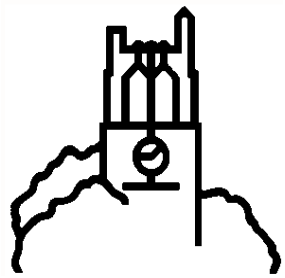
MSU International Development Working Paper

Trends in Per Capita Food Availability in West Africa, 1980-2009

by

Nathalie M. Me-Nsope and John M. Staatz



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All errors of fact or interpretation are solely those of the authors.

EXECUTIVE SUMMARY

The goal of this paper is to provide evidence of shifts in food consumption patterns in the ECOWAS countries of West Africa from 1980 through 2009.[1] In particular, the analysis is intended to identify major contributors to diets, changes in the levels as well as in the composition of food supply at the country-level, and to enhance understanding of the food supply situation within the ECOWAS zone using national-level FAOSTAT food balance sheet data from 1980-2009. The paper provides detailed displays of per capita food availability for each of the 15 countries, which will serve as the basis for more detailed quantitative and qualitative analysis in subsequent reports.

The analysis reveals a trend towards greater per capita calorie supplies for most ECOWAS countries. While the growth in daily energy availability has been much more pronounced and consistent for countries experiencing rapid economic growth (e.g., Ghana and Cape Verde), the growth pattern has been disrupted in countries that have been through civil disruptions like Cote d'Ivoire, Liberia and Sierra Leone. The analysis provides evidence of a diversification in the composition of food supply and reveals that national-level starchy staples consumption patterns have been complex and diverse. The importance of starchy roots and tubers in the diets, particularly in the Sahel region, has grown over time. The analysis reveals a big cassava revolution that has taken place in some of the Coastal Non-Sahelian countries such as Nigeria, Ghana, and Sierra Leone. The growth in the apparent per capita consumption of cassava (e.g., Senegal) and sweet potatoes (e.g., Mali), most likely reflects the lower-income population shifting towards cheaper calorie sources. There has also been positive growth in the supply of Irish potatoes in some countries (e.g., Cape Verde and Senegal), supporting evidence of increasing income (due to the high income elasticity of Irish potatoes), and a westernization of diets (increased consumption of potato *chips*–French fries). Apparent per capita consumption of yams also showed huge increases in some Coastal Non-Sahelian countries (e.g., Ghana and Nigeria). The analysis also provides evidence of a striking growth in apparent per capita consumption of maize in the Sahel (Burkina Faso, Mali and Senegal). Apparent per capita rice consumption increased for most countries in the study period. In Cape Verde, for instance, rice is replacing maize as the dominant cereal.

With respect to the quality of the diet, the supply of daily protein per capita has been increasing for most countries since the early 2000s. Proteins from plant sources are the dominant source of protein in the entire region. Although plant proteins dominate as the major source of protein for most of these countries, some of these countries (e.g., Niger, Sierra Leone, and Cape Verde) derive an important share of vegetable protein from pulses, which are a source of high-quality protein. Some countries have shown a positive trend in the supply of animal protein. The countries that have shown evidence of diet upgrading through increased consumption of animal protein have been mostly those that have also shown evidence of rapid and strong economic growth over time (e.g., Ghana and Cape Verde). Countries with modest economic growth (e.g., Mali) also show modest growth in the consumption of animal protein over time. Apparent per capita daily fat supply increased for most countries in the study period. Based on FAO's recommended daily allowances of various nutrients for a balanced diet, the share of different macronutrient groups in daily energy supply did not change much over time. While most countries meet and/or exceed the recommended daily allowance for *carbohydrates*, the share of protein in daily energy

[1] The Economic Community of West African States (ECOWAS) includes 15 member states: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

continues to remain close to the lower bound of the recommended daily value. However, this has not always meant that the diets have not improved over time, as some countries have experienced not only a positive growth in the supply of total per capita protein availability, but also have been improving in terms of the consumption of animal protein (generally of better nutritional value than most plant proteins) as well as of pulses (of higher quality protein than most other sources of plant protein). Noticeable for almost all countries in the region is the growth in the supply of poultry meat over time, primarily from imports.

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ACRONYMS

CFA	Currency of Francophone West Africa
ECOWAS	Economic Community of West African States
FAO	Food and Agricultural Organization of the United Nations
FAOSTAT	Food and Agricultural Organization Online Statistical Database
FBS	Food Balance Sheet
FPI	Food Price Index
GDP	Gross Domestic Product
GNP	Gross National Product
g	gram
INSTORMIL	Sorghum and Millet Research Support Program
kcal	kilo calories
kg	kilogram
MSU	Michigan State University
R&T	Roots and Tubers
SAP	Structural Adjustment Programs
SRAI	Strengthening Regional Agricultural Integration
UN	United Nations
USAID	United States Agency for International Development
WA	West Africa

1. INTRODUCTION

1.1. Overview

West Africa (WA) has undergone rapid changes in its social and economic environment during the last 25 years, resulting in shifts in food consumption patterns.[2] Some of these changes include urbanization, growth in per capita incomes, population growth, migration within the zone towards the coastal states, and the adoption of more western lifestyles. In addition to the aforementioned structural factors, the region has undergone major policy shifts that constituted major changes in the conditions that determine demand. Examples of these include the structural adjustment programs (SAP) and the 1994 devaluation of the CFA franc (the common currency of 8 of the 15 ECOWAS member states) that brought about changes in relative cereal prices, thereby increasing the domestic price of rice (an internationally traded cereal) relative to that of the local coarse grains (which are only semi-tradables).

1.2. Determinants of Food Consumption Patterns

1.2.1. Population

According to the UN (2011)[3], the 15 West African States that constitute ECOWAS have a population of approximately 250 million people, covering an area of roughly 5 million km². The average annual population growth rate is reported at 3%, and it is forecasted that the sub-region's population will reach 430 million by 2020. Five-year cumulative population growth rates in the period 1980-2010 reveal positive growth for almost all countries in the region (Table 1). The 2010 population figures reveal the overwhelming importance of the coastal countries (especially Cote d'Ivoire, Ghana and Nigeria) in the region's total population. Nigeria alone accounts for about three-fifths of the region's total population, thus making her a major influence in the sub region as far as food demand is concerned. The size of the consumer population obviously has an effect on aggregate food demand since food is a basic necessity. It is also anticipated that, increasingly in the future, the population of WA will be along the coast due to substantial out-migration from the inland countries of the Sudano-Sahelian belt (e.g., Burkina Faso and Mali) to the coastal countries in West Africa. [4] The occurrence of such a shift is likely to have important consequences for how consumption patterns for the region as a whole evolves.

[2] In this paper, the term *West Africa* is used to mean the area covered by the 15 member states of ECOWAS: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.
[3] http://www.ohchr.org/EN/Countries/AfricaRegion/Pages/WestAfricaSummary1011.aspx
[4] http://www.unep.org/dewa/africa/publications/aeo-1/120.htm

Table 1. Five-year Cumulative Population Growth Rate (%) in 1980-2010

Country	1980 to 1985	1985 to 1990	1990 to 1995	1995 to 2000	2000 to 2005	2005 to 2010*	Total Population 2010(000)
Benin	2.7	2.9	3.4	2.9	3.2	3.0	8,850
Burkina Faso	2.5	2.6	2.7	2.8	2.9	2.9	16,469
Cape Verde	1.8	1.2	2.5	2.0	1.6	2.2	496
Côte d'Ivoire	4.2	3.5	3.2	2.4	1.7	1.8	19,738
Gambia	4.0	4.6	3.1	2.8	3.0	2.6	1,728
Ghana	3.3	2.8	2.8	2.4	2.4	2.0	24,392
Guinea	2.2	3.1	5.5	2.0	1.6	2.2	9,982
Guinea-Bissau	2.0	2.0	2.0	2.0	2.0	3.0	1,515
Liberia	2.8	-0.8	-0.3	6.1	2.2	4.5	3,994
Mali	2.0	1.6	2.5	2.8	3.1	3.0	15,370
Niger	2.8	2.9	3.3	3.5	3.5	3.5	15,512
Nigeria	2.6	2.6	2.4	2.3	2.5	2.3	158,423
Senegal	2.8	3.0	2.9	2.6	2.7	2.5	12,434
Sierra Leone	2.3	2.4	-0.4	1.2	4.4	2.0	5,868
Togo	3.4	3.0	2.2	3.2	2.4	2.7	6,028

*Growth rates up to 2005 were calculated from FAO's Population Statistics, while the growth rates for 2005-2010 were taken from the UN population statistics.

1.2.2. Urbanization

The population of WA is not only growing, but increasingly it is becoming more urban. In WA, 85% of the population lived in rural areas in 1960 but by 2020, the urban-rural ratio is expected to be around 60:40 %[5]. In 2010, roughly 137 million people lived in urban areas, as against 170 million rural dwellers. The 2010 figures reveal urban population shares of over 40% for 10 out of the 15 ECOWAS member countries, and a share above 50% for 5 of the 15 (Table 2 and Figure 1). The urban population share grew by more than 100% in the period 1980-2010 in 3 out of the 15 ECOWAS states (Burkina Faso, Cape Verde and Gambia); and by greater than 50% in 7 out of the 15 ECOWAS States (Benin, Ghana, Guinea Bissau, Liberia, Mali, Nigeria and Togo). A key question then is how the growth in the urban population is affecting food availability and consumption in the levels and composition?

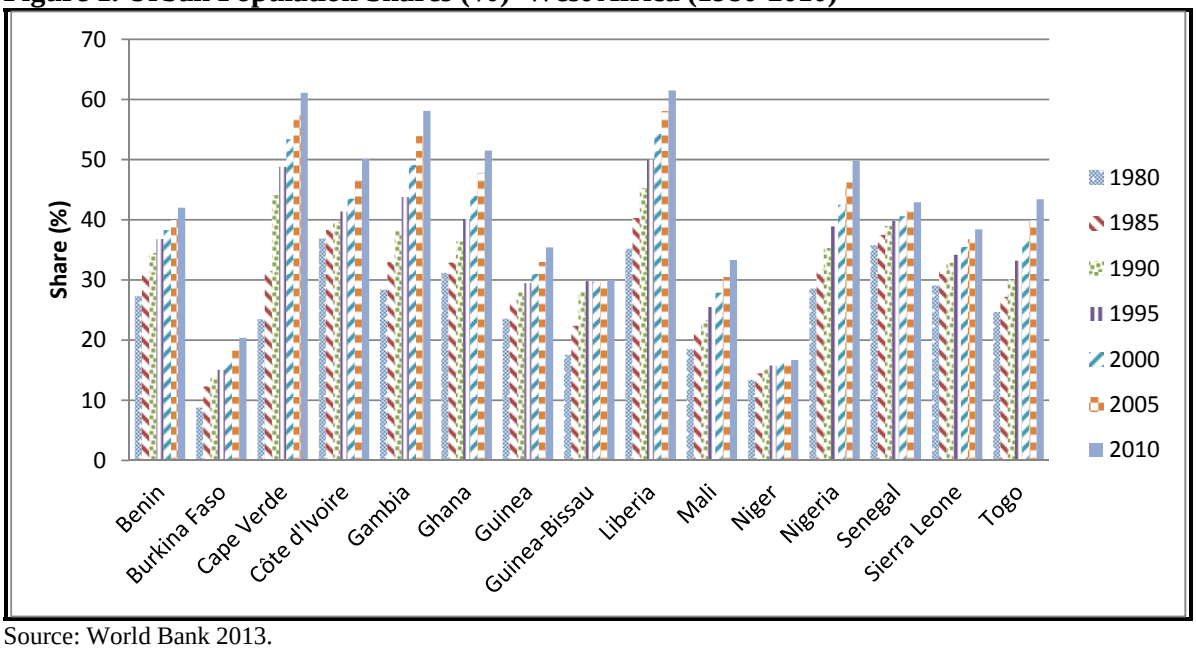
[5] http://westafricainsight.org/articles/PDF/92

Table 2. Urban Population as a Percentage of Total Population

Country	1980	1985	1990	1995	2000	2005	2010	% change 1980 to 2010
Benin	27	31	35	37	38	40	42	55.6%
Burkina Faso	9	12	14	15	17	18	20	122.2%
Cape Verde	24	32	44	49	53	57	61	154.2%
Côte d'Ivoire	37	38	40	41	44	47	50	35.1%
Gambia	28	33	38	44	49	54	58	107.1%
Ghana	31	33	36	40	44	48	52	67.7%
Guinea	24	27	28	30	31	33	35	45.8%
Guinea-Bissau	18	22	28	30	30	30	30	66.7%
Liberia	35	40	45	50	54	58	62	77.1%
Mali	19	21	23	26	28	31	33	73.7%
Niger	13	15	15	16	16	16	17	30.8%
Nigeria	29	32	35	39	43	46	50	72.4%
Senegal	36	38	39	40	41	42	43	19.4%
Sierra Leone	29	32	33	34	36	37	38	31.0%
Togo	25	27	30	33	37	40	43	72.0%

Source: Figures are compiled from the World Bank data on urban population as a percentage of total population.

Figure 1. Urban Population Shares (%)–West Africa (1980-2010)



Source: World Bank 2013.

1.2.3. Economic Growth

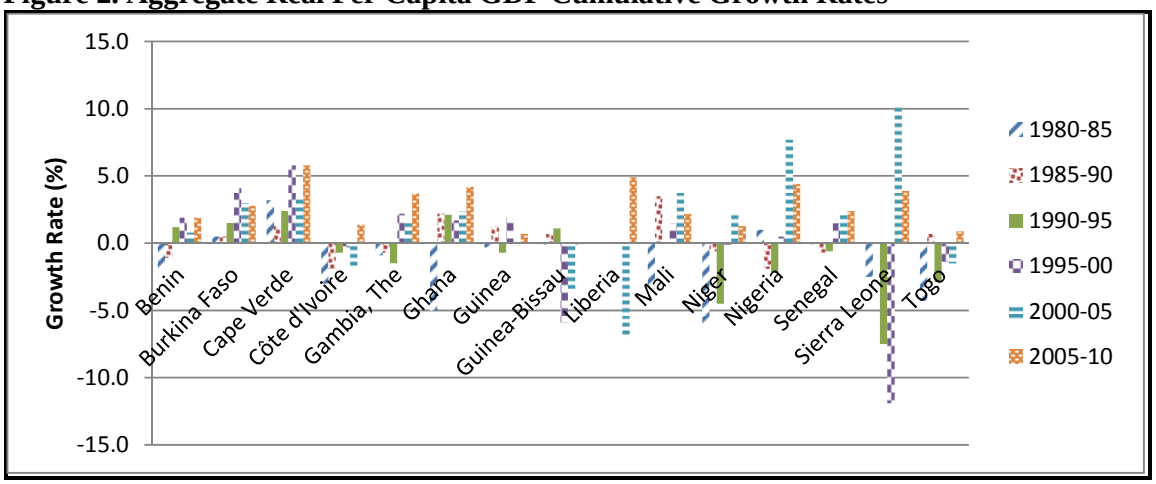
Changes in consumption patterns have also been associated with changes in a nation's per capita gross national product (GNP). In economic theory, the relationship between food consumption and income levels is characterized by Engel's law–the proportion of income spent on food falls as income rises. The evolution in real per capita gross domestic product (GDP) (an indicator of purchasing power) in the region reveals an overall positive trend over the period 1980-2010. Increases in aggregate cumulative real per capita GDP growth rates are particularly large in the 2000s (Table 3 and Figure 2).With the exception of a few countries (Cote d'Ivoire, Guinea Bissau, Liberia, Guinea and Togo), per capita GDP has been growing for most countries since 2000, and the growth rates have been largest for Cape Verde, Ghana, Nigeria, Burkina Faso, Mali and Sierra Leone.

Table 3. Aggregate Real Per Capita GDP Cumulative Growth Rates

Country	1980-85	1985-90	1990-95	1995-00	2000-05	2005-10
Benin	-2.0	-1.1	1.2	1.9	0.8	1.9
Burkina Faso	0.5	0.5	1.5	4.1	3.0	2.8
Cape Verde	3.2	1.3	2.4	5.8	3.4	5.8
Côte d'Ivoire	-3.0	-1.9	-0.7	-0.3	-1.7	1.4
Gambia, The	-0.9	-0.7	-1.5	2.2	1.5	3.7
Ghana	-5.0	2.2	2.1	1.7	2.4	4.2
Guinea	-0.3	1.3	-0.7	1.9	-0.2	0.7
Guinea-Bissau	-0.1	0.7	1.1	-5.9	-3.4	-0.1
Liberia	n/a	n/a	n/a	n/a	-7.0	4.9
Mali	-3.4	3.5	0.0	1.5	3.9	2.2
Niger	-6.0	-0.6	-4.5	-0.1	2.2	1.3
Nigeria	1.0	-1.9	-2.2	0.5	7.7	4.4
Senegal	-0.1	-0.7	-0.6	1.5	2.1	2.4
Sierra Leone	-2.5	0.0	-7.5	-11.9	10.3	3.9
Togo	-4.3	0.7	-2.9	-1.4	-1.5	0.9

Source:Author's computation using per capita GDP (constant prices), national currency from the International Monetary Fund, World Economic Outlook Database, April 2008.

Figure 2. Aggregate Real Per Capita GDP Cumulative Growth Rates



Source: Author's computation using per capita GDP (constant prices), national currency from the International Monetary Fund, World Economic Outlook Database, April 2008.

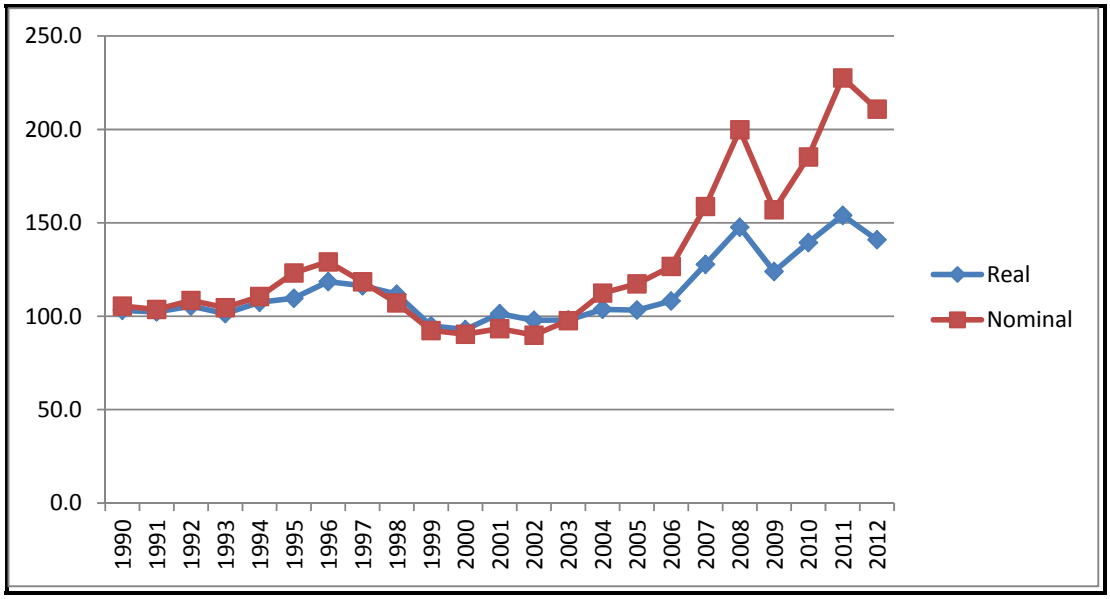
Regmi and Dyck (2001) observe that urbanization is closely related to economic development and that both interact together to bring about important changes in the composition of consumption—the specific effects of urbanization on consumption differ depending on the economic conditions. Urbanization may result in an overall increase in per capita consumption, an increase in diet quality (such as an increase in animal protein consumption), and an increase in the demand for processed or easy-to-prepare food.

1.2.4. Food Prices

The 2007-2008 global food crisis brought a renewed attention to food consumption patterns worldwide and in particular in developing countries. The main symptom of the crisis was a large upsurge in international prices for the main staple foods, principally maize, wheat, rice, and soybeans, thus triggering world-wide concerns about threats to global food security. From a global perspective, the increase in food prices has been attributed to several factors (see Kelly, Dembele, and Staatz 2008; Joseph and Wodon, 2008, and Staatz et al. 2008). Kelly, Dembele, and Staatz (2008) also offer an explanation for the food-price crisis from a Sahelian perspective. An examination of the FAO food price index (FPI), a measure of the change in international prices of a basket of food commodities, shows that in 2011 the index rose above its 2008 peak. The index dropped in 2012 (nominal terms) but still remained generally higher than its 2008 level.[6] See Figure 3 for the trend in FAO's food price index.

The circumstances of the global food crisis in WA, which previously relied on cheap food imports for a substantial part of its staple food supply, have been unique.[7] As observed by

Figure 3. Annual Food Price Index (2002-2004=100)



Data source: FAO's World Food Situation website.

[6]FAO, Food Price Index: retrieved from: http://www.fao.org/worldfoodsituation/FoodPricesIndex/en/.
[7] The deregulation of domestic food markets and the liberalization of agriculture experienced as part of the SAP in the region forced most of West African nations into competition in the world food markets with developed country producers that produced at lower costs and sold at lower prices.

Staatz et al. (2008), trade bans and high international food prices pushed many West African countries away from their historical reliance on regional and international trade as a key component of their food security strategies, thereby leading many governments to conclude that the risks were very high in depending on the international market for staples. Kelly, Dembele, and Staatz (2008) also observe that in the Sahel region, the impact of the food price crisis on household consumption has been differentiated according to each country's food consumption profile and food supply. However, in spite of production shortfalls in some countries, there is a strong potential for production stability at the regional level (Kelly, Dembele, and Staatz 2008). Changing relative prices have been found to promote substitution in cereals (Delgado 1989; Delgado and Reardon 1991).

1.3. Why Analyze Changes in Food Consumption Patterns?

Changes in food consumption patterns have implications for food security. As a result, policies to deal with issues of food insecurity require knowledge about these changes and the factors influencing them. Food consumption patterns also have implications for agricultural market development, currently a priority for WA's development agenda. With urbanization and the growing urban middle class in WA, understanding how these patterns have changed (in level and diversity), whether new food groups are emerging as important sources of household food energy consumption, and whether the traditional cereal habits persist will help identify opportunities and challenges for the development of agricultural value chains to meet the growing effective demand. The findings of this paper will provide evidence that will contribute to the knowledge base and policy dialogue at regional and national levels on key policy issues concerning the evolution of agri-food systems.

1.4. Some Existing Evidence on Food Consumption Patterns in West Africa

Lopriore and Muehlhoff (2003) document the most recent evidence (prior to this paper) on aggregate food consumption patterns in WA from food balance sheets (FBS). They analyze trends in dietary energy supply and also in diet quality and diversity. However, their analysis covers only up to the year 2001. The Taondyandé and Yade (2012) study examined how food consumption patterns have changed over time with increased per capita incomes and the growth in urban population. Using a descriptive approach and data from two household budget surveys for Mali, Senegal, Burkina Faso, Niger, Cote d'Ivoire, and Benin–one collected in the 1990s and the other in the 2000s—the study described for each country (i) the share of food in total expenditure; (ii) the evolution in food expenditure share by product type; and (iii) the evolution in per capita consumption by product type, income, place of residence and geographic location.

1.5. Objective and Hypotheses

This paper aims to update existing evidence of food consumption patterns in WA by investigating from national official statistics (as reported through FAOSTAT) aggregate (national) trends in apparent food consumption in West Africa in the period 1980-2009[8]. The analysis focuses on the 15 ECOWAS member states of West Africa, since ECOWAS is the major player that is defining a regional agricultural policy for West Africa. In particular, this

[8] Most recent FAOSTAT-Food balance sheet data are of 2009.

analysis will help us identify major contributors to diets[9] as well as any new food groups emerging as important contributors to the diet in the region. The analysis is intended to test the following hypotheses: 1) There has been an increase in the level of food availability towards greater calorie consumption in the past 30 years; 2) in the past 30 years, there has been a diversification in the composition of food supply, whereby new food groups (e.g., roots and tubers[10] (R&T) in the non-coastal Sahelian West African countries and maize in the landlocked countries) are emerging as important contributors to the daily caloric consumption; 3) the contribution of animal protein to total daily protein consumption has increased over time as per capita incomes have increased; and 4) based on FAO's recommended daily allowances of various nutrients for a balanced diet, the diets have become more balanced.

1.6. Data and Reliability of Food Balance Sheet Consumption Estimates

National-level official food availability data for the period 1980-2009 and for each country in the region from FAOSTAT's FBS are used for the analysis of aggregate-level trends in food consumption. The reliability of the FBS as a source of national food supply consumption estimates has been questioned. Farnsworth (1961) examines the available food supply and consumption estimates from the national FBS, by considering how they were made, what defects they have, and to what extent and for what purposes they are truly useful. The fundamental question of her paper was whether the defects are mostly of minor significance and mutually offsetting or whether they are large enough to distort the indicated levels and patterns of national food consumption. She examines the statistical shortcomings in the construction of food balances and argues that the FBS figures on per capita availability depend on the accuracy of the production, stocks, and population figures (major elements of the food balance equation), all of which are subject to varying degrees of error across countries. According to Farnsworth (1961), inaccuracies in food production estimates stem from: difficulties and the heavy costs of obtaining data on minor crops, minor producing areas, and/or home gardens; and incomplete crop coverage from the neglect of certain crops and livestock. She notes further that stocks data are either nonexistent or limited to government holdings of a few export products, and population estimates frequently have a margin of error of 10%, sometimes much more.

Farnsworth (1961) observes that the statistical uncertainties involved in food consumption estimates for highly developed countries shrink almost to insignificance compared with the distorting defects and inadequacies of the food statistics and population estimates of many underdeveloped countries. To illustrate this point she considers the problems of balance sheet construction for Nigeria by examining the uncertainties that prevail in the production figures of some commodities. For instance, she notes that the cassava production figures deserve special attention, because they illustrate a peculiarly difficult balance sheet construction problem encountered in many African countries. According to her, unlike practically all other staple foods, mature cassava can be harvested at any time over a period of years. Moreover, since cassava usua1ly ranks as a non-preferred food, and since it is often planted for price specu1ation and as a *hungry season* reserve, large quantities are: never harvested but remain on land abandoned to bush fallow. Hence, if cassava production is estimated by applying data on sampled yields per acre to the total acreage under manioc, the result is inevitably an

[9] The term diet here is more broadly defined and refers to the foods eaten by major food group.
[10] Roots and tubers are plants yielding starchy roots, tubers, rhizomes, corms and stems (FAO 1994). FAO (1994) distinguishes among seven primary root and tuber crops –potatoes, sweet potatoes, cassava, yams, cocoyam (Taro), cocoyam (Yautia) and roots and tubers nes (i.e. other roots and tubers not identified separately because of their minor relevance).

inflated *potential production* figure, rather than an indication of the crop harvested in a single year. Farnsworth (1961) acknowledges that some allowances were made for this peculiar *cassava estimation problem*, as well as for other balance sheet uncertainties.
Farnsworth (1961) attempts some broader generalizations on FBS, some of which are discussed below as caveats on the use of national food supply and consumption estimates.

- The FBS measures *net availability* or *net supplies* of food at the so-called *retail level*, which is just one of the four common concepts or measures[11]of food consumption that need differentiation: Net availability or net supplies of food at the so-called retail level includes not only food delivered to retail outlets and restaurants, but also food bartered, given away, or immediately eaten after harvesting.
- The consumption estimates do not obscure the broad pattern of total food supplies, and while the estimates indicate important calorie contributors, the data afford no firm basis for determining which of the most important food groups furnishes the largest (or smallest) number of food calories.

  National food balances can usually be trusted to indicate the most conspicuous differences in the food supply patterns of different countries; but they cannot be trusted to indicate lesser differences of this kind, nor to measure national differences in supply or consumption levels. Specifically, such figures usually correctly show whether the hypothetical "*average person*" of a given country customarily consumes much or very little meat or milk as compared with “average persons" in other countries; whether the specified country depends very heavily or very little on the typical *"cheap foods*"–cereals and major starchy roots and tubers; whether wheat, rice or some specified cheaper grain is the dominant cereal; and what kind of starchy roots and tubers are most common.
- For many low-income countries the national average pattern of consumption represents a composite of several distinctly different types of diets consumed by different subgroups of the population (e.g., regional subgroups in Nigeria) and as a result may not yield the best information on subgroup diets. Farnsworth (1961) notes that the best checks on national food balance data would come from good dietary surveys that are representative samples of the population, with complete food coverage and taking adequate account of varying seasonal patterns of consumption.
- Agricultural production appears to be more frequently underestimated rather than overestimated in official statistics. Underestimation could be from incomplete coverage (of crop areas or crops) – a characteristic of the agricultural statistics of practically all countries; and it is disturbingly great for many underdeveloped nations. Such crop reporting deficiencies are much greater for subsistence crops than for commercial crops, and greater for minor than major crops, and greater for secondary successive and mixed crops than for single primary crops. Farnsworth (1961) notes that the underreporting of yields per acre also appears to be quite common in low-income countries, where taxes are often tied directly or indirectly to farm output. On the other hand, overestimation is found in some countries, notably (1) the few which employ pre-harvest sampling methods without appropriate adjustment for later losses,

[11]The other three concepts/measures include: (1) consumption defined as the food purchases of representative families–a budget study approach; (2) consumption defined as the food prepared for eating–one of several closely related dietary survey measures; and (3) food intake, referring to food actually (i.e., with plate waste deducted).From one to another of these four levels or stages of consumption, significant loss and waste occurs, so that the raw data from different types of consumption studies are inherently incomparable (Farnsworth 1961).

and (2) those whose government officials fabricate or *adjust* yield and production figures primarily for the purpose of impressing either the voting public or their own superiors. Farnsworth notes that national food supply and consumption estimates rarely reflect the full degree of underestimation or overestimation found in the corresponding national production data.

