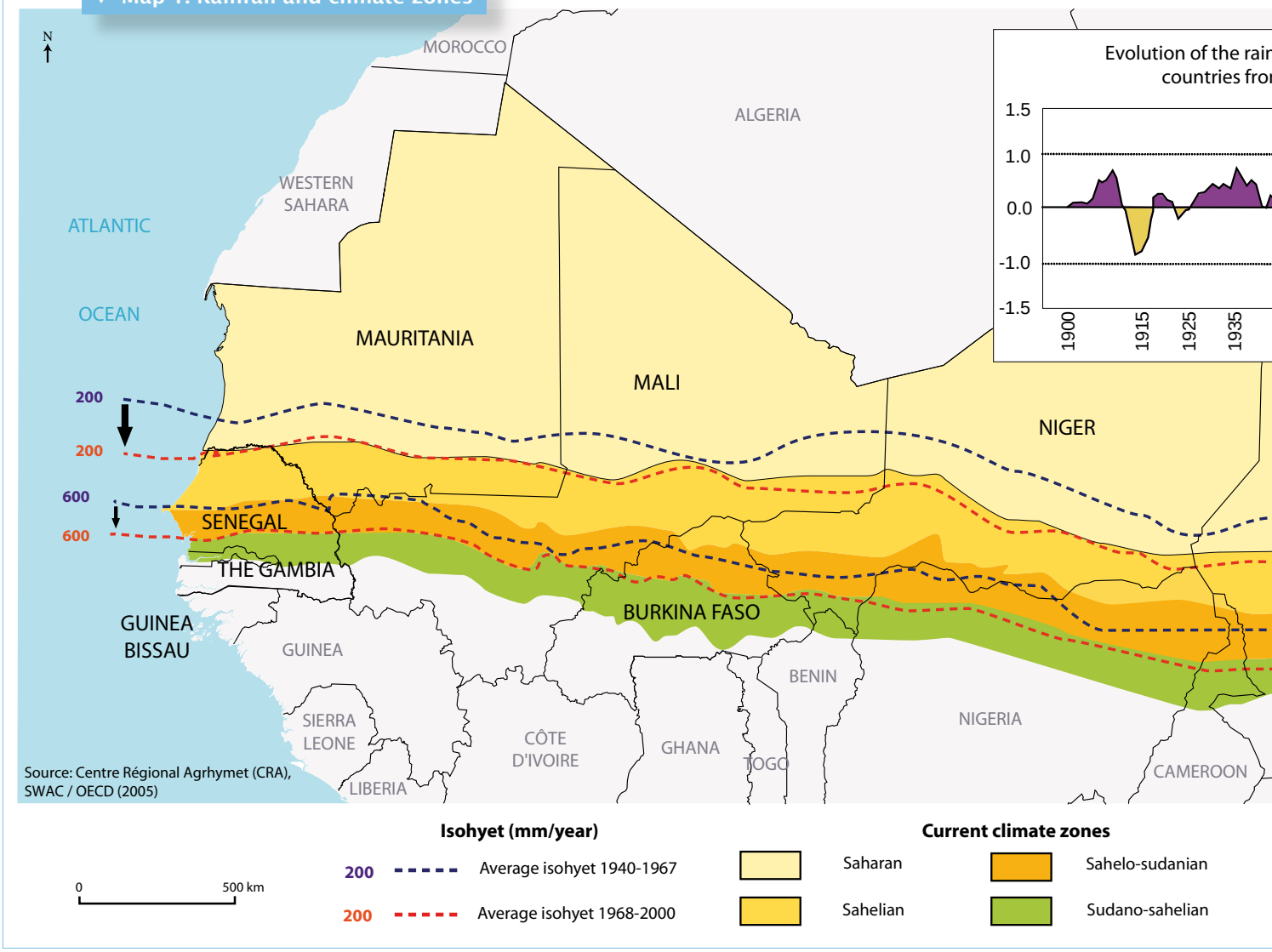
The vegetation is savannah – tree-dotted steppes in the south and bushes the further north you go. The wet season lasts only three months and rainfall varies from one year to another. Much of the soil is barren and vulnerable. This rules out most export crops and makes more intensive farming practices risky[3]. Halfway between the 200 and 600 mm isohyets is the limit of the rain-fed agricultural area, a theoretical border which has many exceptions depending

1. The Permanent Inter-State Committee for Drought Control in the Sahel, set up in 1974 after a serious drought. Member-countries are Burkina Faso, Cape Verde, Chad, The Gambia, Guinea-Bissau, Mali, Mauritania, Niger and Senegal. www.cilssnet.org
2. The AGRHYMET Regional Centre. www.agrhymet.ne
3. Most authors agree that the critical level is between 400 and 800 mm of rainfall, usually about 600 mm. Agricultural intensification is defined here as increasing the amount of labour and/or capital applied to each unit of cultivated land.

