AIAE RESEARCH PAPER 1

Renewable Natural Resources, Sustainable Economic Growth and Poverty Reduction In Nigeria

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RENEWABLE NATURAL RESOURCES, SUSTAINABLE ECONOMIC GROWTH
AND POVERTY REDUCTION IN NIGERIA

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Abstract

This paper analyses the role and implications of the management and use of renewable natural resources in economic growth and poverty reduction in Nigeria. It assesses the changes in quantity and quality of renewable natural resources, quantifies the economic and social impacts that these changes have caused and explores the growth implications for Nigeria. Data was collected from relevant government ministries, departments and agencies, research reports, publications and development agencies. Data were validated through stakeholder technical workshops involving key agricultural and economic data agencies of government.

Despite the dominance of the oil sector, agriculture, (including forestry and fisheries) constitutes the largest single economic sector, accounting for about 35% of GDP and more than 60% of employment. Hence, sustainable growth of renewable natural resources-based sectors is the principal key for unleashing economic growth and reducing poverty. Despite this fact, Nigeria's agricultural growth has predominantly been achieved through unsustainable expansion in cultivated area, rather than by sustained increases in productivity.

Yield increases, even over a period of more than 40 years, were only marginal for a majority of crops. Indications from yield model estimation show that successive crop expansions have taken place on less productive land. Expansion in agricultural land has aggravated competition between cropland and forest, and between cropland and rangeland. Up to 50% of forest/woodland is estimated to have been lost over the past 4-5 decades. The LUV data from 1976/78 to 1993/95 reveal a decline in savannas and other grazing lands from 50 percent to 42 percent of total Nigerian territory. During the subsequent decade, another 6-8 percentage points of rangelands might have been lost to crop cultivation and other land use. Moreover, the LUV data reveal severe losses in savannah vegetation density, and recent estimates obtained from sources at NAPRI indicate declines in fodder yields of 10-20 percent from 1985 to 2003.

The annual cost of yield decline from the 1980s to 2004 is estimated at N500 billion, a significant loss given that the total federal capital budget in 2004 was N350 billion. The estimated costs of deforestation and losses in non-timber forest products in the last 5 decades are at least N120 billion per year, or 1.7% of GDP in 2003, a loss close to the total federal budget for health and education in 2004 (N153 billion). On the whole, poor cropland management, forest and rangeland degradation are costing at least N465 billion (US $3.4 billion) per year, or at least 6.4 percent of GDP in 2003.

Degradation of the resource base and the lack of sustained agricultural growth reflect a failure of past policies to promote rational management of the renewable natural resources. The key challenge is therefore to stimulate and sustain agricultural growth through increased productivity and competitiveness. Sustainable management of renewable natural resources requires environment-friendly agricultural practices as well as agriculture-friendly macroeconomic policies to correct structural distortions and mitigate adverse domestic terms of trade. This challenge entails innovative agricultural entrepreneurship, research and extension to develop and implement sustainable farming systems and promote the adoption and use of modern inputs, technologies and efficient practices. Better funding for renewable natural resources-based sectors is clearly essential to assure and adequate fiscal bases for sustainable economic growth and poverty reduction. Greater political will is required to adopt sound win-win policies which simultaneously promote agricultural growth and environmental sustainability.

1.0 Introduction

Renewable natural resources refer to biological assets capable of indefinite regeneration on a human time scale so long as the prevailing environmental, social, political, economic and management conditions permit. Examples of such natural resources are arable land, forest, water resources (including aquatic life), rangeland/pastures, biodiversity, wetlands and wildlife. Depending on management and use, these resources can be replenished, maintained, improved or degraded. Therefore, the renewability of "renewable natural resources" is not automatic and cannot be taken for granted. In Nigeria, the sustainability of growth and poverty reduction hinge critically on these resources since they constitute the productive base for agriculture, forestry, fishery and wildlife, upon which the livelihoods, employment and incomes of a large majority of Nigerians depend.

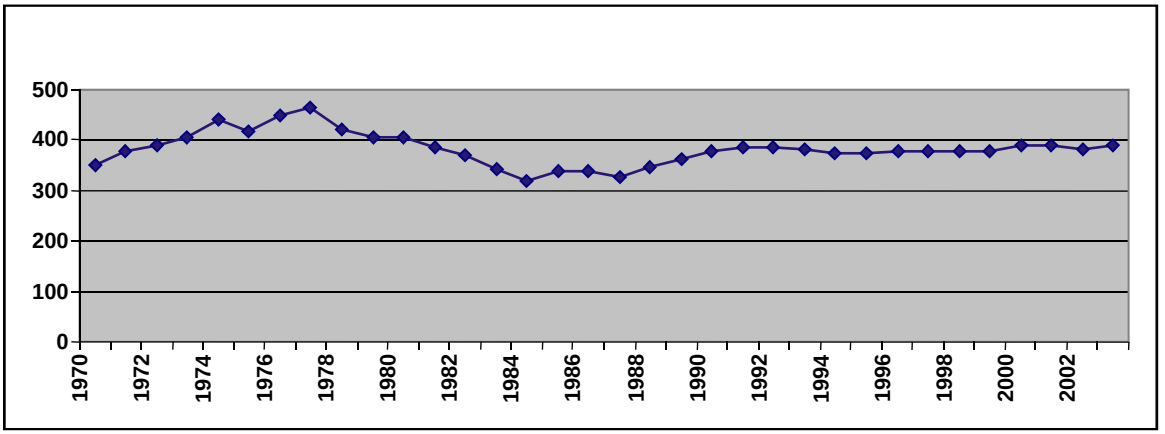
This economic analysis has been undertaken to improve the evidence base on the contribution of renewable natural resources (RNRs) to economic growth and poverty reduction in Nigeria. It assesses the changes in quantity and quality of RNRs, quantifies the economic and social impacts that these changes have caused and explores the growth and poverty reduction implications of the outlook and management of Nigeria's RNRs.

The research provides some evidence base to invigorate the policy debate about the economic and social roles of RNR-based sectors (agriculture, forestry, fisheries). In addition, by improving the knowledge base, we aim at influencing the design and implementation of appropriate and effective agricultural policies and measures under NEEDS and SEEDS.

2.0 Nigeria's Economic Growth Has Been Disappointing

Over the two decades, Nigeria's economic performance has fallen acutely short of growth potentials. Rapid growth in the late 1970s occasioned by oil boom was short-lived and followed by a sharp decline in real per capita GDP from the late 1970s-1984. From 1992-2002, growth in per capita GDP occurred marginally in 2 years only, stagnating or falling in other years.

Fig. 1: GDP per capita 1970-2003 (Constant US$)

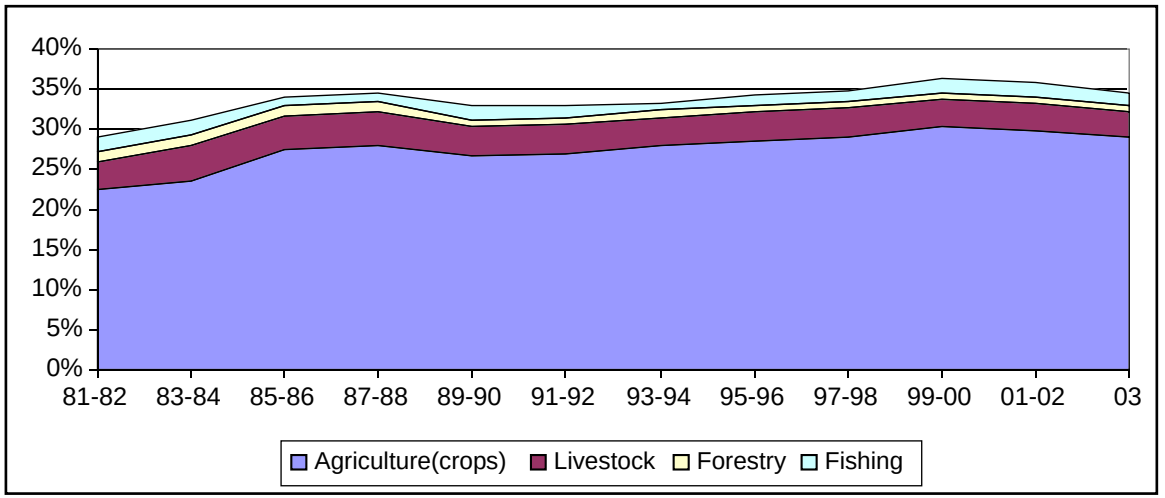


Source: UN National Statistics.

3.0 RNR-based Sectors are Key to Growth, Employment and Poverty Reduction

Despite the dominance of the oil sector in government revenues and foreign exchange earnings, RNR-based sector comprising agriculture, forestry and fisheries constitutes the largest single share of national output, incomes and employment. Agriculture, including forestry and fisheries account for not less than 35% of GDP and is the backbone of rural livelihoods.

Fig. 2: Share of RNR-based sector in GDP



Source: CBN Statistical Bulletin 31.12.2004 (constant 1990 prices).