- National food balance estimates are at their worst when constructed for individual years and accepted as evidence of year-to-year changes in consumption. Only the largest indicated annual changes, say 20% or more, can be relied on as reflections of actual variations in food consumption in most countries, and even these only as indicators of the direction, not the magnitude, of change. Farnsworth examines a couple of reasons for this, one of which is the fact that the customary use of calendar-year or July-June trade data for all food products listed in an annual balance sheet (regardless of differing production years for different foods) further distorts the derived annual consumption figures of those foods for which imports or exports are substantial.
- National food supply and consumption estimates at the retail level are often compared improperly with estimated nutrient requirements at the *intake level*, but it is important to note that substantial national differences in nutrient losses between the two levels exist. Nutrient losses and waste beyond the retail level vary markedly from country to country, from commodity to commodity[12], from year to year (depending mainly on weather conditions and crop quality), and from times of food shortage to times of plenty. Farnsworth (1961) acknowledges that the FAO and USDA estimators employ a uniform 15% allowance for such losses. However, she views the procedure as unrealistic and as partly accounting for the substantial hidden margins of error in existing estimates of national calorie and protein requirements as calculated at the so-called retail level.
- Valid estimates of chronic national food deficits or nutritional gaps simply cannot he derived from comparisons of estimated national food supplies on the one hand, with estimated national nutrient requirements, on the other.

Farnsworth wrote her piece of work more than half a century ago. While some of the concerns about the manner in which FBS are constructed may still be valid, it is also most likely true that national agricultural statistics have improved substantially over time. Nonetheless, her caveats about FBS data still need to be borne in mind. For example, a question can be raised about the extent to which any apparent diversification of the diet over time shown by the FBS reflect real diversification versus just an improvement in the ability of national agricultural statistics to capture other production (particularly non-cereal production). Notwithstanding the criticisms of food balance sheets, the FBS represents a valuable database for the aim of classifying countries according to the structure of their nutrient intake (Petrovici, Ritson, and Ness 2005). Timmer, Falcon, and Pearson (1984) also argue that the analysis of FBS is the starting point for most food policy analysis at the country level.

[12] For example in tropical countries heavily dependent on root crops, plantains, and maize; not only do such foods deteriorate rapidly after harvest in hot, moist climates, but some of the less desired staples, like cassava, may be so amply available that they are wastefully prepared for consumption in producing areas

1.7. Methodological Approach

This paper uses a descriptive approach, based on food supply data from the FAOSTAT FBS to describe aggregate trends in apparent food consumption patterns.[13] The FAO FBS show national and per capita quantities of food available for human consumption for almost all food commodities and all countries. The FBS also show data on per capita food energy availability as well as the availability of individual macronutrient groups (proteins and fats) in grams, per capita/day. Per capita availability of individual macronutrient groups is further classified by source (animal and plant). The analysis of protein availability by source provides some insight into diet quality. The analysis of fat availability also helps to better understand changes in the diets, as most West African diets, at least in the Sahelian countries, are likely deficient in essential fatty acids. With information on per capita availability of individual macronutrients and using an energy efficiency table that specifies kilocalories per nutrient type (the general rule is that protein and carbohydrates contain 4 kcal/gm and fat contains 9 kcal/gm), the caloric energy contribution of proteins and fats are calculated. According to FAO (2000), the healthy range of macronutrient intake (a balanced diet), expressed as a percent of total energy, can be broad: 55-75% from carbohydrates, 15-35% from fats and 10-15% from proteins.

For these key variables, three-year averages are reported to facilitate comparison. In most cases, the results will be presented by specific sub-regions in ECOWAS-WA. These include the Non-Coastal Sahel (Mali, Burkina Faso and Niger); the Coastal Sahel (Cape Verde, Gambia, Guinea Bissau, Senegal); and the Coastal Non-Sahel (Benin, Cote d'Ivoire, Ghana, Guinea, Liberia, Nigeria, Sierra Leone and Togo) sub-regions. The analyses are structured as follows: (i) trends in the level of food availability; (ii) trends in the composition of food supply/availability; (iii) trends in macronutrient availability; iv) trends in the contribution of plant and animal sources to protein availability, and v) trends in the share of macronutrients in food supply.

[13] In this paper, the term *apparent per capita consumption* is used synonymously with the per capita food or nutrient availability at the retail level as measured by the FBS.

2. FINDINGS

2.1. Trends in the Level of Food Availability

This sub-section examines whether there has been an increase in the levels of per capita food availability over time. The positive growth in per capita incomes in the region over time is expected to have had a positive influence on calorie availability. Food availability is measured in terms of per capita daily energy availability (DEA). Table 4 shows information on the trend in reported per capita daily energy availability (kcal/capita/day). Figures 4, 5, and 6 reveal an overall positive trend in reported total per capita DEA, particularly in the last two decades. Burkina Faso, Mali, Ghana and Nigeria experienced the largest growth in reported per capita DEA (50% and more) between 1980-85 and 2004-09. Cote d'Ivoire and Liberia in the same period experienced a drop in reported per capita DEA.

In the Non-Coastal Sahel, reported per capita DEA has been mostly increasing for Burkina and Mali since the 1980s. Table 5 shows the growth (%) in three-year averages of reported total per capita DEA. Within the study period, reported per capita DEA for Mali had the biggest growth in the early and mid-1980s. The high positive change in reported per capita DEA (about 18%) in 1986-1988 compared to 1983-85 corresponds to the period with growth in real per capita incomes of about 3.5%. We recall here that 1983-85 was a period of drought and economic crisis in Mali. In contrast, 1986-88 were characterized by good harvests and improved economic performance. The early and mid-1990s in Mali were also characterized by declines in reported per capita DEA. Mali underwent a coup d'état in 1991, which was initially disruptive. The 1994 CFA franc devaluation may also initially have reduced per capita purchasing power. Real per capita income data (Table 3) also shows very little positive growth in this period. These factors put together could explain the very modest change in per capita DEA observed during the same period. The negative growth in per capita DEA in Mali in the period 1992-1994 was restored back to the positive side in the late 1990s. Although reported per capita DEA went on a rise and growth rate remained positive in the Non-Coastal Sahel in the 2000s, Mali and Burkina Faso experienced a declining trend in the rate of growth in reported per capita DEA in the 2000s compared to the 1980s and early 1990s. In Niger, the rate of growth in per capita DEA has been on the rise since 2001.

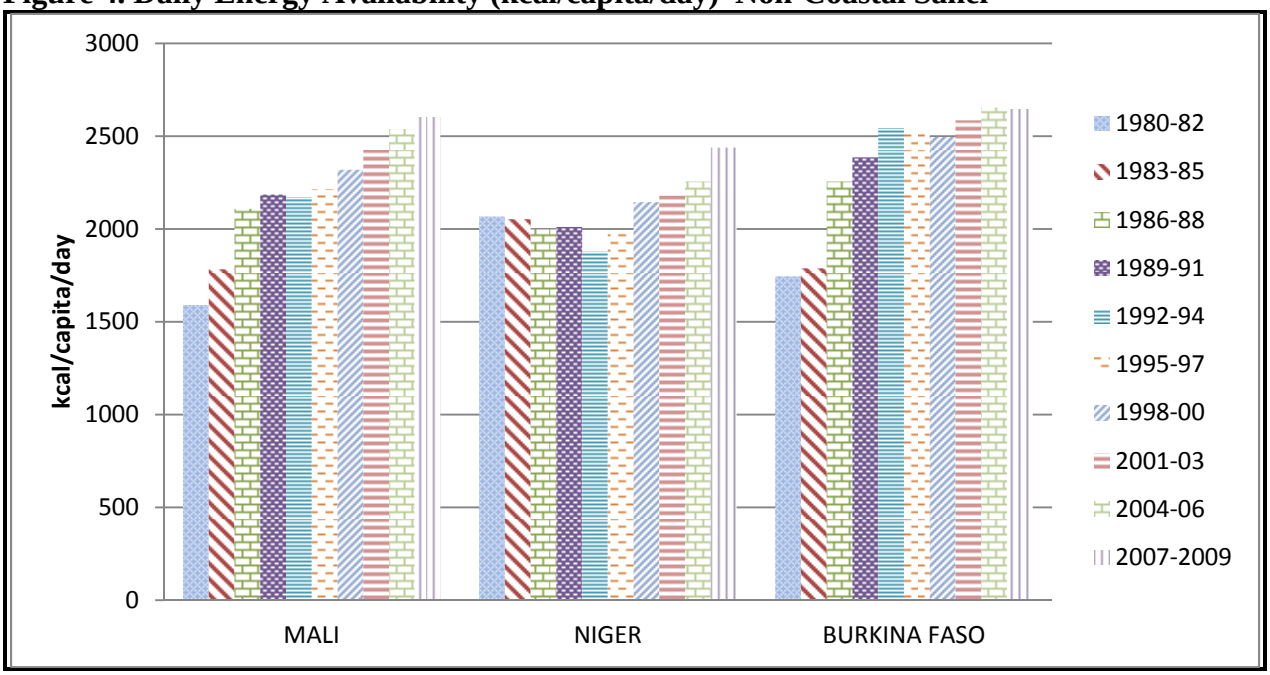
Unlike in the Coastal Non-Sahel, changes in reported per capita DEA have been less conspicuous in the Coastal Sahel. Generally, reported per capita DEA has been increasing for all countries in the Coastal Sahel sub-region since 2001-2003 (Figure 5).Contrary to other Coastal Sahelian countries, Senegal experienced declining trend in reported per capita DEA in early and mid-1980s. The drop in per capita DEA in the 1980s could be explained by the overall drop in GDP in Senegal during this same period, attributable to declining proceeds from groundnuts export sector, which fueled the economy of Senegal in the 1960s and 1970s but has been undergoing crisis since 1987. Per capita DEA dropped further in 1995-1997compared to the early 1990s. However, since the early 2000s, reported per capita DEA has been on the rise in Senegal. While per capita DEA has been growing in Senegal since 2001, the trend in the growth rate has not been steady. See Table 5 for the percentage growth in three-year averages of reported total per capita DEA. A similar pattern of change is noticeable with the growth rates in real per capita incomes (Table 3).

Table 4. Per Capita Daily Food Energy Availability–West Africa (Kcal/capita/day)

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	%change 1980-85 to 2004-09
Non-coastal Sahel											
Mali	1590	1783	2109	2186	2172	2215	2319	2436	2539	2604	53%
Niger	2067	2053	1998	2011	1878	1980	2145	2180	2256	2439	14%
Burkina Faso	1745	1788	2256	2386	2544	2530	2495	2585	2656	2647	50%
Coastal Sahel											
Cape Verde	2239	2412	2596	2357	2458	2360	2382	2381	2525	2631	11%
Gambia	1984	2214	2532	2486	2339	2245	2260	2268	2309	2501	15%
Guinea Bissau	2049	2176	2228	2245	2286	2211	2159	2211	2264	2421	11%
Senegal	2296	2281	2157	2187	2172	2137	2132	2164	2283	2432	3%
Coastal non-Sahel											
Benin	1937	1973	1990	2238	2254	2322	2361	2428	2481	2567	29%
Cote d'Ivoire	2846	2687	2581	2478	2423	2430	2447	2458	2498	2629	-7%
Guinea	2295	2297	2379	2403	2473	2444	2421	2431	2501	2628	12%
Ghana	1656	1825	2015	2052	2368	2483	2559	2664	2802	2909	64%
Liberia	2498	2412	2478	2297	2217	2167	2177	2062	2123	2243	-11%
Nigeria	1850	1756	1972	2192	2464	2532	2590	2555	2665	2741	50%
Sierra Leone	2068	1942	1962	1949	1975	2057	2002	2012	2097	2158	6%
Togo	1967	1879	1793	1921	1880	2013	2010	2054	2133	2297	15%

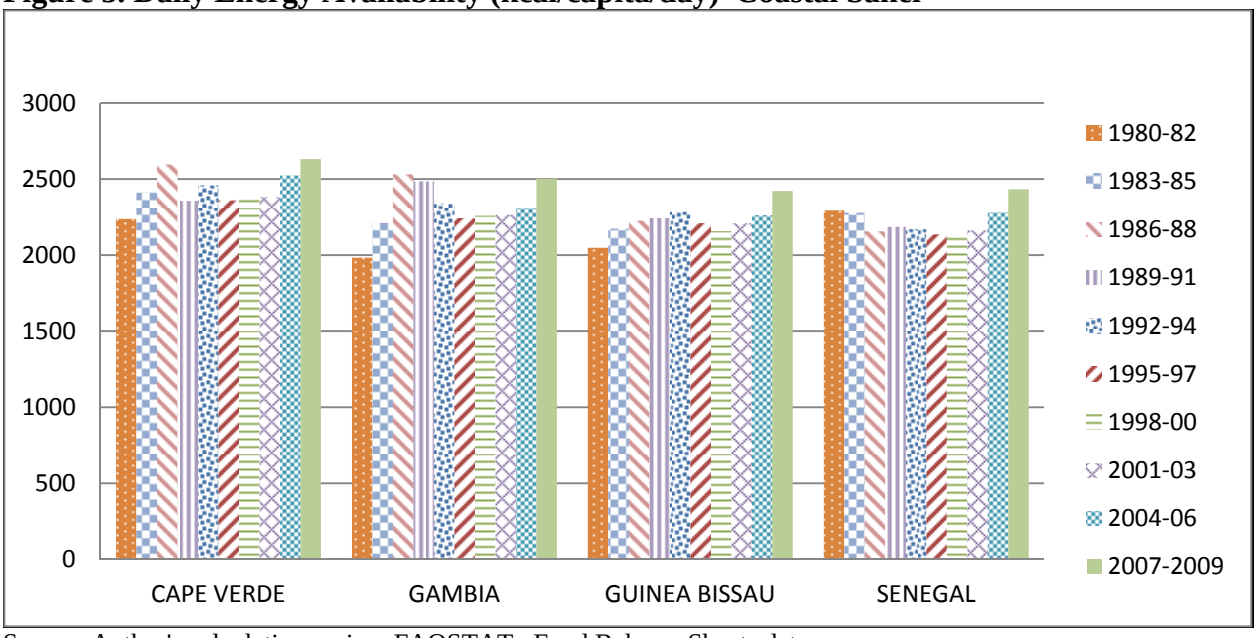
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 4. Daily Energy Availability (kcal/capita/day)–Non-Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

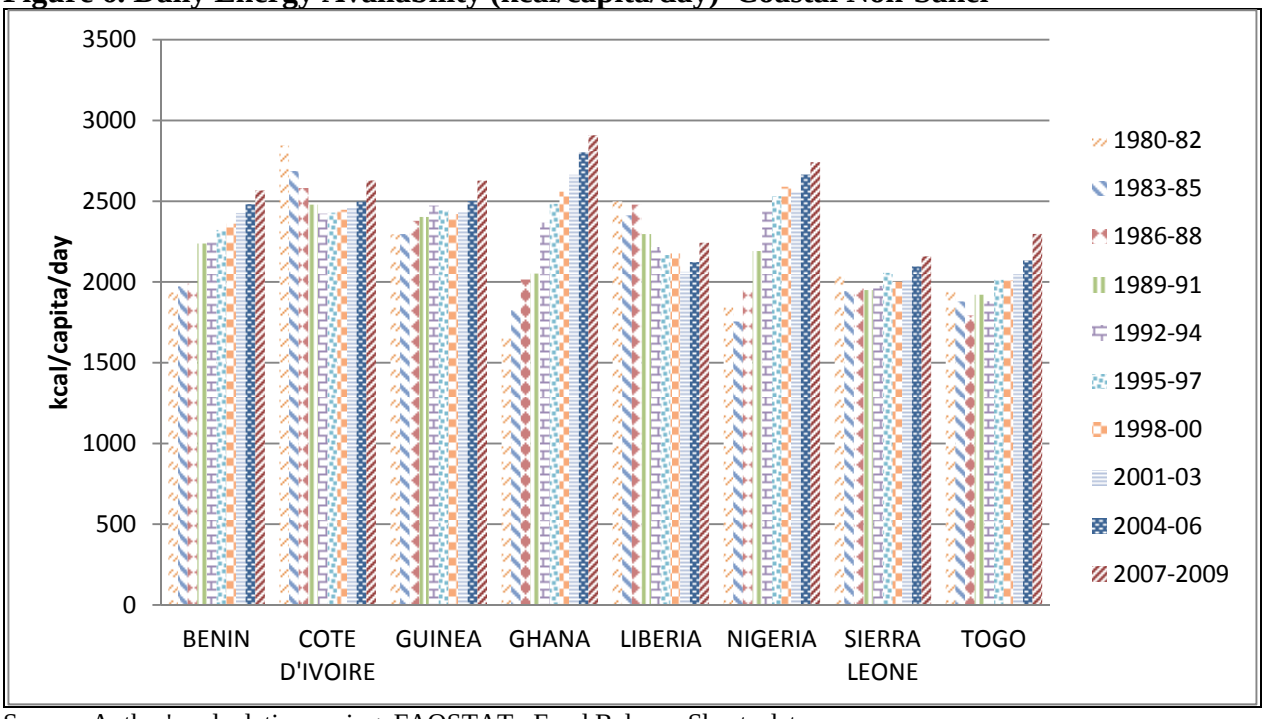
Figure 5. Daily Energy Availability (kcal/capita/day)–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

In the Coastal Non-Sahel region, reported per capita DEA increased dramatically in Ghana and Nigeria (Figure 6). Real per capita income has also been growing for Ghana since the late 1980s. The big positive growth in reported per capita DEA for Ghana is likely explainable by the strong and rapid economic growth experienced by Ghana since the late 1980s (Table 5). In Nigeria, the late 1980s to the early 1990s showed the largest positive growth in reported per capita DEA (Table 5). Until the early 1990s, Cote d'Ivoire was first in terms of per capita DEA in the Coastal Non-Sahel. The high reported per capita DEA during this period in Cote d'Ivoire is explainable by the economic growth enjoyed by Cote d'Ivoire in the 1970s and 1980s from a vibrant cocoa bean export market. Per capita DEA, however, stagnated between the period 1992-1994 and 2001-2003. In 2004-2006, per capita DEA began to rise again. In spite of the 2008 civil disruption in Cote d'Ivoire, reported per capita DEA in 2007-2009 increased compared to the average in 2004-2006. Reported per capita DEA stagnated in Liberia prior to 2003. This declining pattern in per capita DEA in Liberia reflects the debilitating effect of multiple civil wars that the country experienced in the 1990s and in the early 2000s. In 2004-2006, per capita DEA took a positive turn in Liberia. The growth in per capita DEA continued in the period 2007-2009. The positive trend in per capita DEA post 2003 reflects the end of the war in 2003 and a transition of Liberia into post–conflict reconstruction, and into medium-term growth and poverty reduction strategies[14].

Figure 6. Daily Energy Availability (kcal/capita/day)–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

[14] http://www.africaneconomicoutlook.org/en/countries/west-africa/liberia/

Table 5. Growth (%) Over Three-year Average Per Capita Energy Availability (kcal/capita/day)

	1983-85*	1986-88	1989-91	1992-94	1995-97	1998-00	2001-03	2004-06	2007-09
Non-coastal Sahel									
Mali	12	18	4	-1	2	5	5	4	3
Niger	-1	-3	1	-7	5	8	2	3	8
Burkina Faso	2	26	6	7	-1	-1	4	3	0
Coastal Sahel									
Cape Verde	8	8	-9	4	-4	1	0	6	4
Gambia	12	14	-2	-6	-4	1	0	2	8
Guinea Bissau	6	2	1	2	-3	-2	2	2	7
Senegal	-1	-5	1	-1	-2	0	2	5	7
Coastal Non-Sahel									
Benin	2	1	12	1	3	2	3	2	3
Cote D'Ivoire	-6	-4	-4	-2	0	1	0	2	5
Guinea	0	4	1	3	-1	-1	0	3	5
Ghana	10	10	2	15	5	3	4	5	4
Liberia	-3	3	-7	-3	-2	0	-5	3	6
Nigeria	-5	12	11	12	3	2	-1	4	3
Sierra Leone	-6	1	-1	1	4	-3	0	4	3
Togo	-4	-5	7	-2	7	0	2	4	8

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

The high per capita DEA experienced in Sierra Leone in the period 1980-1982 was immediately followed by a decline in the period 1983-1985 of about 6%. The decline in per capita DEA in 1989-1991 coincided with the beginning of civil war in Sierra Leone that lasted from 1991-2002. Since the period 2001-2003, reported per capita DEA has been on the rise in Sierra Leone. Also, since the early 2000s, per capita income has been increasing. Real per capita GDP in Sierra Leone in the period 2000-2005 increased by about 10% compared to the previous period. In 2005-2010, per capita GDP rose further by about 4% compared to 2000-2005. The positive trend in reported per capita DEA in Sierra Leone since the early 2000s is therefore likely explainable by the positive trend in per capita GDP and the end of the civil war in the same period. Reported per capita DEA increased steadily for Benin in the study period. For Togo, in spite of the fluctuations, the overall pattern has been towards an increase in per capita DEA.

The preceding analysis of the trend in per DEA reveals that although the overall pattern for all countries in the region has been a shift towards greater calorie consumption, the magnitude of growth has greatly varied and has been influenced by factors specific to each country. In Ghana, for instance, the strong economic performance in the past 15 years or so has been accompanied by a remarkable performance in terms of increasing per capita DEA. Nigeria has also been through the same story as Ghana–strong economic growth accompanied by remarkable positive changes in per capita DEA. Amongst the non-Coastal Sahelian countries, Mali and Burkina Faso with modest economic growth have also shown modest increases in per capita DEA over time. The analysis has not only highlighted the possible effect of growth in income on per capita DEA but has also highlighted the differences in the trend in per capita DEA in countries that have experienced civil disruption, like Liberia, Sierra Leone and Cote d'Ivoire. The relationship between the time of the civil disruption and movements in per capita DEA seem to be much stronger in Liberia than in Sierra Leone and Cote d'Ivoire.

2.2. Trends in the Composition of Food Supply

The analysis in this sub-section examines if, over time, there has been a diversification in the composition of food supply, whereby new food groups (e.g., starchy roots and tubers in the non-Coastal Sahelian countries) are emerging as important contributors to the reported per capita DEA. There are some differences in major food groups across sub-regions. However, the most popular or major food groups in this analysis are cereals (excluding beer), starchy roots and tubers, fruits (excluding wine), vegetables, vegetable oils, meats and offal, alcoholic beverages, oil crops, sugars and sweeteners, pulses, milk (excluding butter), and fish and seafood. Within each of these groups are a variety of commodities, such that the trend in a major food group, say *starchy roots and tubers*, may not exactly reflect what changes are taking place with respect to the supply of specific starchy roots and tubers types like cassava, potatoes, or yams. Hence, while the focus of this sub-section is on aggregate trends by major food groups, the next sub-section will examine trends in specific commodities within major staple food categories in the region.

2.2.1. Non-Coastal Sahel

A breakdown of food availability by major food groups (kg/capita/year) reveals cereals as a major food group in the Non-Coastal Sahel (Table 6). In Mali, apparent per capita availability increased by 44% for cereals, 729% for starchy R&T; 4% for vegetables; 71% for fruits; and 23% for meats, in the period 1980-85 through to 2004-2009.The supply of eggs per capita declined in Mali in the same period. As discussed above, unlike in the case of cereals that have been for a long time basic staples in the Non-Coastal Sahel and as such most fully reported in official production statistics, agricultural production statistics in underdeveloped low-income countries have been criticized for being deficient in the reporting of figures for crops like cassava, fruits and vegetables as well as livestock. Hence, this raises a question of the extent to which the apparent diversification (more starchy staples, more fruits and vegetables) of the diet over time shown by the FBS reflects real diversification versus just an improvement in the ability of national agricultural statistics to capture non-cereal production (e.g., roots, tubers and horticultural products).

In Burkina Faso reported per capita food supply increased by 55% for cereals; 85% for meats and offal; 71% for vegetable oils; 37% for pulses; 13% for alcoholic beverages; 100% for eggs; and 15% for fish and seafood, in the period 1980-1985 through to 2004-2009. Notwithstanding, egg supply is still below an average of 3 kg/capita/year, and fish and seafood supply below an average of 2 kg/capita/year. Reported per capita food availability declined by 56% for roots and tubers; by 38% for fruits; by 27% for vegetables; and by 29% for milk. In the non-Coastal Sahel region, per capita supply of alcoholic beverages is highest for Burkina Faso–and has generally remained above an average of 50 kg/capita/year.

In Niger, reported per capita cereals availability grew by only 3% during the study period. In contrast, reported per capita availability of pulses increased dramatically since the early 2000s–from 19 kg/capita/year in 2001-2003 to 44 kg/capita/year in 2007-09. Pulse availability per person increased by 44% in the period 1980-85 to 2004-09. Contrary to Mali, the reported per capita supply of starchy roots and tubers in Niger declined by about 57% during the study period. Niger experienced the largest positive changes in per capita availability of vegetables—from an average of 16 kg/capita/year in the period 1983-1985 to 51 kg/capita/year in 2007-2009 – an increase of 170% in the study period. Reported availability of fruits also rose from an average of 7 kg/capita/year in 1980-1985 to 13.5 in 2004-2009, representing an increase of about 93%. As was the case with Mali and Burkina Faso, the supply of meats and offal per capita has also been on the rise in Niger, albeit a much slower growth in the latter. Per capita meat and offal supply in Niger increased by 12% during the study period. A possible explanation for the higher supplies and higher rate of growth in the supply of meats and offal in Mali and Burkina compared to Niger is the higher per capita incomes in the former and economic stagnation in the latter. In contrast, in Niger, consumers appear to have relied more on pulses (particularly cowpeas) as a major, and lower-cost, source of protein in the diet.

Table 6. Food Availability by Major Food Group–Non-Coastal Sahel (kg/capita/year)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Burkina Faso											
Cereals - Excl. Beer	148	148	196	217	229	224	218	224	232	228	55%
Starchy R&T	17	17	15	7	7	6	6	6	7	8	-56%
Sugar and Sweeteners	4	4	4	4	4	5	4	5	5	5	25%
Pulses	10	9	12	12	13	11	12	12	13	13	37%
Oil crops	6	8	11	9	12	11	12	15	12	14	86%
Vegetable Oils	3	4	4	4	4	5	5	5	6	6	71%
Fruits Excl. wine	8	8	7	7	7	6	6	6	5	5	-38%
Vegetables-	21	23	22	24	23	21	19	17	17	15	-27%
Meat and offal	9	11	12	15	16	16	17	18	19	18	85%
Eggs	1	1	1	2	3	3	2	2	2	2	100%
Milk - Excl. Butter	26	22	23	16	16	17	18	16	17	17	-29%
Fish and Seafood	2	2	2	2	2	2	2	2	2	2	15%
Alcoholic Beverages	50	46	55	54	63	61	52	55	54	54	13%

Table 6. Continued. Food Availability by Major Food Group–Non-Coastal Sahel (kg/capita/year)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
				Mali							
Cereals	125	155	185	181	176	181	181	189	198	204	44%
Starchy R&T	4	3	3	5	8	9	13	18	26	32	729%
Sugar and Sweeteners	4	4	6	10	10	11	13	13	13	12	213%
Pulses	4	4	5	6	10	9	12	11	10	7	113%
Vegetable Oils	6	5	7	8	8	7	8	8	8	8	45%
Fruits - Excl. Wine	17	17	18	17	19	23	24	26	30	28	71%
Vegetables	46	49	51	54	51	53	52	52	47	52	4%
Meat and offal	20	19	20	21	18	18	19	21	23	25	23%
Eggs	1	1	1	1	1	1	1	1	0	0	-100%
Milk Excl. Butter	59	47	46	51	51	48	52	52	57	63	13%
Fish, Seafood	10	7	7	8	7	11	9	9	9	8	0%
Alcoholic Beverages	5	6	7	7	5	6	5	6	6	6	9%

Table 6. Continued. Food Availability by Major Food Group–Non-Coastal Sahel (kg/capita/year)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	%change 1980-85 to 2004-09
Niger											
Cereals Excl. Beer	197	201	199	211	200	200	200	202	200	209	3%
Starchy R&T	31	32	29	21	14	17	22	14	14	13	-57%
Sugar and Sweeteners	4	7	7	5	3	6	7	6	7	6	18%
Pulses	23	18	18	15	14	14	24	19	23	36	44%
Vegetable Oils	3	3	2	3	2	4	4	5	5	4	50%
Fruits - Excl. Wine	7	7	6	6	5	5	6	10	12	15	93%
Vegetables	21	16	16	30	34	41	49	54	49	51	170%
Meat and offal	27	22	19	20	21	21	23	25	27	28	12%
Eggs	1	1	1	1	1	1	0	0	0	0	-100%
Fish and Seafood	1	0	0	1	0	1	1	1	3	3	218%
Milk Excl. Butter	57	52	42	40	40	43	45	48	49	59	-1%
Alcoholic Beverages	2	1	1	1	0	1	1	0	0	1	-67%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.2.2. Coastal Non-Sahel

In the Coastal Non-Sahel sub-region, starchy roots and tubers compete with cereals as the most important calorie source. Per capita supply of cereals (kg/capita/year) has been on the rise for all countries in this sub-region. With the exception of Sierra Leone, all Coastal Non-Sahelian countries have had a starchy roots and tuber supply greater than 100 kg/capita/year since the 1980s. Data on three-year averages of reported per capita supply of major food groups in the sub-region are in Table 7.