CLUB DU SAHEL ET DE L'AFRIQUE DE L'OUEST – CSAO SWAC – SAHEL AND WEST AFRICA CLUB

ECOWAS-SWAC/OECD©2006 - April 2006

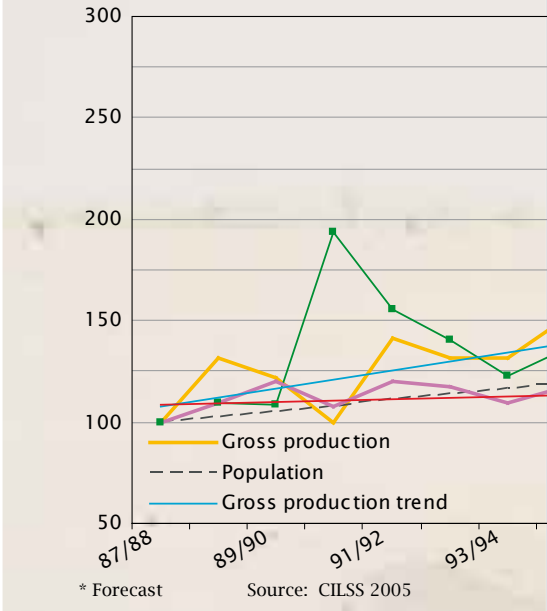
Map 1. Rainfall and climate zones

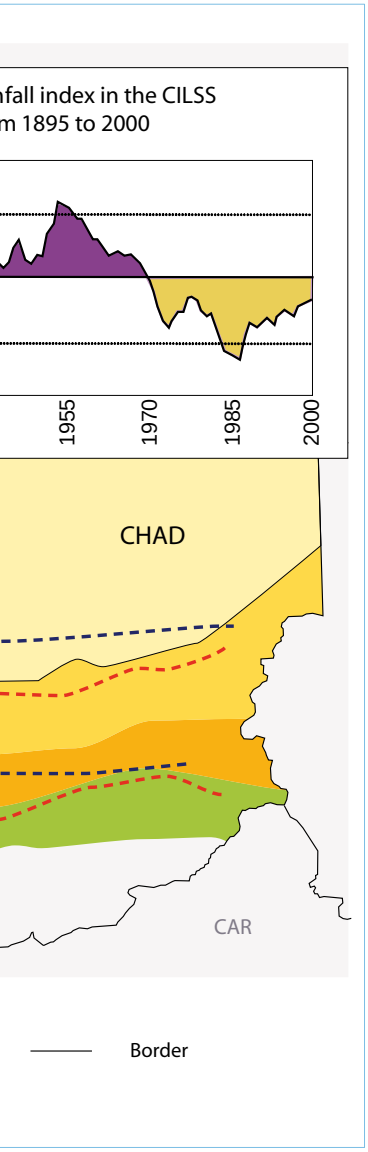


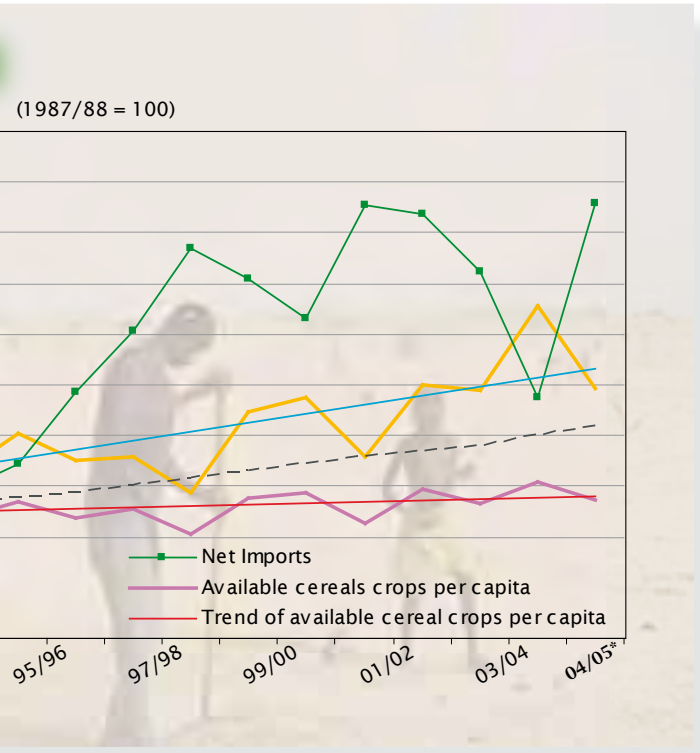
on soil quality and the existence of fossil valleys. North of this line is the "nomadic area" where each year the extent of new vegetation indicates the quality of the rainy season and determines pastoral activity. South of the line are the villages of sedentary farmers, engaged in diverse activities where cattle herds move north during the annual growing season. Both nomadic and sedentary inhabitants have long devised ways to cope with climate variations as best they can — by nomadism, by ancient traditions of human and livestock migration in the dry season and by having extensive and scattered growing areas to reduce economic and climatic risk.

Vulnerability is ever-present and takes many forms in the Sahel and West Africa, in both rural and urban areas as well as in poorer and more affluent zones. However, the inhabitants of the agropastoral area (Sahel) suffer most from uncertainty and risk. This is where the four major droughts of the last century (1909-13, 1940-44, 1969-73 and 1983-85) caused the most devastation and killed the most people.

Figure 1. Cereal production in CILSS countries







It seems that due to global warming the Sahel is becoming drier. There have been two distinct climate periods during the last century — a wet period which preceded a dry period as from the early 1970s. The southward drift of the isohyets is proof of this, which threatens the delicate balance between people and their environment.

II. Food dependency in Sahelian countries is not increasing...

The Sahel's image is one of drought, famine and food shortages. But the record of individual CILSS member countries illustrates a different picture. Their cereal production over the past 17 years has risen faster than their population – by 73% compared to 54%. Per capita cereal availability[4] also increased slightly (Fig. 1). A thorough analysis of all food products shows that output of fruit, vegetables and meat rose substantially over the same period throughout the Sahel and West Africa (a series of the Atlas will deal with agriculture and livestock). The overall share of food imports remained fairly steady, rising from 19% to 21% of gross regional production. The volume of food aid fell sharply (Fig. 2) while commercial imports increased faster than production.

The landlocked countries (Burkina Faso, Chad, Mali and Niger), which produce 90% of the cereals, constitute 75% of the population and import little, are distinct from the Atlantic coastal countries (Mauritania and Senegal), which produce few cereals and import much more.

Figs. 3 and 4 clearly illustrate the differences. Production in the two coastal states has stagnated and their imports have risen sharply. The agricultural sector is very small in Mauritania and average-sized, but greatly degenerated, in Senegal. They are more urbanised than most other countries and where food consumption is heavily dominated by rice of which they do not produce enough.

In the landlocked countries, which have more agricultural potential, cereal production is increasing while the share of imports remains almost the same.

III. ...But cereal production remains very erratic

It seems that over the long-term Sahel countries will probably not rely more on food imports, but will be subject to sharp annual variations in cereal production which reflect the prevailing rainfed cultivation methods. Crisis management of recurrent production shortages involves extra-regional food imports in the forms of commercial imports and food aid, and using existing cereal stocks. Together they play the role of an adjustment variable between supply and demand.

4. Cereal availability = gross production - seeds and losses + net imports + variation in stocks

Figure 2. Food aid to CILSS countries

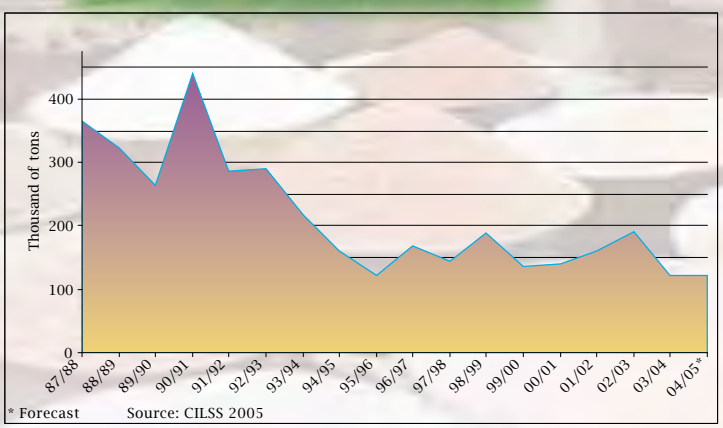


Figure 3. CILSS - Coastal countries

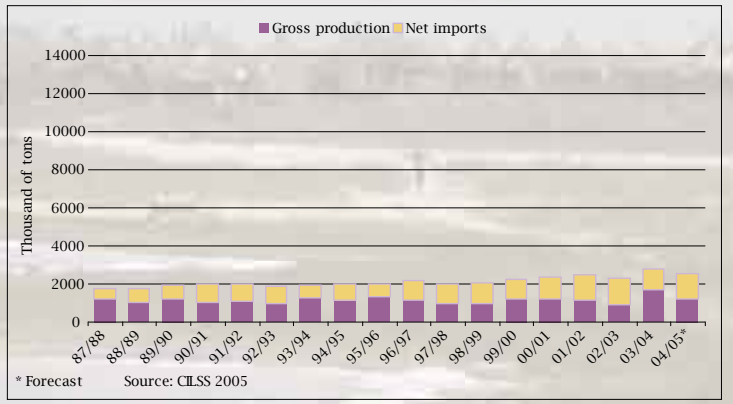
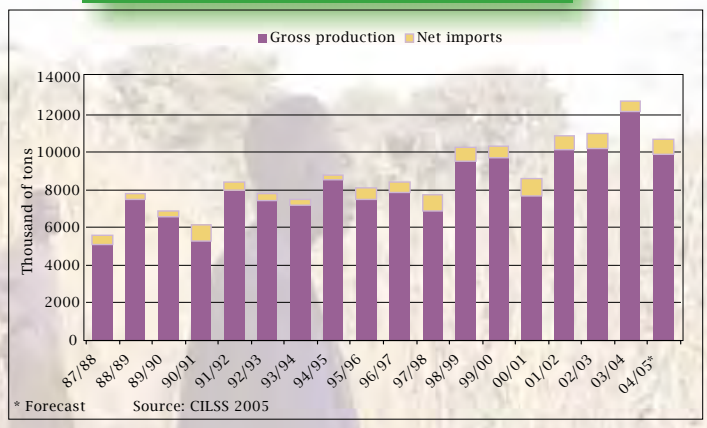


Figure 4. CILSS - Landlocked countries



Since the late 1980s, cereal production has varied by an average 20% from year to year in both coastal and landlocked countries. But the two groups have different ways of stabilising cereal availability. In the coastal states commercial imports significantly stabilise cereal availability, with cereal stocks and food aid having almost no influence. In landlocked countries cereal stock management has the greatest impact on stabilising cereal availability followed by commercial imports and food aid.

IV. The agropastoral area: vulnerability and unpredictability

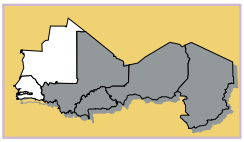
In the rainfall-defined Sahel, an agropastoral area (Map 1), there are between 50 and 110 days of rain a year[5] (Map 5). North of the blue line, the length of the rainy season varies by approximately 30% from year to year. The area suffers from both persistently low and very unpredictable rainfall. This is the area we initially defined as "Sahel's fragile high-risk zone". It is within this area that pockets of food shortages were observed in 2005, especially in Niger.

