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Staff Paper

The Role of Regional Trade in Agricultural Transformation:
The Case of West Africa Following the Devaluation of the
CFA Franc

Mbaye Yade, Anne Chohin-Kuper, Valerie Kelly,
John M. Staatz and James Tefft

Staff Paper 99-28

June 27-30, 1999



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June 27 -30, 1999

34 pages total

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**PAPER PRESENTED AT THE WORKSHOP ON AGRICULTURAL
TRANSFORMATION**

sponsored by

**TEGEMEO INSTITUTE / EGERTON UNIVERSITY, NJORO, KENYA
EASTERN AND CENTRAL AFRICA PROGRAMME FOR AGRICULTURAL POLICY
ANALYSIS (ECAPAPA),
ENTEBBE, UGANDA
MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, USA
and
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT**

MSU Agricultural Economics Staff Paper no. 99-28

**Nairobi, Kenya
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1. INTRODUCTION

In the early 1990s countries in the West and Central African franc zones faced serious economic difficulties evidenced by stagnating (in some cases declining) gross national product (GNP) per capita. Despite several macroeconomic and sectoral reforms (liberalization in particular), the persistent overvaluation of the CFA Franc, which began in the mid-1980s, was contributing to a deepening of the crisis.

The agricultural sector was not spared from this general trend, with continuous declines in the value of agricultural exports and production per capita registered from the mid-1980s to the early 1990s. Slow growth in agricultural productivity, which lagged behind population growth, contributed to uncertainty regarding to food security and general economic development. In short, meeting the challenge of agricultural transformation in the countries of the Franc zone was viewed as a daunting task as the decade of the 1990s began. It was in this context that the historic 50% devaluation of the CFA Franc was introduced on January 14, 1994.

Impacts of the devaluation were expected to vary by sector, social group, and location. While there was concern about the food security of low-income groups and salaried employees in the formal sector (particularly civil servants) being hurt by the devaluation, there was also hope that export crop sectors and those producing food crops with strong demand in regional markets would become more competitive, stimulating economic expansion.

For the food sector, which is the focus of this paper, growth in intra-regional commerce was anticipated among the members of the CFA zone as well as between CFA Franc-zone countries and other West African countries. The potential for expanding regional trade raised hopes of advancing the agricultural transformation through market-stimulated intensification of agricultural

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production. In fact, the thinness of the domestic markets and the poorly developed regional trade networks had always been considered major constraints hampering agricultural transformation. The devaluation was expected to increase the cost of imports from outside the CFA Franc zone and lower the costs of exporting from the Franc zone to other countries in West Africa, thereby strengthening the potential for intra-regional trade and expanding the markets for production originating in the CFA countries.

In this paper, we analyze the progress made in realizing this anticipated boost in economic growth for three agricultural subsectors: cereals, livestock/meat, and horticultural products. We begin with a discussion of the agricultural sector in general, based on an overview of the trends in macroeconomic indicators following the devaluation (section 2). Section 3 examines changes in the trading environment and the reaction of markets to these changes. Section 4 describes the responses of producers and traders to the new opportunities offered by the devaluation; the analysis looks at input/output price trends, trading opportunities and their impact on production. We conclude in section 5 by evaluating the results obtained, drawing conclusions about the devaluation's impact on agricultural transformation, and offering recommendations concerning future directions.

2. EVOLUTION OF MACROECONOMIC AND SECTORAL INDICATORS FOLLOWING THE DEVALUATION

This section presents an analysis of macroeconomic indicators, describing the context in which the opportunities for agricultural transformation were acted upon following changes in regional trade patterns stimulated by the devaluation.

Table 1 compares the average annual GNP per capita before and after the devaluation (1990-93 vs. 1994-1997) for seven countries in the Franc zone.¹ One notes a striking decline in GNP/capita for all countries but Benin between the pre-devaluation and post-devaluation periods. Relatively speaking, Niger experienced the greatest decline (almost 30%), followed by Burkina Faso, Senegal, and Chad (about 20% each). In absolute numbers, Senegal exhibited the largest decline (\$135 between the two periods).

¹As we used methods applied in the *World Bank Atlas*, these numbers are similar to current GNP. Cf. World Bank, *African Development Indicators 1998/99*.

Table 1. Changes in Average Annual GNP Per Capita: 1990-93 vs. 1994-97

	Benin	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal	Chad
Absolute change (US \$)	-12.5	-57.5	-95	-40	-85	-135	-55
Relative change (%)	-3.38	-20.35	-12.3	-13.8	-29.8	-20.3	-19.3

Source : Authors' calculations from data in Table A1

This simple comparison of the two periods, however, masks the evolution taking place within each period. Thus, Table 2 presents the results of regression analysis used to estimate growth rates by country for the periods 1988-1993 and 1994-1997. Economic stagnation prevailed in three (Benin, Burkina Faso, and Chad) of the seven countries from 1988-1993, as the estimated coefficients for the time trend in the pre-devaluation period are not statistically different from zero; in three others (Cote d'Ivoire, Niger, and Senegal) growth was negative. Only in Mali was growth statistically significant and positive before the devaluation. Three of the seven countries exhibit statistically significant and positive rates of growth for the post-devaluation period: Burkina Faso (6%), Senegal (4%), and Benin (3%). Growth was negative during the same period for Niger and Chad (both about -2%). For Cote d'Ivoire and Mali, the overall situation for the post-devaluation period was one of stagnating GNP/capita, however there were signs of positive growth beginning in 1997; 4% for Cote d'Ivoire and 8% for Mali (figures shown in Table A1).

Table 2. Annual Growth Rate of Per Capita GNP (in %)

	Benin	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal	Chad
Before devaluation							
1988/93	0.14	-1.35	-4.83**	+3.24* *	-5.20**	-3.03**	1.28
1993/94	-10.53	-12.5	-10.53	-16.7	-12.5	-12.73	-8
After devaluation							
1994/97	+3.47**	+6.16**	0.82	0.26	-2.43**	+4.32**	-1.93*

Source : Authors' calculation from Table A1

* Regression coefficient significant at 95% level.

** Regression coefficient significant at 95% level.

Despite a drop in the average GNP/capita between the two periods separated by the devaluation, three countries have shown overall per capita GNP growth since the devaluation, and two others began to show signs of positive growth in 1997; only Niger and Chad continue to experience

negative growth trends. Despite the positive trends, however, by 1997 none of the seven countries had reached their pre-devaluation levels of GNP/capita.

Table 3. Relative Changes (%) for Selected Macro Indicators: 1999-93 vs. 1994-1997

	Benin	Burkina Faso	Chad	Côte d'Ivoire	Mali	Niger	Senegal
Current Account Balance Deficit excluding net Capital Grants, as Share of GNP	34	39	38	-52	11	13	-23
Capital Goods Imports in Millions of U.S. Dollars (Current Prices)	NA	-38 ⁽¹⁾	0 ⁽¹⁾	+45 ⁽¹⁾	+25 ⁽¹⁾	NA	1
Net Foreign Direct Investments in Millions of U.S. Dollars (Current Prices)	+33 ⁽²⁾	-24	1	692	-3	-3	-3
Government Deficit including Grants as Share of GNP	-61	-63	-42	-78	-44	-61	-86
Gross Domestic Investment as Share of GNP	26	18	98	95	13	46	19
Value Added in Agriculture in Millions of U.S. Dollars, constant 1987 Prices	23	14	22	11	15	11	8
Agriculture Value Added as Share of GNP	7	11	29	54	20	25	35
Food Imports as Share of Value of Agricultural Exports	NA	-75 ⁽¹⁾	-49 ⁽¹⁾	-20 ⁽¹⁾	-4	NA	44

Source :World Bank, *African Development Indicators 1998/99*.

Notes:

⁽¹⁾ 1990-1993 vs 1994-1996.

⁽²⁾ 1991-1993 vs 1995-1997.

⁽³⁾ Figures grew from negative to positive amounts so no percentage change can be computed.

NA means no data were available.

Table 3 reviews the evolution of selected macroeconomic indicators. Three indicators in particular show strong positive trends across all countries when moving from pre- to post-devaluation measures: (1) gross domestic investment as a share of GNP, (2) value added in agriculture, and (3) agricultural value added as a share of GNP. Growth in domestic investment was particularly important in Chad (98% increase between the two periods) and Cote d'Ivoire

(95% increase). The investment growth in Chad is probably due to investments for petroleum exploration.