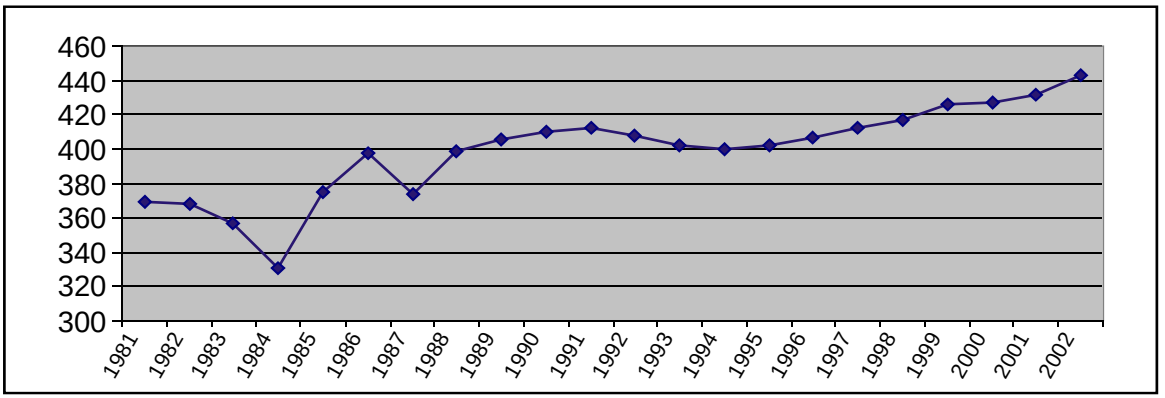
But, this central role is not adequately appreciated within official national accounts. For example, non-marketed RNR-based products (such as fuel wood and medicinal plants) and economic costs of RNR degradation are usually left out in conventional national accounts. Some estimates put the non-marketed consumption of non-wood forest products (NWFPs), fish and fuelwood to be up to additional 10% of GDP.

The RNR-based sectors are central to Nigeria's realization of MDG of halving poverty reduction by 2015. Currently, agriculture-forestry has the highest poverty incidence (67%) among all economic sectors, and about 62% of Nigeria's poor are in agriculture. The rural sector contributes 65% to national poverty and 86% of households in agriculture live in rural areas. In sum, about 7 out of every 10 farmers are poor and 6 out of every 10 poor households are farmers. Hence, growth in RNR-based sectors (and in rural sector) will prove essential for improving the welfare of the vast majority of Nigeria's poor. Farm productivity and production costs largely determine the prices of basic foodstuffs, which account for 52-60% of total household consumption expenditures by the lowest 60% of the country's population[2]. Inevitably therefore, significant reductions in poverty will hinge in great measure on the collective ability of Nigerian farmers, federal and state governments and agricultural scientists to stimulate broad-based agricultural growth.

4.0 RNR-based Sectors Performance Incommensurate to Social and Economic Responsibilities, Yet Strategic in Reducing Growth Volatility

Despite its potentials to drive growth and poverty reduction, agricultural growth has not been impressive particularly during most of the 80s and 90s. Sustainable management of RNRs has been constrained by a wide variety of social, economic, institutional, technological and policy factors, which have in turn reduced the ability of the sectors to meet their acknowledged social and economic responsibilities to the country.

Fig. 3: Real Agric GDP (Naira) per capita (1981-2002)



Source: Population data are from FAO and Agric GDP from CBN's Annual Abstract of Statistics.

The RNR-based sectors have prevented huge economic slump through their strategic, stabilizing and mitigating role. Developing the RNRs sectors can trigger pervasive domestic resource mobilization and

2 FOS (2005) report based on estimates from the Nigeria Living Standard Survey 2004.

impart significant linkage effects throughout the entire economy. In the past, the negative impacts of the volatile enclave oil sector have been moderated by outputs and employment in the RNRs-based sectors.

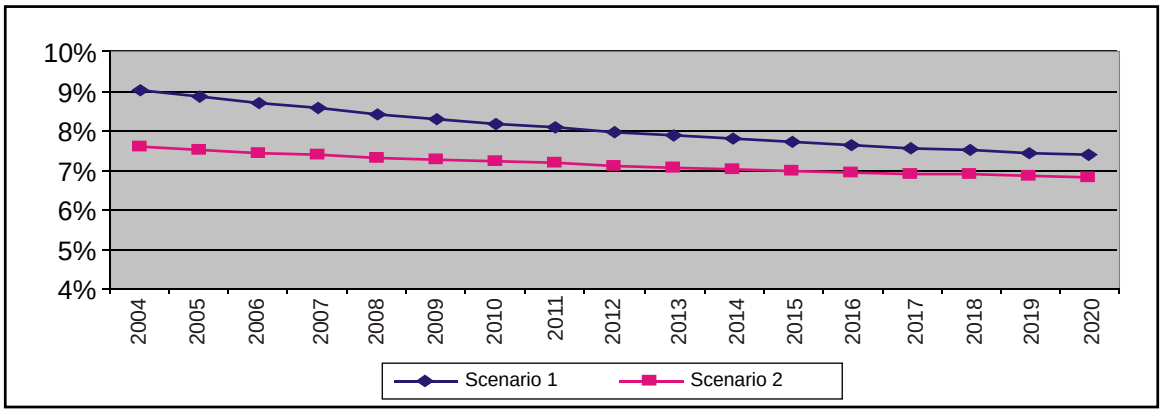
Since GDP per capita reached its low in 1984, agricultural GDP per capita increased by over 30% to 2002. If not for this growth, per capita GDP would have been 20% below today's level.

5.0 Meeting the NEEDS/SEEDS Growth Targets: The Pressure is on Agriculture

Against the backdrop of the link between Nigeria's poor economic performance and the volatile, enclave and distortive oil sector, sustainable growth and poverty reduction would hinge critically on non-oil sectors, particularly, RNRs-based sectors where majority of Nigerians derive employment, income and consumption. Recognizing this, the National Economic Empowerment and Development Strategy (NEEDS) and State Economic Empowerment and Development Strategies (SEEDS) have established policy frameworks to diversify the productive base away from oil, in order to restore the country to the path of rapid, broad-based sustainable growth.

Towards the economic diversification objective, NEEDS set growth targets including annual agricultural growth of 6% and agricultural exports of up to ₦3 billion per year. Given the cyclic, narrow and unstable oil sector, the pressure is on RNRs-based sectors to deliver the NEEDS targets of non-oil growth of more than 8%. In the longer term, Nigeria requires an average annual rate of growth of 7% in order to meet the MDG of halving poverty by 2015[3]. According to the analysis provided in the report, assuming the oil sector continues to grow at its historic rate from the last two decades, agricultural growth needs to be 7.5-9.0 percent a year to bring the economy to a 6 percent GDP growth rate if other non-oil sectors also grow at 6 percent. The pressure on agriculture is somewhat less, that is, 7.0-7.5 percent a year if other non-oil sectors grow equally well.

Fig. 4: Agricultural Growth Requirement to meet the NEEDS Target



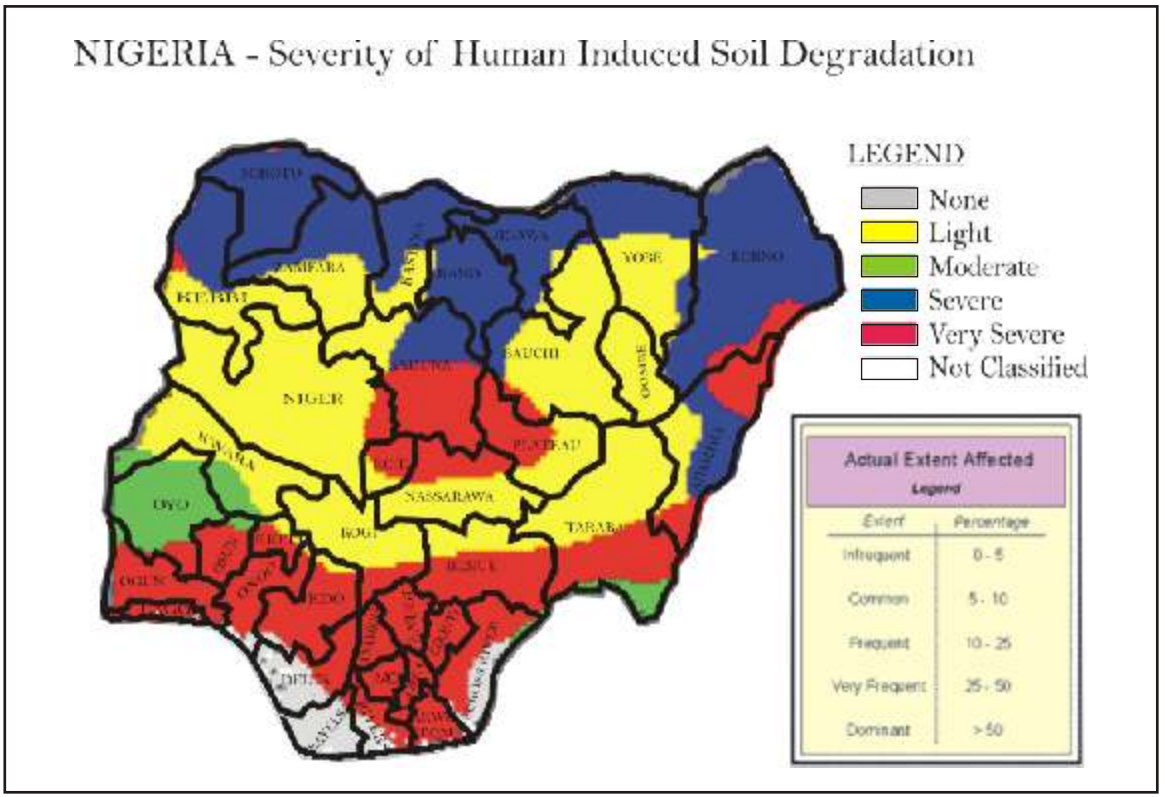
Source: Authors' Analysis

3 NPC-National Planning Commission, 2004. National Economic Empowerment and Development Strategy. Abuja.

6.0 Degradation and Poor Management of RNRs undermine Sustainable Agricultural Growth

Poor environmental management and unsustainable use of RNRs (arable land, forest, and water) undermine the economic potentials of agriculture, forestry and fisheries. Nigeria's soils are rated from low to medium in productivity. However, most of Nigeria's soil would have medium to good productivity if the country's soil resources were managed properly.