Ghana has experienced one of the most noticeable growths in per capita supply of starchy roots and tubers. Starchy root and tuber supply in Ghana has been about double the supply of cereals. Reported per capita availability of starchy roots and tubers increased from an average of 216 kg/capita/year in 1980-1982 to 403 kg/capita/year in 2007-2009, representing an increase of about 72%. Overall, in the study period, the per capita cereals supply increased by about 57%. In 2007-2009, the per capita supply of cereals dropped by about 7% compared to the average in the period 2004-2006. This decline may have been compensated for by the corresponding increase in the supply of starchy roots and tubers in the same period. In the Coastal non-Sahel sub-region, Ghana is in second place to Guinea in the per capita supply of fruits. Per capita fruit supply increased dramatically in Ghana–from an average of 86 kg/capita/year in the period 1980-85 to 147 kg/capita/year in 2004-09--representing an increase of 72%. Reported vegetable supply per capita in Ghana remained below 35 kg/capita/year but grew by 79%; the supply of meats and offal increased by about 22% (the absolute supply remained below 15 kg/capita/year); per capita egg availability stuck around an average of 1kg/capita/year; milk supply rose by about 129%; vegetable oil supply increased by 55%, fish and seafood by 36%; and the supply of alcoholic beverages rose by about 26%, in the period 1980-85 to 2004-09.

In Nigeria, as was the case with Ghana, starchy root and tuber supply increased dramatically and has been almost double the reported per capita supply of cereals. After a period of sticking close to 100 kg/capita/year, the starchy root and tuber supply rose sharply from an average of 111kg/capita/year in 1986-1988 to 231kg/capita/year in 1992-1994. This period corresponds to the *cassava revolution* (characterized by increased cassava availability) in Nigeria (Nweke, Spencer, and Lynam 2002). Overall, in the entire study period, the per capita supply of starchy toots and tubers increased by 117%. Apparent per capita cereals consumption has also been increasing for Nigeria over time, reaching 145 kg/capita/year in 2007-09, an increase of about 43% in the study period. Per capita fruit supply fluctuated between an average of 59 and 66 kg/capita/year, and showed no overall trend in the study period. Unlike fruit supply, the apparent per capita consumption of vegetables in Nigeria increased by 55% in the study period. The supply of alcoholic beverages in Nigeria fluctuated between 59 and 75 kg/capita/year between 1980 and 2009, and dropped by about 4% in the study period. The supply of pulses per capita increased dramatically by 138%; vegetable oils supply per capita increased by 50%; per capita meats and offal supply declined by 12%; milk supply per capita dropped by 34%; fish and seafood declined by 10%; and egg supply increased by 34%, between 1980-85 and 2004-09.

With the exception of starchy roots and tubers (4% increase), sugars and sweeteners (8% increase), vegetable oils (22% increase) and eggs (33% increase), the per capita supply of all other major food groups declined in Liberia. In the period 1980-85 to 2004-09, the per capita supply of cereals decreased by 22%, that of fruits decreased by 16%, that of vegetables decreased by 27%, that of meats and offal decreased by 16%, that of milk decreased by 70%, that of fish and seafood decreased by 64%, and that of alcoholic beverage decreased by 27%.

Sierra Leone has exhibited very few changes in absolute terms with respect to the per capita supply of major food groups. Cereals supply remained between an average of 107 and 117 kg/capita/year and declined by 1% in the period 1980-85 and 2004-09. Relative to the supply of cereals, starchy root and tuber availability per capita has shown a noticeable positive trend, increasing from an average of 37 kg/capita/year in the period 1980-1985 to 71 kg/capita/year in the period 2004-09, an increase of about 95%. In the period1980-1985 through to 2004-09, per capita supply of fruit in Sierra Leone dropped by about 3%; that of vegetables increased by1%; that of fish and seafood grew by about 33%; that of pulses increased by 56%; that of eggs increased by 50%, that of meat and offal by 36%; that of oil crops by 167%; that of milk dropped by 60%; and that of alcoholic beverages increased by 6%.

In Guinea, the supply of cereals has been comparable to that of starchy roots and tubers. Cereals supply per capita increased by about 9% in the study period, while the per capita supply of starchy roots and tubers rose by about 8%. Fruit supply per capita in Guinea is the highest of all the Coastal non-Sahelian countries. Although it has shown some gradual decline over time (declining by 11% in the study period), it still remains above an average of 100 kg/capita/year. The supply of vegetables per capita in Guinea has declined much faster than that of fruits–by about 33% in the study period. In spite of this decline, vegetable supply in the 2000s has been between an average of 50 and 60 kg/capita/year. Per capita meat supply increased by about 90% during the study period, but remains below an average of 11 kg/capita/year.

With the exception of vegetable oil (which increased by 15%) and alcoholic beverages (increased by 7%), reported per capita supply of all other major food groups has been declining in Cote d'Ivoire. In the period 1980-85 through 2004-09, the per capita cereals supply decreased by 15%, that of starchy roots and tubers remained basically unchanged, that of meats and offal decreased by 26%, that of fruits decreased by 24%, that of vegetables decreased by 9%, that of fish and seafood decreased by 21%, and that of milk decreased by about 62%. The per capita egg supply was more or less stable.

In Benin, the supply of both starchy roots and tubers and cereals has been increasing over time. While cereals supply has remained close to 100 kg/capita/year, the supply of roots and tubers has been greater than 250 kg/capita/year in the last two decades. In the study period overall, cereals supply per capita grew by 24% as opposed to a 38% growth in the per capita supply of starchy R&T. In the period 1980-1985 through 2004-09, the per capita supply of vegetables grew by 28%; that of fruits declined by 6%; that of meats and offal grew by 17%; that of pulses increased by 123%; that of sugars and sweeteners by 400%; that of eggs declined by about 50%.

In Togo, reported per capita cereals supply increased from an average of 98 kg/capita/year in 1980-1982 to an average of 130 kg/capita/year in 2007-2009. In the period 1980-1985 through 2004-09, the per capita cereals supply grew by 27%; that of starchy roots and tubers declined by14%; that of vegetable oils increased by 126%; that of milk increased by 37%; that of meats and offal increased by 20%; that of vegetables increased by 14%; that of fruits declined by 32%; that of fish and seafood decreased by 29%; and that of alcoholic beverages decreased by about 52%.

Table 7. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Benin											
Cereals – Excl. Beer	93	92	97	109	107	108	108	108	114	115	24%
Starchy R&T	205	212	229	268	266	283	287	289	278	296	38%
Sugar and Sweeteners	0	2	3	4	6	7	6	6	4	6	400%
pulses	6	7	8	9	9	9	10	10	12	17	123%
Oil crops	7	7	7	8	8	9	9	10	9	8	21%
Vegetable Oils	9	9	6	6	5	5	7	8	9	7	-11%
Fruits Excl. wine	36	35	33	34	31	32	29	30	30	37	-6%
Vegetables-	37	38	42	43	46	49	54	49	48	48	28%
Meat and offal	13	16	13	11	13	12	14	17	14	20	17%
Eggs	2	2	2	1	1	1	1	1	1	1	-50%
Milk – Excl. Butter	8	8	8	6	6	8	12	11	10	8	13%
Fish and Seafood	12	10	11	9	10	10	8	9	9	8	-23%
Alcoholic Beverages	14	12	12	12	11	12	11	12	14	15	12%

Table 7. Continued. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Cote d'Ivoire											
Cereals – Excl. Beer	116	111	105	99	98	96	89	90	92	102	-15%
Starchy R&T	314	295	282	274	268	269	286	281	287	309	-2%
Sugar and Sweeteners	10	10	11	10	10	9	8	9	10	9	-5%
Oil crops	5	4	4	4	4	4	5	5	4	4	-11%
Vegetable Oils	10	10	9	10	10	11	12	13	12	11	15%
Fruits Excl. wine	106	92	87	83	88	91	90	74	75	76	-24%
Vegetables-	40	39	37	43	41	39	34	39	37	35	-9%
Meat and offal	22	21	20	20	17	14	13	14	16	16	-26%
Eggs	1	1	1	1	1	1	2	2	1	1	0%
Milk – Excl. Butter	21	18	21	14	13	9	7	7	8	7	-62%
Fish and Seafood	18	16	20	18	14	13	14	14	14	13	-21%
Alcoholic Beverages	44	40	36	33	31	35	34	40	44	46	7%

Table 7. Continued. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Guinea											
Cereals – Excl. Beer	118	123	135	131	129	127	125	126	126	136	9%
Starchy R&T	119	112	111	115	114	113	117	116	123	126	8%
Sugar and Sweeteners	5	8	10	9	10	11	12	11	12	13	92%
Pulses	7	7	8	8	8	7	7	6	6	6	-14%
Oil crops	4	4	3	3	4	4	4	5	6	6	50%
Vegetable Oils	12	11	10	10	13	13	13	13	15	15	30%
Fruits Excl. wine	117	116	114	117	119	110	104	106	103	104	-11%
Vegetables	82	77	73	68	65	60	57	55	55	51	-33%
Meat and offal	5	5	4	5	6	7	7	8	9	10	90%
Eggs	1	1	1	1	1	1	1	2	2	2	100%
Milk – Excl. Butter	10	12	11	10	12	12	13	12	13	14	23%
Fish and Seafood	7	8	8	9	11	11	12	13	11	10	40%
Alcoholic Beverages	1	1	1	2	2	1	2	2	2	2	100%

Table 7. Continued. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Ghana											
Cereals – Excl. Beer	56	63	67	75	92	83	83	91	97	90	57%
Starchy R&T	216	239	273	283	331	396	402	404	381	403	72%
Sugar and Sweeteners	2	2	6	6	7	5	6	7	10	11	425%
Oil crops	22	17	13	11	11	12	13	13	13	13	-33%
Vegetable Oils	5	6	7	7	7	5	6	6	8	9	55%
Fruits Excl. wine	79	92	83	69	82	106	111	117	136	158	72%
Vegetables	20	18	23	25	24	31	34	31	34	34	79%
Meat and offal	11	12	11	11	11	10	10	11	13	15	22%
Eggs	1	0	0	1	1	1	1	1	1	1	100%
Milk – Excl. Butter	2	5	4	4	3	2	5	7	8	8	129%
Fish and Seafood	21	21	26	25	24	28	31	25	28	29	36%
Alcoholic Beverages	18	17	18	18	24	25	22	20	21	23	26%

Table 7. Continued. Food Availability by Major Food Group-Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Liberia											
Cereals - Excl. Beer	132	126	123	112	91	98	97	86	93	107	-22%
Starchy R&T	173	140	190	179	156	132	160	178	166	161	4%
Sugar and Sweeteners	5	7	7	5	5	5	5	5	6	7	8%
Oil crops	5	5	5	5	6	5	4	4	4	3	-30%
Vegetable Oils	12	15	12	12	18	19	17	16	17	16	22%
Fruits Excl. wine	57	55	48	48	56	62	53	51	48	46	-16%
Vegetables	31	33	34	32	35	34	27	23	23	24	-27%
Meat and offal	13	12	13	10	12	11	10	9	10	11	-16%
Eggs	1	2	2	2	2	2	2	1	2	2	33%
Milk - Excl. Butter	10	13	8	4	3	3	3	2	4	3	-70%
Fish and Seafood	13	15	15	10	6	6	6	4	5	5	-64%
Alcoholic Beverages	11	11	11	9	10	10	8	7	8	8	-27%

Table 7. Continued. Food Availability by Major Food Group-Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Nigeria											
Cereals - Excl. Beer	97	103	123	124	133	137	137	133	141	145	43%
Starchy R&T	107	95	111	166	231	235	238	210	215	223	117%
Sugar and Sweeteners	11	8	6	5	6	7	8	10	10	10	5%
Pulses	4	4	5	8	8	9	10	9	9	10	138%
Oil crops	5	4	4	5	5	6	7	7	8	8	78%
Vegetable Oils	11	9	10	12	14	13	13	14	15	15	50%
Fruits Excl. wine	61	62	58	61	66	64	65	63	62	59	-2%
Vegetables	38	39	41	44	47	52	57	57	60	59	55%
Meat and offal	11	11	9	8	8	9	9	10	9	10	-12%
Eggs	3	3	3	3	4	3	3	3	3	4	34%
Milk - Excl. Butter	15	9	5	6	6	6	5	7	8	8	-34%
Fish and Seafood	16	9	7	10	6	7	7	9	9	13	-10%
Alcoholic Beverages	75	67	65	60	59	62	69	68	69	67	-4%

Table 7. Continued. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Sierra Leone											
Cereals - Excl. Beer	117	111	113	115	112	107	114	112	110	116	-1%
Starchy R&T	37	36	34	34	45	79	69	71	68	74	95%
Sugar and Sweeteners	7	6	5	5	5	4	5	5	6	7	0%
Pulses	8	8	8	8	8	9	11	12	13	12	56%
Oil crops	3	3	5	4	5	7	5	6	9	7	167%
Vegetable Oils	18	16	17	16	16	16	13	12	13	14	-21%
Fruits Excl. wine	36	37	37	36	36	36	36	36	35	36	-3%
Vegetables	46	47	45	43	44	44	42	46	47	47	1%
Meat and offal	6	5	5	6	6	6	6	7	7	8	36%
Eggs	1	1	1	1	1	2	2	2	1	2	50%
Milk - Excl. Butter	16	9	9	8	8	5	3	4	5	5	-60%
Fish and Seafood	22	17	14	14	14	14	15	18	27	25	33%
Alcoholic Beverages	46	48	46	44	43	44	44	50	49	51	6%

Table 7. Continued. Food Availability by Major Food Group–Coastal Non-Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Togo											
Cereals - Excl. Beer	98	102	100	111	112	116	115	119	123	130	27%
Starchy R&T	243	200	177	187	178	188	202	187	185	198	-14%
Sugar and Sweeteners	8	9	7	5	2	3	4	4	6	8	-19%
Pulses	8	8	7	5	7	9	8	8	8	10	15%
oil crops	6	5	4	5	6	5	5	7	7	7	24%
Vegetable Oils	4	4	5	7	6	8	7	8	9	9	126%
Fruits Excl. wine	13	12	12	11	10	9	9	8	8	9	-32%
Vegetables	23	25	30	39	37	31	25	25	26	29	14%
Meat and offal	8	9	11	9	8	7	8	9	9	11	20%
Eggs	0	1	1	1	1	1	1	1	1	1	85%
Milk - Excl. Butter	4	4	4	5	4	5	3	4	6	5	37%
Fish and Seafood	11	10	12	12	11	14	10	7	7	7	-29%
Alcoholic Beverages	28	24	25	18	14	13	10	10	11	14	-52%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.2.3. Coastal Sahel

Table 8 contains data on food supply in the Coastal Sahel by major food group. In the Coastal Sahel, cereals are still the most important food group. Other major food groups in this region are fruits and vegetables, meats and offal, milk, sugars and sweeteners, fish and seafood.

Although cereals are a major component of food availability in this sub-region, over time, per capita cereals supply did not change very much. In Cape Verde, cereals supply per capita, although it remained above an average of 120 kg/capita/year, declined by 20% between 1980-85 and 2004-09. Compared to the Coastal non-Sahel region, the supply of starchy roots and tubers are much lower in the Coastal Sahel region. In Cape Verde, starchy root and tuber supply per capita increased by 69% in the study period. The specific composition of this growth in the supply of starchy roots and tubers will be investigated in the next sub-section. In Cape Verde, in the period 1980-85 to 2004-09, the per capita supply of fruit increased by 106%; that of vegetables increased by 777%; that of meats and offal increased by 332%; that of milk supply also increased by 69%; that of eggs increased by 300%; that of sugars and sweeteners increased by 69%; that of pulses decreased by 27%; that of fish and seafood declined by 59%; and that of alcoholic beverages increased by 200%.

Senegal experienced dramatic changes (especially in the 2000s) in starchy root and tuber supply—from an average of 8kg/capita in 1980-1982 to 29 kg/capita/year in 2007-2009, and increase of 247%. The supply of vegetables in Senegal has also shown major positive changes. Vegetable supply increased from an average of 17 kg/capita/year in 1980-1982 to 64 kg/capita/year in 2007-2009. The overall increase in vegetable supply in the study period was 269%. Fruit supply for Senegal remained at less than 20 kg/capita/year, and increased by 29% during the study period. The supply of meats and offal did not change much in Senegal in the period 1980-2009. Comparing average supply of meats and offal in the period 2004-09 to that in 1980-85, there was an increase of 23% per capita. Fish and seafood supply was generally highest per capita for Senegal in this sub-region and increased by 16%, while milk supply per capita decreased by 24% between 1980-85 and 2004-09.

With the exception of cereals, starchy roots and tubers, alcoholic beverages and fruits, the supply of all other major food groups remained below 20 kg/capita/year in Guinea Bissau. In the period 1980-85 through 2004-09, per capita supply of cereals grew by 2%; that of starchy roots and tubers grew by 50%; that of vegetables increased by 47%; that of fruit declined by 32%; that of meats and offal increased by 7%; that of milk dropped by 6%; and that of alcoholic beverages dropped by 11%. Compared to other Coastal Sahelian countries, fish and seafood supply in Guinea Bissau remained very low (less than 5 kg/capita/year). In spite of the increasing trend in the 1980s and 1990s, since the early 2000s fish and seafood supply in Guinea Bissau has been decreasing.

Food supply per capita in the Gambia has not shown any striking changes over time. Cereals constitute the major food group in the Gambia. Cereals supply was greater than 135 kg/capita/year and increased by 6% between 1980-85 and 2004-09. Meats and offal supply in the Gambia was between an average of 6-11 kg/capita/year, and it declined by 10% in the study period. The supply of vegetables per capita in the Gambia grew by 187% between 1980-85 and 2004-09, while fruit supply per capita did not change in the same period. In the Coastal Sahel region, the Gambia is second place to Senegal in terms of the supply of fish and seafood, and the supply of fish and seafood per person grew by about 58% in the study period. The supply of alcoholic beverages per person almost doubled in the study period.

Table 8. Food Availability by Major Food Group–Coastal Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Cape Verde											
Cereals –Excl. Beer	152	160	152	137	140	124	128	123	125	126	-20%
Starchy R& T	33	22	57	51	33	33	38	42	45	48	69%
Sugar and Sweeteners	13	16	16	17	19	20	22	26	25	23	66%
Pulses	12	14	27	16	6	8	9	8	8	11	-27%
Oil crops	17	15	11	9	7	7	7	8	7	7	-56%
Vegetable Oils	6	8	10	8	13	13	8	8	9	8	21%
Fruits Excl. wine	32	30	31	33	44	49	44	44	53	75	106%
Vegetables	5	8	20	24	26	33	43	46	53	61	777%
Meat and offal	9	10	14	16	26	22	26	30	37	45	332%
Eggs	1	1	1	1	4	5	5	4	4	4	300%
Milk –Excl. Butter	65	72	65	59	80	83	82	87	107	124	69%
Fish and Seafood	34	29	15	17	14	18	20	19	14	12	-59%
Alcoholic Beverages	12	14	17	17	24	24	30	33	38	40	200%

Table 8. Continued. Food Availability by Major Food Group–Coastal Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Gambia											
Cereals - Excl. Beer	145	153	170	160	145	140	137	141	140	175	6%
Starchy R& T	9	9	8	8	8	6	9	10	11	9	11%
Sugar and Sweeteners	20	30	48	48	37	36	32	26	28	28	12%
Oil crops	5	7	7	7	7	7	8	7	6	6	0%
Vegetable Oils	10	10	10	12	16	14	17	18	18	15	65%
Fruits Excl. wine	5	5	4	4	3	4	5	5	4	6	0%
Vegetables	12	11	20	29	35	27	31	27	34	32	187%
Meat and offal	11	10	10	10	8	7	7	6	10	9	-10%
Eggs	1	1	1	1	1	1	1	1	2	2	100%
Milk - Excl. Butter	25	34	28	16	18	17	24	28	24	30	-8%
Fish and Seafood	16	17	16	22	18	24	23	29	24	28	58%
Alcoholic Beverages	16	20	28	23	22	21	31	33	35	35	94%

Table 8. Continued. Food Availability by Major Food Group–Coastal Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Guinea Bissau											
Cereals - Excl. Beer	139	146	140	143	148	140	138	145	146	145	2%
Starchy R& T	46	50	68	63	59	64	71	69	69	75	50%
Sugar and Sweeteners	3	3	2	3	2	4	4	6	12	7	217%
Oil crops	4	3	4	4	4	4	4	3	4	11	114%
Vegetable Oils	9	11	12	11	13	11	11	12	12	16	40%
Fruits Excl. wine	43	44	48	51	52	50	48	46	44	15	-32%
Vegetables	20	18	17	17	17	18	17	16	16	40	47%
Meat and offal	15	15	15	15	16	16	16	16	15	17	7%
Eggs	0	0	0	0	0	1	1	1	1	1	-
Milk - Excl. Butter	16	17	21	20	21	17	15	15	15	16	-6%
Fish and Seafood	3	2	4	4	5	5	4	2	2	1	-40%
Alcoholic Beverages	31	31	26	24	25	23	20	21	29	26	-11%

Table 8. Continued. Food Availability by Major Food Group–Coastal Sahel (kg/capita)

Food Group	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Senegal											
Cereals - Excl. Beer	177	180	175	179	157	154	150	154	163	167	-8%
Starchy R& T	8	7	11	9	9	7	13	18	23	29	247%
Sugar and Sweeteners	16	14	11	15	15	18	14	14	13	15	-7%
Oil crops	11	7	9	7	6	5	4	5	6	5	-39%
Vegetable Oils	11	12	7	9	15	15	15	15	14	16	30%
Fruits Excl. wine	12	12	13	13	13	14	13	15	14	17	29%
Vegetables	17	16	20	27	27	43	47	53	56	64	264%
Meat and offal	13	13	15	14	14	13	13	14	15	17	23%
Eggs	1	1	1	1	1	1	1	2	2	2	100%
Milk - Excl. Butter	36	44	43	39	42	29	27	23	29	32	-24%
Fish and Seafood	23	21	24	26	34	31	30	28	27	24	16%
Alcoholic Beverages	5	4	4	4	4	4	4	4	4	3	-22%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Overall, in the Coastal Sahel region, the growth in the supply of starchy roots and tubers has been very noticeable for Cape Verde and Senegal. Per capita vegetable supply has also shown large increases in this sub-region–with the growth rate ranging from 47% in Guinea Bissau to 777% in Cape Verde. The specific composition of these changes is not known. For starchy staples, the changing composition will be investigated in the following sub section.

2.3. Trends in the Availability of Major Starchy Staple Types

The preceding sub-section examined trends in food availability by major food groups. While such an analysis is important for presenting the big picture of what is happening in terms of food supply, just ending there would conceal changes that have taken place with respect to the supply of specific commodity types. Such information is very pertinent in understanding the dynamics of food supply in the region, and in particular in hypothesizing about possible reasons for any shifts in food supply. For instance, increased supply per capita of starchy roots and tubers could reflect two very different phenomena: (a) the poor shifting towards cheaper sources of calories, such as cassava and sweet potatoes, and (b) the middle class diversifying to a more European diet (potatoes—especially French fries). Decomposing major starchy staple food groups into specific commodity types will, therefore, permit us to understand the nature of the diversification–the trend in the relative importance of each starchy staple type in the diet, as well as advance possible reasons for the shift. Also, with the rising share of urban population and growth in per capita incomes, it is worth investigating the trend in the mix of cereals supply and to see descriptively, for example, whether the expected shift to rice (due to urbanization) from coarse grains (e.g., millet and sorghum) is reflected in aggregate cereals supply trends. As a result, this sub-section examines in a disaggregated manner the trends in the supply of major starchy staple commodity types.

2.3.1. Non-Coastal Sahel

Table 9 shows the trends in the supply of major starchy staple types in the Non-Coastal Sahel region. In the 1980s and 1990s, millet and sorghum were the most important cereals in Mali in terms of quantities supplied. In more recent years (i.e., 2000s), while millet continues to be first in terms of quantity supplied, the per capita supply of sorghum has declined and rice has taken over sorghum as the second most important cereal in Mali. This is not surprising because of Mali's efforts towards self-sufficiency in rice supply–rice production in Mali in the 2000s has more than doubled its level in the 1990s and the supply of rice for food has shown dramatic increases in the 2000s.

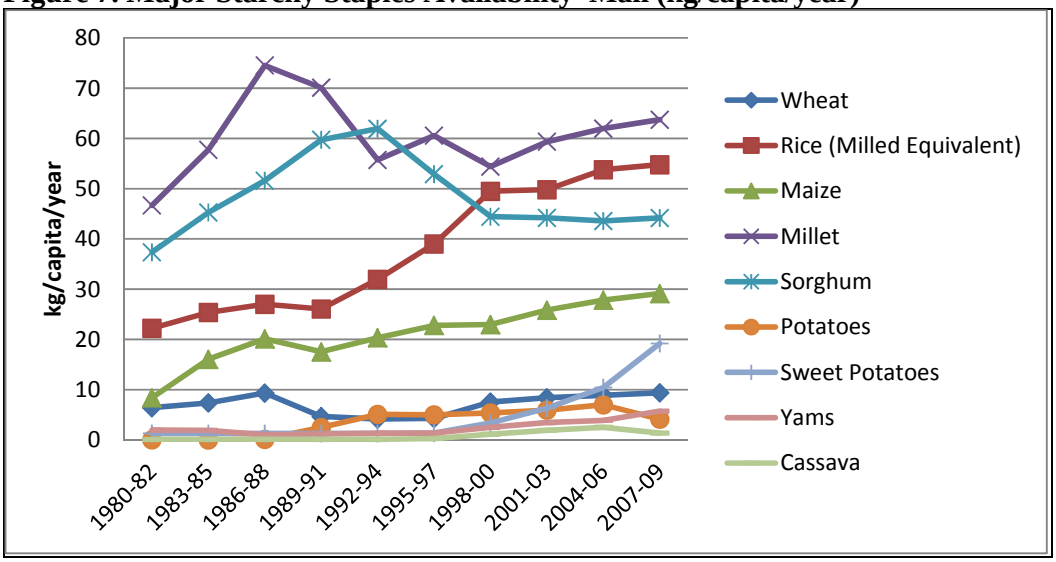
In the period 1980-85 through to 2004-09 in Mali, the biggest growth in the per capita availability of starchy staples was seen with rice, with an absolute increase in per capita apparent consumption of 31 kg/year. The second largest absolute increase in per capita apparent consumption was experienced with maize (16.5 kg/year); and the third largest with sweet potatoes (13.5kg/year). The growth in sweet potato availability may reflect the poor shifting to cheaper sources of calories. The absolute increases over the entire period in per capita apparent consumption of millet and Irish potatoes were 10.5 kg/year and 5.5 kg/year respectively, while that of wheat, sorghum, cassava and yams were generally below 5 kg/year. Thus, from this breakdown in the supply of major starchy staple types in Mali, it is clear that the recent growth in the supply of the starchy root and tuber food group seen in the previous sub-section is mostly driven by increases in the supply of sweet potatoes and to a lesser extent yams and Irish potatoes. Figure 7 illustrates the trends in the availability (kg/capita/year) of major starchy staples in Mali.