The Sahel's vulnerable zone is also the "front line" against locust invasions that regularly sweep West Africa,[6] most recently in 1986-89 and 2004, causing huge damage to crops and vegetation.

The insects breed in the desert in April and May. They

Table 1. Average annual variation in cereal availability

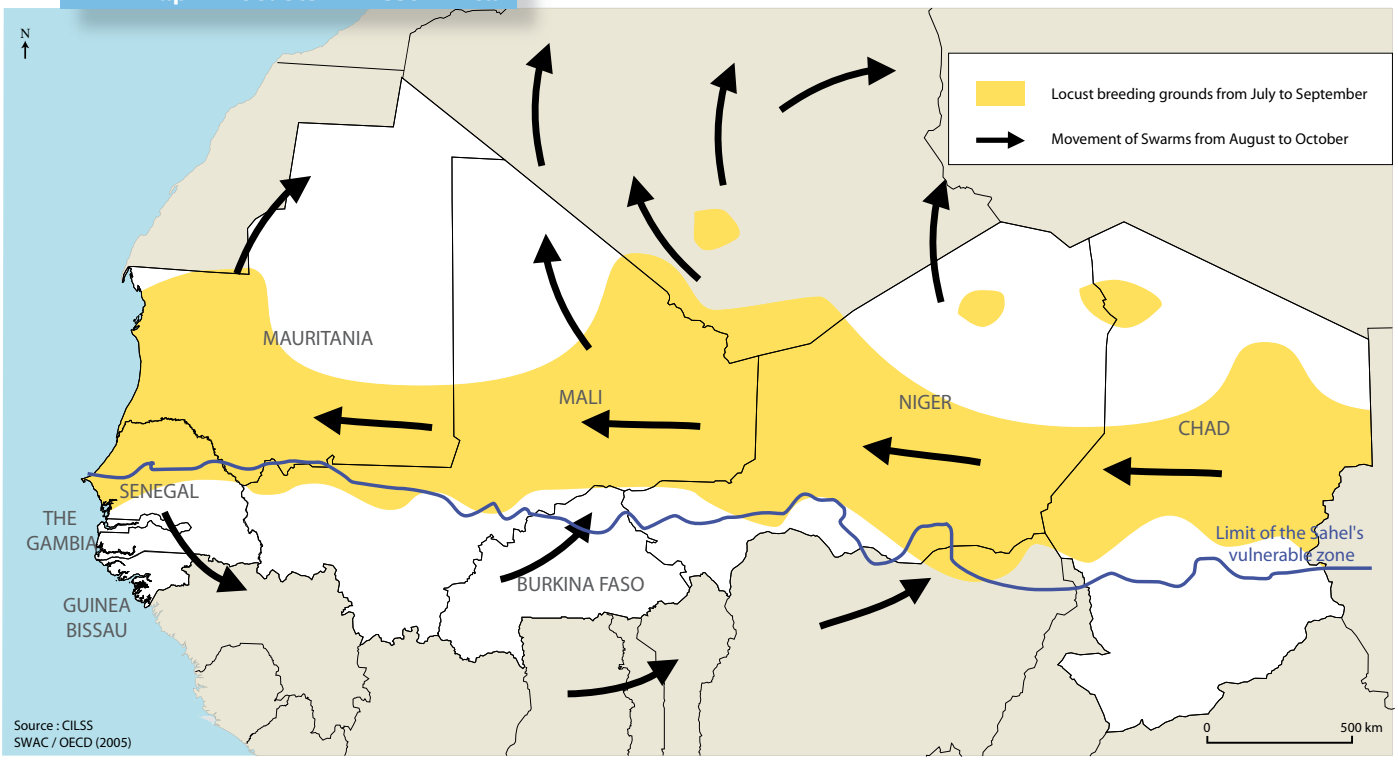
Source: CILSS 2005



1 = PRODUCTION	20%
2 = 1 + IMPORTATIONS	16.6%
3 = 2 + STOCK VAR.	12.4%
4 = 3 +FOOD AID	12.1%

In the landlocked countries, large producers, food stocks play off-setting production variation ; but the fluctuations of cereals In the coastal atlantic countries, imports for the most part offs both cases, food aid plays a marginal role.

Map 2. Locusts in West Africa



move south and attack the pastoral area between May and July. A second wave appears in the Sahel, summer breeding ground, and the insects lay waste to crops between August and October before often moving north (Map 2) to winter and spring breeding grounds.

> "The swarms (...) attack the Sahelian crops from July to September..."

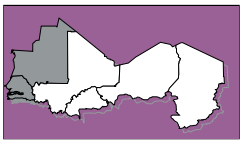
V. Vegetation and soil problems are not just in the Sahel

Vegetation and soil quality are key determinants to West Africa's food security given the large part of the population that remain directly dependent on the exploitation of these resources for their subsistence.

Rainfall and rural demographic pressure are closely linked to the Sahel's vegetation, which seems set in long-term decline as isohyets fall.

But paradoxically, the vegetation season increased in the 1990s in the Sahel (Map 4), especially after 1995 when vegetation significantly spread northward.

Soil suitability for agriculture varies greatly from region to region and determines significantly rural population settlement (Map 3). Hence no area combines major climatic uncertainty with the exploitation of poor soil. Densely-populated areas with unsuitable soil are situated south of the climatically defined vulnerable zone. This confirms that vulnerability and thus food insecurity are not only characteristics of the Sahel. Therefore, most of the Sahelian population is naturally concentrated mainly in Niger, where the best soils lie.