Fig. 5: Soil Degradation

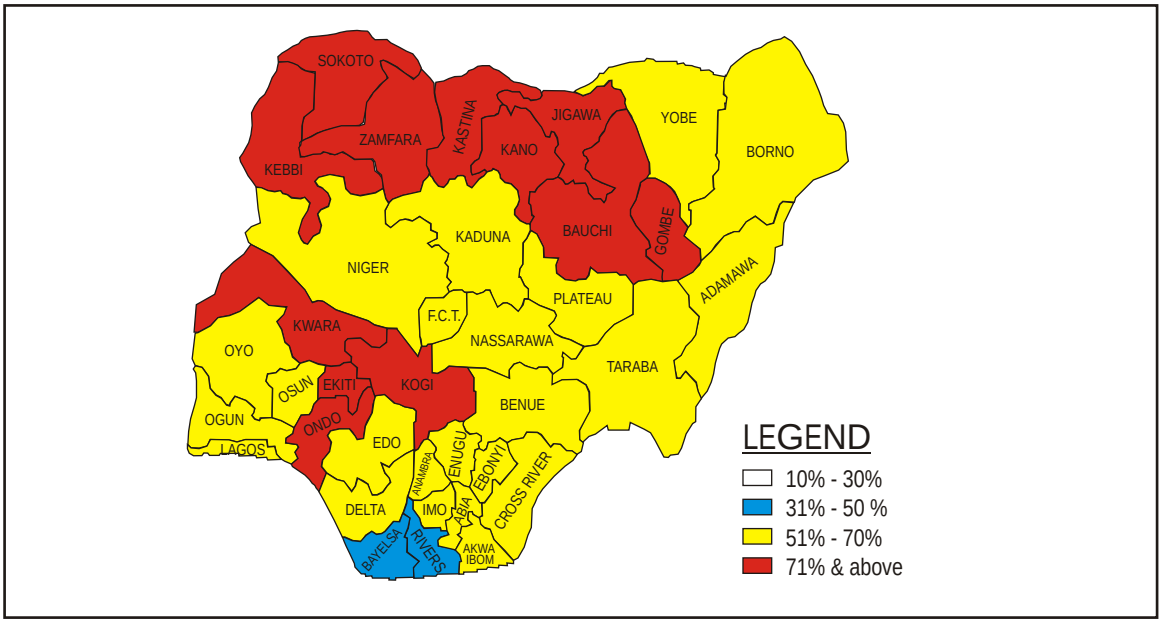


Source: FAO (2004).

7.0 Poverty is Linked with Degradation of RNRs

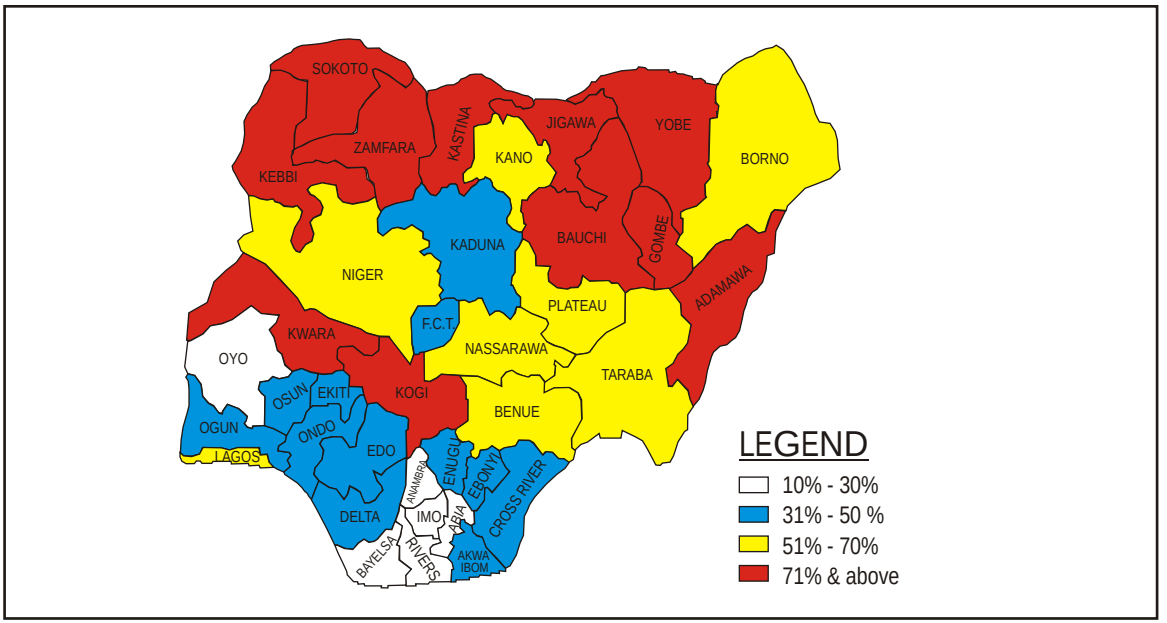
Recent Nigeria Living Standard Survey (NLSS) shows that poverty in Nigeria was 54.4% in 2004, down from 65.7% in 1996. The national poverty rate masks sharp differences in poverty across states, with poverty incidence above 70% in parts of the Northwest and Northeast compared to less than 30% in parts of the southeast.

Fig. 6: Nigeria Poverty 1996



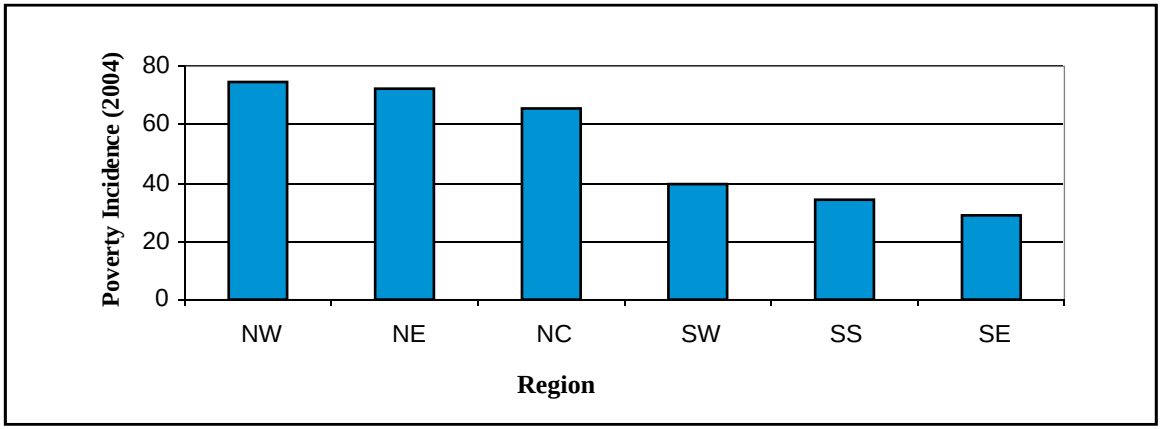
Source: Developed using data from FOS-NLSS, 2005.

Fig. 7: Nigeria Poverty 2004



Source: Developed using data from FOS-NLSS, 2005.

Fig. 8: Regional Poverty Incidence 2004

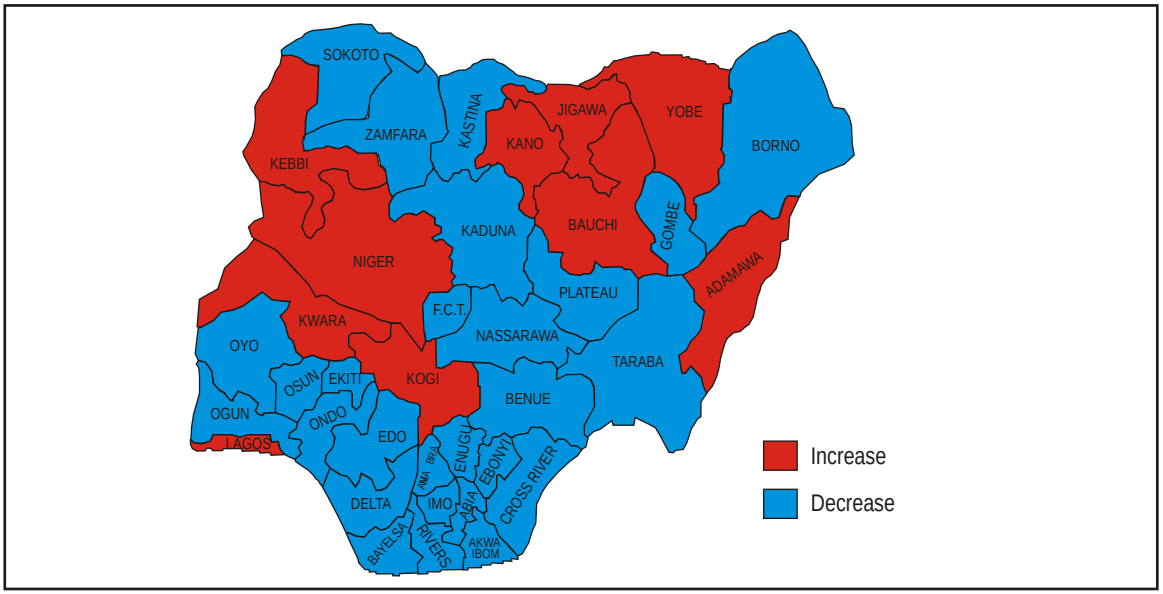


Source: Calculated from FOS-NLSS 2005

7.1 Change in Poverty: 1996-2004

Poverty increased in 10 states from 1996 to 2004. With one exception, they were all in the North-West, North-East, and North-Central regions that are characterized by lower rainfall, lower agricultural crop yields, and lower rangeland productivity than in the south.