Table 9. Starchy Staples Availability (kg/ capita/year)–Non-Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Burkina Faso										
Wheat	4	4	4	3	5	7	7	3	7	7
Rice (Milled)	7	14	13	13	15	21	21	20	19	18
Maize	16	15	20	34	28	30	35	39	45	49
Millet	49	49	69	78	76	65	70	70	72	65
Sorghum	71	66	89	87	104	99	82	89	88	87
Cassava	4	3	1	0	0	0	0	0	0	0
Sweet Potatoes	4	3	3	2	1	1	2	3	4	4
Yams	10	10	11	4	5	4	4	3	3	3
Mali										
Wheat	6	7	9	5	4	4	8	8	9	9
Rice (Milled)	22	25	27	26	32	39	50	50	54	55
Maize	8	16	20	18	20	23	23	26	28	29
Millet	47	58	75	70	56	61	54	59	62	64
Sorghum	37	45	52	60	62	53	44	44	44	44
Potatoes	0	0	0	2	5	5	5	6	7	4
Sweet potatoes	1	1	1	1	1	1	3	6	10	19
Cassava	0	0	0	0	0	0	1	2	3	1
Yams	2	2	1	1	1	1	3	3	4	6
Niger										
Wheat	6	7	6	8	7	4	5	6	5	5
Rice (Milled)	8	11	10	10	9	10	12	18	20	11
Maize	2	3	2	1	1	3	6	4	4	2
Millet	136	142	140	155	149	147	145	141	130	148
Sorghum	44	38	40	37	35	35	30	33	39	42
Cassava	28	25	24	16	9	13	16	10	9	8
Sweet Potatoes	3	7	5	4	4	4	4	3	3	3

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

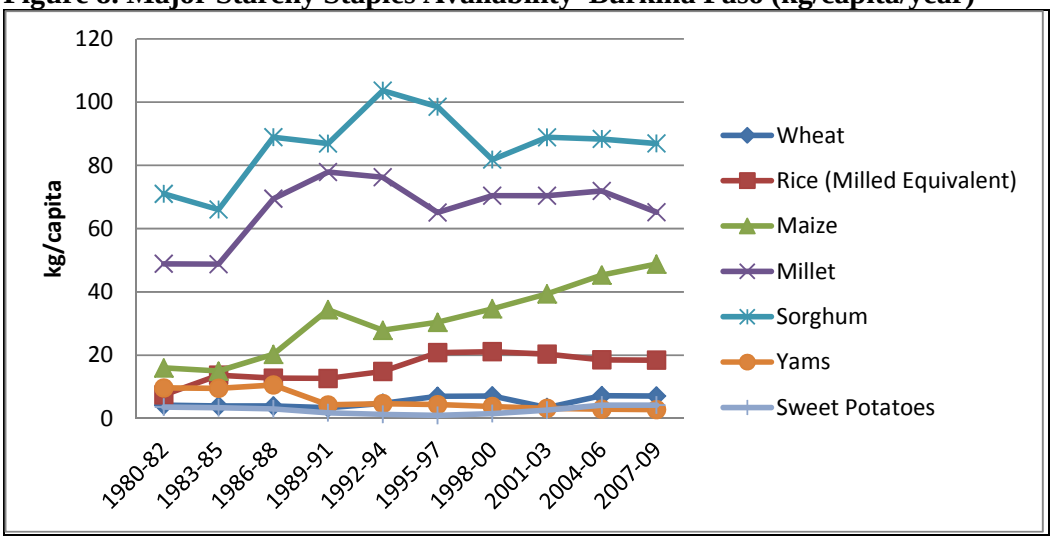
Figure 7. Major Starchy Staples Availability–Mali (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

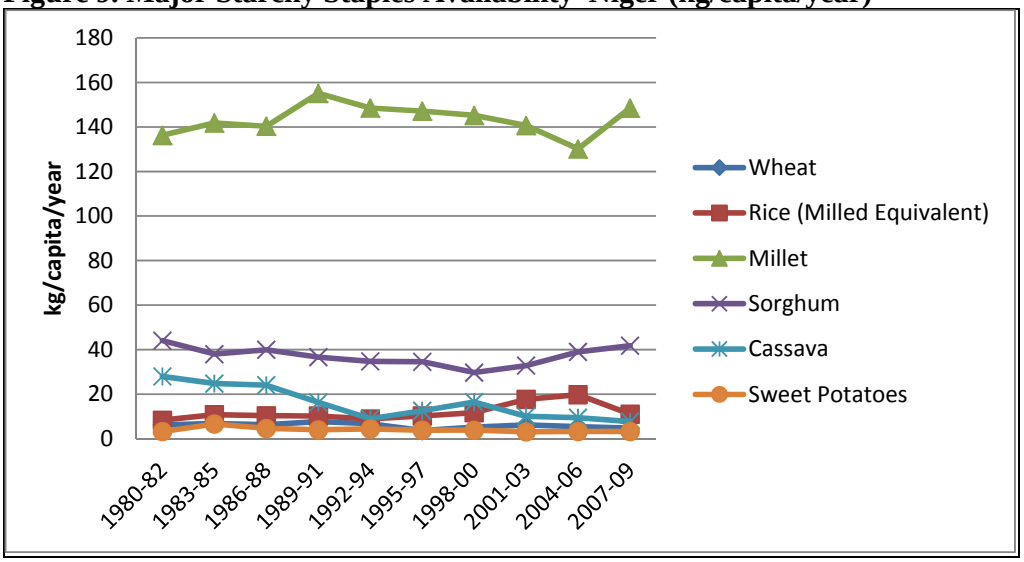
Burkina Faso has the largest supply per capita of sorghum in the Non-Coastal Sahel region. In contrast to Mali, in the period 1980-85 through 2004-09, absolute increases in apparent per capita consumption were largest for maize in Burkina Faso–31.5 kg/year. Millet and sorghum tied in second place in terms of increases (about 19 kg/year); while rice was in third place (8 kg/year). There was an absolute decrease in apparent per capita consumption of yams of 7 kg/year. Apparent per capita consumption of wheat increased by 3 kg/year, that of sweet potatoes increased by 0.5 kg/year, while that of cassava decreased by 3.2 kg/year in the period 1980-85 through 2004-09. Figure 8 shows the trends in the availability of major starchy staples (kg/capita/year) in Burkina Faso.

Figure 8. Major Starchy Staples Availability–Burkina Faso (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 9. Major Starchy Staples Availability–Niger (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Unlike the case of Mali, the apparent per capita supply of major starchy staples in Niger has shown very little change over time. With the exception of millet (which did not change), rice (which increased by 6 kg/capita/year), and maize (which increased by 0.85 kg/year), there was an absolute decrease in apparent per capita consumption of all major starchy staple types in Niger. The decrease was largest for cassava (18%). This stagnating trend in per capita food supply most likely reflects the impact of economic stagnation in the Sahel. Millet remains the dominant cereal in Niger–averaging above 130 kg/capita/year. In 2007-2009 apparent per capita rice supply dropped to 11 kg/capita/year, reflecting a decline of about 45% compared to previous period. This probably reflected a reduction in imports in response to the very high price of rice during this period. Figure 9 shows the trends in the availability (kg/capita/year) of major starchy staple types in Niger.

2.3.2. Coastal Sahel

Table 10 shows the trends in the supply of major starchy staple types in the Coastal Sahel region. In Cape Verde, maize dominated as the major starchy staple in the 1980s and the 1990s. However, the per capita supply of maize has drastically reduced over time, while that of rice has been increasing, with rice becoming the dominant starchy staple type in Cape Verde since the mid-2000s. In the period 1980-85 through to 2004-2009, there was an absolute increase in apparent per capita rice supply of 60 kg/year, while that of maize declined by 30.5 kg/year. An increase in rice supply implies increases in imports because most of it is imported. Per capita apparent consumption of wheat declined by 2.5 kg/year during the study period. Also very noticeable in Cape Verde is the fast growth in the supply of Irish potatoes. The apparent per capita supply of Irish potatoes rose from an average of 11 kg/capita/year in the period 1980-1985 to an average of 29 kg/capita/year in 2004-2009, an absolute increase of 18 kg/year. Unlike cassava, Irish potatoes may have a high income-elasticity of demand. As a result, the growth in the supply of Irish potatoes in Cape Verde could be the result of the rapid economic growth experienced in the last 20 years (Table 3).

Table 10. Starchy Staples Availability (kg/capita)–Coastal Sahel

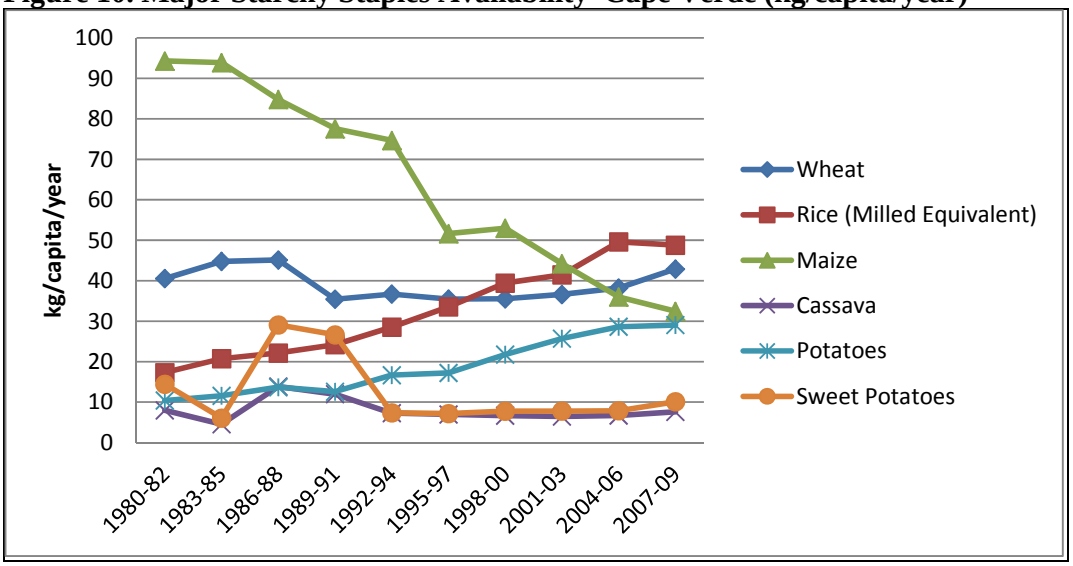
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Cape Verde										
Wheat	41	45	45	35	37	35	36	37	38	43
Rice (Milled)	17	21	22	24	29	34	39	41	50	49
Maize	94	94	85	78	75	52	53	44	36	32
Cassava	8	5	14	12	7	7	7	6	7	8
Potatoes	10	12	14	13	17	17	22	26	29	29
Sweet potatoes	14	6	29	27	7	7	8	8	8	10
Gambia										
Wheat	15	14	15	14	14	13	17	20	19	29
Rice (Milled)	79	86	86	87	71	74	47	40	40	58
Maize	8	11	12	10	12	6	5	8	7	15
Millet	26	34	48	40	38	36	52	56	57	58
Sorghum	14	9	9	9	9	8	12	16	15	15
Cassava	9	8	7	6	6	5	5	5	5	5
Potatoes	0	1	1	1	3	1	4	5	5	4

Table 10. Continued. Starchy Staples Availability (kg/capita)–Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Guinea Bissau										
Wheat	7	5	7	5	5	6	7	13	13	13
Rice (Milled)	74	90	92	103	108	100	95	95	79	91
Maize	18	10	9	10	9	9	15	16	22	14
Millet	13	14	15	13	15	12	10	11	19	17
Sorghum	21	21	15	10	9	11	10	7	11	9
Cassava	0	5	21	16	13	19	25	26	26	27
Other roots	46	45	46	46	46	45	45	43	42	49
Senegal										
Wheat	20	19	19	25	23	23	25	28	30	33
Rice (Milled)	68	66	60	64	57	62	69	69	69	74
Maize	13	16	17	16	14	11	9	11	27	28
Millet	54	54	62	60	51	47	36	34	28	25
Sorghum	21	24	16	15	12	11	11	12	9	8
Cassava	4	3	8	6	6	4	9	12	16	19
Potatoes	2	3	3	3	3	2	3	3	5	6
Sweet Potatoes	1	1	1	0	0	0	1	3	2	3

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 10. Major Starchy Staples Availability–Cape Verde (kg/capita/year)



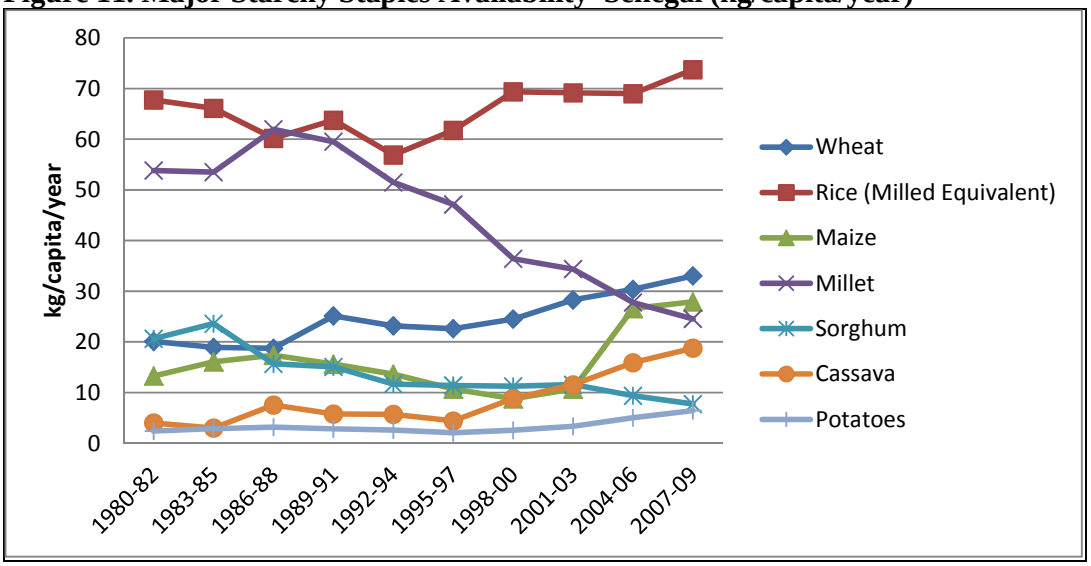
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Another possible explanation for the growth in the supply of Irish potatoes in Cape Verde is changes in lifestyle–i.e., growth in the consumption of more potatoes chips (French fries) as people adopt a more Western diet. Figure 10 is a graph of the trends in the supply of major starchy staple types in Cape Verde.

In Senegal, rice was the dominant starchy staple type (greater than 55 kg/capita/year) throughout the study period, however, apparent per capita rice consumption increased by just 4.5 kg/year over the 30-year period The largest absolute increases in apparent per capita consumption of starchy staples in Senegal in the period 1980-85 through to 2004-09 were for cassava (14kg/year), maize (13 kg/year), and wheat (12 kg/year). Increases in wheat supply imply an increase in imports since most of it is imported. The apparent per capita consumption of Irish potatoes increased by 3 kg/year, and that of sweet potatoes by 1.7 kg/year. While the growth in the supply of Irish potatoes could be the result of the westernization of diets, the rapid growth in the supply of cassava and to a lesser extent sweet potato may represent a shift of the poor to cheaper sources of calories. Millet and sorghum experienced an absolute decrease in per capita apparent consumption of 27.5 kg/year and 14 kg/year respectively. Figure 11 shows the trends in the supply of major starchy staple types in Senegal.

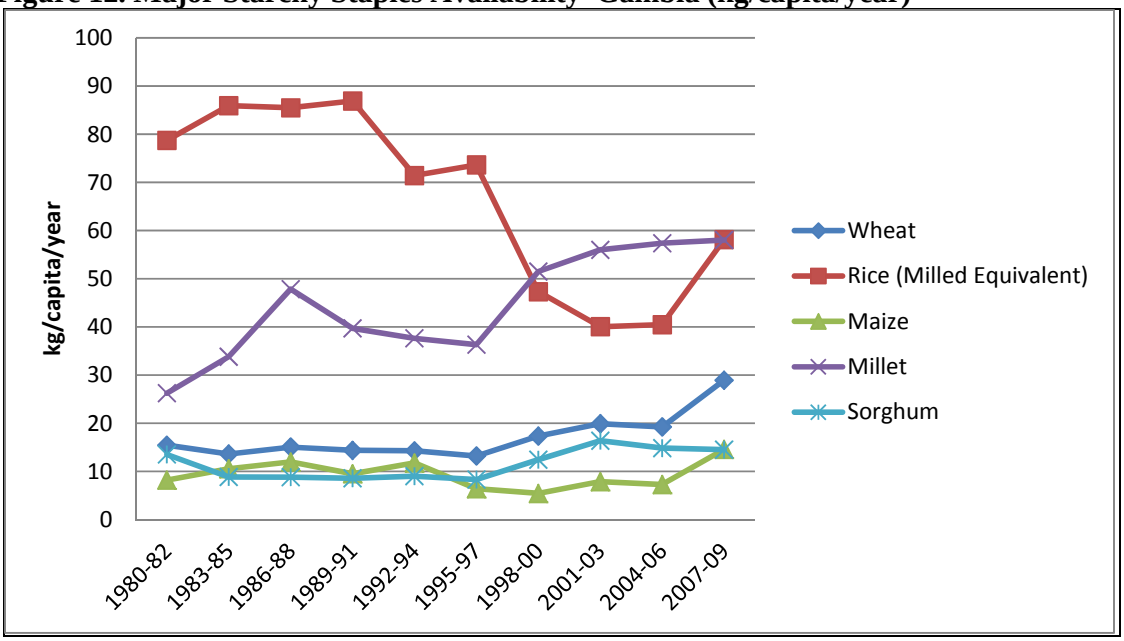
Figures 12 and 13 also show the trends in the supply of major starchy staples in the Gambia and Guinea Bissau, which are also in the Coastal Sahel sub-region. In the Gambia, the largest absolute change in apparent per capita consumption occurred for millet (plus 27 kg/year) and rice (minus 33.5 kg/capita) in the period 1980-85 through to 2004-09. Apparent per capita wheat consumption also grew for the Gambia (9.5 kg/year) in the same period. In Guinea Bissau, apparent per capita consumption of cassava increased by 24 kg/year, that of wheat increased by 7 kg/year; that of rice increased by 3 kg/year; that of millet increased by 4.5 kg/year, while that of sorghum decreased by 11 kg/year in the period 1980-85 through to 2004-09.

Figure 11. Major Starchy Staples Availability–Senegal (kg/capita/year)



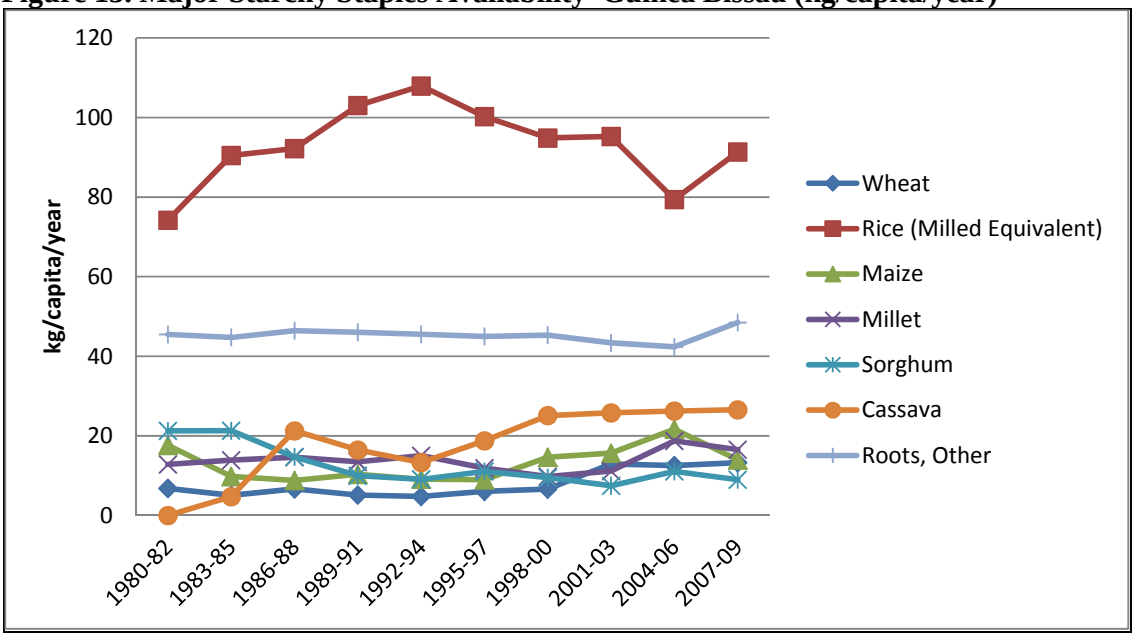
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 12. Major Starchy Staples Availability–Gambia (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 13. Major Starchy Staples Availability–Guinea Bissau (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.3.3. Coastal Non-Sahel

Table 11 shows the trends in the supply of major starchy staple types in the Coastal non-Sahel region. In Ghana, cassava, yams and other roots (e.g., cocoyam) are the dominant starchy staple types. With the exception of millet (whose per capita availability remained basically unchanged), apparent per capita consumption in Ghana increased for all major starchy staple types in the period 1980-85 through to 2004-09. In the period 1980-85 through to 2004-09, there was an absolute increase in per capita apparent consumption of cassava of 86 kg/year, that of yams increased by 66.5 kg/year, that of rice by 19 kg/year, that of wheat by 8 kg/year, and that of maize by 5.5 kg/year. The increase in apparent per capita consumption of rice and wheat certainly has implications for imports. Figure 14 illustrates the trends in the supply of major starchy staple types in Ghana.

Table 11. Starchy Staples Availability (kg/capita/year)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Benin										
Wheat	14	9	11	11	12	9	9	8	5	9
Rice (Milled)	7	11	10	16	17	20	12	18	31	33
Maize	56	53	56	60	58	60	67	61	58	57
Millet	1	1	3	3	3	3	3	3	3	3
Sorghum	15	17	17	17	16	15	17	18	16	13
Cassava	116	118	119	145	145	160	144	144	137	146
Sweet Potatoes	8	8	7	6	7	9	8	8	6	7
Yams	81	86	102	116	114	114	134	137	135	143
Cote d'Ivoire										
Wheat	22	20	20	17	15	14	16	16	15	16
Rice (Milled)	61	59	56	54	53	53	46	50	53	64
Maize	29	28	26	24	26	26	23	21	20	19
Millet	1	1	2	2	2	2	2	1	1	1
Sorghum	2	1	1	1	1	1	1	1	1	1
Cassava	109	106	102	100	98	101	110	103	101	110
Potatoes	1	1	1	1	1	1	1	1	1	1
Sweet Potatoes	1	1	2	2	2	2	3	2	2	2
Yams	189	177	170	166	165	162	170	172	180	193

Table 11. Continued. Starchy Staples Availability (kg/capita/year)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Ghana										
Wheat	10	8	10	12	12	8	13	11	16	18
Rice (Milled)	6	7	9	12	17	11	12	22	24	27
Maize	25	33	34	36	43	43	40	42	41	28
Millet	7	7	7	6	7	8	6	6	6	6
Sorghum	8	8	8	9	12	13	11	9	9	10
Cassava	126	120	148	163	198	231	219	215	206	212
Sweet Potatoes	0	0	0	0	0	3	5	4	4	5
Yams	45	68	64	61	74	95	110	117	114	132
Other roots	45	51	60	59	59	67	69	67	57	55
Guinea										
Wheat	9	11	14	16	15	12	15	12	12	14
Rice (Milled)	68	69	83	90	96	93	88	91	91	100
Maize	16	15	11	9	9	10	10	10	10	9
Millet	8	8	7	3	0	1	1	1	1	1
Sorghum	4	5	4	3	1	1	1	1	1	1
Cereals, Other	13	15	16	11	9	11	11	12	12	11
Cassava	92	85	81	82	82	84	89	91	99	103
Sweet Potatoes	12	12	15	16	16	16	17	17	18	18
Yams	10	10	11	12	11	10	9	5	2	2

Table 11. Continued. Starchy Staples Availability (kg/capita/year)–Coastal Non-Sahel

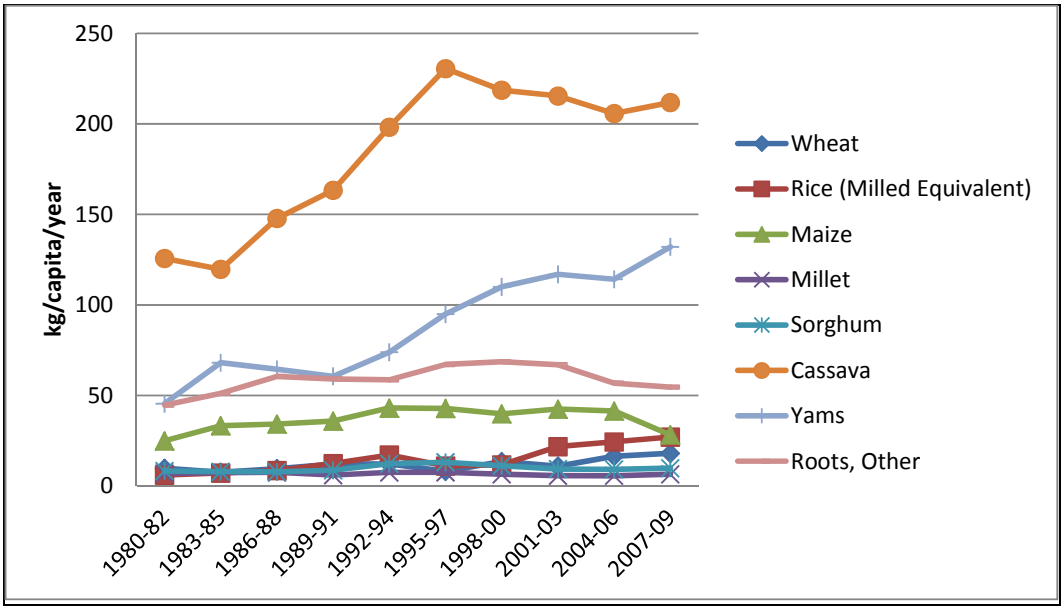
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Liberia										
Wheat	8	8	8	6	9	52	36	24	31	22
Rice (Milled)	124	117	114	106	81	39	54	57	60	85
Maize	0	0	0	0	1	7	6	5	2	0
Cassava	152	118	167	159	132	107	139	159	148	145
Sweet Potatoes	7	7	7	7	8	7	6	5	5	5
Yams	7	7	7	7	8	9	7	6	6	5
Other roots	7	7	7	7	8	9	8	8	7	7
Nigeria										
Wheat	16	14	6	4	9	8	15	17	18	21
Rice (Milled)	16	14	15	21	20	20	22	23	22	21
Maize	7	9	28	31	33	29	22	20	23	27
Millet	24	28	32	35	32	36	36	32	35	37
Sorghum	33	37	42	34	39	44	43	40	43	39
Cassava	81	74	84	115	155	151	144	114	116	110
Sweet Potatoes	1	1	1	1	2	9	12	14	16	13
Yams	24	20	25	48	72	72	74	73	72	85
Potatoes	0	0	0	0	1	0	2	3	3	4

Table 11. Continued. Starchy Staples Availability (kg/capita/year)-Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Sierra Leone										
Wheat	8	7	9	10	10	14	14	15	14	11
Rice (Milled)	98	93	93	96	92	83	91	87	85	92
Maize	4	4	3	2	1	2	2	4	4	5
Millet	3	5	5	5	5	5	2	2	3	4
Sorghum	2	2	3	3	3	3	3	2	3	3
Cassava	29	30	30	29	38	68	62	65	63	68
Sweet Potatoes	3	3	3	3	5	11	7	5	5	5
Other roots	4	3	1	1	1	1	1	1	1	0
Togo										
Wheat	11	12	13	12	8	11	8	17	11	9
Rice (Milled)	9	9	10	11	11	13	23	17	23	21
Maize	42	42	36	52	58	60	58	61	61	71
Millet	10	13	16	12	11	9	5	6	5	6
Sorghum	24	25	23	24	23	21	21	18	21	23
Cassava	113	111	93	109	92	106	112	105	105	112
Yams	125	85	80	74	80	79	85	76	77	82
Other roots	5	3	3	3	3	2	4	4	2	3

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 14. Major Starchy Staples Availability–Ghana (kg/capita/year)

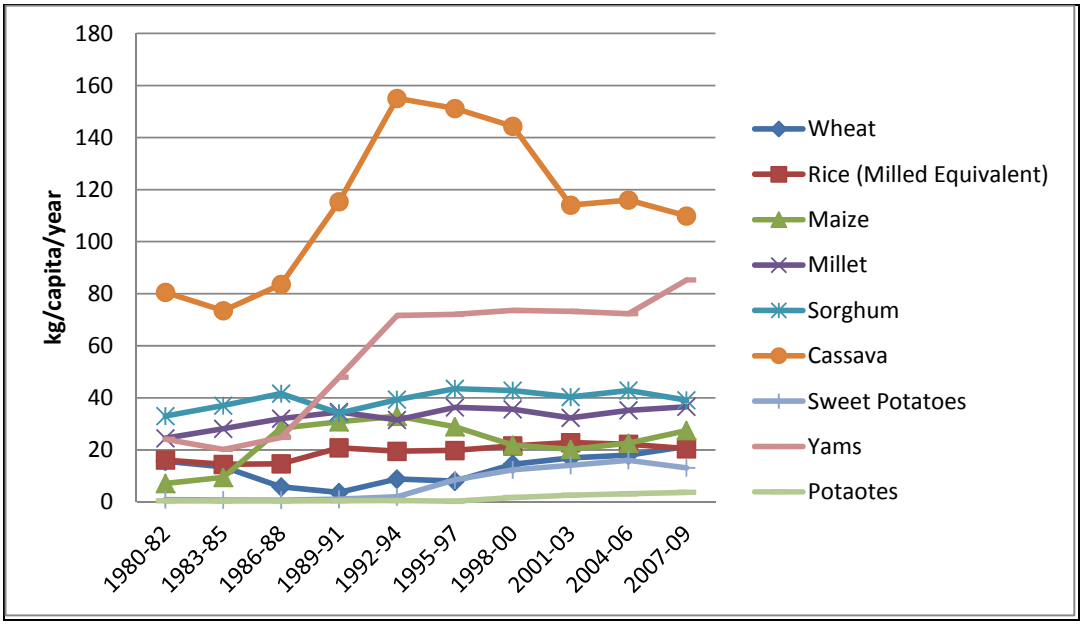


Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

In Nigeria, as was the case for Ghana, cassava and yams dominate as major starchy staples, and both have experienced the biggest absolute increase in apparent per capita consumption in the period 1980-85 through to 2004-09–35.5 kg/year for cassava and 56.5 kg/year for yams. In the same period, apparent per capita consumption of sweet potatoes increased by 13.5 kg/year. In the case of cereals, apparent per capita consumption increased the most for maize–17 kg/year– in the study period. Apparent per capita supply of wheat increased by 4 kg/year, that of rice by 6.5 kg/year; that of millet by 10 kg/year and that of sorghum by 6 kg/year in the study period. In the Coastal Non-Sahel, apparent per capita millet supply has been largest for Nigeria over time. The high supply of millet in Nigeria compared to other Coastal non-Sahelian countries is not surprising because Nigeria is the only one of these countries that also has a large Sudano-Sahelian zone, which is the major area where millet is produced. The supply of Irish potatoes experienced an absolute increase of 3.5 kg/capita/year in the period 1980-85 through to 2004-09. Figure 15 illustrates the trends in the supply of major starchy staple types in Nigeria.