18%

5.5%

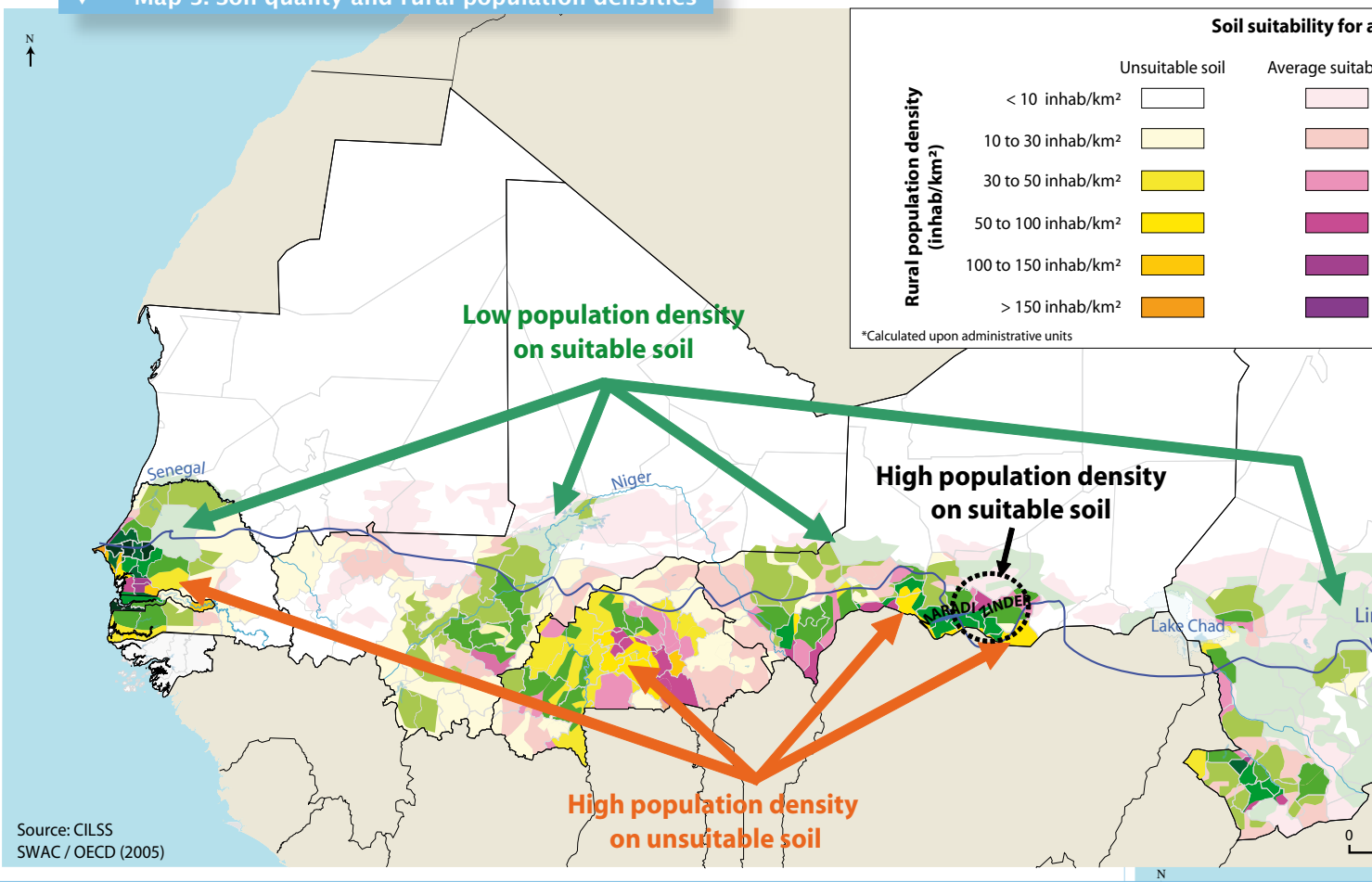
5.8%

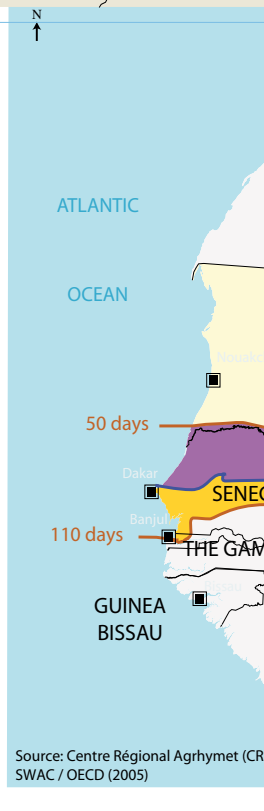
5.6%

a more important role in
s availability remains acute.
et production variations. In

5. Source: The CILSS AGRHYMET Regional Centre; 2005.
6. The main invasions occurred in 1926-34, 1940-48, 1949-63, 1967-69, 1986-89 and 2004.

Map 3. Soil quality and rural population densities





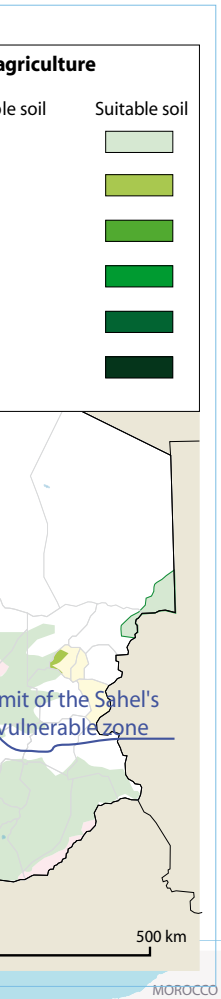
VI. Most agricultural and pastoral methods are still traditional...

The lifestyle of most inhabitants in the vulnerable zone is probably one of West Africa's least-changed in recent decades. The main production system, apart from traditional nomadic cattle-raising, is food crops/pastoral. This system is centred around growing millet in northern regions, and sorghum in southern regions and is accompanied by transhumant livestock farming so as to minimise risk. This farming system is essentially defined by auto-subsistence, with little or no inputs, and monetary income from crops or livestock is small or non-existent.

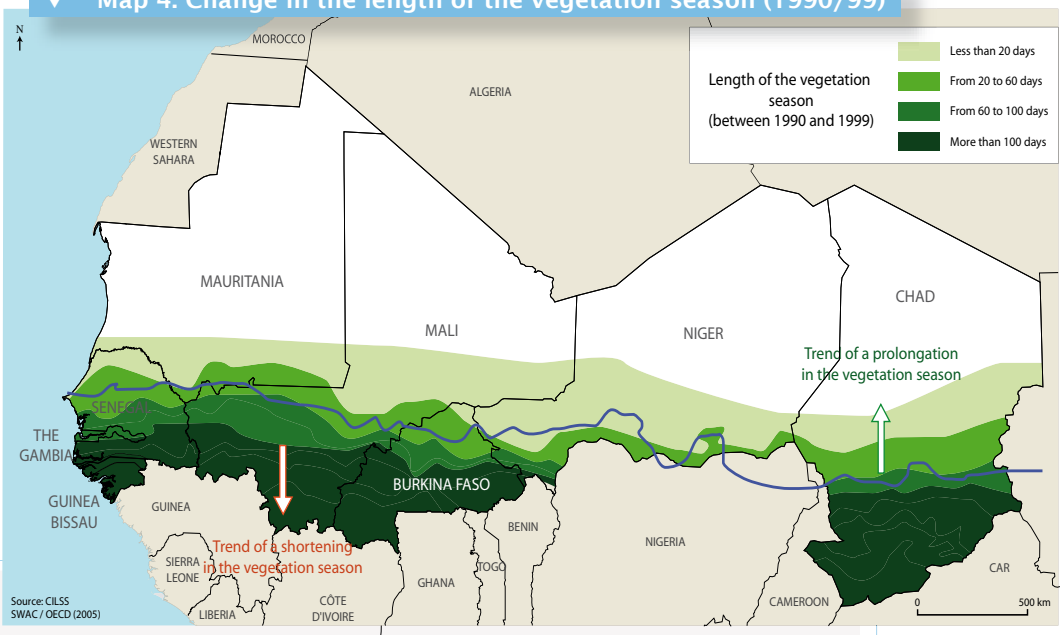
Between Maradi and Zinder in Niger, cowpeas, considered a cash crop although not comparable with groundnuts or much less cotton, are grown with millet and sorghum. Cowpeas are a food crop and are grown in the same way as traditional cereals (with few inputs) and largely depend on good rainfall. In the Louga area, groundnuts and cowpeas are associated with livestock in a system which also heavily relies on rainfall.

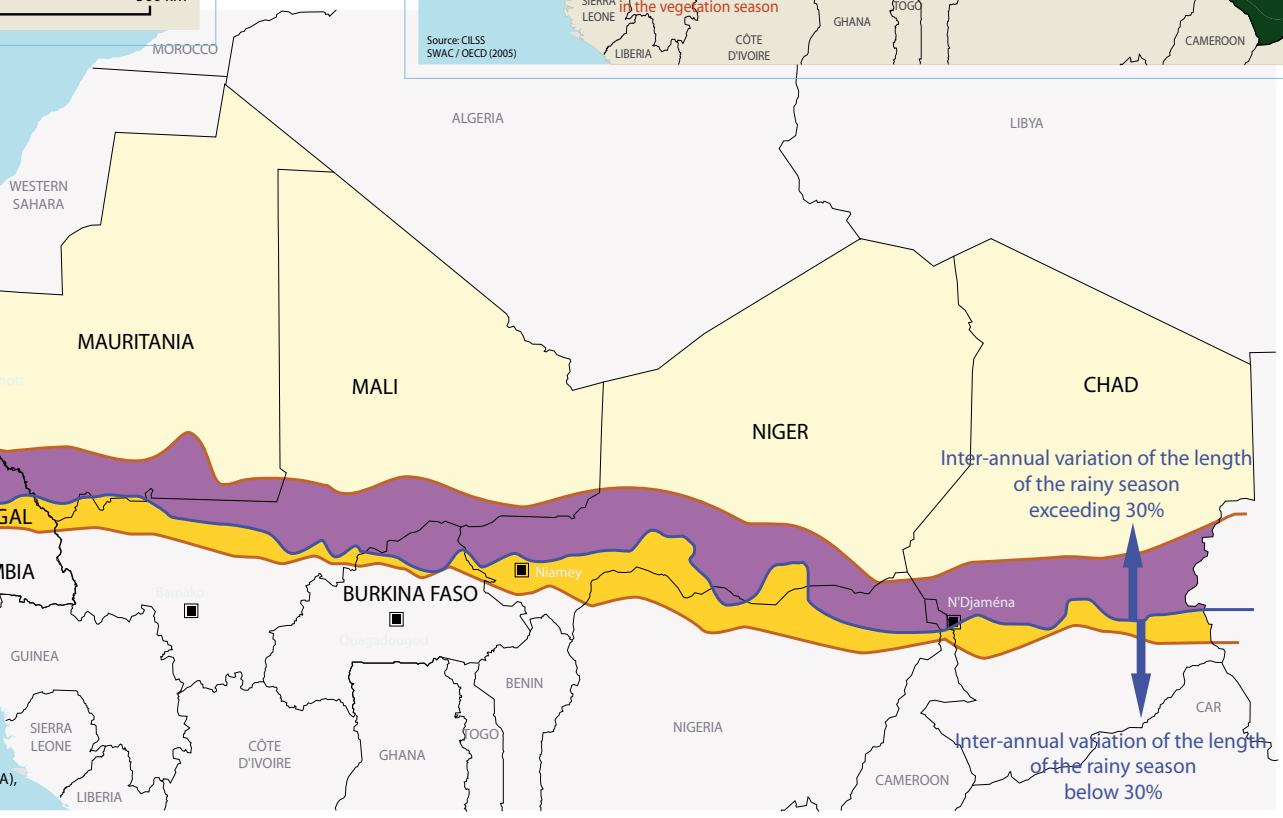
Only irrigated rice paddies in the Senegal and Niger River valleys provide protection against vulnerability except during severe drought.