Fig. 9: Change in Nigeria Poverty Incidence (1996-2004)



Source: Derived using data from FOS-NLSS 2005.

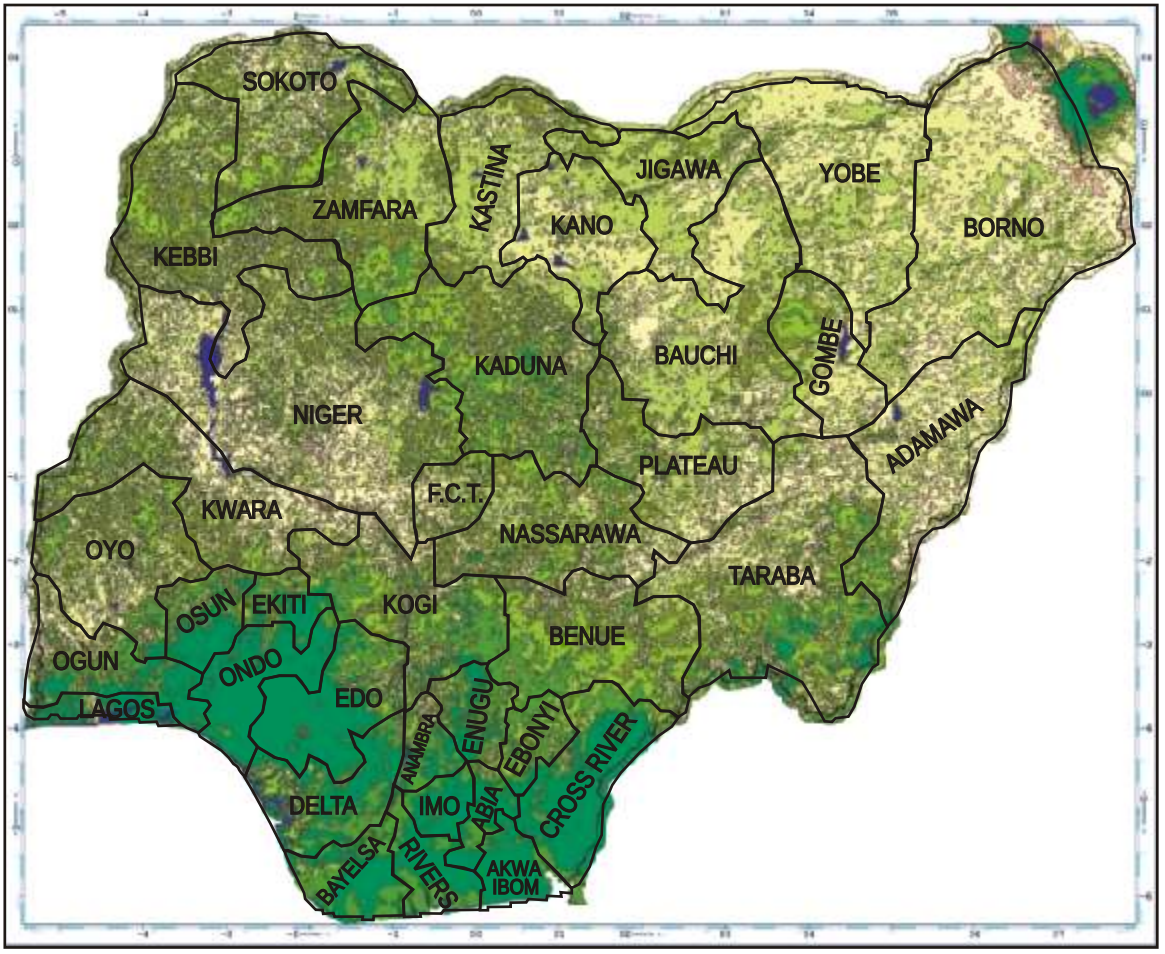
7.2 Satellite Imagery reveals Remarkable De-Vegetation over the Years

The northern regions also experienced the most serious losses in vegetation density from 1976/78 to 1993/95, a situation that may be contributing to high poverty incidence, and the increase in poverty in many of the states in those regions.

Fig. 10: Nigeria Vegetation 1976/78

Source: Satellite Imagery from FORMECU (1998) Report prepared by Geomatics Nig. Ltd.

Fig. 11: Nigeria Vegetation 1993/95 (many years later)



Source: Satellite Imagery from FORMECU (1998) Report prepared by Geomatics Nig. Ltd.

8.0 Crop Yield is Low and not Internationally Competitive

Crop yield is one of the defining features of international competitiveness of a country's agriculture. We analyzed trends in aggregate national yields of some major crops from 1961-2004 and changes in yields at the state level from 1996-2003. Crop yields are acutely below potentials, hence Nigerian farmers are unable to compete internationally.

Estimates by the Projects Coordinating Unit show that in 2004, root and tubers accounted for 44.5% of total crop production[4] (in sorghum grain equivalent), followed by cereals 39.6% and legumes (15.9%).

Increases in production have predominantly been achieved through expansion in area under cultivation. Yield increases, even over a period of more than 40 years, were only marginal for a majority of crops. Moreover, yields of major crops peaked in the 1980s (cereals) and early 1990s (pulses, roots and tubers) and have since then declined.

8.1 Some factors influencing yield over time

Understanding yield trends and influential factors is important to design policies for sustainable agricultural growth. Using cereals as example, yield model is estimated to find factors that significantly influence productivity over time. The model is specified for 1960-2004 as follows using national aggregate data from FAOSTAT:

$$DLog(CEYD) = \beta_0 + \beta_1 DLog(CEAH,2) + \beta_2 DLog\left(\frac{FECO}{CEAH},2\right) + \beta_3 DLog\left(\frac{AGIR}{CEAH},3\right) + \beta_4 DLog\left(\frac{AGPO}{TOAH},5\right) + \nu$$

where:

- CEYD = Cereal Yield (tons per ha)
- CEAH = Total Cereal Area Harvested
- $\left(\frac{FECO}{CEAH}\right)$ = fertilizer consumption per cereal area harvested
- $\left(\frac{AGIR}{CEAH}\right)$ = Total Irrigated area per Cereal area harvested
- $\left(\frac{AGIR}{CEAH}\right)$ = Agric Population per total crop area harvested

4 Root and tubers include cassava, yam, cocoyam, sweet potato, irish potato; cereals include maize, sorghum, rice, millet, acha, wheat; legumes include groundnut, cowpea, soybean, bambara nut, pigeon pea, beniseed.

The results of the model estimation are as follows in Table 1.

Table 1: Model Estimates of Variability of Cereals Yield Variation over Time

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Cereal Area Harvested: CEAH	-0.361741	0.136226	-2.655447	0.0121
Fertilizer Consumption: $\left(\frac{FECO}{CEAH}\right)$	0.066686	0.045680	-1.459855	0.1538
Irrigated Area: $\left(\frac{AGIR}{CEAH}\right)$	0.215099	0.070838	3.036508	0.0046
Agric population: $\left(\frac{AGPO}{TOAH}\right)$	-0.051740	0.029497	-1.754105	0.0887

R-squared: 0.469036; Adjusted R-squared: 0.420766; S.E. of regression: 0.104042; Durbin-Watson stat: 1.810382; Akaike info criterion:-1.586230; Schwarz criterion:-1.412077

The model shows that harvested cereal area is negative and significant on yield, implying that successive lands are less productive than preceding lands. This suggests that agricultural expansion is taking place onto marginal lands, a trend which reveals the un-sustainability of agricultural growth through expansion of cultivated lands. On the other hand, fertiliser use intensity is positive on yield but not significant. Low fertiliser is inimical to agricultural growth. Also, total irrigated area is positive and significant on yield, in line with ex ante expectation that irrigation development is critical to improved yields. The negative coefficient of agricultural population per area harvested suggests that population pressure may be leading to lower yield due to land use intensification, such as reduced fallow periods, unaccompanied by yield-increasing technologies.

8.2 [5]Yield variation across the states

Crop yields vary widely across states. The variations are a product of interplay of several factors including agro-ecological, socio-economic, institutional and farm-level management conditions. Appreciating these variations is important for agricultural planning and policy. Research to explore the factors underlying these variations is necessary to guide policy and programmes in Nigeria. Even differences in regional averages are pronounced.

Yield index was computed for these major crops including cassava, maize, rice, millet and sorghum based on grain equivalent ratios. While the index is similar in the North-Central, South-West and South-South, regional average yield index in the South-East is almost twice as high as in North-West and North-East (Fig. 12).