Agricultural value added grew fastest in Benin (23%) and Chad (22%). The consistent growth in agricultural value added as well as the growth in the share of agricultural value added in GNP confirms that the agricultural sector was among the sectors benefitting from the devaluation.

Although budget deficits continue to be the rule, the share of GNP represented by these deficits has declined across all countries -- most strongly for Cote d'Ivoire (-78%) and Senegal (-86%). The value of food imports as a share of the value of agricultural exports has declined substantially in Burkina Faso, Chad, and Cote d'Ivoire (-75, -49, and -20%, respectively) but remained relatively stable in Mali (-4%) and actually increased in Senegal (+44%).

Performance of other indicators such as balance of trade deficits and foreign investments is mixed and at times disappointing, even though slight improvements occurred in some countries. For example, Côte d'Ivoire, Senegal, and Mali were able to attract significantly more foreign investment after the devaluation, and the first two countries even improved their balance of payments.

Growth in agricultural value added is an important indicator of general health in the agricultural sector. The first two columns of Table 4 show the results of regression analyses used to estimate pre- and post-devaluation growth rates for agricultural value added (using constant 1987 U.S. dollars). From 1990-93, growth rates for Benin, Burkina Faso, and Chad were positive and statistically significant (6%, 9%, and 13%, respectively); in the remaining countries, coefficients were not significant, suggesting stagnation in the growth of value added. From 1993-1997, growth in value added was positive and statistically significant for all countries but Niger. Although growth rates remained positive for Benin, Burkina Faso, and Chad following devaluation, they did decline (Chad, the worst case, dropped from a growth rate of 13% to about 2%).

Growth in the value of agricultural exports is another good indicator of agricultural sector performance. Unfortunately, the number of observations was insufficient (data series ending in 1996) for estimating post-devaluation growth rates. Regression results presented in the third column of Table 4 show that from 1990-1993 agricultural export growth was either stagnant (Benin, Cote d'Ivoire, Mali) or strongly negative (Niger, Burkina Faso, Chad, and Senegal exhibiting rates ranging from -7% in Niger to -26% in Senegal). Although the negative trends were attenuated following the devaluation, not a single country exhibited consistent year-to-year growth in agricultural exports between 1993 and 1996 (Table 5). By 1996, however, five of the seven countries were realizing agricultural export receipts substantially greater than those earned in 1993 (bottom line of Table 5): Benin had more than doubled receipts while Burkina Faso, Cote d'Ivoire, Mali, and Chad had increases ranging from 25% to 51%. Niger is the only country showing absolutely no growth in agricultural exports since 1993. For Senegal, despite a dramatic increase in exports from 1993 to 1994 (38%), the trend has been negative ever since.

Table 4. Estimated Growth Rates for Selected Indicators of Agricultural Productivity

	Agricultural Value Added (% growth/yr using constant 1987 prices)		Agricultural Exports (% growth/yr. using current US\$ values)
	1990-93	1993-97 ¹	1990-93
Benin	5.59*	4.31**	1.37
Burkina Faso	9.15**	5.25**	-9.97**
Côte d'Ivoire	1.18	5.38**	-2.12
Mali	0.81	4.85**	1.37
Niger	2.56	0.98	-6.63**
Senegal	-2.75	2.5**	-26.07**
Chad	13.20**	1.73**	-10.15**

Source: Authors' calculation from *The World Bank African Development Indicators 1998/99*

Notes:

¹ Data for 1997 are preliminary

* Regression coefficient significant at 95% level.

** Regression coefficient significant at 99% level.

Table 5. Annual Percentage Change in U.S.\$ Value of Agricultural Exports: 1993-1996

	Benin	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal	Chad
1993/94	38.55	-13.98	-0.62	-4.76	0	38.46	40.48
1994/95	74.78	76.25	39.02	12.92	-6.25	-8.73	22.88
1995/96	-6.47	-12.77	8.3	15.87	0	-24.35	-12.41
1993/96	126.49	32.25	49.63	24.61	-6.25	-4.4	51.2

Source: Authors' calculation from *The World Bank African Development Indicators 1998/99*; export values reported in millions of U.S. dollars, current prices.

3. CHANGES IN THE CONTEXT AND INTENSITY OF REGIONAL TRADE

Regional trade is determined by regional production and prices as well as by both the regional and world markets. This analysis will focus on three important commodities that are traded in the region: livestock/meat, cereals and horticultural products. Given that existing statistics only partially cover regional trade, the following analysis is primarily qualitative and indicative.

3.1 Livestock/meat²

At the time of the devaluation of the CFA franc, the livestock subsector in the Sahel (Burkina Faso, Mali, Niger) was facing stiff competition from international meat exports, primarily heavily subsidized meat from the European Union, in its traditional export markets on the coast (Benin, Cote d'Ivoire, Ghana, Nigeria and Togo). This led coastal countries to gradually substitute imported European beef for Sahelian imports. Consequently, the main hoped-for effect of the 1994 devaluation for this subsector was the restoration of the competitiveness of Sahelian exports in the coastal markets.

The livestock subsector in the region is characterized by relatively weak state direct involvement and, as a consequence, sparse and unreliable statistics. In contrast to commodities such as cotton and peanuts, which are sold almost exclusively on the international market, livestock is a tradeable good whose market is primarily regional. Consequently, the main challenge facing this subsector was to reconquer its traditional regional markets by substituting for non-African beef that was being heavily imported into the coastal countries.

Before examining the changes in the trade, as reflected in official regional trade statistics on live cattle exports, we examine briefly the changes in factors affecting regional livestock/meat trade.

Five factors explain trade flows of cattle and meat between Sahelian and coastal countries: the offtake from Sahelian cattle herds, consumer demand in the Sahelian countries, consumer demand in the coastal countries, livestock production in coastal countries, and non-Sahelian beef imports. The following section discusses recent trends in each of these factors.

After the devaluation, offtake from Sahelian cattle herds was stimulated by remunerative producer prices that resulted from the effective transmission of large price consumer increases for meat back to herders. Despite an increase in input prices, especially in intensive production systems, the profitability of cattle production increased. Herd levels, on the other hand, historically constrained by recurring droughts, increased over time less quickly than the human population. Thus, following large sales of cattle immediately after the devaluation in 1994, the increased offtake rates from Sahelian herds could not be sustained.

²This section draws heavily on studies by PRISAS on the evolution of the cattle subsector in five countries (Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Senegal) following the CFA franc devaluation. See Yade et al., 1998.

Sahelian consumer demand competes with exports for available supply. The devaluation reduced real incomes in Sahelian countries, especially for urban consumers, who were faced with rising prices of meat and nearly stagnant cash incomes. Thus, local slaughter levels within the Sahelian countries dropped at the expense of increased exports towards coastal countries.

Consumer demand for beef in coastal countries also has been decreasing. In Cote d'Ivoire, for example, annual per capita meat consumption dropped from 7.6 kilograms in 1986 to 4 kg in 1995 (Yade and Kanté 1998). Total meat consumption there decreased from 79,880 tons in 1988 to 56,774 tons in 1996, a drop of 29%. This fall can be explained partly by the rise in prices and loss of consumers' purchasing power following the devaluation. The higher prices resulted from the drastic reduction in supply, which was due to sharp fall in non-African beef imports, which were not entirely offset by increased cattle imports from the Sahel. The lower purchasing power in coastal countries limited beef imports from Sahelian countries. But the price increases in coastal countries made Sahelian exports more competitive versus local slaughter in the Sahel.

Livestock production in coastal countries, responding to livestock policy in Côte d'Ivoire and Ghana, has risen in recent years, but without any real impact on imports, given these countries' low levels of self-sufficiency in beef and rapid population growth. Despite the coastal countries' desire to develop their livestock industries, production in these countries has not constrained Sahelian imports either before or after the devaluation.

Non-African beef imports into the coastal countries are a key determinant of trade within the region, in the sense that they constitute one of the two main sources of supply (the other being regional trade). Competition between these two sources is nearly a zero-sum game--i.e., increased market share for one is gained at the expense of the other. This competition is affected primarily by the following factors: European Union policy on meat subsidies, Sahelian countries' export policies, coastal countries' import policies, CIF prices, and the constraints encountered by Sahelian exporters.

The devaluation coincided with a favorable policy environment for Sahelian exporters, characterized by a streamlining of export procedures, the reduction of massive export subsidies on European beef, and the establishment by coastal country governments of compensatory import taxes to offset the EU export subsidies. The competitiveness of Sahelian exports still is strongly affected by high export marketing costs, particularly transport costs. It costs \$230 per ton of meat equivalent to ship cattle from the Sahel to the coast, compared with only \$80/ton for beef shipped by non-African exporters from the world market to the West African coast..