By simplifying, one could describe the cereal-producing areas in more or less horizontal strips: one of millet in the North; one of sorghum mostly south of the 400 mm isohyet; and an area of maize in the southern Sahel. This observation, based on agro-ecological criteria, is confirmed by production figures. Agricultural surveys suggest that about a third of the



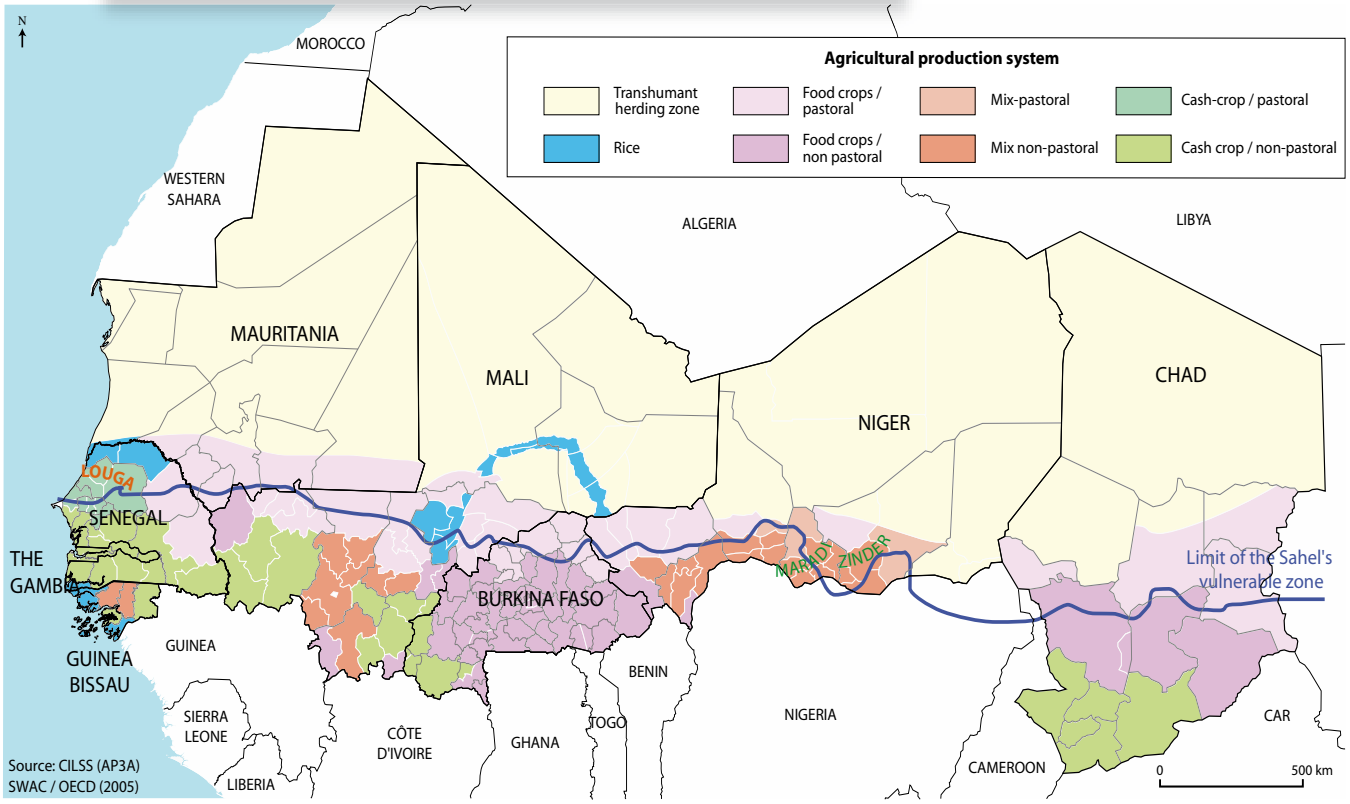
Map 4. Change in the length of the vegetation season (1990/99)





Map 5. The Sahel's vulnerable zone

Map 6. Agricultural production systems in Sahel countries



Sahel countries' total millet production was grown in the vulnerable zone in 2000, along with 15% of all sorghum and just under 10% of maize.

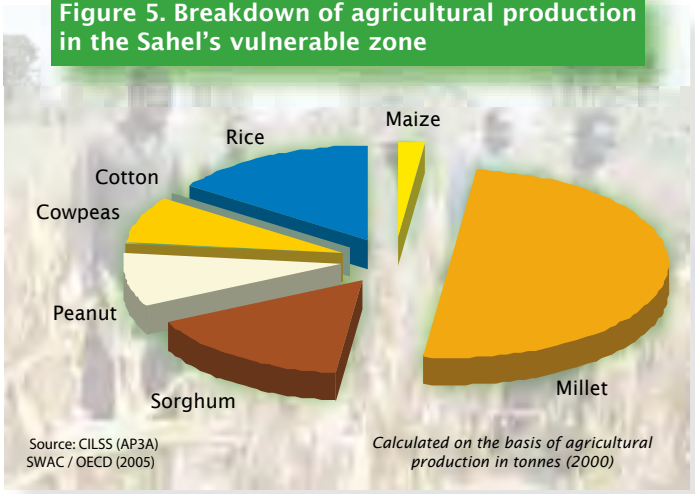
In this zone, millet is the main cereal crop in Chad, Mali, Niger and Senegal whereas flood-recession grown sorghum is the main cereal crop in Mauritania.

Livestock plays an important role in all Sahelian countries. It accounts for up to 10-15 % of the GDP in Burkina Faso, Chad, Mali, Niger and Senegal. In the largely nomadic northern area, mainly camels and goats are reared. In the Sahelian zone, transhumant cattle with great seasonal North-South movements are raised throughout the Sahel, along with agro-pastoral livestock rearing that migrate less and even sedentary livestock farming in the southern most parts.

FAO estimates show, that cattle farming in the Sahel's vulnerable (agro-pastoral) zone accounts for a relatively small number of livestock and no longer plays a significant role for the rest of West Africa (Map 8). The permanent migration of herds southward after the major droughts of 1973 and 1984[7] as well as the rapid growth of sedentary livestock farming in cotton-growing areas partly explains this evolution.