5 *Data on average yields at the state and regional levels were obtained from Projects Coordinating Unit (PCU) of the Federal Ministry of Agriculture and Rural Development. PCU collates crop area and yield data from the various Agricultural Development Programmes in the states.*

Fig. 12: Regional Yields of Major Crops (Crop Yield Index 2001-2003)

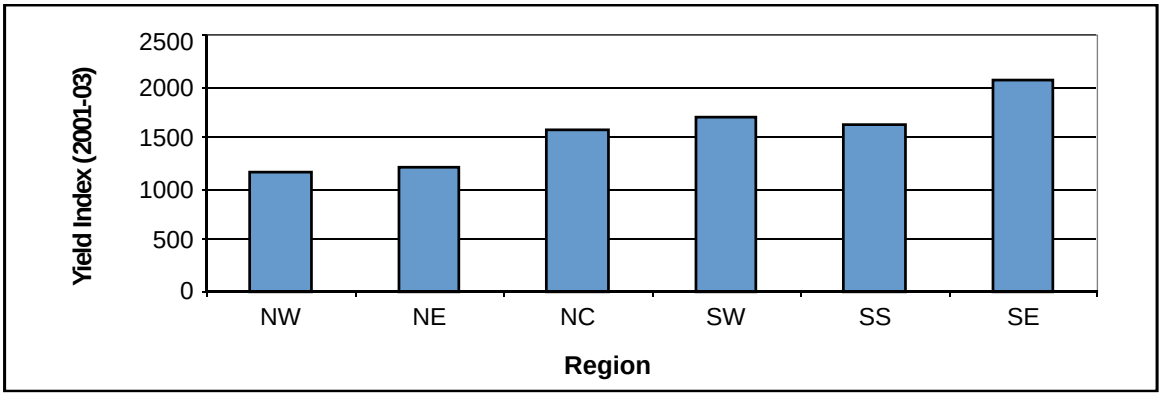


Fig. 13: Yield Index across the states (2001-2003)

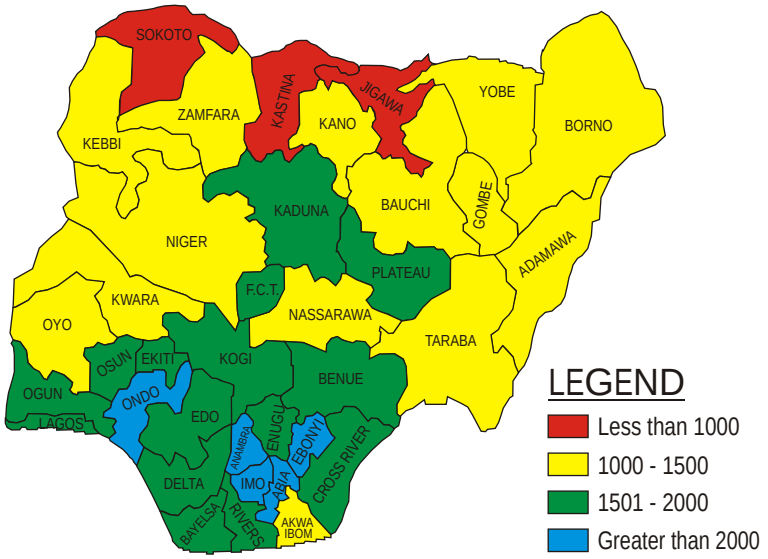
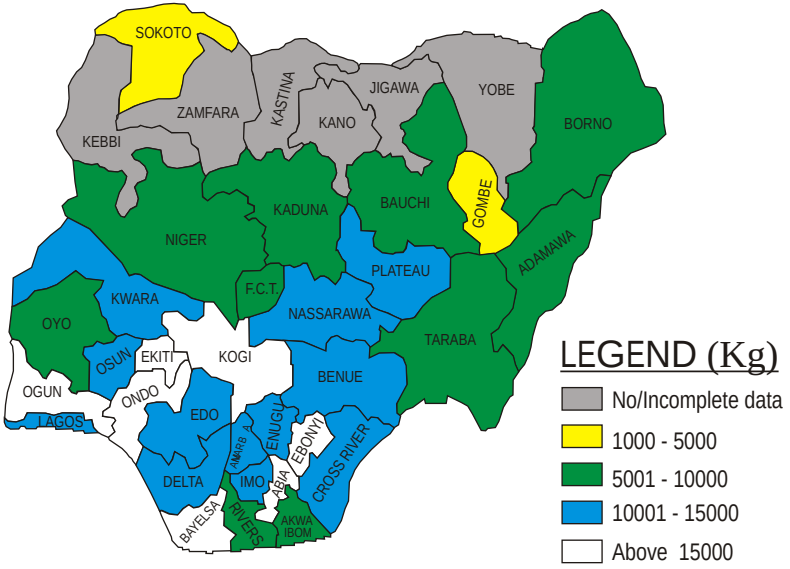


Fig. 13 above shows that the lowest overall yields are found in parts of the north, corresponding roughly with areas with the highest decline in vegetation density, lowest rates of illiteracy and highest rates of poverty.

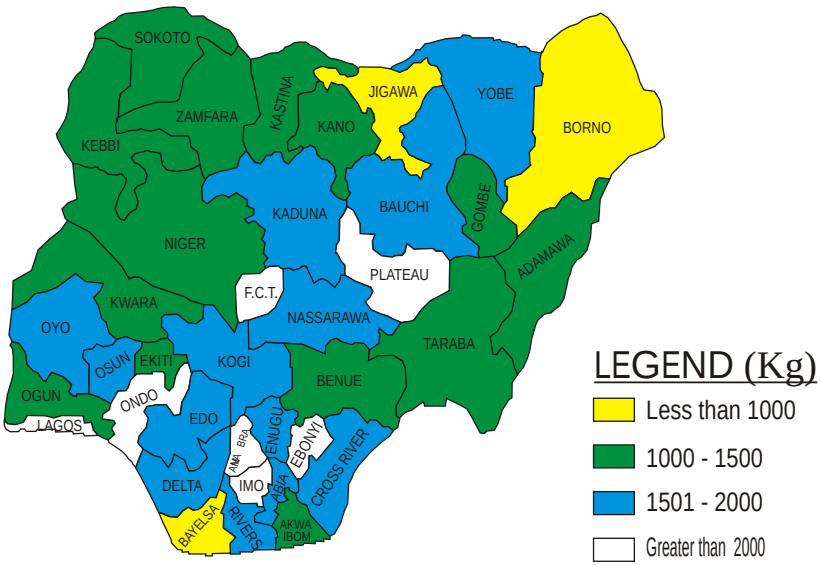
Using data covering 2001-2003, 32% of the included 30 states and FCT recorded average annual cassava yield of between 5-10 mt/ha, 39% achieved 10-15 mt/ha while only 23% of the states recorded cassava yield of more than 15 mt/ha. PCU estimates average cassava yield for small scale farmers at 12.4 mt/ha. FAOSTAT 2004 estimates average cassava yield at close to 20 mt/ha for Thailand and about 16 mt/ha for East and Southeast Asia.

Fig. 14: Average annual cassava yield (2001-2003)



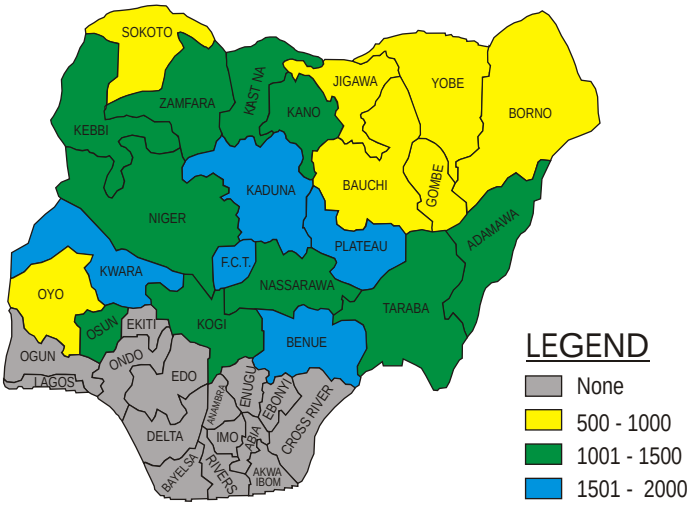
Regarding maize yield (2001-2003), majority (73%) of the states and FCT recorded average annual yield of 1.0-2.0 mt/ha, while only 19% achieved more than 2.0 mt/ha (Fig. 15). Meanwhile, FAOSTAT 2004 estimates average yield of maize in Thailand at 3.6 mt/ha and about 3.3 mt/ha for East and Southeast Asia.