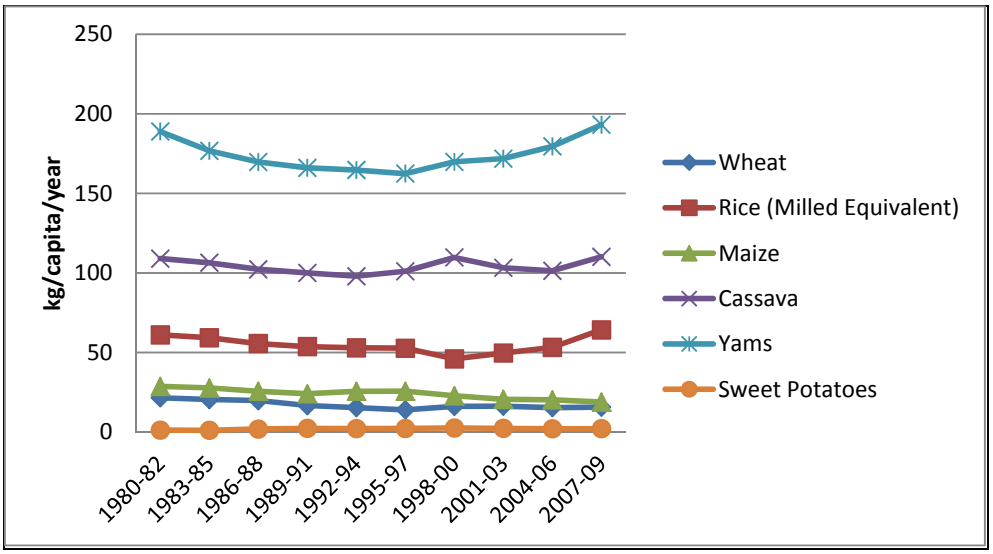
In Cote d'Ivoire, with the exception of millet (who's per capita consumption remained unchanged), sweet potatoes (increased by 0.9 kg/year) and yams (increased by 3.5 kg/year), apparent per capita consumption dropped for all other major starchy staples in the period 1980-85 through to 2004-09. Figure 16 illustrates the trends in the supply of major starchy staple types in Cote d'Ivoire.

Figure 15. Major Starchy Staples Availability–Nigeria (kg/capita/year)



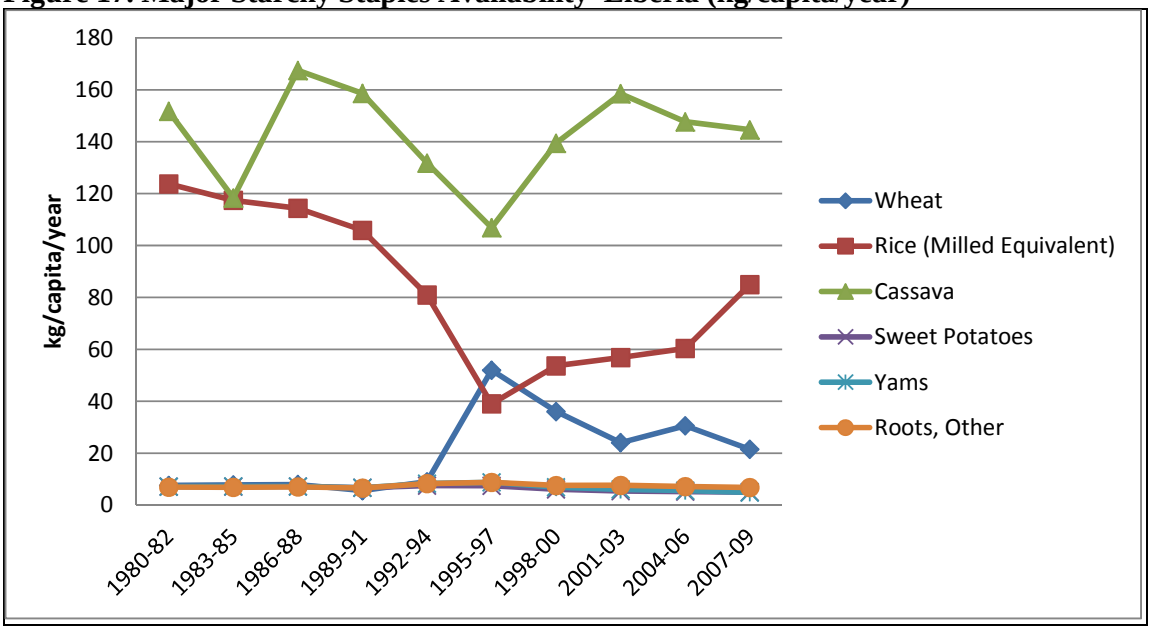
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 16. Major Starchy Staples Availability–Cote d'Ivoire (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 17. Major Starchy Staples Availability–Liberia (kg/capita/year)

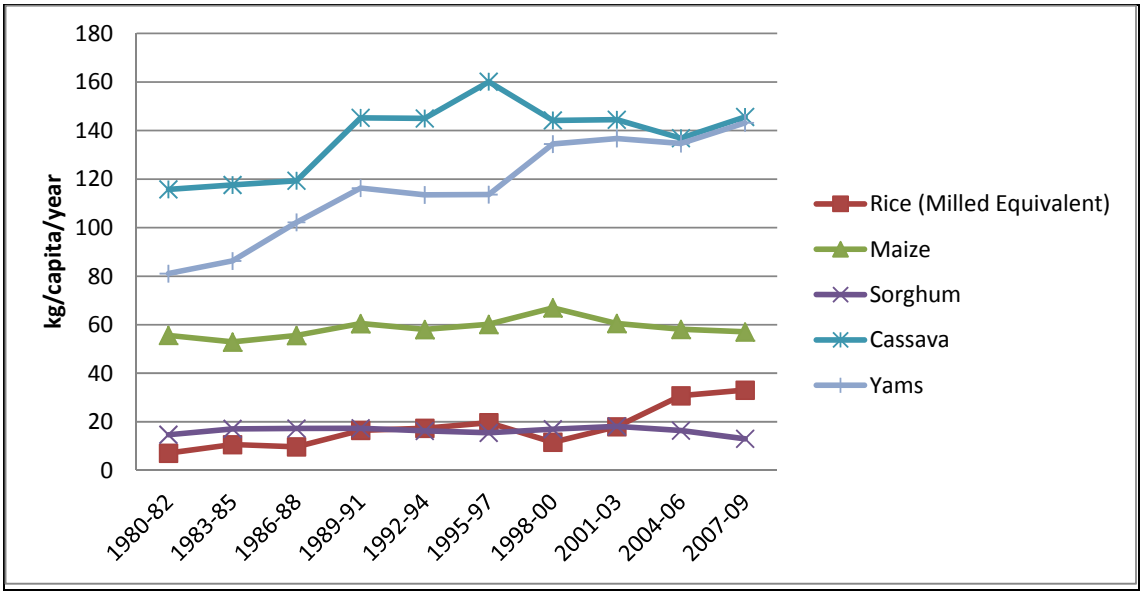


Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Rice and cassava are major starchy staple types in Liberia. However, apparent per capita consumption of rice declined by 48 kg/year and that of cassava increased by 11.5 kg/year in the period 1980-85 through to 2004-09. In Liberia, following a period of low and relatively stable per capita supply of wheat in the 1980s, per capita wheat supply jumped from an average of 9 kg/capita/year in the period 1992-1994 to 52 kg/capita/year in the period 1995-1997, representing an increase of about 477%. This corresponded to the period when the first Liberian civil war ended. Per capita availability of rice also fell in Liberia during this period, and most likely the spike in wheat supplies reflects an influx of imported wheat to substitute for domestic rice production that had been decimated by the civil war. Overall, in the period 1980-85 through to 2004-09, apparent per capita consumption of wheat increased by 18.5 kg/year. Figure 17 illustrates the trends in the per capita supply of major starchy staple types in Liberia.

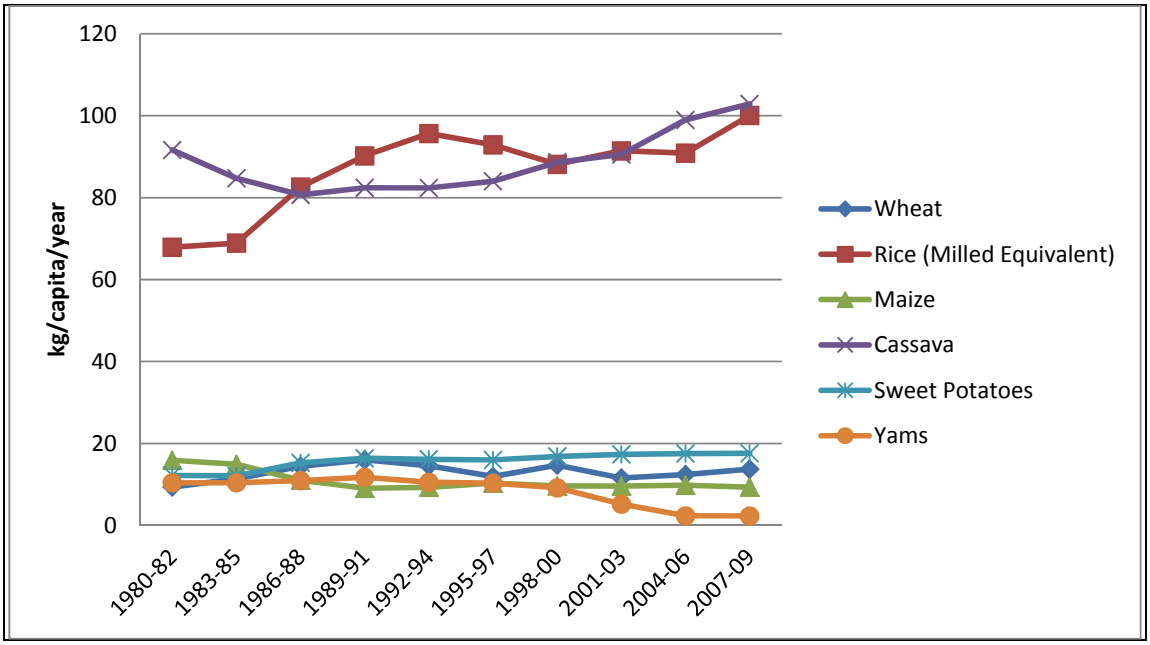
Figures 18, 19, 20, and 21 illustrate the trend in the availability of major starchy staples in other Coastal non-Sahelian countries–Benin, Guinea, Sierra Leone, and Togo, respectively. In Benin, apparent per capita consumption increased the most for yams (55.5 kg/year), cassava (24.5 kg/year) and rice (22 kg/year) in the study period. Given the importance of unrecorded trade between Benin and Nigeria, it is possible that some of the increase in recorded per capita rice availability in Benin actually represented rice transshipped into Nigeria. Maize has over the years maintained its position as the dominant cereal type in Benin. However, apparent per capita maize consumption increased only by 3 kg/year in the period 1980-85 through to 2004-09. As is the case with Liberia, rice and cassava are major starchy staple types in Guinea and apparent per capita consumption increased for rice by 27 kg/year and for cassava by 12.5 kg/year in the period 1980-85 through to 2004-09. In Sierra Leone, apparent per capita consumption of cassava grew by 36 kg/year, while that for rice decreased by 7 kg/year in the study period. This reflects some degree of substitution of cassava for rice, since both crops have been over time major starchy staples in Sierra Leone. In Togo, the largest increases in apparent per capita consumption were seen with rice (13kg / year) and maize (24 kg/year).

Figure 18. Major Starchy Staples Availability–Benin (kg/capita/year)



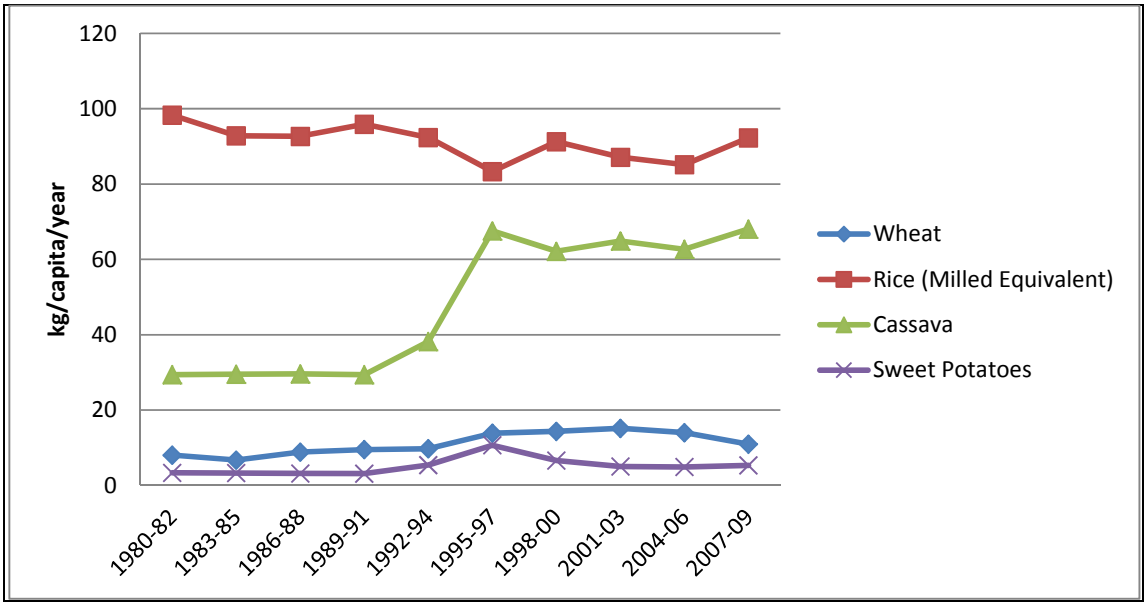
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 19. Major Starchy Staples Availability–Guinea (kg/capita/year)



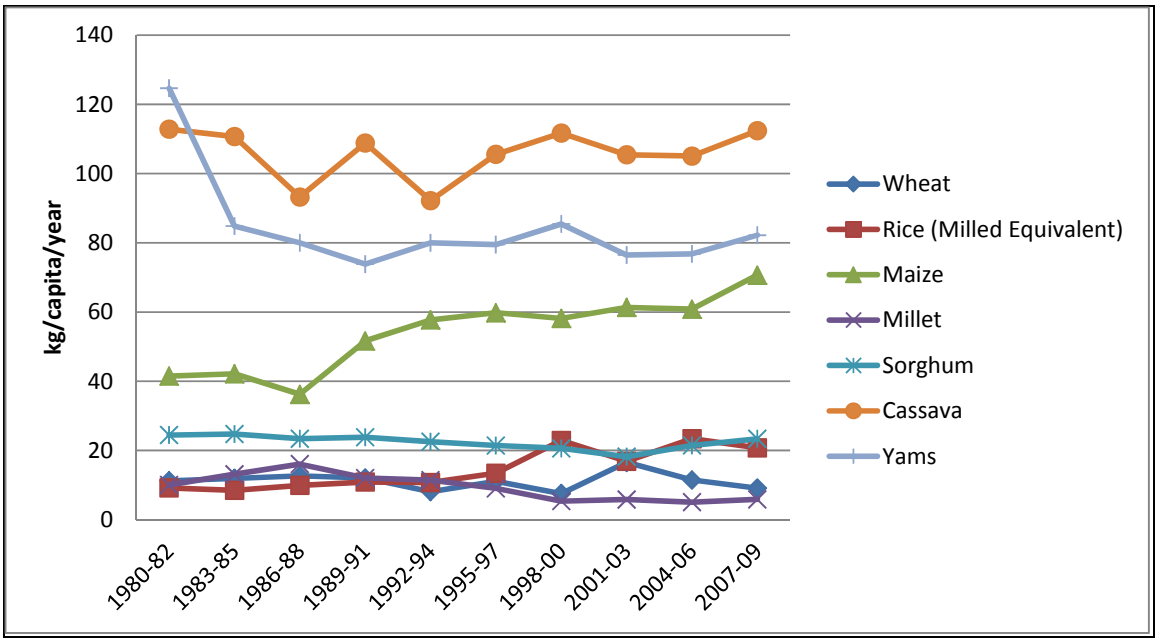
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 20. Major Starchy Staples Availability–Sierra Leone (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 21. Major Starchy Staples Availability–Togo (kg/capita/year)



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

In summary, the national average per capita availability data from the food balance sheets indicates that starchy staple consumption patterns at the national level have been complex and diverse. In the Non-Coastal Sahel sub-region, the pattern has been an increase in the apparent per capita consumption of rice and maize. In Mali, the absolute increase in apparent per capita consumption of rice was almost twice that of maize. In Burkina Faso, the absolute increase in apparent per capita consumption of maize was about four times that of rice. The absolute increases in per capita rice and maize consumption were much smaller for Niger than they were for Mali and Burkina Faso.

In the Coastal Sahel sub-region, the pattern has been much more diverse. With the exception of The Gambia, apparent per capita consumption of rice has been on the rise in this sub-region. In Cape Verde, rice is replacing maize as the dominant starchy staple type–in the study period, there was an absolute increase in apparent per capita rice supply of 60 kg/year, while that of maize declined by 30.5 kg/year. Apparent per capita consumption of wheat has also been on the rise in this sub-region. Such an increase in per capita rice and wheat supply has implications for imports because most of the rice consumed is imported. In contrast, in The Gambia, apparent per capita rice consumption declined drastically in the study period (by 30 kg/year), and it is most likely being substituted by millet which experienced an absolute increase in per capita supply of about 27 kg/year. It is also worth noting that prior to the CFA franc devaluation, The Gambia had a large re-exportation trade of imported rice to Senegal. The decline in apparent per capita rice consumption in the Gambia may be a reflection of the decline in those largely unrecorded previous re-exportations. Also noticeable in the Coastal Sahel region is an increase in the apparent per capita consumption of starchy roots and tubers. Apparent per capita consumption of cassava increased for Senegal (14 kg/year) and Guinea Bissau (24 kg/year). The growth in the apparent per capita supply of Irish potatoes ranged from 3 kg/year in Senegal to 18 kg/year in Cape Verde. While the growth in the consumption of Irish potatoes may reflect a westernization of diets – i.e., increased consumption of French fries, the growth in the apparent per capita consumption of cassava may reflect the poor shifting to cheaper sources of calories.

The trend in the Coastal Non-Sahel supports evidence of a cassava revolution. The absolute increase in apparent per capita cassava consumption ranged from 11.5 kg/year in Liberia to 86 kg/year in Ghana. In Sierra Leone, cassava has been substituting for rice. The apparent per capita consumption of yams has also shown large absolute increases in the Coastal Non-Sahel sub-region–ranging from an increase of 55.5 kg/capita/year (in Benin) to an increase of 66.5 kg/capita/year in Ghana. Nigeria has shown a positive trend in the apparent per capita consumption of sweet potatoes and Irish potatoes. However, the absolute growth in sweet potatoes supply has been much larger than that of Irish potatoes. As was with the growth in cassava supply, the growth in the apparent per capita consumption of sweet potatoes may reflect the poor switching to cheaper sources of calories. Apparent per capita rice consumption increased for most countries in the Coastal Non-Sahel region and the absolute increases ranged from 6.5 kg/capita/year (Nigeria) to 27 kg/year for Guinea. Liberia and Sierra Leone experienced decreases in the apparent per capita consumption of rice concomitant with their civil wars. Apparent per capita maize consumption has also been on the rise in the Coastal Non-Sahel region, ranging from an increase of 5.5kg/capita/year in Ghana to an increase of 24 kg/capita/year in Togo. In a nutshell, the analysis of food balance sheet data reveals complex and diverse patterns of substitution amongst different starchy staple types in the different sub-regions. From these results it is clear that the substitution is not just between rice and wheat and traditional starchy staples (millet and sorghum), but also involves other starchy staples types like cassava, yams, sweet potatoes, Irish potatoes and maize.

2.4. Trends in Macronutrient Availability

This section examines the trends in the apparent supply of food by major macronutrient group – fats and proteins. To investigate changes in the quality of food supply over time, the section further breaks down for each country in the region, protein supply by source–animal and plant sources of protein. Protein quality varies a lot depending on its balance of essential amino acids.[15] Animal protein generally has a better amino acid balance than plant protein, although that generalization has several exceptions.[16] Animal protein is also more expensive than plant protein. With increases in per capita incomes over time, one would expect an increase in the consumption of animal proteins (essentially from meats, eggs, dairy products and related products). This section goes further to disaggregate total animal protein supply by type of product in order to identify the principal source(s) of animal protein and shifts in their absolute and relative contributions, as well as determine if the suspected increase in the consumption of frozen chicken in the region is a reality. The section also disaggregates the change in plant protein between the portion due to pulses (beans and dry peas–which are a source of high-quality protein) and all other plant sources (which will generally be cereals and are of lower quality).

2.4.1. Analysis of Protein Supply

Table 12 contains data on three-year average daily per capita protein availability for all the 15 ECOWAS member states. Between 1998-2000 and 2007-2009, per capita protein supply increased for almost all 15 countries.

Non-Coastal Sahel: Figure 22 is a graph of the trend in total daily protein supply in the Non-Coastal Sahel sub region. Per capita daily protein supply has been largest for Burkina Faso over time. Burkina Faso experienced a growth of 49% in total daily protein supply in the period 1980-85 through 2004-09, Mali had a growth of 42% and Niger had a growth of about 19% during the same period (Table 12).

The analysis of protein supply by source in the non-Coastal Sahel region reveals that in spite of the largest supply and growth in total daily protein in Burkina Faso over time, the absolute contribution of animal protein to total daily protein supply in Burkina Faso is lower (less than an average of 10 g/capita/day) than that of Mali and Niger. However, Burkina Faso also exhibited the largest growth in animal protein supply (43%) between 1980-85 and 2004-09. Animal protein supply in Mali and Niger during the same period grew by 16% and 10% respectively.

[15] Proteins are made up of amino acids, and the quality of a protein for human nutrition depends on its balance of nine essential amino acids, which the human body cannot synthesize itself. The amino acid that appears in the smallest quantity in the protein determines the quality of the protein for human consumption and is referred to as the *limiting amino acid*.

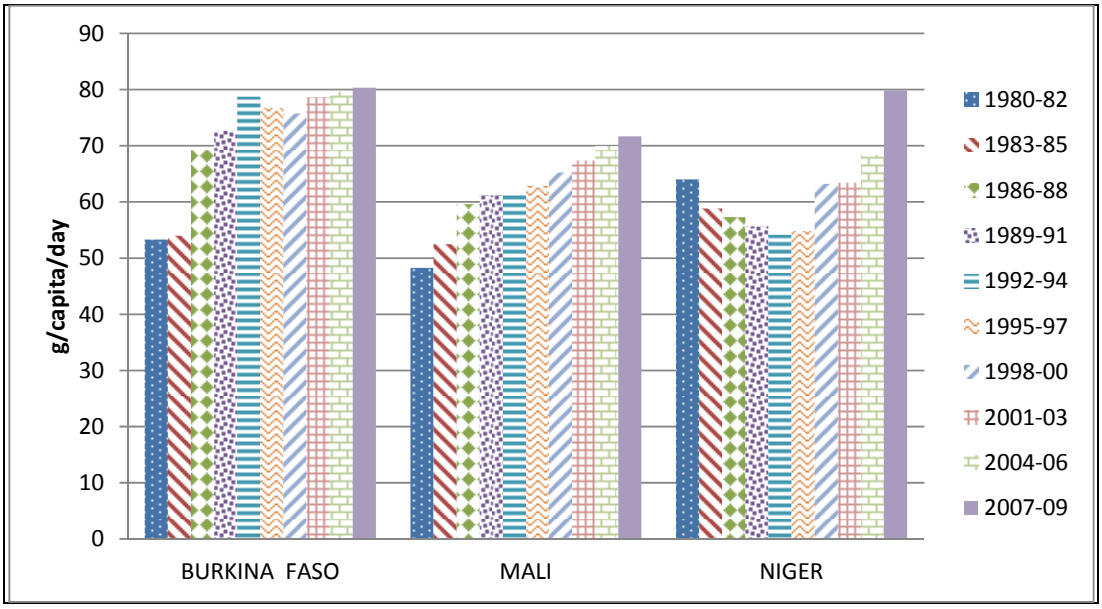
[16] For example, gelatin (an animal-based protein) has a poor balance of essential amino acids, while pulses (a plant source of proteins) have a good balance. Furthermore, by appropriate mixing plant sources (e.g., maize and beans), one can obtain a mixture of amino acids similar to that available in many animal proteins.

Table 12. Daily Protein Availability (g/capita)–West Africa

	1980 To 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Non-Coastal Sahel											
Burkina Faso	53	54	69	73	79	77	76	79	80	80	50%
Mali	48	53	60	61	62	63	65	67	70	72	41%
Niger	64	59	57	56	54	55	63	63	68	80	20%
Coastal Sahel											
Cape Verde	65	67	71	62	61	59	63	63	67	73	6%
Gambia	48	51	55	54	50	49	51	54	54	60	15%
Guinea Bissau	43	44	45	45	45	44	43	43	43	45	1%
Senegal	66	65	67	65	62	59	59	54	58	61	-9%
Coastal Non-Sahel											
Benin	46	47	49	53	54	54	56	58	58	62	29%
Cote d'Ivoire	61	56	56	53	50	48	48	49	50	53	-12%
Ghana	38	41	45	45	50	52	54	54	58	60	49%
Guinea	52	52	53	54	54	53	53	53	53	56	5%
Liberia	49	47	47	42	39	41	40	34	35	38	-24%
Nigeria	43	41	46	50	53	56	58	58	61	64	49%
Sierra Leone	44	41	40	41	41	43	44	47	52	51	21%
Togo	45	45	44	46	46	49	47	47	49	53	13%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

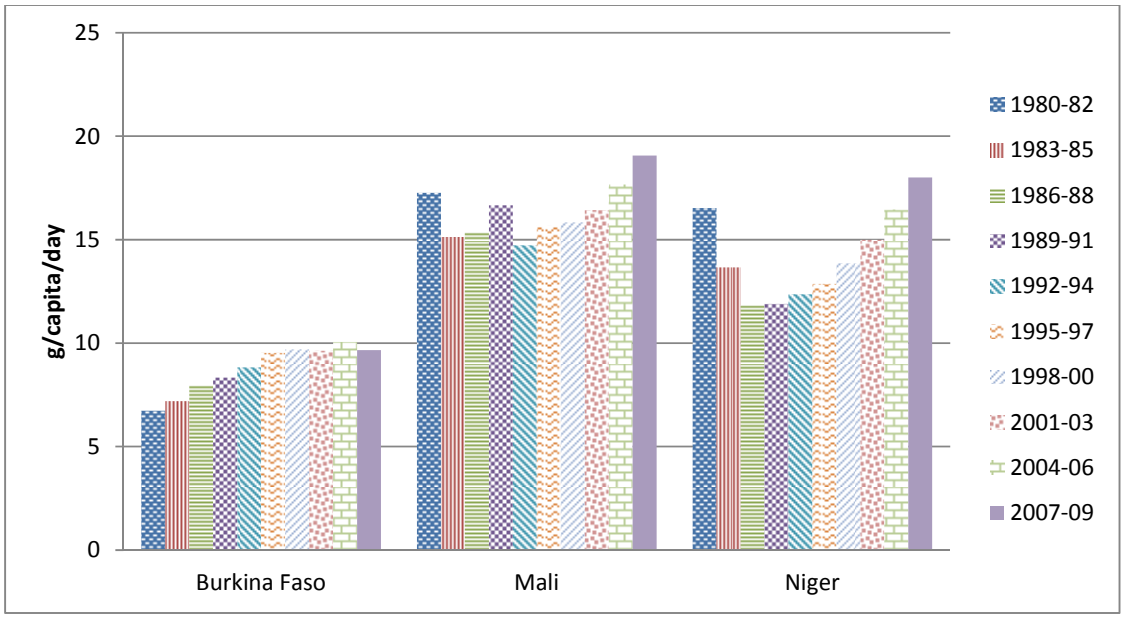
Figure 22. Protein Availability (g/capita/day)–Non-Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

In all three non-Coastal Sahel countries, growth in plant protein accounted for over 85% of the change in total protein supply in the period 1980-85 through to 2004-09. This increase largely reflects the substantial increase in per capita cereal availability in these countries that was described earlier. Table 13 contains information on daily protein availability by source in the Non-Coastal Sahel. Figure 23 is also a graphical representation of the supply of animal protein in the Non-Coastal Sahel sub-region.