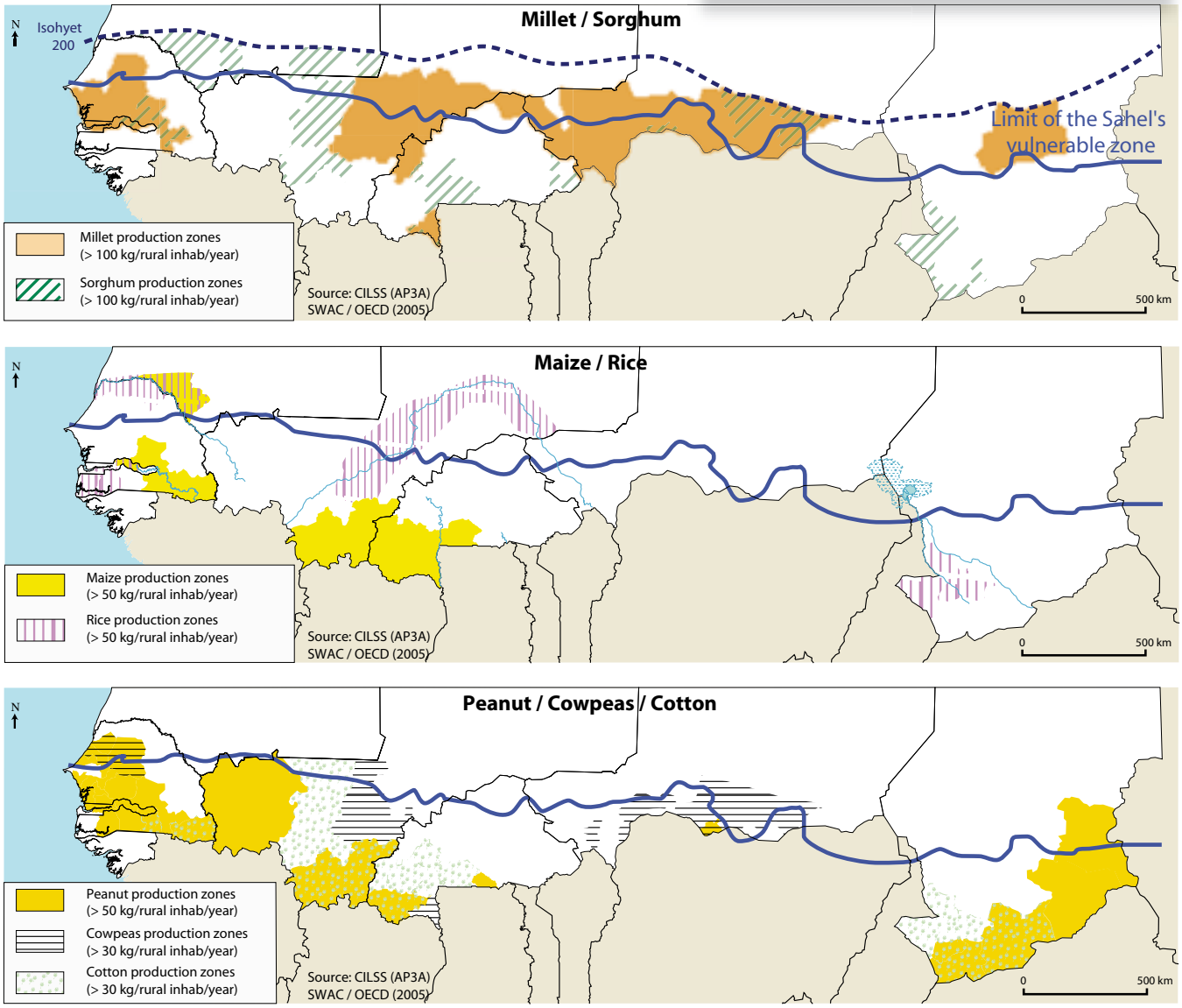
But livestock is still a major activity in the vulnerable zone — which has a very high ratio of cattle per rural inhabitant (Map 11) — and is very often the main source of income for rural families (Map 12).