Fig. 15: Average annual yield of maize (2001-2003)



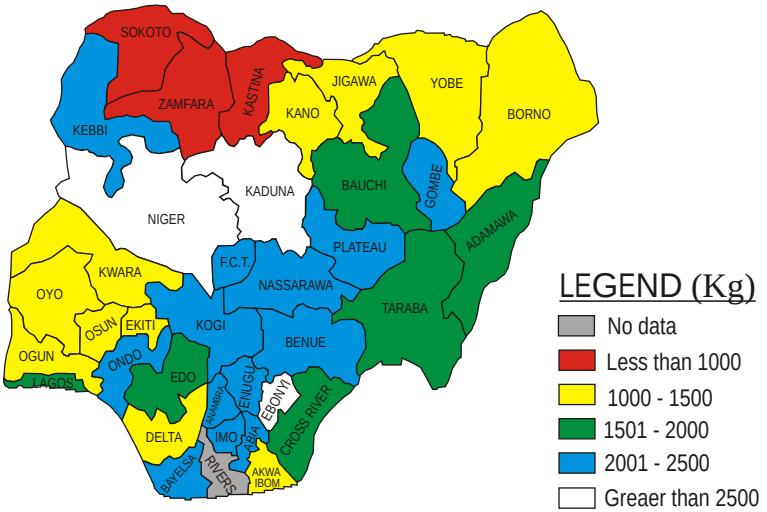
With respect to sorghum, about 46% of the 22 states included achieved average annual yields of sorghum (2001-2003) of 1.0-1.5 mt/ha, while only 23% recorded 1.5-2.0 mt/ha. Up to 32% recorded less than 1.0 mt/ha (Fig. 16). PCU estimates average sorghum yield from small scale farming in Nigeria at 1.55 mt/ha in 2004. FAOSTAT 2004 estimates average yield of sorghum at 2.3 mt/ha for Thailand.

Fig. 16: Average annual sorghum yield (2001-2003)



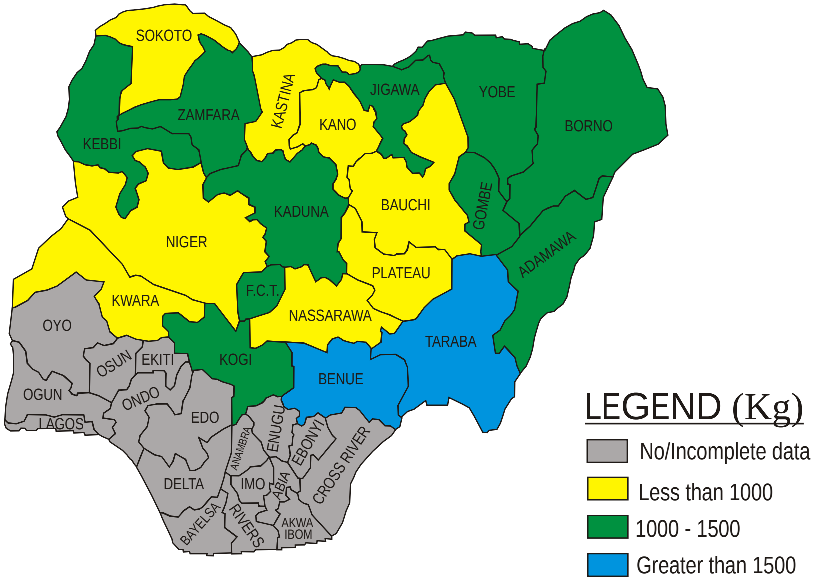
For rice, during 2001-2003, only 8% of the 37 states and FCT achieved average annual yield of more than 2.5 mt/ha, up to 39% recorded less than 1.5 mt/ha. About 53% recorded 1.5-2.5 mt/ha (Fig. 17). PCU estimates average rice yield from small scale farming in Nigeria at 2.0 mt/ha in 2004. Comparatively, FAOSTAT 2004 estimates average yield of rice at 3.7 mt/ha for East and Southeast Asia.

Fig. 17: Average annual rice yield (2001-2003)



Up to 90% of the 20 states covered by millet data (2001-2003) recorded average annual yield of less than 1.5 mt/ha (Fig. 18).

Fig. 18: Average annual millet yield (2001-2003)



8.3 Some factors influencing yield across states

Yield variation across states was modelled to explore the role of socioeconomic, agro-ecological factors and regional peculiarities. The model is specified as follows:

$$Y_d = f(X_t).Where : (X_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

X is a vector of the variables identified above. Y_d is yield across states and Abuja.

$$LogYIND = \alpha_0 + \alpha_1 LogPOLD_d + \alpha_2 LogARFL + \alpha_3 REDN + \alpha_4 LogMASE_s + \mu \ldots\ldots\ldots (2)$$

where *YIND* is total yield (derived yield index), *POLD* is population density, MASE = male secondary enrolment, ARFL = average rainfall, REDN is dummy for North. The data are from the period 2001-2003. The yield index includes cassava, rice, millet, sorghum, and maize. The results of model estimation are as follows (table 2).

Table 2: Estimated Model of Yield Variations across States

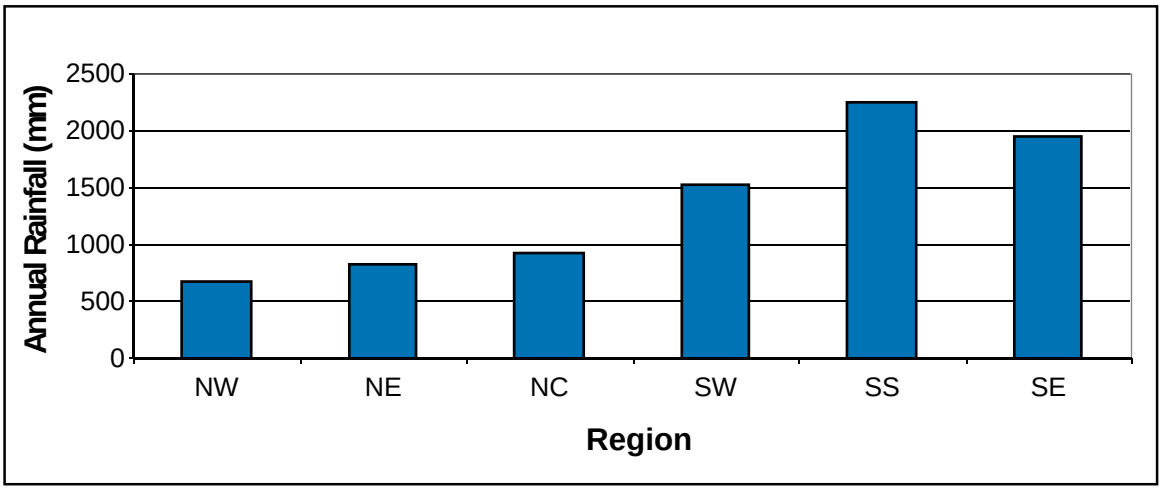
Variable	Coefficients	Std. Error	t-Statistic	Prob.
Population density:(LogPOLD)	-0.032174	0.044143	-0.729	0.0163
Average rainfall: Log(ARFL)	0.24947	0.10295	2.423	0.0212
Literacy rate:(LogMASE)	0.66746	0.28307	2.358	0.0247
Regional dummy (REDN)	-0.0098795	0.065617	-0.151	0.8813
Constant	2.7267	0.91282	2.987	0.0054

R-squared: 0.57; Durbin-Watson stat: 2.4.

Rainfall and literacy both have significant positive effects on yield. Literature is replete with evidence on the direct relationship between educational background and adoption decisions of farm households. Better education promotes the adoption and use of new yield-increasing technologies/inputs and more efficient farm management practices. The positive effects of rainfall underscore the critical importance of water for increased crop productivity, hence the need to improve water management and irrigated cultivation in parts of the country, especially in water-short or drier areas.

The dummy for the northern region is statistically insignificant. This implies that the lower yield in the north is largely associated with lower rainfall and the lower literacy rates generally observed in the north. Water is critical to crop yields in rain-fed agriculture. The northern parts of Nigeria receive substantially less rain than the south. Rainfall is particularly low in the North-West, which receives only a third of the annual average in the South-East and South-South.

Fig. 19: Rainfall distribution across regions



Source: Derived from state rainfall data 2001-2002 from the CBN Statistical Bulletin 2004

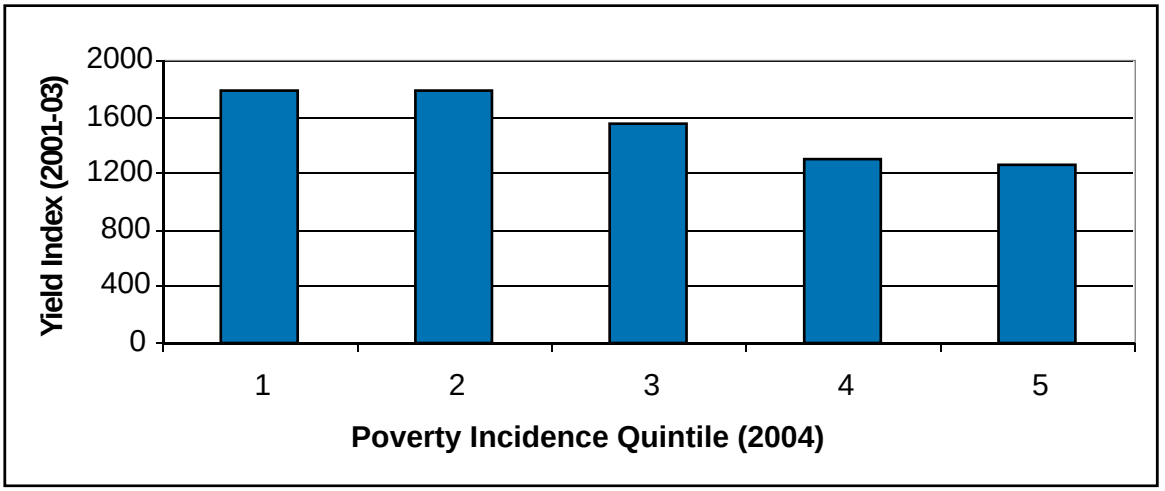
Besides rain water, Nigeria's surface and underground water resources have great potentials to enhance agricultural production and productivity, thereby reducing the pressure to expand area under cultivation.