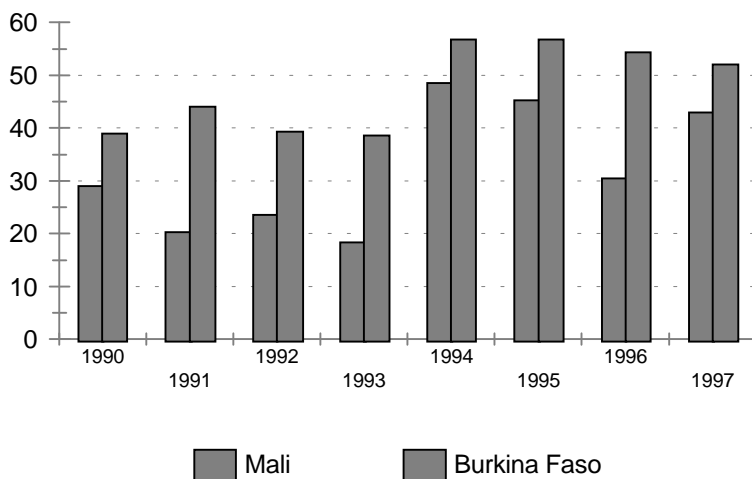
The analysis of European Union foreign trade statistics reveals that the volume of beef and offal exports to West and Central Africa (CMA/WCA)³ decreased fell by 74% percent between 1991-93 and 1995-97, while the value of those exports (in ECUs) dropped by 61%. These exports, which represent two-thirds of EU meat exports to CMA/WCA during this period, dropped 23%

³Countries covered by the Council of Ministers of Agriculture of West and Central Africa, an organization that is promoting regional trade.

between 1995-1997. They were dethroned by poultry exports, which saw their market share go from 23% to 68% during the same period. Moreover, Côte d'Ivoire and Ghana, which were receiving more than half of CMA/WCA imports, have been relegated to second tier status by Congo and Gabon.

Given all these factors, regional trade of cattle on the hoof has increased considerably since the devaluation of the CFA franc. Over the period 1994-97, a larger share of local offtake in Burkina Faso and Mali has gone to exports, at the expense of local slaughter. Given the weak capacity of actors to increase total supply of cattle in the short run to meet growing demand, market forces

Figure 1. Evolution of the Share of Exports in Total Offtake (in %)



have allocated more of the existing supply to the coastal countries, which have stronger effective demand than the Sahelian countries.

Figure 1 shows that in Mali, the average share of exports in total offtake has increased from 23% in 1990-93 to 42% between 1994 and 1997. In Burkina Faso, the average share increased from 40% before the devaluation to 55% after the devaluation.

Pressure on local slaughter in Burkina Faso is very strong, given the favorable price differential between Ouagadougou and coastal cities like Abidjan and Accra.

In absolute terms, in Burkina Faso and Mali, exports have increased 58 and 85%, respectively, compared to the 1990-93 period, while local slaughter has dropped 11 and 18 percent; these figures exclude 1994 which was an exceptional year.

In Burkina Faso, export sales have become less concentrated. Before the devaluation (1990-93) more than 90% of Burkina cattle exports went to Cote d'Ivoire. While Ghana has absorbed 27% of Burkina exports since the devaluation, the depreciation of the cedi to the CFA franc began to slow this movement in the third quarter of 1995. Despite the constant depreciation of the cedi, however, the Ghanaian share of Burkina cattle exports increased to 37% in 1997. This larger share is probably due to the decision of the Ghanaian government to reduce import tariffs in 1997.

Even though Sahelian exports have not completely compensated for the decline in non-African meat imports into coastal markets, the devaluation together with the reduction of European beef subsidies and creation of compensatory import taxes, have nevertheless contributed to the recovery of Sahelian livestock industry and the recapturing of market share in Ghana and Côte d'Ivoire.

3.2 Cereals

Cereals - rice and maize, millet and sorghum - are another set of commodities that are widely traded among West African countries, but whose flows are poorly documented by official statistics. The importance of this trade has been corroborated by other more focused studies and is consistent with analyses (discussed below) of the correlation of agricultural production and of market integration in the region, as well as a comparison of price differentials with transport costs. Prior to presenting the results of analysis of available national statistics, we will first examine the potential for cereals trade in the region.

3.2.1 Changes in Trade Potential

*Correlation of Production*⁴: This section analyzes the opportunities for regional trade by looking at the probability that a cereal-deficit country could satisfy its food needs by importing from a neighboring food-surplus country. In other words, this analysis examines whether agricultural production is positively correlated between different countries. If it is, the future development of regional trade may be constrained even if that trade is driven primarily by effective demand (“the market”). A positive correlation implies that a drop in production in one country would likely be accompanied by a drop in production in the surrounding countries, making all the countries “short” of grain at the same time. Therefore, there would be little room for regional trade to smooth out supplies. Conversely, the absence of any significant positive correlation, or the presence of significant negative correlation, would broaden the scope for regional trade; production shortfalls in one country would be accompanied by no change in production, or even a production increase, in neighboring countries. In such a situation, regional trade can help stabilize national markets.

No country in the region is self-sufficient in rice. Even if all countries import rice, however, certain countries are also rice exporters. Rice exports are not only re-exports of rice imported in excess of national consumption needs. There are countries, such as Mali, that have adopted the strategy of exporting higher-value local rice while importing a lower quality rice from the world market to make up the deficit. Limited purchasing power of poorer groups of the population prevents them from buying the preferred local rice, particularly during the hungry season when prices are highest. People at these income levels turn to the lower quality imported rice, which has the additional advantage of expanding more than local rice during cooking and is thus able to more cheaply feed the family. This import/export strategy could be expanded through the further development of irrigated rice schemes in Mali, particularly in the Office du Niger zone.

The degree to which countries satisfy national cereal needs with local production varies widely. National production in Mali, Guinea and Nigeria satisfies 80% of their total cereal needs, while Ghana, Mauritania and Senegal only meet 40% of their requirements. In fact, 80% of the region’s cereal imports from outside of West Africa are accounted for by Senegal, Nigeria, Cote d’Ivoire

⁴ Analysis for the period 1992/93 -1998/99 is based on production data from DIAPER/CILSS for CILSS countries and from FAO for other countries.

and Ghana. Considering Mali's potential exportable surplus, which stems from the growth of production in the Office du Niger zone (see below), and the absence of any positive correlation of Mali's rice production with that of the largest rice importers in the region (with the exception of Ghana), an expanded rice trade in the region is highly foreseeable in the future (see annex table A2).

For coarse grains (millet, sorghum, maize), production in the largest producing countries (Nigeria, Burkina Faso, Mali and Niger) is not significantly correlated (table A2). Nigeria's production is negatively correlated with that in Mali and Burkina Faso. And production in Burkina Faso and Mali, the two countries that have the potential to be the largest coarse grain exporters in West Africa, is not significantly correlated with that of other countries. The correlation coefficients tend to be negative (although not statistically significant), a sign indicating a potential for regional trade. This same pattern applies between Niger and Nigeria, the former's main source of supply.

Market Integration: The integration of markets is another factor important in promoting regional trade of coarse grains. Price correlation coefficients are a tool to measure market integration. Although they require caution in their interpretation (Harriss 1979), correlation coefficients (Annex table A3) indicate the extent to which prices in different markets move together.

The analysis of monthly cereal prices in 1992/93 (prior to the devaluation) in four capital cities (Bamako, Dakar, Niamey and Ouagadougou) reveal very few positive correlations. The only significant correlations were between Dakar and the following markets: Bamako and Niamey for millet, Ouagadougou for sorghum, and Bamako for maize. After the devaluation (1994-1997), however, prices for every cereal were significantly correlated between every combination of cities. This development reflects not only the impact of the devaluation, but also the result of efforts over the last ten years to liberalize the economies and expand regional trade in countries in the region.