Figure 5. Breakdown of agricultural production in the Sahel's vulnerable zone

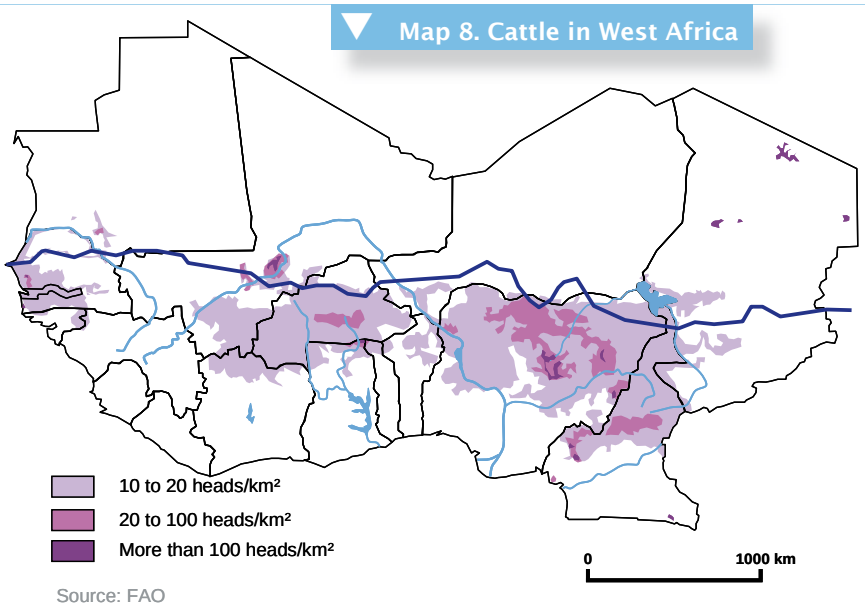


7. In Niger, for example, the number of cattle has halved over 30 years due to a steady decline in available fodder.

Map 7. Main crops in CILSS countries



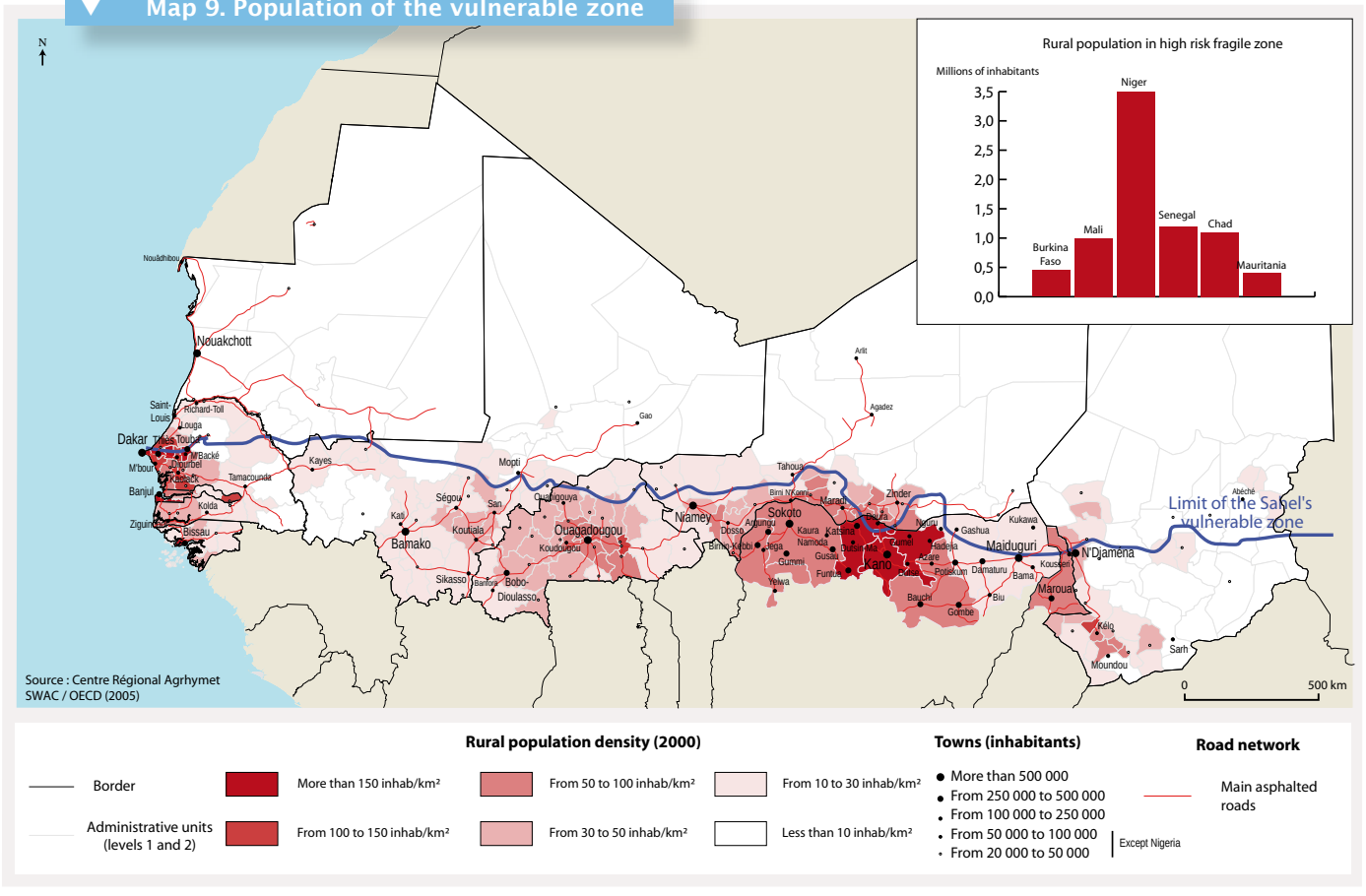
Map 8. Cattle in West Africa



VII. Facing the regional market

Although production methods and life-styles in the Sahel's vulnerable zone remains mostly very traditional, the overall environment has greatly changed over the past 30 years. The climate has become drier and the average isohyets have moved 100-150 km further south. Also, West Africa's population has grown very rapidly, from less than 130 million to nearly 300 million between 1975 and 2005. The number of cities of over 100,000 people has risen from 30 to 135 and the network of main roads has expanded more than five-fold.

Map 9. Population of the vulnerable zone



The Sahel's vulnerable zone is now home to 8 million people — about 3% of West Africa's population — and has very few significant urban centres. Its increasing links with big urban settlement areas mean that the old Sahel lifestyles are now up against markets whose fluctuations can magnify the effect of nature's uncertainties such as locusts and lack of rainfall. This is what happened during the 2005 dry season, especially in southern Niger, whose inhabitants are heavily influenced by northern Nigeria (Map 9).

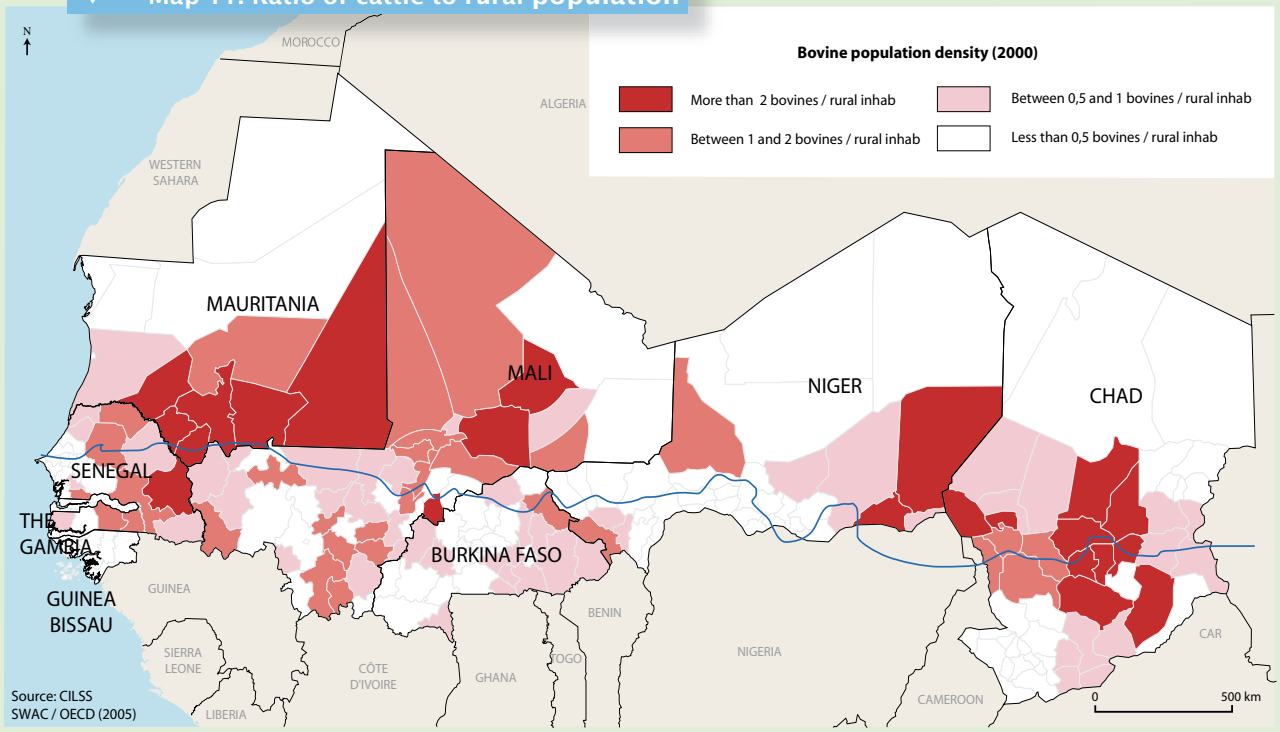
But this proximity to large urban centres also provides part of the rural population with opportunities and income, especially through seasonal migration to towns and to commercial agriculture areas (Map 12).

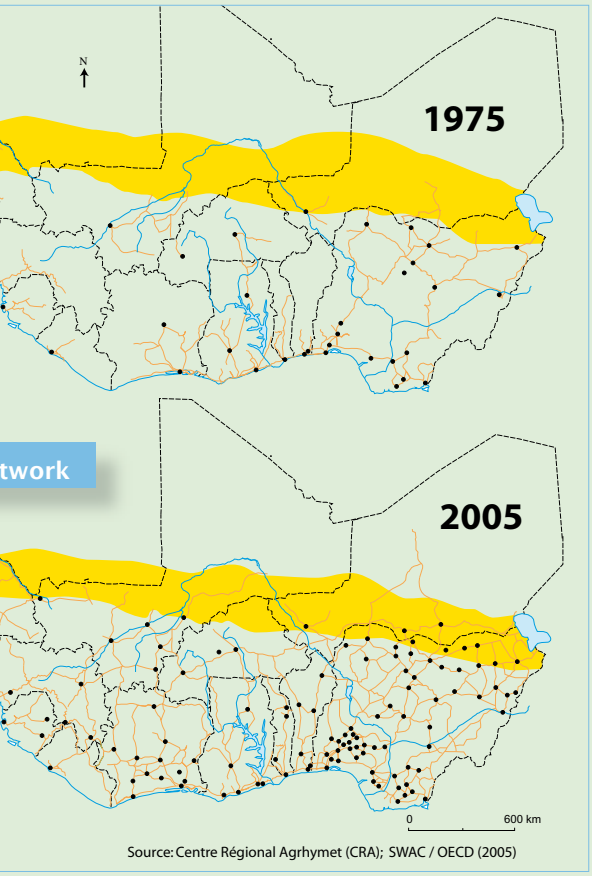
The connection of the Sahel with West African markets is now a reality that neither prevention nor management strategies of food shortages nor long-term development policies can ignore.