8.4 Linkages of Yields and Poverty

Given the high incidence of poverty in agriculture, it is instructive to explore the links between poverty and crop yields.

Fig. 20 below presents yields of major crops in relation to poverty incidence. Quintile 1 contains the 7-8 states with the lowest poverty incidence while quintile 5 is the 7-8 states with the highest poverty incidence. Average yields are close to 30 percent lower in the poorest 15 states (quintile 4 and 5) than in the least (poorest) 15 states (quintile 1 and 2).

Fig. 20: Regional Crop Yields and Poverty Incidence



Source: Regional poverty incidence is calculated from FOS-NLSS 2005 and state level PCU crop yield data. Crops are cassava, maize, millet, rice and sorghum for the years 2001-2003.

Using data on state-level arable crop yield and poverty incidence, the linkage of poverty to yield was modelled as follows:

$$DLog(PINC) = \alpha_0 + \alpha_1 LogTOPE + \alpha_2 LogRUPO + \alpha_3 DLog(YIND + \varepsilon$$

where PINC is poverty incidence, RUPO is rural share of total population, YIND is yield index (including cassava, sorghum, rice, maize and millet) and TOSE is literacy rate (given as total secondary enrolment).

Table 3: Estimated Model of Poverty and Yield

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Yield: DLOG(YIND)	-0.835791	0.230327	-3.628712	0.0010
Share of Rural Population: LOG(RUPO)	0.262504	0.146112	1.796596	0.0816
Literacy Rate: LOG(TOPE)	-0.253026	0.143016	-1.769212	0.0861

R-squared: 0.378708; Adjusted R-squared: 0.341054; S.E. of regression: 0.538459; Durbin-Watson stat: 3.253952; level of significance applied is 10%.

The model shows that yield has significant negative effect on poverty, that is, higher yields reduce poverty. Better yields connote greater resource use efficiency and higher incomes. Both characteristics embed agricultural growth which reduces poverty. Increasing agricultural yields should therefore be one of the central elements of Nigeria's economic growth and poverty reduction agenda.

The rural share of population has significant effect on poverty. This corroborates evidence that poverty incidence is higher in rural areas. Reducing poverty therefore requires improving economic growth in rural areas. On the other hand, literacy is significantly negative on poverty, in line with *ex ante* evidence that literacy reduces poverty[6]. In this wise therefore, promoting literacy will contribute significantly to reducing poverty. This finding underscores the need for greater efforts on human resources development in the RNRs sectors as a means to promote growth and reduce poverty. Improving literacy should be a necessary goal of growth and poverty reduction strategy, particularly in the northeast and northwest parts of the country.

Many factors are likely to have influenced this decline in yields, including a drop in fertilizer consumption. Total fertilizer consumption peaked in 1993, but, per hectare, consumption seems to have peaked already in 1983.

Crop land quality and fertility may have also influenced the poor yield performance in the last 1-2 decades. There are indications from our yield model estimation results that successive crop expansions have taken place on less productive land. Crop land quality and fertility may also have degraded in recent times in parts of the country due to reduced fallow periods and other factors. Although further assessment of this aspect is needed in order to draw firm conclusions, some indication of a decline in land productivity may be evidenced from declines in yields of several major crops in the last decade during which fertilizer consumption was relatively constant.

6 Literacy also influences poverty through the effect on yields. This effect was presented in Table 2.

9.0 Degradation of RNRs Cost the Economy at Least 6.4% of GDP

We did quantitative analyses of the costs of degradation and poor management of arable land, forest and rangeland.

9.1 Cropland degradation

While data limitations make it difficult to estimate cost of possible crop land degradation, the historic crop yield data provide an opportunity to present an estimate of the annual value foregone from declines in crop yields since they peaked in the 1980s and early 1990s. The annual cost of yield decline from 1995 to 2004 is estimated at ₦210 billion. More than 60 percent of this cost is from roots and tubers. The annual cost of yield decline from peak year to 2004 is estimated at ₦500 billion. Almost 50 percent of this cost is from cereals and 40 percent is from roots and tubers. Cereal yields peaked in 1981 and yields of pulses and roots and tubers peaked in 1990. These losses are highly significant given that the total federal capital budget in 2004 was ₦350 billion.

9.2 Forest degradation and Deforestation

Up to 50% of forest/woodland may have been lost in the last 4-5 decades, judging from both FAO and LUV data over the last 3 decades. Forestry GDP was ₦31 billion in 2003 (CBN), or close to 0.5 percent of GDP. While loss in potential timber production is the most visible measure of the cost of deforestation, the economic cost goes far beyond this measure of forestry contribution in the national accounts. The rural population traditionally relies on the forest for various food products and fuel wood (NTFPs), both for own consumption and for sales to the urban sector. Five decades ago, with almost twice as much forest, and forest being more accessible to a substantially larger share of the population than now, per capita income and consumption from NTFPs might have been twice as high.

While there are no hard data available to assess the exact magnitudes, orders of magnitudes of the cost of deforestation and losses in NTFPs in the last 5 decades are at least ₦120 billion per year, or 1.7% of GDP in 2003, if losses of NTFPs are in proportion to forest and woodland losses. This is roughly the size of the total federal budget for health and education in 2004 (₦153 billion). Deforestation is also impacting fuel wood supply. Real fuel wood prices in various parts of the country have doubled in the last two decades due to increased collection and transportation cost. This is estimated to have an economic cost of at least ₦45 billion per year. This cost can be viewed as being included in the above total cost estimate of NTFP losses of ₦120 billion per year.

If Nigeria loses its remaining forest resources, the economic cost will be substantially higher than the current losses. Not only would the current non-wood forest products and timber revenues be lost, but also much of fuel wood supply. If the population currently depending on fuel wood for cooking were to switch to kerosene, the annual cost would be on the order of ₦650-980 billion per year. This amount, in addition to the non-wood forest products and timber values foregone, is equivalent to 9-14% of current GDP.

9.3 Rangeland degradation

Nigeria's livestock resources have been estimated to be in excess of US$6 billion, providing income for more than 44 million of Nigeria's poor. The rising population of livestock, combined with losses in rangeland areas, aggravates pressure on rangelands, predisposing the land to degradation, including fadama lands which are a critical resource for about two-thirds of the national cattle population. The LUV data from 1976/78 to 1993/95 reveal a decline in savannas and other grazing lands from 50 percent to 42 percent of total Nigerian territory. During the subsequent decade, another 6-8 percentage points of rangelands might have been lost to crop cultivation and other land use. Moreover, the LUV data reveal severe losses in savannah vegetation density, and recent estimates obtained from sources at NAPRI indicate declines in fodder yields of 10-20 percent from 1985 to 2003. Valuing the yield declines at observed fodder prices, the present value of annualized cost of yield losses from 1985-2003 is on the order of ₦135-260 billion per year, or 1.9-3.6% of 2003 GDP. The estimated annual loss from rangeland degradation approximates the total federal budget for health and education in 2003 (₦143 billion).

Overall, poor management of agricultural crop land, rangeland degradation, and forest losses and degradation is costing at least ₦465 billion (US $3.4 billion) per year, or at least 6.4 percent of GDP in 2003. This is just the direct cost and does not include the economic multiplier effects and dynamic gains of increased rural incomes that would have prevailed in the absence of degradation and poor management.

Much of these significant losses can be avoided if arable land, rangelands and forests are managed in a sustainable manner to guarantee long-term productivity and incomes.

*Table 4: Estimated annual cost of RNR degradation and poor management**

RNRs degradation	***₦ billion (US $ billion)***	***Percent of GDP***
Poor crop land management	210 ($1.5)	*2.8 %*
Rangeland degradation	135 ($1.0)	*1.9 %*
Forest resources degradation/losses	120 ($0.9)	*1.7 %*
Total	*465 ($3.4)*	*6.4 %*

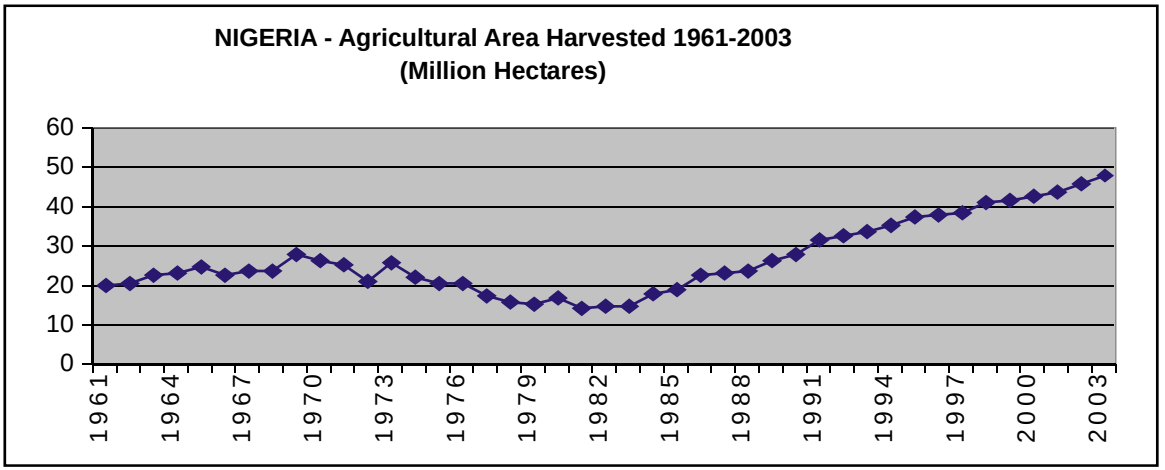
** These estimates represent a lower bound of the cost of degradation and poor management. A plausible range is presented in the main report.*

These huge economic losses from degradation and poor management of RNRs imply missed opportunities to accelerate growth, employment and reduce poverty in Nigeria. Now is the time to reverse the situation and restore outputs and incomes in a sustainable manner through better and rational management of the productive resource base.