Barry et al. (1998) used more sophisticated methods to measure market integration for rice in the region, notably between Malian markets and those in Cote d'Ivoire, Guinea, Niger and Senegal between 1993 and 1996. Using the Gordon model, they arrived at the following conclusion:

"... Malian markets and those in neighboring countries seem ... badly integrated due to a thin trade in rice and high transport costs ... but the level of integration between Malian markets and sub-regional markets seems to have improved after the devaluation ... the direction of trade between Mali and certain regional markets such as northern Cote d'Ivoire and Guinea, reversed [following the devaluation]....⁵

Price Differentials: If the correlation analyses of cereal production and of prices point out two necessary conditions for trade between two countries in the region, notably the existence of

⁵The reversal of trade came about because it was no longer profitable following the devaluation to re-export rice imported from the world market to Mali. After 1994, Malian rice began to become competitive in certain markets in Côte d'Ivoire and Guinea.

surplus for one country and a deficit in another, and the connection of two regions by a market, one additional and fundamental condition must be met. Such trade must be profitable.⁶ In other words, in addition to the first two conditions, it is necessary that the price differential between markets in two countries covers transport costs and the margins of the different economic actors. It is well documented that transport costs constitute a major obstacle to trade in the region.

In Annex Figure A1, the difference between the wholesale prices of maize, millet and sorghum in Bamako and the consumer prices in Dakar/Tilene is compared to the cost of rail transport - the most economical mode of transport - for the period 1992-97. In order to increase trade flows, the price differential must cover marketing costs and margins of the exporter, wholesaler and retailer. After the devaluation, margins for maize improved significantly. For millet and sorghum, with the exception of 1995 and 1997, margins were negative, and even in 1995 and 1997, the margins were much lower than those for maize.

More recent analysis of these maize margins between Mali and Senegal for the period October 1998 to March 1999 reconfirm these findings. For rice, millet and maize during the same period, however, margin analysis revealed that trade potential was weak between the two countries. Estimates of export margins of the four cereals between Mali and Cote d'Ivoire also augurs well for future trade (PASIDMA/OMA/INSAH-PRISAS 1999).

3.2.2. *Evolution of Regional Trade*

Annex table A4 provides information on coarse grains exports from CILSS countries between 1987/88 and 1998/99, based on data obtained from the series of annual cereals balance sheets published by DIAPER.⁷ Official data capture exports mainly Mali prior to the devaluation, and *only* from Mali after the devaluation. It's clear that this does not entirely reflect reality, and for this reason, we will analyze broad trends in regional trade rather than a detailed statistical analysis of official data.

To illustrate, however, we will focus on Mali's exports. Its recorded exports of coarse grains increased considerably after the devaluation, moving from an annual average of 7,468 m.t. between 1987/88 and 1992/93 to 30,000 m.t. between 1994/95 and 1998/99, i.e. an increase on the order of 300%. Over the same period, the coefficient of variation of its exports fell from 93% to 64%. It's worth noting that the production of these cereals did not significantly increase in Mali after the devaluation. Without doubt, the substitution by certain countries in the region of cheaper millet, sorghum, and maize, obtained through regional trade, for their previous imports from the world market, influenced both coarse grain prices and cereals flows from Mali.

⁶ Even if there are short-term losses, profits must outweigh losses in the long term.

⁷DIAPER (*Diagnostic Permanente*) is a CILSS program aimed at improving agricultural production and trade statistics of CILSS member states.

Annex tables A5 and A6 show declared cereals export intentions by Malian traders between 1990 and 1998.⁸ Declared export intentions concern mainly millet and sorghum throughout the period, with the exception of 1994, the year of the devaluation. During that year, there was a strong demand for maize from countries that normally import it from the world market, such as Senegal. However, this competitiveness of Malian maize was quickly lost due to the rapid increase in local maize prices. For example, during the last few years, the largest Senegalese importer has been regularly importing 25,000 m.t. of maize from the world market every year.

The most important export destinations for Malian cereals traders have been Côte d'Ivoire and Senegal, especially right after the devaluation, as shown by the graphs in Annex Figure A1. These two countries have good seaports and hence are well integrated into the world market. They were replaced as the main export destinations by two landlocked countries, Burkina Faso and Niger, in 1998, which was a bad production year in those two countries. Trade between these two countries and Mali can reverse from year to year, depending on local production conditions.

3.3 Horticultural products: African Markets—Engine of Development?

The quality of data on horticultural production and trade is similar to that in the livestock sector, making it difficult both to predict and to measure quantitatively the evolution of intra-regional trade in horticultural products.

Recognizing these limits, we analyzed the post-devaluation evolution of the subsector and the potential for regional trade for a number of important crops -- onions, garlic, tomatoes, potatoes and green beans.

The value of production and trade for the products studied raises a key question: Will the African regional market be the motor of

development for the horticultural sector? Information in Table 6 suggests that the answer to this question is yes. The subsector response for products targeted primarily at regional markets (onions, tomatoes, garlic, and even potatoes in Mali) was stronger after the devaluation than was the response of products aimed at the European export market (green beans from Burkina Faso and export quality potatoes ('primeur') from Senegal). Production increased significantly for onions in Mali and Senegal, and for tomatoes in Benin. Precise numbers are not available for

Table 6. : Indicators of Horticultural Sector Performance: 1993-96

Product	Country	Production %93-96	1996 Value ('000 000 CFA F)
<i>Onion</i>	Mali	+125%	17061
	Senegal	+70%	24717
	Burkina	n.a.	4400
<i>Potato</i>	Mali	(+) n.a.	9 150
	Senegal	-40%	1 870
<i>Tomato</i>	Benin	+36%	18 050
		Exports %93-96	Value ('000 000 CFA F)
<i>Green Beans</i>	Mali	+93%	685
	Senegal	+26%	3 510
	Burkina	-8 à -24%	1 995

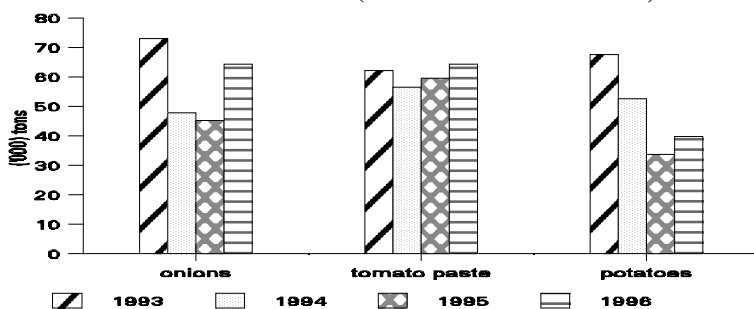
⁸In Mali, traders who wish to export products must make a prior declaration of their export intentions to the government, even though such a declaration does not oblige the trader to carry out the exportation, nor does it expose him/her to any additional taxes. (The declaration requirement is part of a government effort to improve statistics on regional trade.)

onion and garlic production in Chad and potatoes in Mali, but it appears that this production, destined primarily for regional markets (Congo, Central African Republic, and Côte d'Ivoire, for example) increased substantially after the devaluation. By contrast, exports of green beans from Burkina Faso dropped by 10-20%. The value of onion production in Mali, Senegal and Burkina Faso reached 46 billion CFA F, much higher than the 6.2 billion CFA F generated by exports of green beans from the same countries, despite an increase in green bean exports from Senegal (26%) and Mali (93%).

The lack of data on regional trade and imports does not permit a precise analysis of what is driving the consumption of the increased production since the devaluation: substitution for European imports, increases in consumption, or exports to the regional market. Following the devaluation, it seems that increases in local production substituted partly for European imports to West and Central Africa, which decreased in 1994 and 1995 (figure 2), and that regional trade increased (potatoes and, to a lesser extent, onions from Mali; and onions from Chad). Surprisingly, imports into West and Central Africa have increased since 1995 and reached, in some countries, levels that are higher than pre-devaluation ones (e.g., onions in Senegal). But these import increases were not accompanied by drops in local production. On the contrary, onion production is still increasing in Senegal and Mali, suggesting higher local consumption and probably more regional trade.

It is dangerous to conclude from our study of only five crops and six countries that the African market for "basic" horticultural products (onions, tomatoes, potatoes, and garlic) could generate more income than European export markets, but aggregate import/export data for West and Central Africa suggest this might be the case for most countries (Table 7). The average annual

Figure 2: Evolution of West and Central African Imports of Basic Horticultural Products: 1993-96 (Source: FAOSTAT 1998)



value of "basic" horticultural imports⁹ for these regions was US\$98.493 million (1993-1996). Total fruit and vegetable exports from the two regions generated about three times more income than was spent on basic imports, but 72% of these exports were concentrated in two countries: Ivory Coast (primarily pineapples) and Cameroon. Excluding these exceptional cases, we find that

fruit and vegetable exports covered only 79% of "basic" horticultural imports, suggesting that each country needs to carefully evaluate the costs and benefits of import substitution versus European export strategies for the horticultural sector.