Figure 23. Animal Protein Availability (g/capita/day)–Non-Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 13. Daily Protein Availability by Source (g/capita)–Non-Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	% of total change
Burkina Faso												
Plant	47	47	61	64	70	67	66	69	70	71	50%	89%
Animal	7	7	8	8	9	10	10	10	10	10	43%	11%
Total	54	54	69	72	79	77	76	79	80	81	50%	
Mali												
Plant	31	37	44	45	47	47	49	51	52	53	54%	88%
Animal	17	15	15	17	15	16	16	16	18	19	16%	12%
Total	48	52	59	62	62	63	65	67	70	72	41%	
Niger												
Plant	48	45	45	44	42	42	49	48	52	62	23%	88%
Animal	17	14	12	12	12	13	14	15	16	18	10%	13%
Total	65	59	57	56	54	55	63	63	68	80	20%	

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 14. Three-Year Averages of Animal Protein Supply (kg/capita)–Non-Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Burkina Faso												
Bovine Meat	3.2	3.9	4.4	5.7	6.4	6.8	7.1	7.4	7.7	7.2	109 %	3.0%
Mutton and Goat Meat	2.1	2.6	2.8	3.2	3.3	3.3	3.3	3.3	3.2	3.1	35%	1.2%
Pig Meat	0.4	0.6	0.7	0.8	1.1	1.3	1.6	2.0	2.4	2.2	357%	6.3%
Poultry Meat	1.4	1.6	2.0	2.2	2.2	2.2	2.2	2.3	2.2	2.2	49%	1.5%
Meat, Other	0.9	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.6	-35%	-1.6%
Fish and Seafood	1.5	1.5	2.0	1.7	1.6	2.4	2.3	1.6	1.8	1.7	15%	0.6%
Eggs	1	1	1	2	3	3	2	2	2	2	100%	2.8%
Milk - dry equiv.	2.6	2.2	2.3	1.6	1.6	1.7	1.8	1.6	1.7	1.7	-29%	-1.4%
Mali												
Bovine Meat	5.8	6.7	7.8	8.3	6.0	6.1	6.6	7.4	8.2	9.0	37%	1.3%
Mutton and Goat Meat	6.5	4.7	4.2	4.9	4.3	4.5	4.8	5.1	5.5	6.9	10%	0.4%
Pig Meat	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	8%	0.0%
Poultry Meat	1.7	2.2	2.8	2.7	2.7	2.6	2.8	2.8	3.1	2.8	50%	1.7%
Meat, Other	3.3	2.9	2.7	2.6	2.4	2.4	2.5	2.6	2.9	2.9	-7%	-0.3%
Fish and Seafood	10.2	7.3	7.1	8.3	7.2	11.3	9.4	9.1	9.0	8.1	-2%	0.0%
Eggs	0.6	0.7	0.9	0.8	0.8	0.7	0.6	0.5	0.4	0.5	-37%	-1.8%
Milk - dry equiv.	5.9	4.7	4.6	5.1	5.1	4.8	5.2	5.2	5.7	6.3	13%	0.5%

Table 14. Continued. Three-Year Averages of Animal Protein Supply (kg/capita)–Non-Coastal Sahel

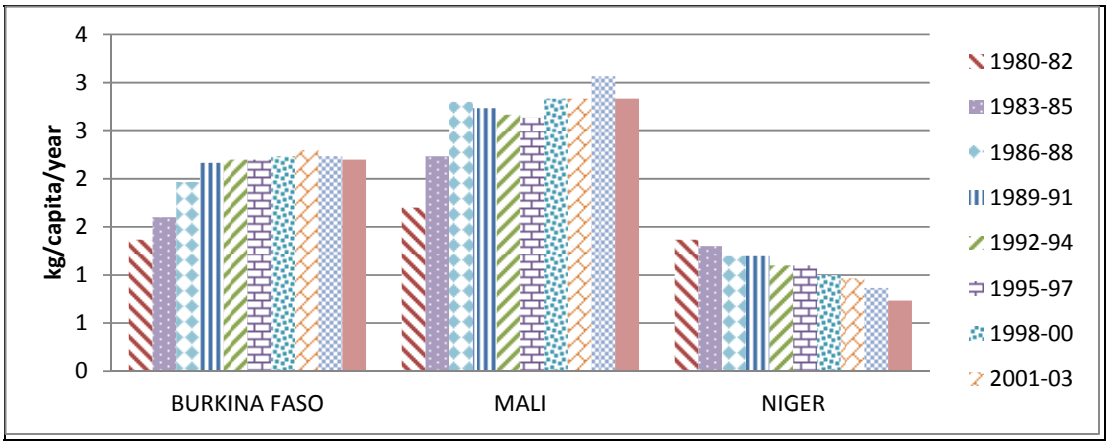
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Niger												
Bovine Meat	9.1	8.2	6.5	6.9	8.0	8.8	10.3	11.9	12.9	14.1	56%	1.8%
Mutton and Goat Meat	9.7	6.7	6.5	6.2	5.7	5.7	5.9	5.7	6.2	6.5	-23%	-1.0%
Pig Meat	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	-50%	-2.7%
Poultry Meat	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.7	-40%	-2.1%
Meat, Other	3.0	2.5	2.7	3.0	3.4	3.1	3.0	3.1	3.3	3.2	18%	0.7%
Fish and Seafood	1.4	0.4	0.4	0.7	0.3	0.6	0.9	1.5	3.4	2.5	218%	4.7%
Eggs	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.3	-46%	-2.4%
Milk - dry equiv.	5.7	5.2	4.2	4	4	4.3	4.5	4.8	4.9	5.9	-1%	0.0%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

To further examine the sources of animal protein, total animal protein supply was disaggregated by specific sources and the absolute and relative importance of each source is discussed. Table 14 contains information on the trends in the availability (kg/capita/year) of animal protein from meat, fish, dairy products and eggs in the Non-Coastal Sahel. Over time, bovine, mutton and goat meat have dominated as major sources of meat in the Non-Coastal Sahel region. In Burkina Faso, in the period 1980-85 through to 2004-09, apparent per capita consumption of bovine meat increased by 3.8 kg/year (an increase of 109%), while that of mutton and goat meat increased by 0.8 kg/year (an increase of 35%). Apparent per capita consumption of pig meat grew by 1.8 kg/year (about 357%) between 1980-85 and 2004-09, albeit from a very low base. Poultry meat supply in Burkina Faso grew by 49 % in the study period. Fish and seafood supply in Burkina Faso has been generally less than 2.5 kg/capita/year, growing by 15% in the study period. Apparent per capita supply of eggs increased by 1kg/capita (an increase of about 100%) in the period 1980-85 and 2004-09. To ensure comparability, the supply of milk reported in FAOSTAT is converted[17] to its dry milk equivalent given that liquid has a high water content. Milk supply in dry milk equivalent decreased by 0.7kg, representing a decline of about 29%.

In Mali, poultry meat supply grew the fastest (50%) in the study period but still remains well below the supply of bovine, mutton and goat meat. Fish and seafood supply is largest for Mali in the Non-Coastal Sahel region, and has been fairly stable over time. Milk supply in Mali increased by 0.7 kg, representing an increase of 13% in the period 1980-85 through to 2004-09. Apparent per capita supply of eggs was below 1 kg/capita in the study period. In Niger, the largest absolute increase in apparent per capita meat consumption in the period 1980-85 through to 2004-09 was experienced with bovine meat (4.9 kg/year)–an increase of 56%. Apparent per capita consumption of fish and seafood also grew by 2.1 kg/year–an increase of about 218 %, while that of poultry meat dropped by 40%. Figure 24 is a graph illustrating the trends in the supply of poultry meat in the Non-Coastal Sahel.

Figure 24. Poultry Meat Supply (kg/capita/year)–Non-Coastal Sahel



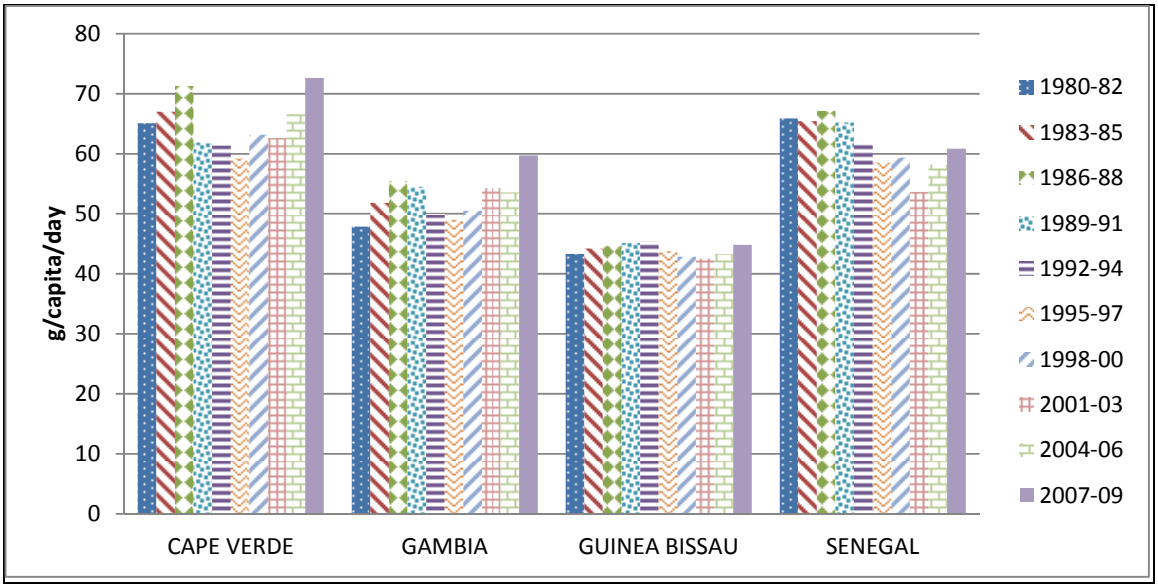
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

[17] Conversion factor is 10%, i.e., dry milk equals liquid milk divided by 10.

To further examine the quality of protein supplied, the change in plant protein was disaggregated between the portion due to pulses (beans and peas, which are a source of high-quality protein) and all other plant sources (which will generally be cereals and will be of lower quality protein). The share of pulses in total vegetable protein supply in Burkina Faso has been between 10 and 13%, and it declined by 8% in the period 1980-85 through to 2004-09. Pulses accounted for 9% of the total change in plant protein supply in the study period. In Mali, the share of pulses in total vegetable protein supply has also been below 15% and it increased by 46% in the period 1980-85 through to 2004-09. In the study period, pulses accounted for 16% of the total change in plant protein supply in Mali. Compared to Mali and Burkina Faso, the share of pulses in plant protein supply in Niger has been quite large (greater than 20%) and has increased by 20% in the period 1980-85 through to 2004-09. In Niger, pulses account for about 57% of the growth in plant protein supply in the period 1980-85 through to 2004-09. Thus, in addition to protein derived from animal sources, Nigeriens still obtain a good proportion of high quality protein from pulses. Table 15 shows the contribution of pulses to total daily vegetable protein supply in the Non-Coastal Sahel sub region.

Coastal Sahel: Figure 25 is a graph of the trend in total daily protein supply in the Coastal Sahel sub-region. As seen on Table 12, in the Coastal Sahel apparent daily per capita supply of protein increased by 14% in the Gambia, by 6% in Cape Verde, by 1% in Guinea Bissau, and declined by 9% in Senegal in the period 1980-85 through to 2004-09.

Figure 25. Protein Availability (g/capita/day)–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 15. The Contribution of Pulses to Plant Protein Supply (g/capita/day)–Non-Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% of total change	% change 1980-85 to 2004-09
Burkina Faso												
Plant - Total	46.6	46.8	61.4	64.3	69.9	67.2	66.1	69.1	69.6	70.7		
Pulses -Total	5.8	5.4	6.9	7.2	7.5	6.7	7.0	6.8	7.7	7.8	9%	
Pulse Share	13%	11%	11%	11%	11%	10%	11%	10%	11%	11%		-8%
Mali												
Plant - Total	31.0	37.3	44.3	44.6	46.8	47.2	49.4	51.0	52.3	52.6		
Pulses -Total	2.2	2.5	3.2	3.4	6.0	5.5	7.5	6.8	6.1	4.5	16%	
Pulse Share	7%	7%	7%	8%	13%	12%	15%	13%	12%	9%		46%
Niger												
Plant - Total	47.5	45.2	45.4	43.8	41.7	41.9	49.4	48.4	51.9	61.9		
Pulses -Total	13.9	10.8	11.4	9.2	8.4	8.4	14.8	11.8	14.5	22.1	57%	
Pulse Share	29%	24%	25%	21%	20%	20%	30%	24%	28%	36%		20%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 16. Daily Protein Availability by Source (g/capita)–Coastal Sahel

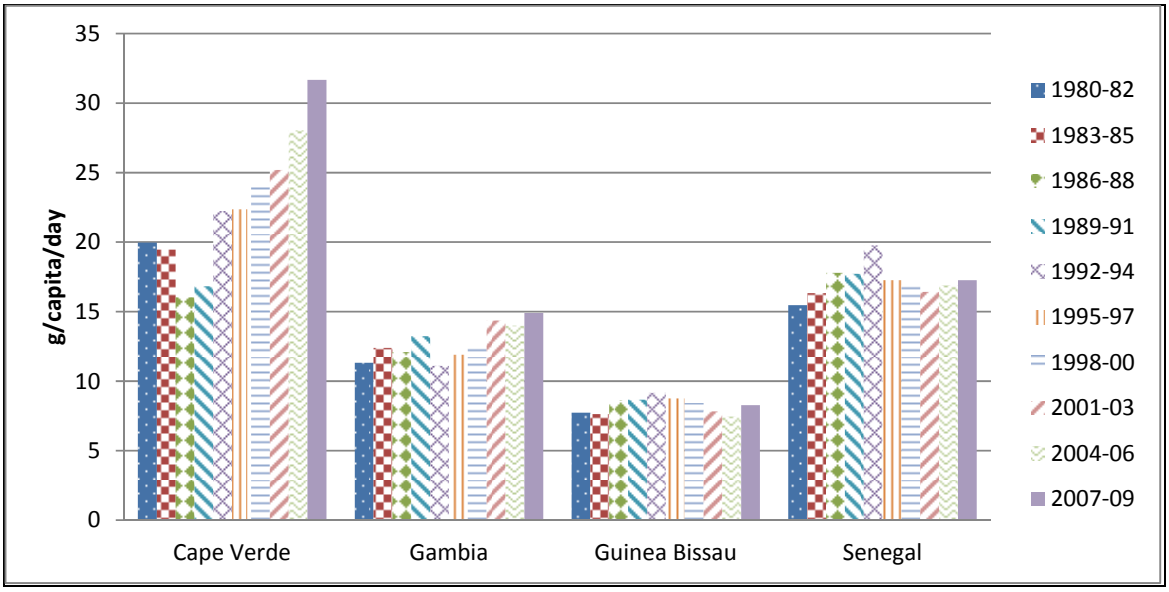
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	% of total change
Cape Verde												
Plant	45	48	55	45	39	37	39	37	39	41	-14%	-162.5%
Animal	20	19	16	17	22	22	24	25	28	32	54%	262.5%
Total	65	67	71	62	61	59	63	62	67	73	6%	
Gambia												
Plant	37	39	43	41	39	37	38	40	40	45	12%	60.0%
Animal	11	12	12	13	11	12	13	14	14	15	26%	40.0%
Total	48	51	55	54	50	49	51	54	54	60	15%	
Guinea Bissau												
Plant	36	37	36	36	36	35	34	35	36	37	0%	0.0%
Animal	8	8	9	9	9	9	8	8	7	8	-6%	100.0%
Total	44	45	45	45	45	44	42	43	43	45	-1%	
Senegal												
Plant	50	49	49	48	42	41	42	37	41	44	-14%	127.3%*
Animal	15	16	18	18	20	17	17	16	17	17	10%	-27.3%*
Total	65	65	67	66	62	58	59	53	58	61	-9%	

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.
* Represents the percentage of the decline in total protein supply.

A breakdown of per capita protein supply by source (Table 16) reveals that the supply of animal protein has not only been the highest for Cape Verde, but has also shown significant growth (+54%) between 1980-85 and 2004-09. The supply of animal protein has been greater than 20 g/capita/day since 1992-1994 and the share of animal protein in total daily protein supply in Cape Verde has been greater than 40% and increasing since 2000. In Cape Verde, animal protein growth accounts for about 263% of the growth in total daily protein supply experienced in the study period. The high apparent per capita consumption of animal protein in Cape Verde and the corresponding growth over time is not surprising giving the rapid economic growth experienced by the country in the past two decades. Animal protein supply in Senegal has been between an average of 15-20 g/capita/day since the 1980s. Total daily per capita supply of animal protein in Senegal increased by 10%, while plant protein declined by 14% in the period 1980-85 through to 2004-09. The decrease in plant protein accounts for 127% of the decline in daily protein supply in the study period, while animal protein supply per capita increased in the study period.

In Guinea Bissau, animal protein supply remained below an average of 10 g/capita/day and decreased by 6% in the study period. Animal protein supply accounts for 100% of the change (decline) in total daily protein supply experienced by Guinea Bissau in the period 1980-85 through to 2004-09. In Gambia, plant protein still dominates in total per capita daily protein supply. However, in the study period, the growth in per capita plant protein supply (12%) has been less than that of animal proteins (26%). Per capita animal protein supply has stayed between an average of 10 and 15 g/day throughout the study period and has accounted for about 40% of the overall increase in total daily protein supply per capita. Figure 26 is a graph of animal protein supply in the Coastal Sahel region (g/capita/day).

Figure 26. Animal Protein Availability (g/capita/day)–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 17. Three-Year Averages of Animal Protein Supply (kg/capita)–Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980/85 to 2004/09	CAGR 1980/85 to 2005/09
Cape Verde												
Bovine Meat	1.2	1.2	1.6	1.9	3.9	3.4	1.7	1.7	2.0	3.0	113%	3.0%
Mutton and Goat Meat	1.0	0.9	1.1	1.2	1.3	1.1	1.2	1.1	1.5	1.9	84%	2.4%
Pig Meat	4.8	5.7	8.9	10.7	17.8	15.1	18.3	18.8	19.4	21.6	290%	5.6%
Poultry Meat	1.0	1.1	1.4	1.5	1.9	1.5	2.8	7.1	12.5	16.7	1246%	11.1%
Meat, Other	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.1	-	n.d.
Fish and Seafood	34.1	29.1	14.9	16.8	14.0	18.3	19.9	18.6	14.3	11.6	-59%	-3.5%
Eggs	1	1	1	1	4	5	5	4	4	4	300%	5.7%
Milk - dry equiv.	6.5	7.2	6.5	5.9	8	8.3	8.2	8.7	10.7	12.4	69%	2.1%
Gambia												
Bovine Meat	5.3	4.5	5.2	5.2	4.0	3.2	2.9	2.4	3.0	2.5	-43%	-2.3%
Mutton and Goat Meat	1.6	1.6	1.5	1.2	0.9	0.7	0.6	0.8	1.0	1.0	-37%	-1.9%
Pig Meat	0.6	0.5	0.5	0.6	0.5	0.4	0.3	0.3	0.4	0.5	-24%	-0.8%
Poultry Meat	0.7	0.7	0.8	0.9	1.1	0.9	1.5	1.2	4.4	3.4	455%	7.1%
Meat, Other	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.7	1.0	-43%	-2.2%
Fish and Seafood	16.0	16.5	15.9	22.4	18.1	24.0	22.8	29.4	24.3	27.5	59%	1.8%
Eggs	1	1	1	1	1	1	1	1	2	2	100%	2.8%
Milk - dry equiv.	2.5	3.4	2.8	1.6	1.8	1.7	2.4	2.8	2.4	3	-8%	-0.4%

Table 17. Continued. Three-Year Averages of Animal Protein Supply (kg/capita) - Coastal Sahel

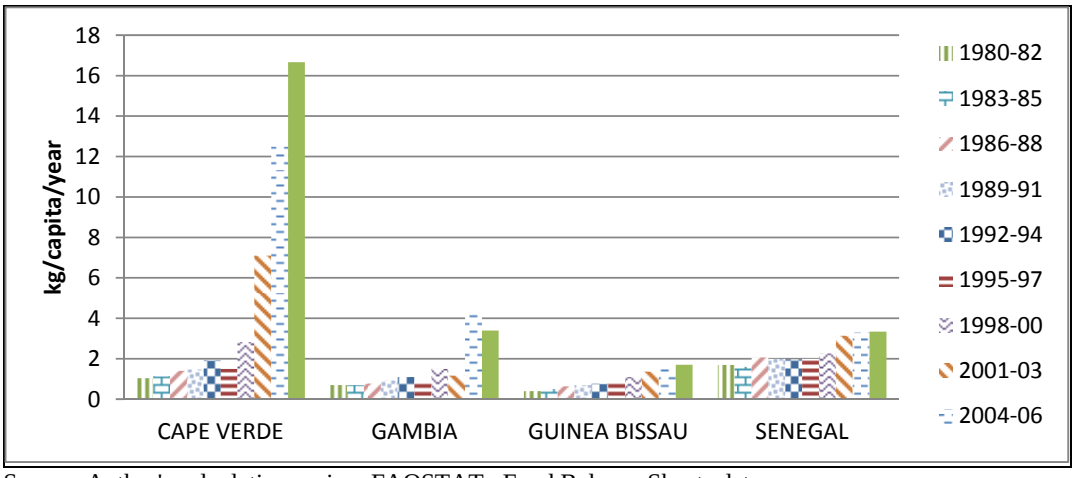
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Guinea Bissau												
Bovine Meat	2.7	3.0	3.0	3.5	3.9	3.8	3.9	3.6	3.6	3.9	32%	1.1%
Mutton and Goat Meat	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.4	18%	0.7%
Pig Meat	9.4	9.4	9.3	8.8	8.7	8.5	8.3	8.0	7.9	8.4	-14%	-0.6%
Poultry Meat	0.4	0.5	0.6	0.7	0.8	0.8	1.1	1.4	1.5	1.7	256%	5.2%
Meat, Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	n.d.
Fish and Seafood	3.0	1.9	4.4	4.1	4.7	5.1	3.9	2.2	1.5	1.4	-40%	-2.0%
Eggs	0.3	0.4	0.4	0.4	0.4	0.5	0.6	0.7	0.7	0.7	110%	3.0%
Milk - dry equiv	1.6	1.7	2.1	2	2.1	1.7	1.5	1.5	1.5	1.6	-6%	-0.2%
Senegal												
Bovine Meat	6.1	6.0	6.2	5.9	5.4	4.9	4.7	4.5	5.1	6.4	-5%	-0.2%
Mutton and Goat Meat	1.9	2.0	2.6	2.7	2.7	2.7	2.5	2.4	2.6	2.9	41%	1.4%
Pig Meat	0.7	0.7	0.5	0.4	0.5	0.5	0.7	1.0	0.9	0.9	34%	1.0%
Poultry Meat	1.7	1.6	2.1	2.0	2.0	2.0	2.3	3.1	3.3	3.3	101%	2.8%
Meat, Other	1.3	1.3	1.4	1.5	1.5	1.3	1.3	1.3	1.2	1.3	-4%	-0.2%
Fish and Seafood	22.8	21.4	24.1	26.3	34.3	30.7	29.8	28.3	26.5	24.2	15%	0.6%
Eggs	1	1	1	1	1	1	1	2	2	2	100%	2.8%
Milk - dry equiv	3.6	4.4	4.3	3.9	4.2	2.9	2.7	2.3	2.9	3.2	-24%	-1.1%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 17 contains information on the supply of meats, fish, milk and eggs in the Coastal Sahel. In all Coastal Sahelian countries, the supply of poultry meat showed the biggest change in the period 1980-85 and 2004-09. In Cape Verde, per capita supply of poultry meat increased by 1,246%. Pig meat supply per person, in the same period, increased by about 290%, and pig meat has been the dominant source of meat over time in Cape Verde. In spite of the high apparent per capita consumption of fish and seafood in Cape Verde in the early and mid-1980s, per capita consumption dropped by 59% in the study period. Apparent per capita supply of eggs increased by 3kg (an increase of 300%) while that dry milk also increased by about 5% (an increase of about 69%) in the study period. Also noticeable in Cape Verde is a rapid growth in poultry meat supply that is competing with pig meat as important sources of meat, and a gradual decline in the supply of fish and seafood. Comparing national production figures, we notice that unlike pig meat production that has been between an average of 5,000-8,000 tons since the period 1992-94, poultry meat production has been between 0-1,000 tons during the same period. Hence, it is most likely that a significant portion of the growth in poultry meat supply is furnished through imported frozen poultry. Figure 27 illustrates the trend in the supply of poultry meat in the Coastal Sahel sub-region.

In Senegal, bovine meat dominated in meat supply over time. However, the per capita supply of poultry meat witnessed the largest increase (101%), while the per capita supply of bovine declined by 5% in the period 1980-85 and 2004-09. Fish and seafood supply in Senegal grew from an average of 22 kg/person/year in the period 1980-85 to 25 kg/person/year. Apparent per capita supply of eggs increased by about 1kg/capita (100%) while that of dry milk decreased by 1kg/capita (24%). In the Gambia, bovine meat still dominated the meat supply over time. However, the per capita poultry meat supply increased by about 455% in the period 1980-85 and 2004-09, while all other sources of meat experienced a decline in per capita supply. Fish and seafood supply in the Gambia has been quite high, growing from an average of 16 kg/person/year in the period 1980-85 to an average of 26 kg/person/year in the period 2004-09, a growth of about 59%. Pig meat is the dominant source of meat in Guinea Bissau. However, its per capita supply has declined over time (about 14%). Poultry meat per person experienced the largest percentage increase (256%) in supply in Guinea Bissau in the study period. Thus, common in the Coastal Sahel region is a very conspicuous growth in the apparent per capita consumption of poultry meat.

Figure 27. Poultry Meat Supply (kg/capita/year)–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 18. The Contribution of Pulses to Plant Protein Supply (g/capita/day)

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% of total change	% change 1980-85 to 2004-09
Cape Verde												
Plant- Total	45.1	47.5	55.3	45.0	39.2	36.9	39.1	37.4	38.6	41.0		
Pulses -Total	7.1	8.4	16.3	9.6	3.9	4.9	5.6	4.8	4.6	6.5	33%	
Pulse Share	16%	18%	29%	21%	10%	13%	14%	13%	12%	16%		-16%
Gambia												
Plant- Total	36.5	39.4	43.3	41.3	38.8	37.2	37.9	40.0	39.6	44.9		
Pulses -Total	3.1	2.8	2.5	2.2	2.0	1.6	1.7	2.6	1.3	1.2	-40%	
Pulse Share	8%	7%	6%	5%	5%	4%	4%	7%	3%	3%		-62%
Guinea Bissau												
Plant- Total	35.6	36.6	36.0	36.5	36.2	35.0	34.4	34.7	35.8	36.6		
Pulses -Total	1.3	1.3	1.2	1.2	1.1	1.1	1.1	0.9	0.9	1.8	38%	
Pulse Share	4%	3%	3%	3%	3%	3%	3%	3%	2%	5%		3%
Senegal												
Plant- Total	50.4	49.2	49.4	47.5	42.1	41.3	42.5	37.2	41.3	43.6		
Pulses -Total	1.9	2.8	3.0	1.4	2.1	2.0	3.1	1.1	2.2	3.5	-7%	
Pulse Share	4%	6%	6%	3%	5%	5%	7%	3%	5%	8%		40%

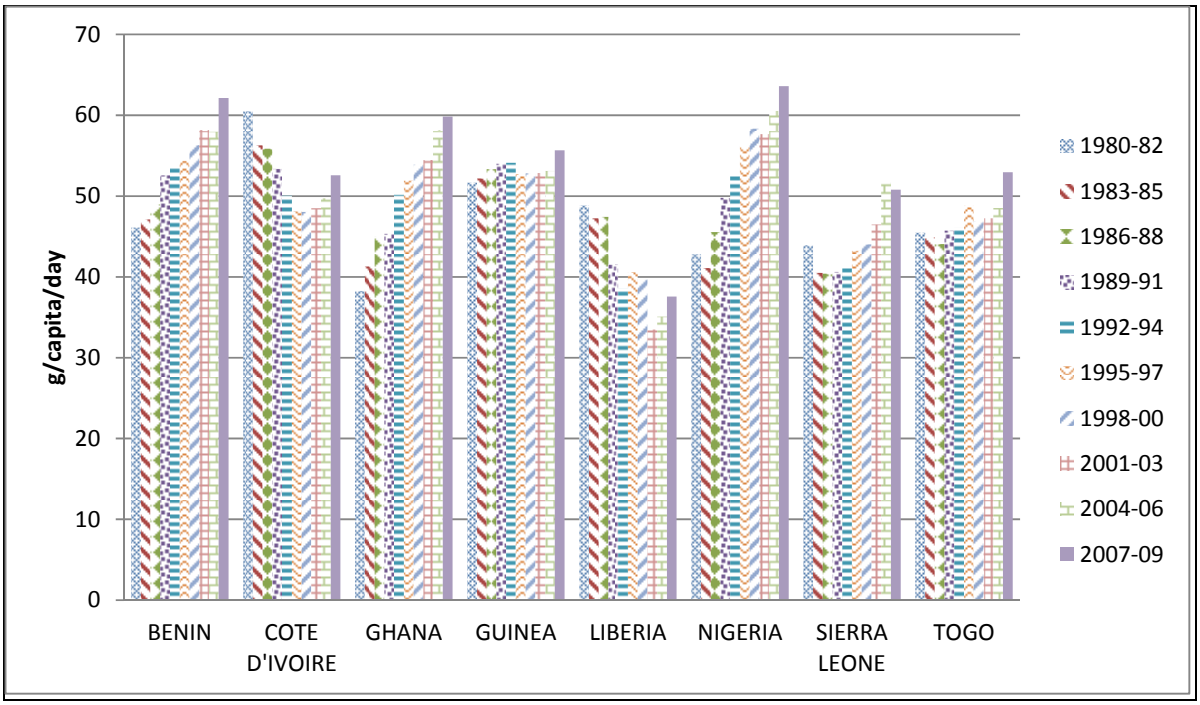
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

To investigate other sources of high quality protein in the Coastal Sahel region, plant protein supply is further disaggregated between protein from pulses (generally of higher quality) and other vegetable proteins. Table 18 shows the contribution of pulses to plant protein supply. With the exception of Cape Verde (and unlike in the Non-Coastal Sahel), the share of pulses in total daily supply of plant protein is less than 10%. The share of pulses in plant protein supply declined for Cape Verde (16%) and the Gambia (62 %); and increased for Guinea Bissau (3%) and Senegal (40%).