Map 10. West Africa's road and urban ne

- Town of more than 100 000 inhabitants
- Main paved or partially improved roads
- Sahelian zone (between 200 and 600 mm)

Map 11. Ratio of cattle to rural population





Source: Centre Régional Agrhymet (CRA); SWAC / OECD (2005)

Conclusion

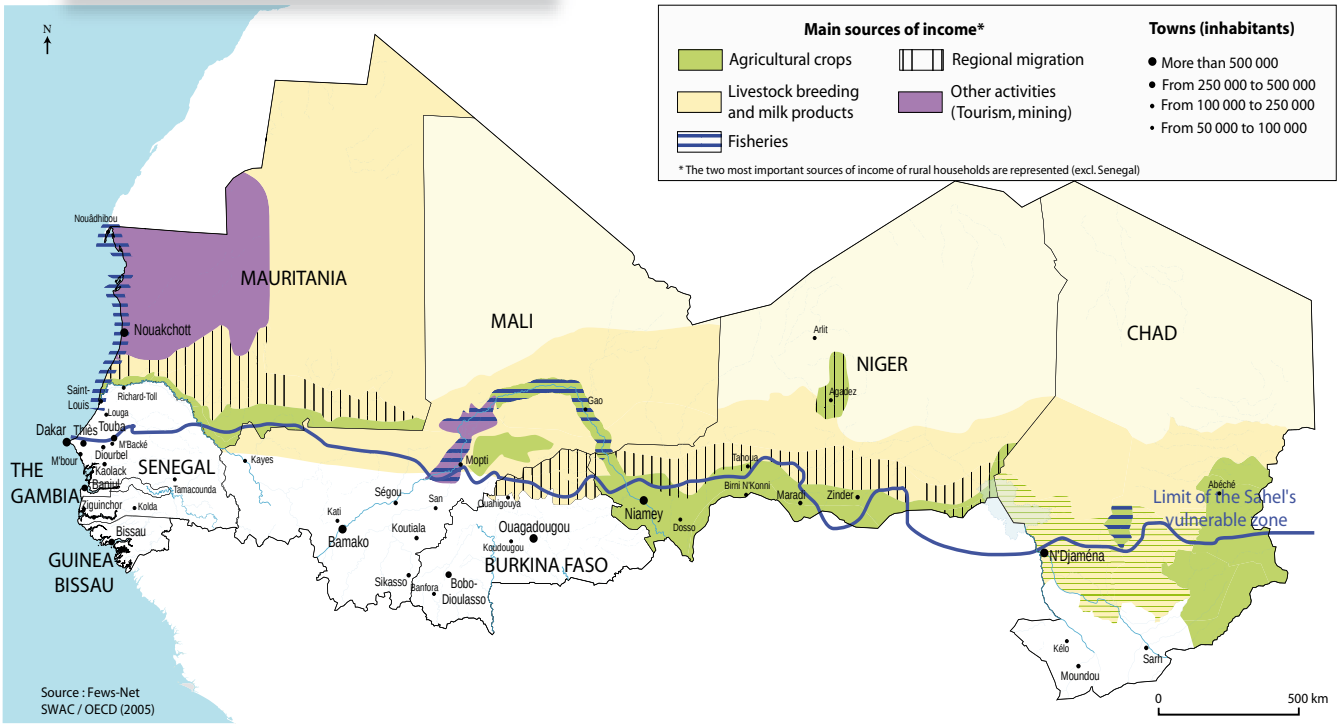
The past and recent history of the Sahel's vulnerable zone shows that this part of West Africa deserves special attention and probably special treatment in medium- and long-term development policies. Some past and present trends are not very encouraging. It is an area of structural emigration[8] and represents only a small percentage of the region's population. It is no longer a significant livestock breeding area and it is plagued by unpredictable weather and crop pests and now also by market uncertainties. Its demographic, economic and climatic transition is probably the most difficult and least-promising in West Africa.

However, the situation and the prospects are not homogenous. The major valleys, of the Senegal and Niger rivers, have a future as irrigated farmland that is still very under-used. But further east, especially in central Niger, the quest for positive connections to the Nigerian market is a more complicated issue.

The economic potential of these areas is often limited and they are naturally areas of temporary or permanent emigration. The lure of more attractive urban and rural areas will probably continue. It is not about encouraging or opposing migration but rather to support those who cannot or do not want to leave the region and help them acquire the means to live in that region with dignity.

8. See CILSS-CERPOD; "Atlas migration et environnement au Sahel"; 2000.

Map 12. Main sources of income



Bibliography and data sources

CILSS - Centre Régional Agrhymet (2001): *Le contexte de la vulnérabilité structurelle par système de production dans les pays du CILSS.* Projet Alerte Précoce et Prévision des Productions Agricoles (AP3A); Programme Majeur Information; Niamey.
CILSS (2004): *«Vingt ans de prévention des crises alimentaires au Sahel, bilan et perspectives»;* Ouagadougou.
CILSS – CERPOD (2000): *Atlas migration et environnement au Sahel;* Bamako.
CILSS – Centre Régional Agrhymet (2004): *Atlas décennal de la sécurité alimentaire et de la gestion des ressources naturelles au Sahel (1991-2000).*
CILSS (2005): *Gestion de la situation alimentaire 2004-2005 au Sahel.* Forum on the medium- and long-term challenges for food security in the Sahel and West Africa, SWAC (OECD, Paris), 18 October 2005.

CIRAD (2003): *Atlas: Agriculture et développement rural des savanes d'Afrique centrale (Cameroun, République centrafricaine, Tchad).* Pôle régional de recherche appliquée des savanes d'Afrique centrale (PRASAC), N'Djaména, Chad; Montpellier, France.

SWAC/ECOWAS (2005): *Atlas des transports et des télécommunications dans la CEDEAO;* Paris-Abuja.
SWAC (2004): *Analyse régionale de quelques indicateurs socio-économiques ouest-africains;* Paris.
SWAC (2003): *Transformation in West African Agriculture and the Role of Family Farms;* Paris.
SWAC (1997): *État des réflexions sur les transformations de l'agriculture dans le Sahel;* Paris.
ENDA-Diapol/SWAC (2004): *Maradi-Katsina-Kano: couloir de développement,* Paris-Dakar

FAO Agro maps: www.fao.org/landandwater/agll/agromaps
FAOSTAT: http://faostat.fao.org/faostat

FEWS Net (2005): *Burkina Faso Livelihood Profiles.* USAID, Fews Net Project.
FEWS Net (2005): *Chad Livelihood Profiles. USAID,* Fews Net Project, March.
FEWS Net (2005): *Niger Livelihood Profiles. USAID,* Fews Net Project, January.
FEWS Net (2005): *Mali Livelihood Profiles. USAID,* Fews Net Project.
FEWS Net (2005): *Mauritania Livelihood Profiles.* USAID, Fews Net Project, March.
FEWS Net, CILSS (2005): *Suivi de la situation alimentaire au Sahel et en Afrique de l'Ouest. Evolution des marchés et situation alimentaire en 2004 et 2005.* Forum on the medium- and long-term challenges for food security in the Sahel and West Africa, SWAC (OECD, Paris), 18 October 2005.

WFP (2005): Interim Report: *Niger – Analysis of Cereal Markets in 2004-2005.*
WFP (2005): *WFP Emergency Assessment Brief: Niger.*

Bernus E. and Hamidou S.A. (1981): *Atlas du Niger;* Ed. J.A.; Paris.
Lerebours-Pigeonnière A. and Arnaud J.C. (2001): *Atlas du Mali;* Ed. J.A.; Paris.
Lerebours-Pigeonnière A. and Ménager. T. (2001): *Atlas du Burkina Faso;* Ed. J.A.; Paris.
Pelissier P. and Laclavère G. (1980): *Atlas du Sénégal;* Ed. J.A.; Paris.

Chapter produced by P. Heinrigs and C. Perret. Under the supervision of L. Bossard
Photos: USAID/M. McGahuey; WFP/Mahamane Goni Boulama; UNESCO/Alfred Wolf/Georges Malempré/B. Peloux/Eduardo Barrios; Michel Hasson

ECOWAS
Executive Secretariat
60, Yakubu Gowon Crescent,
Asokoro District, PMB 401
Abuja – Nigeria
Tel: +234-9-31 47 647-9
Fax: +234-9-31 43 005
Web site: www.ecowas.int
Contact: hwarkani@ecowasmail.int

SWAC/OECD
2 rue André-Pascal
75775 Paris Cedex 16 - France
Tel: +33 (0)1 45 24 78 55
Fax: +33 (0)1 45 24 90 31
Web site: www.oecd.org/sah
Contact:
laurent.bossard@oecd.org