⁹ Potatoes (other than export quality 'primeur' in Senegal), although much less consumed than onions and tomatoes, have entered into regional consumption habits, particularly those of urban consumers, hence we include them in the category of "basic" products.

There are a number of factors that contributed to the rapid growth in the supply of these “basic” products. First, devaluation made local production more competitive with European imports. In addition, these products exhibit demand and marketing characteristics that facilitate subsector expansion: Onions, tomatoes, and garlic:

- represent an important share of total vegetable consumption throughout the West and Central African regions (10-25% for onions, 7-39% for tomatoes);
- are ‘basic food products’ consumed almost daily by both urban and rural households rather than ‘luxury products’ consumed primarily in urban areas, restaurants, and wealthier households. Rural consumption is particularly important because most evidence suggests that the bulk of the income gains from the devaluation have accrued in rural areas.
- are imported from Europe by many countries in the region, even after the devaluation (Figure 2);
- can be stored and/or processed more easily -especially onions- than most horticultural products.

Potatoes do not exhibit all of these characteristics, particularly the strong local demand; this might explain the relatively weaker post-devaluation response for this subsector.

In brief, the African demand for “basic” horticultural products is substantial. Our hypothesis is that with an appropriate mix of policies and investments African producers should be able to remain competitive and expand production of these products with less effort than it would take to expand into niche export markets (such as the green bean and ‘primeur’ potato markets recently targeted by Burkina Faso and Senegal) which are characterized by:

- weak local and regional demand, hence heavy reliance on European demand;
- strong competition in European markets by well-established exporters;
- difficult enforcement and litigation of international production and marketing contracts;
- very demanding quality, storage, and packaging requirements;

Table 7. Average Annual Value of Horticultural Imports and Exports in West and Central Africa (WCA):1993-1996

Imports		Exports ^a	
Product	Value ('000 US\$)	Zone	Value ('000 US\$)
Onions ^b	22757	West Africa	226 720
Garlic	1043	(66 % Côte d'Ivoire	
Tomato		Central Africa	56720
paste	58788	(99% Cameroun)	
Potatoes	15905		
Total	98 493	Total WCA	283 440
		WCA minus RCI and Cameroun	78131

Source: FAOSTAT online data base, 1998

Note : (a) Includes all fruits and vegetables. (b) Onions includes shallots

4. IMPACT OF THE DEVALUATION ON THE PRODUCTION ENVIRONMENT

In this section we examine the response of different categories of actors to the opportunities and challenges presented by the devaluation and the impact that these responses have had on aggregate production and productivity.

4.1 Evidence on Micro-level Response

4.1.1 Changes in Production Systems and Technologies

In situations where the general policy environment was favorable to agricultural growth (e.g., progress made toward market liberalization and improvements in government fiscal balances) and prior investments had been made to support agricultural productivity or market development (e.g. roads, irrigation, market information systems), the devaluation-induced changes in input/output price relationships appear to have had a positive impact on stimulating farm level investments and agricultural intensification. The Office du Niger, or ON (Mali's main irrigated rice area), is a case in point.

In the post-devaluation period, we found that many ON farmers increased rice yields substantially by switching from broadcast seeding to transplanting rice started in nurseries and/or using more organic and inorganic fertilizer on these crops (Table 8). There was also increased diversification into dry-season horticultural products such as onions and tomatoes, accompanied by increases in use of organic and inorganic fertilizers. This diversification and input use increases the annual productivity of land and irrigation investments well beyond what can be produced with a single rice crop (or even a double rice crop, because dry-season rice yields are quite low). Both rice intensification and diversification into horticulture were stimulated by increased demand for the products; this demand came not only from Malian consumers but also from other countries in the region (primarily Cote d'Ivoire, but also Ghana).

Farmers producing rice under irrigated conditions in the Senegal River Valley did not respond positively to the devaluation. Both fertilizer use and aggregate production declined. The factors affecting this response are numerous. Among the most important are: (1) delayed liberalization of rice marketing in Senegal (not seriously undertaken until after the devaluation), (2) greater price competition from imports of low-quality (broken) Asian rice in the major rice consuming area of the country -- Dakar¹⁰, (3) relatively small producer price increases after devaluation (28% in Senegal vs. 48% in Mali), and (4) larger fertilizer price increases.

¹⁰ The fact that Dakar is a port helps reduce the transport costs for imported rice delivered to the city; this contrasts sharply with rice imports to Mali, which must be shipped overland by train from Dakar or by truck from Abidjan.

Table 8. Fertilizer Use Following the Devaluation

Crop	Country	Fertilizer Type	Ave. Use After Devaluation kg/ha ^a	% Change After Deval. ^b
Rice ^c	Mali	Urea	169	27%
		DAP	97	18%
	Senegal	Urea	200	-13%
		DAP	100	-23%
Cotton	Burkina	NPK (<i>Complexe Coton</i>)	141	-13%
	Mali	NPK (<i>Complexe Coton</i>)	117	4%
	Senegal	NPK (<i>Complexe Coton</i>)	156	5%
	Chad	NPK (<i>Complexe Coton</i>)	n.a.	
Maize	Burkina	NPK sb	163	-31%
	Mali Sud	NPK sb	100	37%

Sources: Rice: Mariko, Chohin-Kuper, and Kelly (1999) and Liagre (1997). Cotton/maize: Tefft et al., 1998a.

Notes:

^a Years covered: for rice (average of 1995/96 and 1996/97), for cotton and maize (1996/97)

^b Years compared: for rice (1992/93-1993/94 vs. 1995/96-1996/97), for cotton and maize (1993/94 vs. 1996/97)

^c Rice data concern irrigated rice in the Office du Niger, Mali and in the Senegal River Basin, Senegal.

The response of CFA zone farmers operating under rainfed conditions tended to be one of extensification rather than intensification. For example, average annual cotton area for the 1994-96 period was higher in Burkina Faso (7%) and Mali (61%) than it was during the pre-devaluation period (1990-93), yet yields were lower (-2% for Burkina Faso and -12% for Mali). In Senegal, due probably to less pass-through of devaluation benefits to the producer, both the area and the yield impacts were negative (-23% for area and -20% for yields). Not only have yields declined in all countries for which the data are available, but the return to extensive practices raises concerns about long-run negative impacts on soil quality.

Farmers frequently increased the use of manure to compensate for declining use of inorganic fertilizers, but quantities used were generally not an adequate substitute for the nutrients lost through diminished use of inorganic fertilizers (Tefft et al. 1998b). The cotton area increase is attributable to reductions in fallows, new land being cleared and brought under cultivation, and a substitution of cotton for food crops. In Mali, the percentage of cotton area in the agricultural system of the cotton zone increased from 21% to 30% between 1994/95 and 1997/98 (Dakar and Healy 1999).

In some cases (Mali, in particular), the cotton company responded to the devaluation-led increase in pesticide costs by selecting a lower-cost substitute. According to some farmers surveyed, the substitute was not as effective as the pre-devaluation product and, therefore, contributed to the lower post-devaluation yields.

In Mali, changes in input/output price ratios following the devaluation appear to have been less favorable for rice than for cotton, yet there has been more intensification of the former crop. As suggested above, a number of factors contributed to the stronger response by rice producers: (1) prior investment in rehabilitating irrigation infrastructure (by the government as well as by farmers) combined with good research and extension programs had increased the general agronomic potential for rice in the ON, (2) opportunities for technical increases in yield were particularly strong in rice zones that had not yet shifted from broadcast seeding to transplanting, (3) land constraints in the ON were greater than in the cotton zone, providing more incentive for intensification, (4) government policies to protect urban consumers from cereal price inflation were well-chosen and implemented (i.e., demand and prices for high-quality ON rice remained strong in both national and export markets, while imports of lower quality Asian rice were encouraged to meet the demand of low-income consumers).

There is some evidence that farmers' desire to ensure food security in the cotton zones led to a shift of fertilizer from cotton to maize crops following the devaluation, with fertilizer use on maize increasing as much as 70% from 1994/95 to 1997/98 (Doucouré and Healy 1999). This shift of fertilizer from cotton to maize suggests that farmers were implementing a program of cereal intensification to free up land for less intensive cotton production. If maize varieties grown in the region are more fertilizer responsive than cotton, this could be a more cost-effective use of fertilizer, even if it does reduce cotton yields.