Coastal Non-Sahel: As seen from Table 12, total daily protein supply per capita increased most rapidly for Ghana (49%) and Nigeria (49%) in the period 1980-85 and 2004-09. In contrast, for Cote d'Ivoire and Liberia, the overall pattern has been a decline in total daily protein per capita supply in the same period by 12% and 24% respectively. Benin, Sierra Leone and Togo experienced modest increases in total daily per capita protein supply of 29%, 21% and 13% respectively. The supply of protein per person in Guinea did not change much over time. Figure 28 illustrates the trend in the supply of protein in the Coastal Non-Sahel sub-region.

A breakdown of total daily protein supply by source (Figure 29 and Table 19) reveals remarkable growth in Ghana with respect to the supply of animal protein. Animal protein supply per person increased in Ghana between 1980-85 and 2004-09 by 32%. The growth in per capita animal protein supply is explainable by the strong economic growth experienced by Ghana in the last 15 years. In spite of being amongst the leaders in total daily protein supply per capita in the Coastal Non-Sahel, the supply of animal protein in Nigeria is relatively low–it has been less than an average of 10 g/capita/day since the period 1983-1985. Thus, plant protein largely dominates animal protein in Nigeria, and per capita vegetable protein increased by 66% while animal protein per person decreased by 11% in the study period.

Figure 28. Protein Availability (g/capita/day)–Coastal Non-Sahel

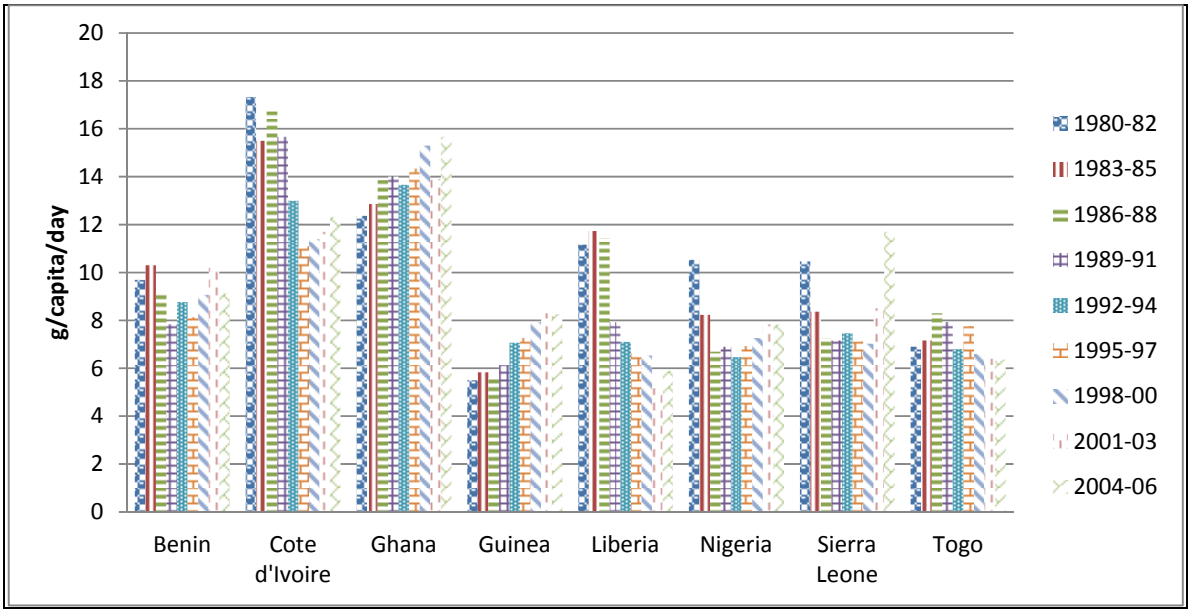


Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

In Nigeria, vegetable proteins accounted for 105% of the increase in total daily protein supply in the study period, while 5% of the change in total daily protein supply in the study period was as a result of a decline in the supply of animal protein. In contrast, in spite of the almost constant level of total daily protein supply in Guinea, the supply of animal protein has been increasing over time. Animal protein supply increased by 42% in Guinea in the study period.

Prior to the 1990s, Cote d'Ivoire sustained the largest per capita supply of animal protein in the sub-region. However, the supply per person of animal protein dropped in the 1990s and the early 2000s. Animal protein supply has been between 11 and 12 g/capita/day since the 2000s in Cote d'Ivoire. Overall, in the study period, animal protein supply per person in Cote d'Ivoire dropped by 27%. Liberia also exhibited a sharp decline in animal protein supply per person–from slightly over an average of 10 g/capita/day in the 1980s, to less than 8 g/capita/day in the 1990s, and finally to less than 6 g/capita/day in the 2000s. Overall, animal protein supply per capita in Liberia declined by 48% in the study period. Animal protein supply per capita in Togo was less than an average of 8 g/capita/day and declined by 7% in the study period. In contrast, animal protein supply per person has been increasing in Sierra Leone since 2001-2003, with an overall increase of 28% in the study period. With the exception of Cote d'Ivoire, Guinea and Liberia in the Coastal Non-Sahel region, more than 75% of the change in total daily supply of protein per person is accounted for by the growth in plant protein supply.

Figure 29. Animal Protein Availability (g/capita/day)–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 19. Daily Protein Availability by Source (g/capita)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	% of total change
Benin												
Plant	36	37	40	45	45	46	47	48	49	52	38%	104%
Animal	10	10	9	8	9	8	9	10	9	10	-5%	-4%
Total	46	47	49	53	54	54	56	58	58	62	29%	
Cote d'Ivoire												
Plant	43	41	39	38	37	37	37	37	37	40	-8%	44%
Animal	17	16	17	16	13	11	11	12	12	12	-27%	56%
Total	60	57	56	54	50	48	48	49	49	52	-14%	
Ghana												
Plant	26	28	31	31	37	38	39	41	42	43	57%	80%
Animal	12	13	14	14	14	14	15	14	16	17	32%	21%
Total	38	41	45	45	51	52	54	55	58	60	49%	
Guinea												
Plant	46	46	48	48	47	45	45	45	45	47	0.0%	0%
Animal	6	6	6	6	7	7	8	8	8	9	42%	100%
Total	52	52	54	54	54	52	53	53	53	56	5%	

Table 19. Continued. Daily Protein Availability by Source (g/capita)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	% of total change
Liberia												
Plant	38	36	36	34	31	34	33	28	29	32	-18%	54%
Animal	11	12	11	8	7	7	7	5	6	6	-48%	46%
Total	49	48	47	42	38	41	40	33	35	38	-25%	
Nigeria												
Plant	32	33	39	43	46	49	51	50	53	55	66%	105%
Animal	11	8	7	7	6	7	7	8	8	9	-11%	-5%
Total	43	41	46	50	52	56	58	58	61	64	49%	
Sierra Leone												
Plant	33	32	33	33	34	36	37	38	40	40	23%	75%
Animal	10	8	7	7	7	7	7	9	12	11	28%	25%
Total	43	40	40	40	41	43	44	47	52	51	24%	
Togo												
Plant	39	38	36	38	39	41	40	41	42	46	14.3%	110%
Animal	7	7	8	8	7	8	7	6	6	7	-7.1%	-10%
Total	46	45	44	46	46	49	47	47	48	53	11.0%	

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 20. Three-Year Averages of Animal Protein Supply (kg/capita)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Benin												
Bovine Meat	3.5	3.6	3.4	3.4	4.1	2.8	2.9	2.8	2.8	2.9	-20%	-0.9%
Mutton and Goat Meat	1.6	1.9	1.3	1.2	1.0	1.1	1.0	0.9	0.9	0.9	-49%	-2.6%
Pig Meat	1.5	1.5	1.5	1.1	1.2	1.2	0.5	0.6	0.6	0.7	-57%	-3.3%
Poultry Meat	4.1	6.2	4.3	3.2	4.7	4.9	7.8	10.0	8.5	13.6	115%	3.1%
Meat, Other	1.6	1.5	1.4	1.3	1.2	1.1	0.9	2.2	0.8	0.8	-50%	-2.6%
Fish and Seafood	11.7	10.3	10.6	9.2	9.7	9.6	8.4	8.7	9.2	7.7	-23%	-1.0%
Eggs	2	2	2	1	1	1	1	1	1	1	-50%	-2.7%
Milk - dry equiv	0.8	0.8	0.8	0.6	0.6	0.8	1.2	1.1	1	0.8	13%	0.5%
Cote d'Ivoire												
Bovine Meat	5.8	5.2	4.7	5.3	4.0	2.7	2.4	1.9	2.1	2.1	-62%	-3.8%
Mutton and Goat Meat	1.2	1.1	0.9	0.8	0.7	0.7	0.6	0.6	0.7	0.6	-44%	-2.3%
Pig Meat	1.1	0.9	0.9	0.9	0.8	0.6	0.4	0.4	0.7	0.8	-23%	-1.1%
Poultry Meat	2.4	2.2	2.5	2.1	1.8	1.6	1.4	1.6	1.6	1.3	-38%	-1.8%
Meat, Other	10.2	9.8	9.3	9.0	8.2	7.4	7.1	7.4	7.6	8.2	-21%	-0.9%
Fish and Seafood	18.1	15.5	19.8	17.9	14.1	12.6	14.1	13.6	13.7	13.3	-20%	-0.9%
Eggs	1	1	1	1	1	1	2	2	1	1	0%	0.0%
Milk - dry equiv.	2.1	1.8	2.1	1.4	1.3	0.9	0.7	0.7	0.8	0.7	-62%	-3.7%

Table 20. Continued. Three-Year Averages of Animal Protein Supply (kg/capita)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Ghana												
Bovine Meat	1.6	1.8	1.6	2.1	2.7	1.6	1.4	1.3	1.4	1.7	-7%	-0.4%
Mutton and Goat Meat	0.9	0.7	0.7	0.7	0.7	0.7	0.9	1.1	1.2	1.3	56%	1.8%
Pig Meat	0.8	0.7	0.8	0.9	0.7	0.8	0.7	0.7	0.7	0.9	9%	0.3%
Poultry Meat	0.8	0.5	0.5	1.0	1.1	1.2	1.7	2.7	3.7	5.2	570%	8.0%
Meat, Other	6.7	7.3	6.5	6.1	5.6	5.3	5.0	4.8	4.6	4.5	-35%	-1.7%
Fish and Seafood	20.7	20.8	25.7	25.0	24.1	28.1	30.7	24.9	28.4	29.0	38%	1.2%
Eggs	1	0	0	1	1	1	1	1	1	1	100%	2.8%
Milk - dry equiv	0.2	0.5	0.4	0.4	0.3	0.2	0.5	0.7	0.8	0.8	129%	3.4%
Guinea												
Bovine Meat	2.6	2.7	2.1	2.7	3.2	3.7	3.8	4.1	4.6	5.1	81%	2.4%
Mutton and Goat Meat	0.5	0.6	0.5	0.6	0.6	0.8	0.9	1.0	1.2	1.5	150%	3.7%
Pig Meat	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	-38%	-2.2%
Poultry Meat	0.4	0.3	0.4	0.4	0.6	0.5	0.6	0.6	0.9	1.2	190.9%	4.5%
Meat, Other	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	-29.2%	-1.5%
Fish and Seafood	6.9	7.7	8.3	9.2	11.1	10.9	12.3	12.7	10.7	10.4	45%	1.4%
Eggs	1	1	1	1	1	1	1	2	2	2	100%	2.8%
Milk - dry equiv	1	1.2	1.1	1	1.2	1.2	1.3	1.2	1.3	1.4	23%	0.8%

Table 20. Continued. Three-Year Averages of Animal Protein Supply (kg/capita)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Liberia												
Bovine Meat	1.4	1.3	0.9	0.9	1.7	0.7	0.6	0.5	0.4	0.3	-73%	-5.3%
Mutton and Goat Meat	0.6	0.6	0.6	0.6	0.7	0.6	0.5	0.4	0.4	0.5	-28%	-1.1%
Pig Meat	2.1	2.0	2.2	2.3	2.3	2.2	1.9	1.9	2.4	2.6	21%	0.8%
Poultry Meat	1.5	1.8	2.4	2.7	2.9	3.1	3.4	3.0	4.2	4.6	168%	4.0%
Meat, Other	6.9	6.3	6.7	3.6	3.6	3.6	3.2	2.5	2.2	2.4	-65%	-4.1%
Fish and Seafood	13.0	15.4	14.6	10.3	5.5	5.6	6.0	4.4	4.7	4.9	-66%	-4.0%
Eggs	1	2	2	2	2	2	2	1	2	2	33%	1.2%
Milk - dry equiv.	1	1.3	0.8	0.4	0.3	0.3	0.3	0.2	0.4	0.3	-70%	-4.6%
Nigeria												
Bovine Meat	5.0	5.2	3.0	2.2	2.3	2.5	2.4	2.2	2.0	1.9	-62%	-3.8%
Mutton and Goat Meat	1.2	1.4	1.6	1.7	1.8	2.1	2.6	2.8	2.8	2.8	110%	3.1%
Pig Meat	0.5	0.6	1.0	1.1	1.1	1.2	1.3	1.4	1.4	1.4	158%	3.8%
Poultry Meat	1.8	1.7	1.7	1.8	1.6	1.5	1.4	1.5	1.6	1.6	-8%	-0.4%
Meat, Other	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.9	-31%	-1.3%
Fish and Seafood	15.7	9.0	7.4	9.8	5.7	6.7	7.3	9.2	8.9	13.2	-10%	-0.5%
Eggs	3	3	3	3	4	3	3	3	3	4	12%	0.6%
Milk - dry equiv.	1.5	0.9	0.5	0.6	0.6	0.6	0.5	0.7	0.8	0.8	-17%	-1.6%

Table 20. Continued. Three-Year Averages of Animal Protein Supply (kg/capita)–Coastal Non-Sahel

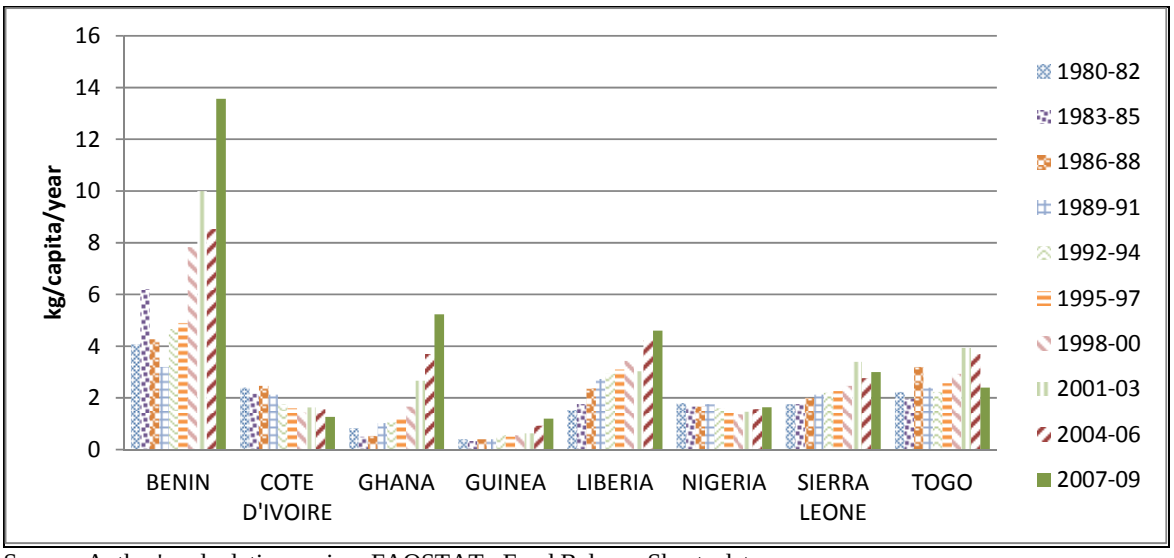
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09	CAGR 1980/85 to 2005/09
Sierra Leone												
Bovine Meat	1.7	1.6	1.4	1.4	1.8	1.5	1.4	1.1	1.3	1.5	-14.3%	-0.7%
Mutton and Goat Meat	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.2	0.4	0.5	16.7%	0.5%
Pig Meat	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	-3%	-0.3%
Poultry Meat	1.8	1.8	2.0	2.1	2.2	2.3	2.5	3.4	2.8	3.0	63%	1.9%
Meat, Other	0.6	0.6	0.5	0.5	0.5	0.5	0.6	1.1	1.8	1.8	203%	4.5%
Fish and Seafood	21.5	17.2	14.4	14.0	13.8	13.8	14.6	17.8	27.2	25.3	36%	1.2%
Eggs	1	1	1	1	1	2	2	2	1	2	50%	1.6%
Milk - dry equiv.	1.6	0.9	0.9	0.8	0.8	0.5	0.3	0.4	0.5	0.5	-60%	-3.6%
Togo												
Bovine Meat	2.0	3.0	3.1	1.6	1.2	1.4	1.3	1.5	1.5	8.2	95%	-1.8%
Mutton and Goat Meat	0.9	1.0	1.5	1.7	1.1	1.0	1.3	1.3	1.3	1.6	50%	1.4%
Pig Meat	1.2	1.1	1.2	1.5	1.5	1.0	1.2	1.3	1.4	1.4	20%	1.0%
Poultry Meat	2.2	2.0	3.2	2.4	2.2	2.6	2.9	3.9	3.7	2.4	45%	3.0%
Meat, Other	1.4	1.2	1.2	1.1	1.0	0.9	0.8	0.9	0.8	4.1	89%	-1.8%
Fish and Seafood	10.7	10.0	11.6	12.4	10.6	13.6	10.0	7.5	7.4	7.3	-29%	-1.6%
Eggs	0	1	1	1	1	1	1	1	1	1	0%	2.8%
Milk - dry equiv.	0.4	0.4	0.4	0.5	0.4	0.5	0.3	0.4	0.6	0.5	0%	1.3%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Animal protein is further disaggregated by source to identify its major sources in the Coastal Non-Sahel (Table 20). Throughout these coastal countries, fish and seafood remains by far the dominant source of animal protein. Among meats, the figures reveal that poultry meat has been the dominant meat type in Benin over time. Poultry meat supply per capita increased by 115% between 1980-85 and 2004-09, while the supply of all other types of meats declined in the same period. It is important to note that some of this apparent increase in per capita chicken consumption in Benin may reflect chicken that was clandestinely exported to Nigeria, which had a ban on frozen chicken import during some of this period. While fish and seafood have been dominant sources of animal protein in Benin, per capita supply has been declining over time–declining from an average of 11 kg/capita/year in 1980-85 to an average of 8.5 kg/capita/year in 2004-09. Egg supply per person declined by 1kg (50%) in the study period, and milk supply remained around an average of 1kg throughout the period of study.

In Cote d'Ivoire, the per capita supply of all the different types of animal protein declined over time, and the largest increase (62%) was experienced by bovine meat and milk. In Ghana the per capita supply of poultry meat increased by 570%, while that of fish and seafood increased by 38% in the study period. Per capita supply of fish and seafood is largest for Ghana (mostly greater than 25 kg/capita/year) in the Coastal Non-Sahel sub-region. Milk supply per person in Ghana increased from an average of 3.5kg in the beginning of the period to an average of 8kg at the end of the period, representing an increase of about 129%. Poultry meat supply per person in Nigeria dropped by 8% and that of fish and seafood dropped by 10% in the study period. Guinea, Liberia, Sierra Leone and Togo experienced increases in the per capita supply of poultry meat of 190%, 168%, 63% and 45% respectively. Guinea and Sierra Leone also experienced increases in apparent per capita fish and seafood consumption of 45% and 36% respectively. Figure 30 shows the trend in the supply of poultry meat in the Coastal Non-Sahel sub-region.

Figure 30. Poultry Meat Supply (kg/capita/year)–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 21. The Contribution of Pulses to Plant Protein (g/capita/day)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% of total change	% change 1980-85 to 2004-09
Benin												
Plant - Total	36.4	36.9	39.8	44.7	45.0	46.3	47.2	48.0	48.8	51.7		
Pulses -Total	3.3	3.7	4.3	4.7	5.2	4.9	5.6	5.7	6.4	8.9	31%	
Pulse Share	9%	10%	11%	11%	12%	11%	12%	12%	13%	17%		59%
Cote d'Ivoire												
Plant - Total	43.2	40.8	39.1	37.7	37.1	37.0	36.6	36.8	37.4	40.4		
Pulses -Total	0.5	0.4	0.4	0.4	0.3	0.5	1.0	1.0	1.2	1.3	-26%	
Pulse Share	1%	1%	1%	1%	1%	1%	3%	3%	3%	3%		200%
Ghana												
Plant - Total	25.9	28.4	31.1	31.3	36.5	37.6	38.6	40.6	42.5	43.3		
Pulses -Total	0.7	0.5	0.6	0.6	0.5	0.4	0.4	0.3	0.4	0.4	-1%	
Pulse Share	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%		-55%
Guinea												
Plant - Total	46.2	46.4	47.8	47.9	47.1	45.4	44.9	44.6	44.8	47.0		
Pulses -Total	4.4	4.4	4.7	5.1	4.5	4.1	4.0	3.8	3.6	3.3	257%	
Pulse Share	10%	9%	10%	11%	10%	9%	9%	9%	8%	7%		-22%

Table 21. Continued. The Contribution of Pulses to Plant Protein (g/capita/day)–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% of total change	% change 1980-85 to 2004-09
Liberia												
Plant - Total	37.6	35.5	36.0	33.6	31.5	34.0	33.2	28.3	29.2	31.5		
Pulses -Total	0.8	0.8	0.8	1.1	1.8	2.4	2.6	1.4	1.7	1.5	-13%	
Pulse Share	2%	2%	2%	3%	6%	7%	8%	5%	6%	5%		142%
Nigeria												
Plant - Total	32.3	32.9	38.9	42.9	46.3	49.2	51.1	49.8	52.7	54.6		
Pulses -Total	2.6	2.3	2.9	4.6	4.8	5.3	5.9	5.4	5.6	6.3	16%	
Pulse Share	8%	7%	7%	11%	10%	11%	11%	11%	11%	11%		46%
Sierra Leone												
Plant - Total	33.4	32.2	33.2	33.4	33.8	36.1	37.0	38.0	40.0	39.5		
Pulses -Total	4.8	4.6	4.6	4.8	4.7	5.5	6.9	7.5	7.6	7.2	39%	
Pulse Share	14%	14%	14%	14%	14%	15%	19%	20%	19%	18%		30%
Togo												
Plant - Total	38.6	37.8	35.7	37.8	39.3	41.0	40.3	40.9	42.2	45.9		
Pulses -Total	4.1	4.7	3.9	2.7	3.8	5.0	4.3	4.3	4.9	6.1	19%	
Pulse Share	11%	12%	11%	7%	10%	12%	11%	11%	12%	13%		8%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 21 shows the contribution of pulses to vegetable proteins in the Coastal Non-Sahel. For all countries in this sub-region, apparent per capita protein supply from pulses has been less than 10 grams per day. The share of pulses in total daily per capita supply of vegetable protein has also been less than 10% for Cote d'Ivoire, Ghana and Liberia. The share of pulses in plant protein supply increased for Benin, Cote d'Ivoire, Liberia, Nigeria, Sierra Leone and Togo, in the period 1980-85 through to 2004-09.

The preceding analysis of protein supply has shown different patterns in the supply of proteins across the 15 ECOWAS countries. Some countries, such as Ghana and Nigeria (Coastal Non-Sahel) and Cape Verde (Coastal Sahel) have shown remarkable growth in apparent per capita daily protein consumption; other countries like Mali (non-Coastal Sahel) have shown modest growth in apparent daily protein consumption per capita; and still other countries like Liberia and Cote d'Ivoire have shown a declining trend in the apparent daily protein consumption per capita. With respect to protein supply by source, plant protein still remains the principal source of protein for almost all countries in the region, with the exception of Cape Verde, and the growth in total daily protein supply per capita was mostly driven by growth in plant protein in the period 1980-85 through to 2004-09. Animal protein supply has been increasing for most countries in the region. However, growth in the supply of animal protein has been remarkable in countries that have experienced rapid economic growth over time like Ghana and Cape Verde. Countries with modest economic growth over time like Mali have also shown modest changes in the supply of animal protein over time. Countries that have been through civil disruption like Liberia and Sierra Leone also showed significant declines in total protein and animal protein supply during periods of war. In Nigeria, the largest country of the ECOWAS zone, while total protein availability per capita increased, per capita supplies of animal-based proteins fell, but were offset to some degree by increases in consumption of pulses, a source of high-quality proteins.

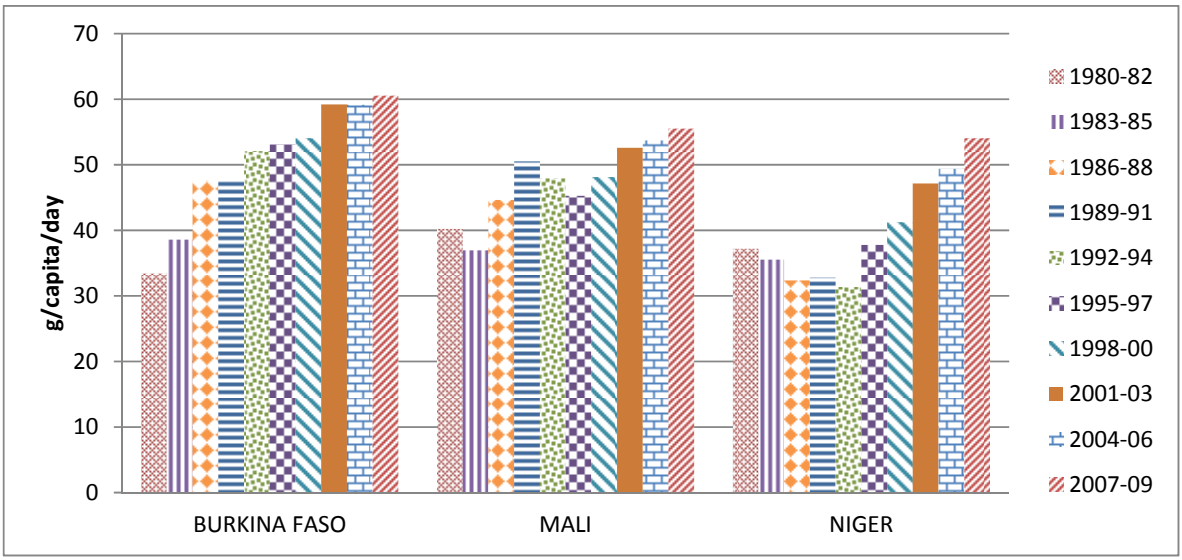
The analysis of animal protein by source revealed some interesting trends. The rate of growth in the apparent per capita consumption of poultry meat has been quite large for most countries in the region–from 45% in Togo to 1246% in Cape Verde, in the period 1980-85 through to 2004-09. In Benin for instance, poultry meat supply per capita and milk increased at the expense of all other sources of animal protein, indicating some level of substitution. Fish and seafood supply grew in Niger and Mali (Non-Coastal Sahel), Senegal and the Gambia (Coastal Sahel), and in Guinea and Sierra Leone (Coastal Non-Sahel). In the Gambia, poultry meat, fish, and seafood and, to a small extent, eggs are substituting for all other sources of animal protein. A disaggregation of vegetable protein supply between pulses (usually of higher protein quality) and other sources of vegetable proteins reveals pulses to be an important share of vegetable protein supply in Cape Verde and in Niger. Pulses have accounted for 9% (Burkina Faso) to 57% (Niger) of the change in plant protein supply in the period 1980-85 through to 2004-09. Compared to the Non-Coastal Sahel, and with the exception Cape Verde, pulses contribute less than 10 g/capita/day of protein and have had small shares (less than 10%) in total daily vegetable protein supply in the Coastal Sahel. In the Coastal Non-Sahel sub-region, pulses accounted for from 16% (Nigeria) to 257% (Guinea—from a small base) of the growth in plant protein in the period of study. The growth in the share of pulses in total daily plant protein supply reflects some degree of diet upgrading. Thus, in spite of the relatively low apparent per capita consumption of high quality animal protein in most countries in the region, the positive growth in protein supply from pulses as well as in the share of pulses in daily vegetable protein supply supports the emergence of pulses as *poor people's meat* in the region.

Table 22. Daily Fat Availability (g/capita)–ECOWAS-West Africa

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	% change 1980-85 to 2004-09
Non-Coastal Sahel											
Burkina Faso	33	39	48	48	52	53	54	59	59	61	67%
Mali	40	37	45	51	48	45	48	53	54	56	43%
Niger	37	36	32	33	31	38	41	47	49	54	41%
Coastal Sahel											
Cape Verde	55	65	69	66	81	79	70	69	73	79	27%
Gambia	45	48	51	55	65	60	71	73	74	67	52%
Guinea Bissau	50	54	58	55	58	55	51	52	54	60	10%
Senegal	61	59	51	51	67	62	63	64	65	69	12%
Coastal Non-Sahel											
Benin	48	49	40	41	41	40	46	51	53	47	3%
Cote d'Ivoire	50	48	45	45	44	46	49	51	50	49	1%
Ghana	36	37	40	37	38	35	39	39	45	50	30%
Guinea	50	47	42	43	51	52	53	55	60	61	25%
Liberia	47	54	48	46	62	64	58	55	57	55	11%
Nigeria	49	44	48	53	59	58	60	62	66	67	43%
Sierra Leone	61	56	59	56	58	60	48	48	55	55	-6%
Togo	29	30	32	39	39	43	39	46	47	50	64%

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 31. Fat Availability (g/capita/day)–Non-Coastal Sahel

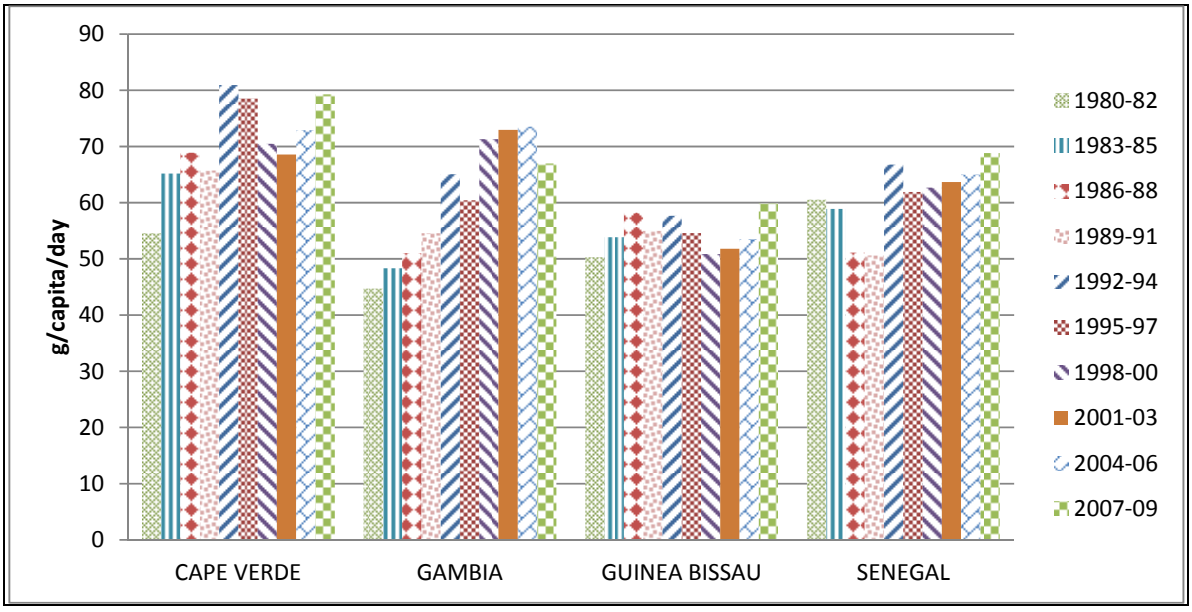


Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.4.2. Analysis of Fat Supply

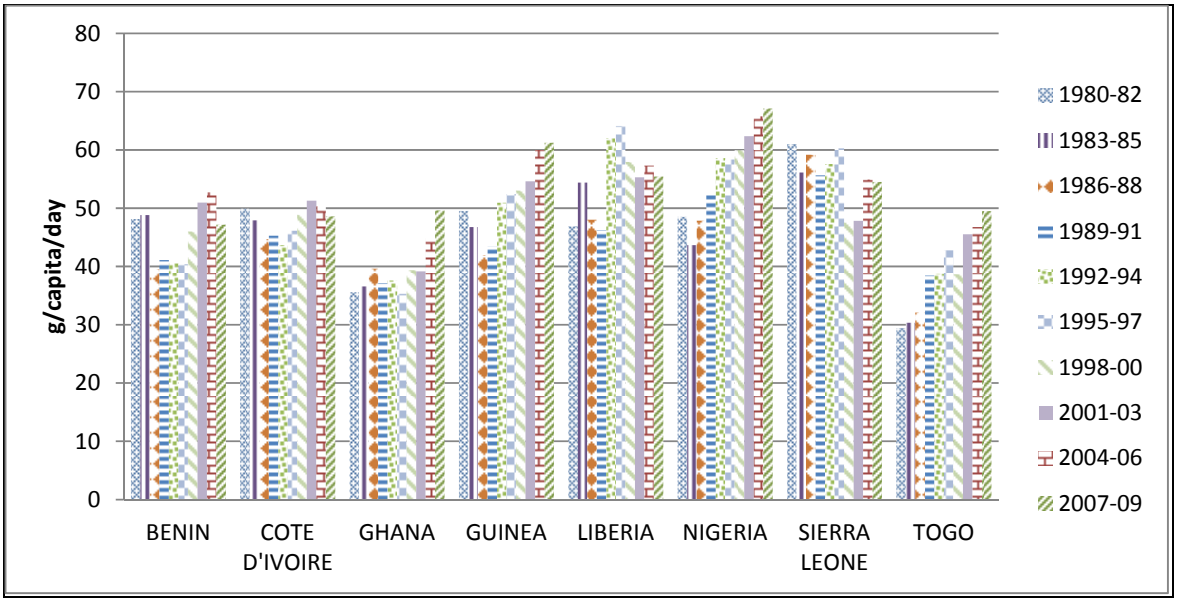
Table 22 shows data on fat supply in the 15 ECOWAS members of WA. With the exception of Sierra Leone, apparent per capita fat consumption increased for all countries in the period 1980-85 and 2004-09. Over time, daily fat supply per capita has been generally highest for Coastal Sahelian countries. However, the increases in per capita fat supply in the study period were largest for non-Coastal Sahelian countries. Figures 31-33 show the trends in total daily fat supply (g/capita/day) by sub-region.

Figure 32. Fat Availability (g/capita/day)–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 33. Fat Availability (g/capita/day)–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.5. Trends in the Share of Macronutrient Group in Daily Per Capita Energy Supply

The contribution of various macronutrient groups to total daily per capita energy supply also indicates the quality of the diet. This section examines whether diets are becoming more balanced, based on the joint FAO/WHO guidelines for various nutrients for a balanced diet—55-75% from carbohydrates , 15-35 % from fats and 10-15 % from proteins (Nishida et al. 2004). The analysis of the contribution of different macronutrient groups—fats, protein and carbohydrates—to daily per capita energy availability reveals that over time, while most countries in ECOWAS-WA have remained close to the upper bound of the daily recommended share of carbohydrates in energy supply, few of these countries deviate from the lower bound of the recommended share of protein and fats in daily energy supply.

2.5.1. Non-Coastal Sahel

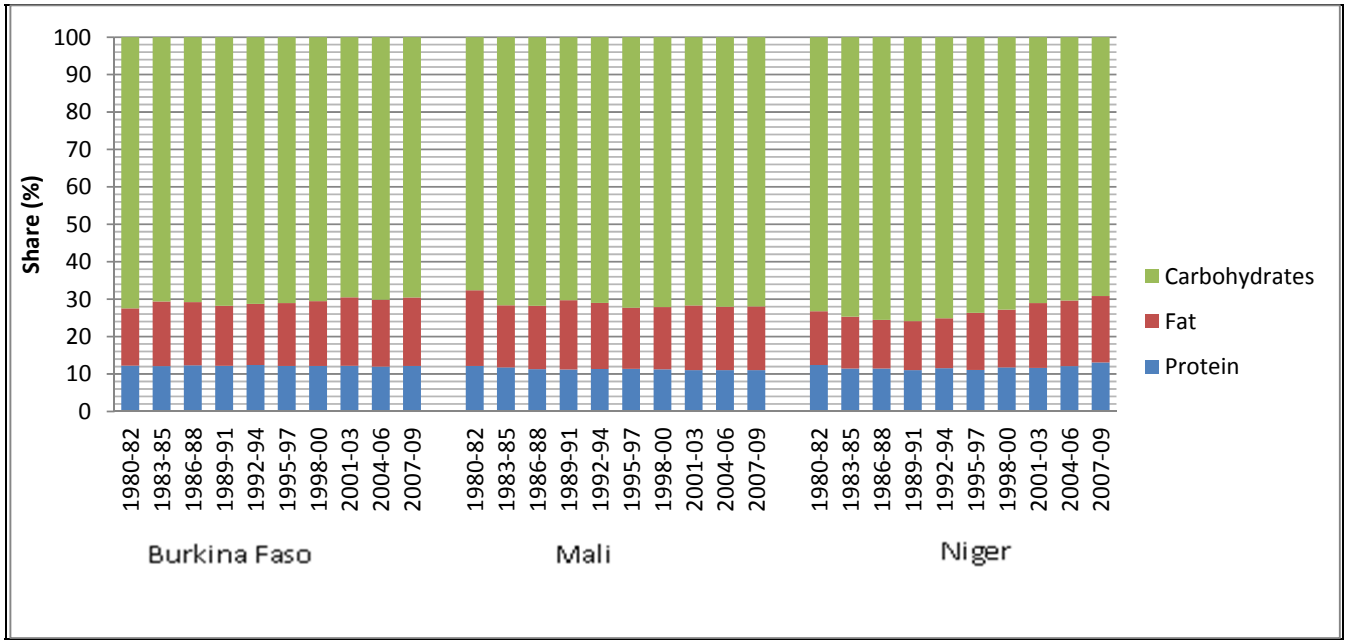
In the Non-Coastal Sahel sub-region, the share of each macronutrient group in total daily energy supply has not changed much. In particular, the share of protein seems almost constant over time, as minor redistributions takes place between fats and carbohydrates. Nonetheless, since total per capita availability increased markedly for these countries over the study period, the absolute levels of fat and protein consumption also increased substantially. In addition, we saw from the analysis of protein by source in the Non-Coastal Sahel that the contribution of animal protein has been growing since the early 2000s. Thus, in spite of the almost constant share of protein in total daily energy supply, the quality of protein supply has not been constant; rather it has improved to some extent due to the growth in consumption of animal protein that is much richer in essential amino acid balance. Table 23 and Figure 34 show the trends in the share of various macronutrient groups in total daily energy supply per capita in the Non-Coastal Sahel.

Table 23. Trends in the Share (%) of Macronutrients in Daily Per Capita Energy Availability–Non-Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Burkina Faso										
Protein	12	12	12	12	12	12	12	12	12	12
Fat	15	17	17	16	16	17	17	18	18	18
Carbohydrates	72	71	71	72	71	71	71	70	70	70
Mali										
Protein	12	12	11	11	11	11	11	11	11	11
Fat	20	17	17	18	18	16	17	17	17	17
Carbohydrates	68	72	72	70	71	72	72	72	72	72
Niger										
Protein	12	11	11	11	12	11	12	12	12	13
Fat	14	14	13	13	13	15	15	17	18	18
Carbohydrates	73	75	76	76	75	74	73	71	70	69

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 34. Daily Caloric Share (%) by Macronutrients–Non-Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

2.5.2. Coastal Sahel

In the Coastal Sahel region, the share of carbohydrates still remains close to the upper bound of the daily recommended share. The share of protein has also remained close to its daily recommended lower bound. The Gambia and Guinea Bissau over time have fallen below the minimum daily protein share in total daily energy supply. As was the case in the Non-Coastal Sahel, just focusing on the share of protein in total daily energy supply obscures the important changes that have taken place (in particular in Cape Verde) in terms of the quality of protein supply. The share of fat in daily energy supply has been much higher in the Coastal Sahel than in the Non-Coastal Sahel. See Table 24 and Figure 35 for information on the share of macronutrient groups in total daily energy supply per capita in the Coastal Sahel.

2.5.3. Coastal Non-Sahel

In the Coastal Non-Sahel region, a similar pattern of not much variation in the share of each macronutrient group in daily per capita energy supply is observed. However, unlike in the case of the Coastal and Non-Coastal Sahel, the share of protein in daily energy, over time, and for almost all Coastal Non-Sahelian countries has remained below the recommended daily protein share (10%) in total daily energy supply. With the exception of Sierra Leone, which has shown a slight increase in protein share over time, protein share in all the other countries has been either constant or declining. It is, however, worth noting that while the share of protein in total daily energy supply has not shown much change, the analysis of protein supply in absolute terms as well as of the contribution of animal protein to total protein supply seen earlier revealed not only an increase in the amount of protein supplied over time (Benin, Ghana, Nigeria, Sierra Leone), but also an increase in the quality of protein supply over time (Ghana, Nigeria, and Sierra Leone), thus indicating some upgrading in the diet, at least for some countries in the sub-region. Ghana and Cote d'Ivoire have consistently had higher than the daily recommended carbohydrate share over time, and this seems not to be changing much. This is not surprising because of the high consumption of starchy roots and tubers in these countries. Guinea, Liberia and Togo have experienced a decline in the share of carbohydrates towards the upper bound of the recommended daily share. Table 25 and Figure 36 show information on the share[18]of each macronutrient group in total daily energy supply.

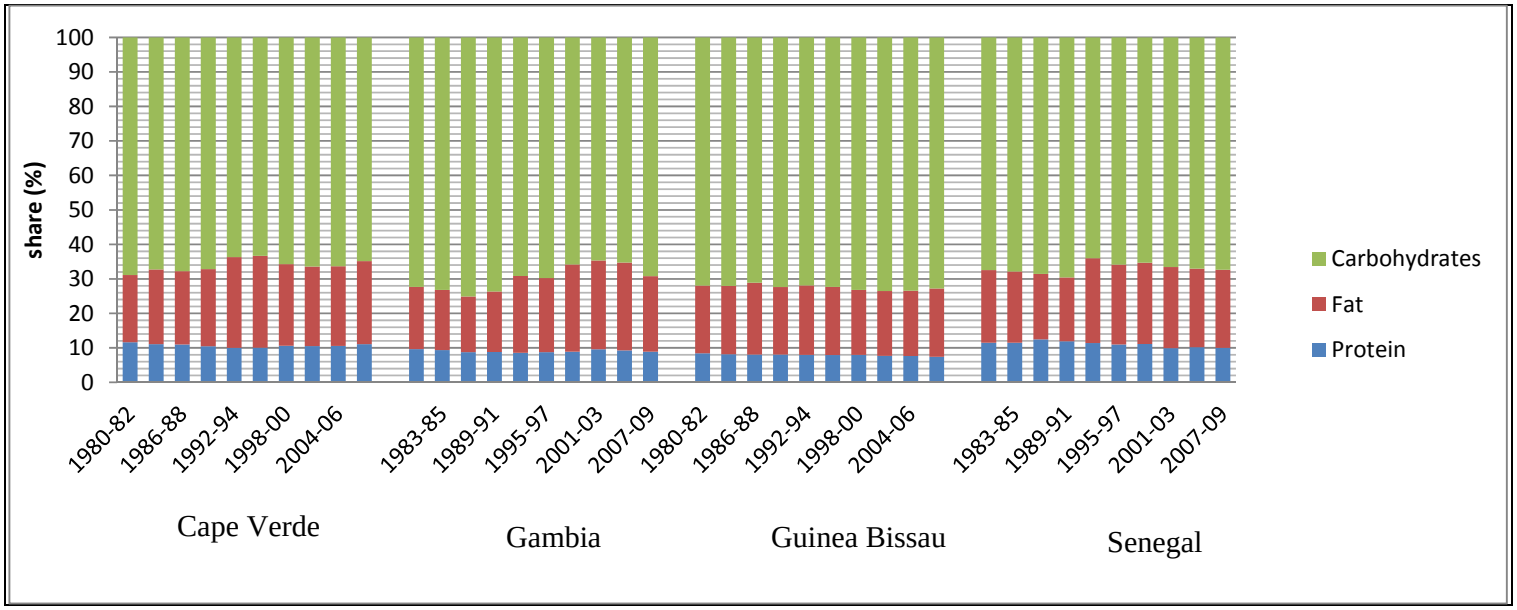
[18] Shares do not always add up to 100 because of rounding up.

Table 24. Trends in the Share (%) of Macronutrient Groups in Total Per Capita Daily Energy Availability– Coastal Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Cape Verde										
Protein	12	11	11	11	10	10	11	11	11	11
Fat	19	22	21	22	26	27	24	23	23	24
Carbohydrates	69	67	68	67	64	63	66	66	66	65
Gambia										
Protein	10	9	9	9	9	9	9	10	9	9
Fat	18	17	16	18	22	22	25	26	25	22
Carbohydrates	72	73	75	74	69	70	66	65	65	69
Guinea Bissau										
Protein	8	8	8	8	8	8	8	8	8	7
Fat	20	20	21	20	20	20	19	19	19	20
Carbohydrates	72	72	71	72	72	72	73	74	73	73
Senegal										
Protein	11	11	12	12	11	11	11	10	10	10
Fat	21	21	19	19	25	23	24	24	23	23
Carbohydrates	67	68	69	70	64	66	65	67	67	67

Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 35. Daily Caloric Share (%) by Macronutrients–Coastal Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Table 25. Trends in the Share (%) of Macronutrient Groups in Total Per Capita Daily Energy Availability– Coastal Non-Sahel

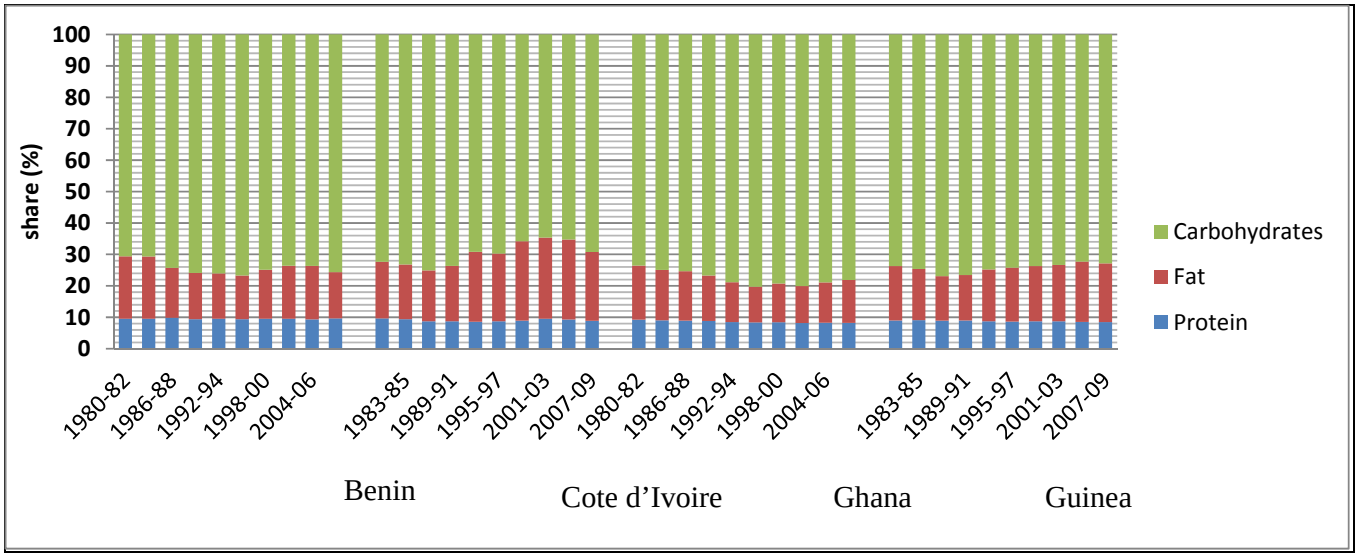
	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Benin										
Protein	10	10	10	9	10	9	10	10	9	10
Fat	20	20	16	15	14	14	16	17	17	15
Carbohydrates	71	71	74	76	76	77	75	74	74	76
Cote d'Ivoire										
Protein	9	8	9	9	8	8	8	8	8	9
Fat	14	14	14	15	14	15	16	17	16	22
Carbohydrates	77	77	77	77	77	77	76	75	76	69
Ghana										
Protein	9	9	9	9	8	8	8	8	8	8
Fat	17	16	16	15	13	11	12	12	13	14
Carbohydrates	74	75	75	77	79	80	79	80	79	78
Guinea										
Protein	9	9	9	9	9	9	9	9	8	8
Fat	17	16	14	14	16	17	18	18	19	19
Carbohydrates	74	75	77	77	75	74	74	73	72	73
Liberia										
Protein	8	8	8	7	7	7	7	6	7	7
Fat	15	18	16	16	22	24	21	21	22	20
Carbohydrates	77	74	77	77	71	69	71	72	72	74

Table 25. Continued. Trends in the Share (%) of Macronutrient Groups in Total Per Capita Daily Energy Availability–Coastal Non-Sahel

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009
Nigeria										
Protein	9	9	9	9	9	9	9	9	9	9
Fat	21	20	19	19	19	18	19	20	20	20
Carbohydrates	70	71	71	72	72	73	72	71	71	71
Sierra Leone										
Protein	8	8	8	8	8	8	9	9	10	9
Fat	24	23	24	23	23	23	19	19	21	20
Carbohydrates	68	69	68	69	68	68	72	72	69	70
Togo										
Protein	9	10	10	10	10	10	9	9	9	9
Fat	12	13	14	16	16	17	15	18	18	17
Carbohydrates	79	78	76	74	74	73	75	73	73	74

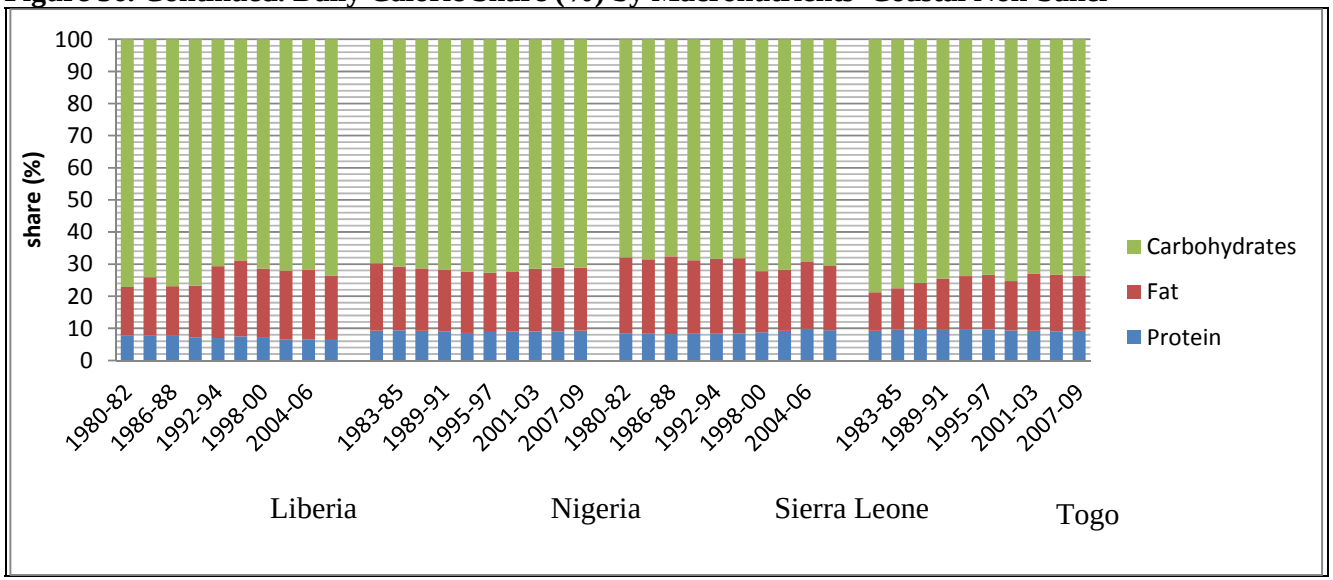
Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 36. Daily Caloric Share (%) by Macronutrients–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

Figure 36. Continued. Daily Caloric Share (%) by Macronutrients–Coastal Non-Sahel



Source: Author's calculations using FAOSTAT– Food Balance Sheets data.

3. PAPER SUMMARY

The goal of this paper was to provide evidence of shifts in food consumption patterns in ECOWAS West Africa. In particular, the analysis was intended to identify major contributors to diets, changes in the levels as well as in the composition of food supply at the country-level and to enhance understanding of the food supply situation within the ECOWAS using national-level FAOSTAT's food balance sheet data from 1980-2009. The analysis reveals a trend towards greater calorie supply for most ECOWAS countries. While the growth in daily energy availability has been much more pronounced and consistent for countries experiencing rapid economic growth (e.g., Ghana and Cape Verde), the growth pattern has been disrupted in countries that have been through civil disruptions like Cote d'Ivoire, Liberia and Sierra Leone. The analysis also provides evidence of a diversification in the composition of food supply. The importance of starchy roots and tubers in the diets, particularly in the Sahel region, has grown over time. The analysis reveals a big cassava revolution that has taken place in some of the Coastal Non-Sahelian countries such as Nigeria, Ghana, and Sierra Leone. The growth in the apparent per capita consumption of cassava (e.g., Senegal) and sweet potatoes (e.g., Mali), most likely reflects the lower income population shifting towards cheaper calorie sources. Apparent per capita consumption of yams also showed huge increases in some Coastal Non-Sahelian countries (e.g., Ghana and Nigeria). There has also been positive growth in the supply of Irish potatoes in some countries (e.g., Cape Verde and Senegal), supporting evidence of increasing income (due to the high income elasticity of Irish potatoes), and a westernization of diets (increased consumption of potato chips). The analysis also provides evidence of a striking growth in apparent per capita consumption of maize in the Sahel (Burkina Faso, Mali and Senegal). Apparent per capita rice consumption increased for most countries in the study period. In Cape Verde for instance, there is been a replacement of maize with rice as the dominant type of cereal.

With respect to the quality of the diet, the supply of daily protein per capita has been increasing for most countries since the early 2000s. Proteins from plant sources are the dominant source of protein in the entire region. Although plant protein dominate as the major source of protein for most of these countries, some of these countries (e.g., Niger, Sierra Leone, and Cape Verde) derive an important share of vegetable protein from pulses, which are also a source of high quality protein. Some countries have shown a positive trend in the supply of animal protein. The countries that have shown evidence of diet upgrading through increased consumption of animal protein have been mostly those that have also shown evidence of rapid and strong economic growth over time (e.g., Ghana and Cape Verde). Countries with modest economic growth, such as Mali, have also shown modest growth in the consumption of animal protein over time. Apparent per capita daily fat supply increased for most countries in the study period. The share of carbohydrates, fats, and proteins in total daily energy supply did not change much over time. While most countries meet and even exceed the WHO/FAO recommended daily allowance for carbohydrates, the share of protein in daily energy continues to remain close to the lower bound of the recommended daily value. However, this has not always meant that the diets have not improved over time as some countries have experienced not only a positive growth in the supply of proteins in absolute terms, but also have been improving in terms of the consumption of animal protein (generally of better nutritional value than plant protein) as well as pulses (of higher quality protein than most other sources of plant protein). Although fish and seafood remains the main animal protein source for most of the coastal states in the ECOWAS zone, most of the countries in the region have experienced growth in the per capita supply of poultry meat over time, primarily from imports.

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