For the beef sector, too, the increased prices for inputs pushed producers to change their strategies, with the aim of reducing costs in order to profit from the devaluation (Yade et al. 1998). Senegalese cattle feeders experimented with reducing the length of the feeding cycle or adopted a forage-based feeding system. Wholesale butchers there also changed their strategies; faced with an increase in purchase prices, they vertically integrated by going to buy animals directly in the production areas.

Malian livestock producers increased the number of old cull cows being sold and some shifted toward animals with shorter reproductive cycles. Although not statistically documented, it appears that livestock feeding/fattening activities increased in certain localities, such as Bamako, Segou and Sikasso.

The large increase in the price of heifers recently observed in the Malian and Burkina Faso markets suggests that herds are now being rebuilt. This can be taken as an indication of herders' intentions to increase production.

At the level of meat processing and marketing in Mali, the distinction between the functions of the wholesale and retail butcher is becoming blurred. The "classical" role of the wholesale butcher is

progressively disappearing in favor of the butcher who holds a license to slaughter his own animals and who also custom-slaughters for his colleagues who do not have such a license.

In sum, there are numerous examples of how producers in both the crop and livestock sectors have adjusted production practices and technologies in an effort to take advantage of the opportunities offered and the constraints imposed by the devaluation.

4.1.2 Investments

Survey data show some evidence of farmer investments in productive assets following the devaluation. This was particularly true for farmers in the ON zone of Mali. For example, Malian rice producers continued to invest in small-scale rice mills -- something they had begun before the devaluation due to the inefficiency of parastatal facilities for industrial processing. The privatization of the industrial mills in 1996 and their resumption of activities in 1997 raise some questions about the continued competitiveness of the small scale mills, but it is too soon to tell if there is room in the market for both types of processing. Malian rice farmers also invested in traction animals and equipment and continued to invest substantial amounts of labor in maintaining/leveling irrigated parcels. In addition, some village associations were able to invest in large scale equipment such as threshers.

In the Senegalese horticultural sector, there was some early investment by private sector firms (with donor credit support) in cold storage facilities for onions and potatoes. There was also some investment in farm-level storage facilities in Chad (in conjunction with an Africare project) that enabled farmers to realize more profit by selling onions when prices were higher.

Some of the investments mentioned by farmers were not direct investments in agriculture but ones that could contribute indirectly to more efficient farm/household operations: new houses or additions to existing ones (including more space for crop storage) and improved means of transport (motorcycles, bikes). There has also been substantial community investment in new schools and health clinics in those areas of Mali that have benefitted from the devaluation-induced cotton and cattle booms (Tefft, Staatz, and Dioné 1997). Many women horticultural farmers purchased jewelry. (It is not clear if this was viewed as a means of savings/investment or simply a consumption expenditure).

4.2 Impact on Production

Comparisons of figures on aggregate cereal production before (average 1990-1993) and after (average 1994-1998) the devaluation show a 20% increase in rice production for the five CILSS countries, compared with only a 10% increase for coarse grains (Table 9) . However, situations differ among countries with a strong cereal production increase in Chad (+39%) due primarily to gains in coarse grains. Average rice production in Burkina Faso and Mali rose by 83 % and 44 %, respectively, whereas in Senegal -- an outlier with respect to rice patterns -- production dropped by 12%.

Estimated rates of growth in cereal production for 1993/94 - 1998/99 shown in Table 10 further confirm that rice production is advancing more rapidly than coarse grain production in Cote d'Ivoire, Mali and Burkina Faso (rates ranging from 6% to 11% for rice vs. <3% for coarse grains). In Senegal, both rice and coarse grain growth rates are negative (-7 and -4%, respectively), while in Niger rice is declining (-6%) and coarse grains are advancing (+7%). Niger is the only country represented in Table 10 where coarse grain growth was positive and statistically significant; rates for two countries were negative and significant, while rates for the remaining two countries were not statistically different from zero (i.e., stagnant).¹¹

Although coarse grains still account for the bulk (about 90 %) of cereals produced in the 4 Sahelian countries considered in Table 10, production of these crops has not progressed much. Yields remain highly dependent on rainfall and intensification is not evident except in Mali, where fertilizer use on maize is progressing (Table 8) and yields have increased by 16% since the devaluation (Table 11).

Growth in aggregate cereal production is a function of changes in area planted as well as yield growth. Table 11 shows that for the case of rice in both Burkina Faso and Mali, growth in area cultivated was the primary reason for increases in aggregate rice production; yields appear to have declined slightly (data refer both irrigated and non-irrigated crops). However, in Mali, the context of liberalization of cereal markets enhanced by the devaluation stimulated intensification of rice production in the large-scale irrigated schemes of the Office of Niger. Yields in this zone increased by 27% from 3.2 to 4.1 T/ha on average (Mariko, Chohin-Kuper, and Kelly 1999).

Changes in the amount of area devoted to coarse grains was mixed -- stagnant or declining in Burkina Faso and Senegal but increasing in Mali and Niger. In Burkina, the drop in coarse grain area was accompanied by yield increases for both maize and sorghum/millet (12%), while in Senegal maize yields declined (-9%) and millet/sorghum yields increased (5%). Mali and Niger exhibited generally positive moves for both coarse grain area and yields.¹² Malian farmers showed the most enthusiasm for maize, with both areas and yields increasing 16%, while millet/sorghum yields remained stagnant and areas increased slightly (5%). Maize area in Niger, starting from a very low base, increased by 312% and yields by 3%; millet/sorghum area increased slightly (2%) and yields by 11% (but remaining at <300 kg/ha on average). By combining information provided in Tables 9-11, we conclude that there is not strong evidence of Sahel-wide intensification, area expansion, or increased aggregate production for coarse grains following the devaluation, but simply a few individual country situations where particular coarse grains made some advances.

¹¹ Information in Table 8 suggests that growth rates in Chad may have been as favorable for coarse grains as those in Niger, but we did not have adequate data to estimate a growth rate for Chad.

¹² Although Doucouré and Healy report that Malian farmers reduced their coarse grains area in favor of cotton, their results only apply to the cotton zone (CMDT), while the figures in Table 11, showing an increase in coarse grain area, refer to the entire country.

Table 9. Cereal Production in Metric Tons: 1990-93 vs. 1994-98

Country	Cereals	1990-1993	1994-1998	% change
Burkina Faso	Rice	50,203	91,922	83%
	Millet/maize/sorghum/other	2,186,130	2,244,630	3%
	Wheat	0	0	0%
	<i>All cereals</i>	2,236,333	2,336,552	4%
Mali	Rice	393,588	567,280	44%
	Millet/maize/sorghum/other	1,732,475	1,733,450	0%
	Wheat	2,130	4,690	120%
	<i>All cereals</i>	2,128,193	2,305,420	8%
Niger	Rice	71,741	62,830	-12%
	Millet/maize/sorghum/other	1,922,605	2,244,178	17%
	Wheat	8,941	4,570	-49%
	<i>All cereals</i>	2,003,287	2,311,578	15%
Senegal	Rice	202,488	178,020	-12%
	Millet/maize/sorghum/other	787,580	803,028	2%
	Wheat	0	0	0%
	<i>All cereals</i>	990,068	981,048	-1%
Chad	Rice	78,767	95,950	22%
	Millet/maize/sorghum/other	670,648	946,098	41%
	Wheat	2,500	2,666	7%
	<i>All cereals</i>	751,915	1,044,714	39%
<i>CILSS</i>	Rice	987,209	1,194,352	20%
	Millet/maize/sorghum/other	7,508,798	8,227,690	10%
	Wheat	13,571	11,926	-12%
	<i>All cereals</i>	8,509,578	9,433,968	11%

Source: CILSS/DIAPER

Table 10. Estimated Cereal Production Growth Rates (%): 1993/94 to 1998/99

	Rice (paddy)	Coarse Grains	Total cereals
Burkina Faso	+10.56**	-2.86*	-2.43*
Mali	+9.57**	-1.79	0.73
Niger	-5.53**	+6.88**	+6.48**
Senegal	-6.85**	-4.09**	-4.59**
Côte d'Ivoire	+6.18**	1.53	+4.38**

Source : Authors' calculation from DIAPER data for CILSS countries and FAOSTAT for Côte d'Ivoire.

* Regression coefficient significant at 95% level; ** Regression coefficient significant at 99% level.

Country averages for other crops (groundnuts, cotton, and sugar cane) shown in Table 11 exhibit few signs of intensification following the devaluation except for groundnuts in Niger, where yields increased by 50% (but remain about 50 % of the yields obtained in other countries); small percentage increases were realized for groundnuts in Burkina Faso, Mali, and Senegal (15%, 10%, and 5%, respectively). Sugarcane yields in Mali also increased slightly (8%). Burkina Faso's cotton yields were down by 2% in the post-devaluation period, Mali's by 12%, and Senegal's by 20%.

Horticultural crops show increases in area and production for crops targeted primarily to the local market (see section 3.3) in response to favorable producer prices. These increases were possible where input supply systems were efficient and transport and credit were not major constraints (e.g., in the ON zone, where inputs and transport were already in place for rice producers). The higher producer prices also resulted in increases in producer revenues for onions in Senegal, Mali and Chad, potatoes in Mali and tomatoes in Benin.

In general, even if the official statistics cannot be considered terribly reliable, it is clear that cattle producers responded favorably to the price incentives by massive destocking in 1994. The recovery of the beef subsector in Mali was full of contrasts. After a very strong reaction to the favorable conditions in 1994, characterized by a substantial increase (on the order of 58%) in recorded offtake compared with 1993, the level of offtake fell in 1995 and 1996 to levels comparable to those prior to the devaluation. Nonetheless, in 1997, offtake levels were back up to 18% above the levels of 1990-93. Is this a case of one-time increase? Or is it the consequence of producers adapting to the new situation, three years after the devaluation? Without doubt, we'll have to wait for a few years to see whether this "trend" toward higher offtake is confirmed.

In Burkina Faso, the increase in offtake was more modest in 1994 but, in contrast, seems to have been more sustained. Compared with the level of 1990/93, offtake increased by 30% in 1994 and, despite a drop in 1995, it has thereafter settled at a level 17% above that of the pre-devaluation period (1990-93).

5. CONCLUSIONS

The devaluation of the CFA Franc led to a reversal of the decline in GNP per capita prevailing in most of the countries in the West African Franc zone since the late 1980s. The devaluation was also accompanied by a significant reduction in budget deficits for these countries.

For the agricultural sector, the devaluation appears to have stimulated an increase in the level of agricultural value added as well as the agricultural sector's share in GDP. Food imports as a share of total agricultural exports have declined for all countries in the zone but Senegal, where agricultural exports fell precipitously after the devaluation.

Although lacking precise data, it appears that regional trade in food products has increased more than food production, resulting in an increase in food prices accompanied by a decline in consumption per capita in certain cases. This tendency is particularly apparent for products previously imported heavily from outside the region, for which local production is now substituting.

Growth in demand for products that exhibited good price transmission to producers (sectors with limited direct state involvement in marketing) was expected to stimulate growth in production.

For rice, the response from producers in the Malian Office du Niger was as anticipated: strong growth in both production and productivity. The same tendency was found among rice producers in Burkina Faso and Cote d'Ivoire, with the key difference that in the latter two countries production went toward domestic consumption, whereas a significant portion of the increase in Malian production was exported elsewhere in the region.

Horticultural production in the region also increased, as did intra-regional trade in horticultural products and imports from the world market for many countries. This combination of changes suggests an aggregate increase in the consumption of horticultural products in the region following the devaluation, perhaps due to income growth, particularly in rural areas.

Probably the greatest increase in regional trade was found in the livestock (beef cattle) subsector following the devaluation. The increased trade was due in large part to coastal countries substituting Sahelian production for European imports. Prior to the devaluation, producers had been overstocking the range, as the demand for Sahelian production (and therefore prices) was very low. Immediately after the devaluation was announced in 1994, producers rapidly began selling animals to compensate for the prolonged period of overstocking. Although offtake rates declined after the first year, they remain higher than the predevaluation period.

Table 11. Evolution of Area and Yields by Crop and Country

	Area ('000 ha)			Yields (T/ha)		
	90-93	94-96	%	90-93	94-96	%
Burkina Faso						
Millet/sorghum	2567	2594	1%	0.73	0.82	12%
Rice	21.7	40.5	87%	2.3	2.1	-9%
Maize	239	198	-17%	1.28	1.43	12%
Cotton	171	183	7%	0.93	0.91	-2%
Groundnut	195	243	25%	0.74	0.85	15%
Mali						
Millet/sorghum	1969	2073	5%	0.72	0.72	0%
Rice	195	300	54%	2	1.7	-15%
Maize	201	234	16%	1.16	1.34	16%
Cotton	206	332	61%	1.28	1.13	-12%
Groundnut	194	187	-4%	0.84	0.92	10%
Sugar cane	4.5	3.6	-20%	66	71	8%
Niger						
Millet/sorghum	6940	7107	2%	0.27	0.3	11%
Rice	n.a.	n.a.		n.a.	n.a.	
Maize	2.5	10.4	316%	0.37	0.38	3%
Groundnut	113	280	148%	0.29	0.44	52%
Senegal						
Millet/sorghum	1005	1058	5%	0.66	0.69	5%
Rice	75	74	-1%	2.4	2.1	-12%
Maize	105	102	-3%	1.15	1.05	-9%
Cotton	44	34	-23%	1.28	1.03	-20%
Groundnut	853	863	1%	0.76	0.8	5%

Source: CILSS/DIAPER, except for cotton (Tefft et al. 1998a), and groundnuts in Mali (République du Mali 1998), groundnuts in Senegal (Ministry of Agriculture cited in Freud et al. 1997), and rice, millet/sorghum in Senegal (GOS/MDRH/DS cited by Duruflé 1996).

Notes: Senegal cereals average for 1994-95 only; Niger figures for maize do not include 1991, for which data are missing.

Producers' reaction to the opening up of regional trade following the devaluation has been mixed. Subsectors benefitting the most from the regional trade stimulated by the devaluation were ones that had already benefitted from liberalization and also had good access to inputs and general infrastructure (roads, markets, irrigation) -- the horticultural producers and rice producers in the irrigated perimeters of the Office du Niger, for example. Nevertheless, very high levels of debt among these producers continues to threaten the long-run sustainability of these relatively short-run gains.

By contrast, production increases responding strictly to changes in relative prices rather than to a more complete 'package' of policy reforms and investments, appear to be less durable. This is currently the case with the coarse grain and livestock subsectors, two subsectors that benefitted from substantial producer price increases, but remain do not show signs of 'intensification' leading to increased factor productivity. Cotton production also expanded rapidly, but again mainly through extensification.

The devaluation can only help spur long-term agricultural transformation if it is accompanied by basic changes in the production environment -- the types of changes that come from investments to reduce production costs and increase the quality of the output. A key question for many subsectors is whether the increased earnings stemming from the devaluation will be channeled back into public and private investments that will bring about these basic changes in the production environment. Whether this will occur will depend on individual producers' investment and consumption decisions and on public decisions regarding taxation and public expenditures.

Finally, even for the subsectors having made substantial progress after the devaluation, much more could be accomplished if governments would respond to some of the challenges associated with the expansion of regional trade -- for example, the poor transport infrastructure in the region that renders producer prices low, input prices high, and input deliveries frequently too late to be of use. Regional approaches to reducing these problems are needed if producers are to intensify production, find remunerative markets and have the devaluation serve as an engine of agricultural transformation.

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Table A1: Evolution of GNP per Capita in U.S. Dollars, Calculated Using the World Bank Atlas Method

	BENIN	BURKINA FASO	COTE D'IVOIRE	MALI	NIGER	SENEGAL	CHAD
1988	370	290	930	260	340	720	270
1989	370	290	830	280	340	700	270
1990	360	290	780	280	310	730	250
1991	370	310	750	270	300	720	300
1992	370	290	800	310	290	660	340
1993	380	240	760	300	240	550	250
1994	340	210	680	250	210	480	230
1995	350	220	670	250	190	500	210
1996	360	240	680	240	200	530	210
1997	380	250	710	260	200	540	230

Source: World Bank, *Africa Development Indicators, 1998/99*.

Table A2. Spearman Correlation Coefficients among Grain Production in Different West African Countries

A/Rice

Côte d'Ivoire	.2571								
Ghana	.8857*	.2000							
Guinea	.8857*	.6000	.8286*						
Mali	.9429**	.3143	.9429**	.9429**					
Niger	-.3143	-.8286*	-.4286	-.5429	-.3714				
Nigeria	.8407*	.4638	.5218	.8117*	.7247	-.2609			
Mauritania	.6571	.4286	.3143	.7143	.6000	-.0857	.9276**		
Senegal	-.4857	.2571	-.7714	-.3714	-.6000	.0286	.0290	.2000	
	Burkina	Côte d'Ivoire	Ghana	Guinea	Mali	Niger	Nigeria	Mauritania	

B/ Millet/Maize/Sorghum/Fonio

Côte d'Ivoire	-.7714								
Ghana	-.3714	.2571							
Guinea	-.7143	.8286*	.3143						
Mali	.7143	-.8286*	-.3143	-.4286					
Mauritanie	.2000	-.7714	.0286	-.6000	.5429				
Niger	.4286	-.3143	.0857	.0857	.7143	.0857			
Nigeria	-.6571	.7714	.2000	.9429**	-.3143	-.5429	.2571		
Senegal	.0857	-.3143	.7714	-.2571	.0286	.4286	-.0286	-.4286	
	Burkina	Côte d'Ivoire	Ghana	Guinea	Mali	Mauritania	Niger	Nigeria	

C/All Cereals

CI	-.7714								
GHANA	-.5429	.3143							
GUINEA	-.7143	.6000	.7143						
MALI	.6000	-.2000	.0286	-.0286					
MAURITAN	-.0286	.2571	.0857	-.2571	.2571				
NIGER	.2571	-.1429	.3143	.2571	.8286*	.3143			
NIGERIA	-.7143	.6000	.7143	1.0000**	-.0286	-.2571	.2571		
SENEGAL	.4857	-.6000	.1429	-.5429	.0857	.1429	-.0857	-.5429	
	Burkina	Côte d'Ivoire	Ghana	Guinea	Mali	Mauritania	Niger	Nigeria	

* - Signif. $\leq .05$ ** - Signif. $\leq .01$ (2-tailed)

Source: Authors calculations from DIAPER and FAO Data

Table A3 : Correlation of Quarterly Retail Grain Prices*Before Devaluation (1992 to 1993)*

	Millet	Sorghum	Maize
Bamako-Dakar	.5724**	0.0978	.7646**
Bamako-Niamey	-0.0654	NA	NA
Bamako-Ouagadougou	0.0814	0.0549	0.2662
Dakar-Niamey	.3995**	NA	NA
Dakar-Ouagadougou	-0.0162	.4942**	0.3306
Ouagadougou-Niamey	-2281	NA	NA

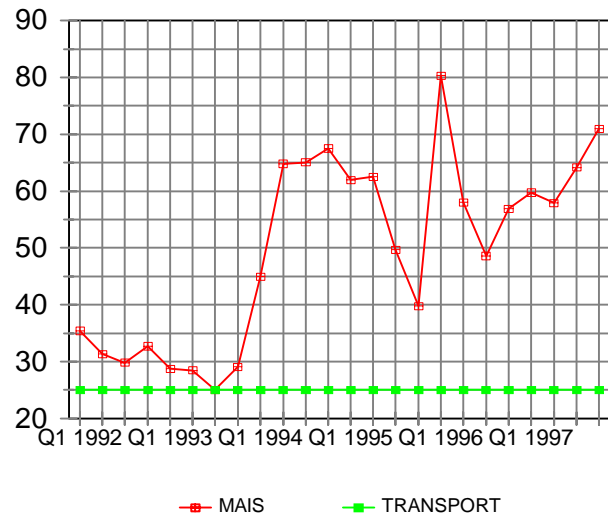
After Devaluation (1994 to 1997)

	Millet	Sorghum	Maize
Bamako-Dakar	.7056**	.8270**	.8990**
Bamako-Niamey	.6526**	NA	NA
Bamako-Ouagadougou	.9245**	.8606**	.8649**
Dakar-Niamey	.3913**	NA	NA
Dakar-Ouagadougou	.7098**	.8258**	.8729**
Ouagadougou-Niamey	.6417**	NA	NA

* - Signif. $\leq .05$ ** - Signif, $\leq .01$ (1-tailed)**Source:** Authors' calculations from data of market information systems in Burkina Faso, Mali, Niger and Senegal.

Figure A1. Evolution of the Differential between Wholesale Prices for Cereals in Bamako and Retail Prices for Cereals in Dakar, Compared with the Cost of Transporting the Cereals between the Two Cities by Rail

A. Maize



B. Millet

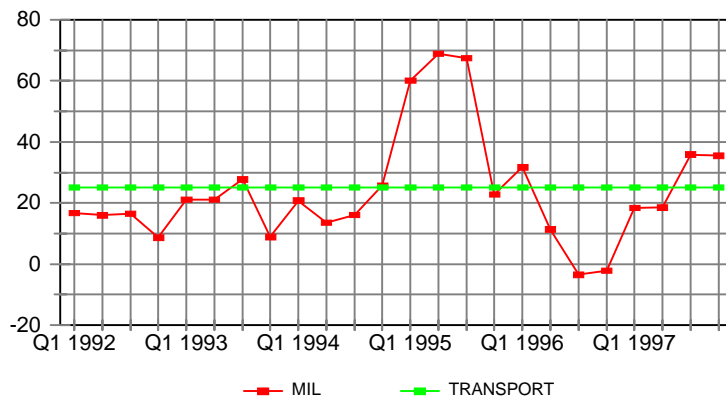
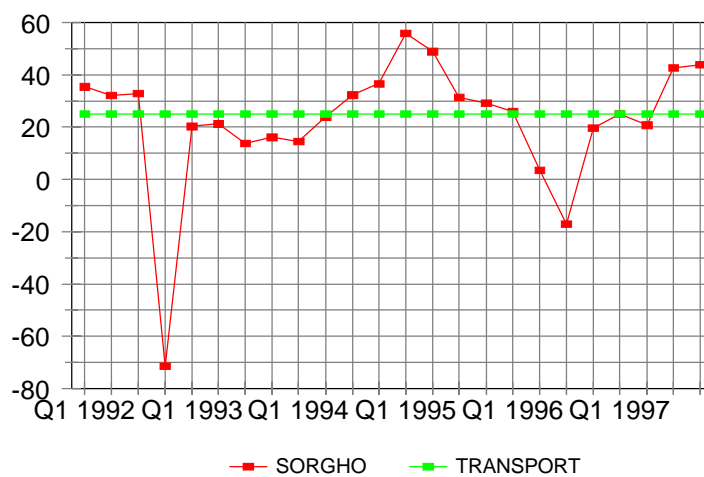


Figure A.1 (continued)

C. Sorghum



Source: Authors' calculations from Data of Market Information Systems in Mali and Senegal.

Table A4. Millet, Maize and Sorghum Exports of CILSS Countries

	Burkina Faso	Mali	Niger	Chad	Total CILSS
1987/88	0	0	0	0	0
1988/89	0	5000	400	0	5400
1989/90	1000	20000	0	2830	23830
1990/91	0	0	0	0	0
1991/92	2860	10790	0	0	13650
1992/93	0	9020	0	0	9020
1993/94	0	2490	0	0	2490
1994/95	0	66000	0	0	66000
1995/96	0	9600	0	0	9600
1996/97	0	18500	0	0	18500
1997/98	0	30900	0	0	30900
1998/99 ⁽¹⁾	0	25000	0	0	25000
Mean 1987/88- 1992/93	643.33	7468.33	66.67	471.67	8650
Coefficient of Variation 1987/88- 1992/93 in %	164.21	92.79	223.61	223.61	96.24
Mean 1994/95- 1998/99	0	30000	0	0	30000
Coefficient of Variation 1994/95- 1998/99 in %	-	64.47	-	-	64.47

Source : DIAPER Cereal Balance Sheets for CILSS Countries

⁽¹⁾ Preliminary data

Table A5. Declared Export Intentions by Malian Traders, by Type of Cereals

	Cereal type		
	Paddy rice	Maize	Millet/Sorghum
1990	116	1890	17737
1991	,	,	3115
1992	,	,	16547
1993	400	,	13634
1994	,	16970	9373
1995	,	3737	37610
1996	,	1800	6648
1997	105	11220	30713
1998	365	4525	42870

Source: Direction des Affaires Economiques du Mali.

Table A6. Declared Export Intentions for Millet and Sorghum by Malian Traders, by Destination

	Target Country					
	Burkina Faso	Côte d'Ivoire	Mauritania	Niger	Senegal	Other Countries in West Africa
1990	,	9477	120	,	8130	,
1991	,	3115	,	,	,	,
1992	720	9940	2000	558	2214	1000
1993	,	6070	3780	558	3186	,
1994	,	3320	,	,	6051	,
1995	,	2970	,	,	33808	832
1996	,	1100	1908	,	3640	,
1997	3740	15180	3920	4610	2563	,
1998	18395	10430	4100	7210	1710	75

Source: Direction des Affaires Economiques du Mali.