10.0 Agricultural Growth has come from Land Expansion and not Productivity Gains

Degradation of the resource base and the lack of sustained agricultural growth reflect a failure of past policies to promote rational management of the RNRs base. Rather, agricultural policies have led to increased outputs through expansion in cultivated land, not by sustained increases in productivity.

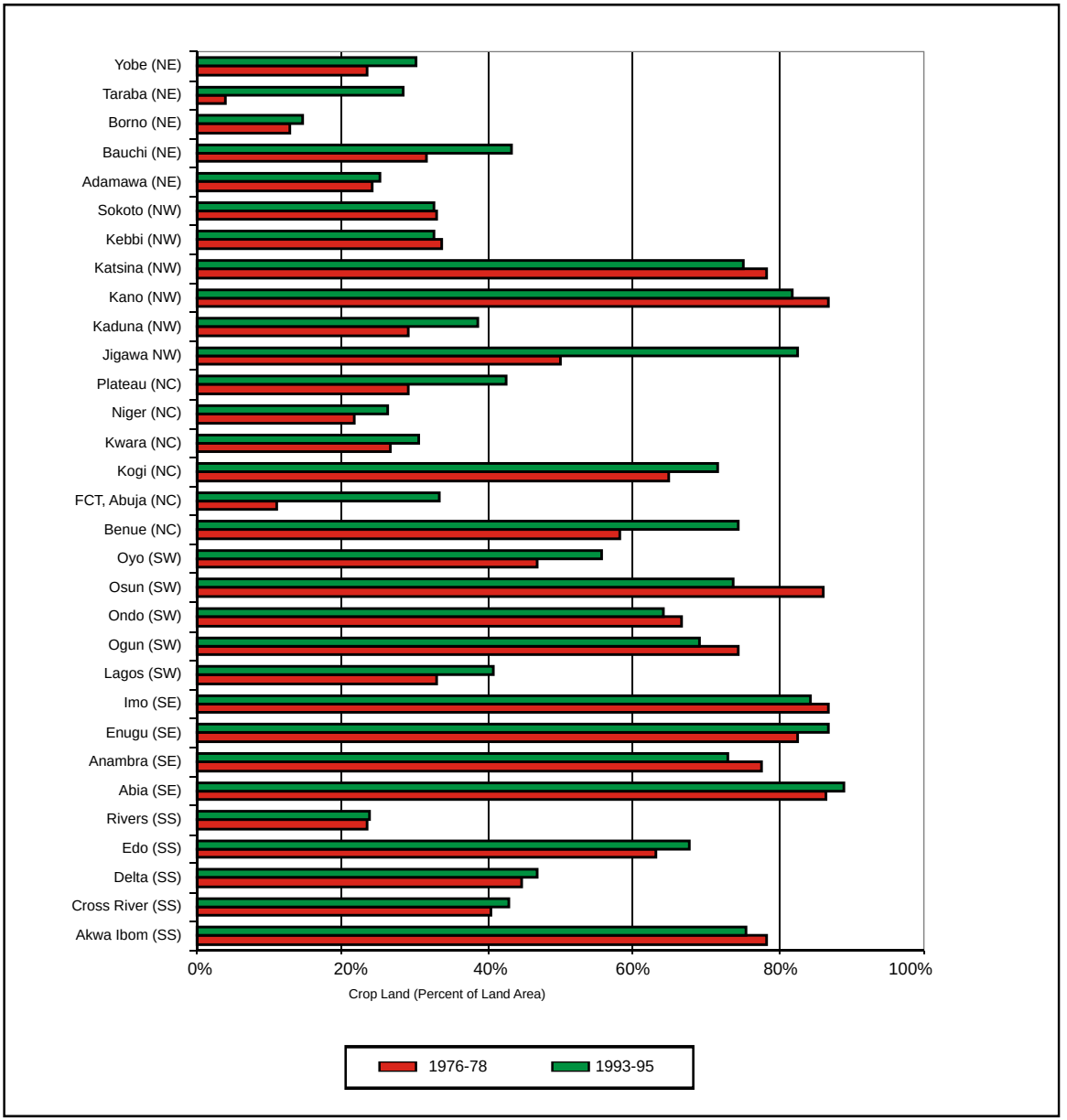
Fig. 21: Expansion in agricultural area harvested



Source: Derived from FAOSTAT.

Agricultural growth in the past two decades has been driven by a tripling of area harvested, while yields of many major crops have stagnated or fallen. Land under crop cultivation is expanding rapidly in many states.

Fig. 22: Cropland as a share of total land

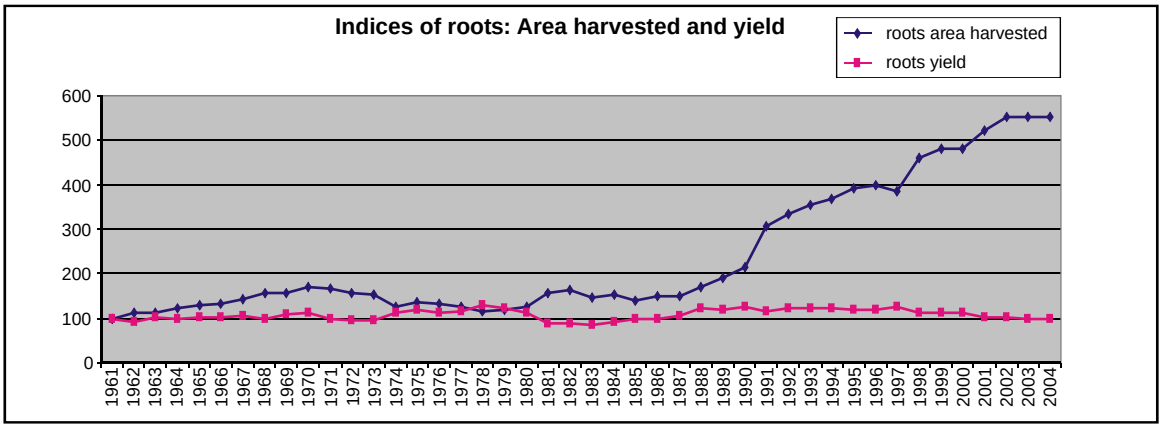


Source: Derived from FORMECU (1998).

Satellite land use and vegetation data shows that already by 1995, cropland occupied nearly 70 percent or more of total land area in 40 percent of the states[7]. Analysis indicates that cropland expansion is increasingly taking place on marginal land with lower yields. This trend is forced by lack of productivity gains in agriculture and lack of off-farm and urban income opportunities for a rapidly increasing population.

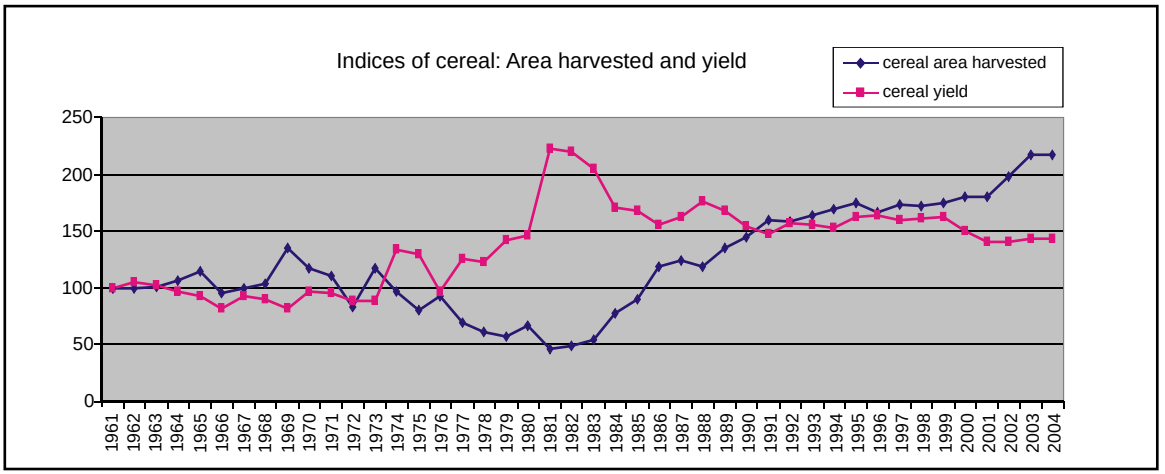
The unsustainable growth trends are evident from the outlook of cropped area and crop yield over a 40-year period (1961-2004) for root crops and cereals.

Fig. 23: Trends in Area Harvested and Yield of Roots



Source: Derived from FAOSTAT data.

Fig. 24: Trends in Area Harvested and Yield of Cereals



Source: Derived from FAOSTAT data.

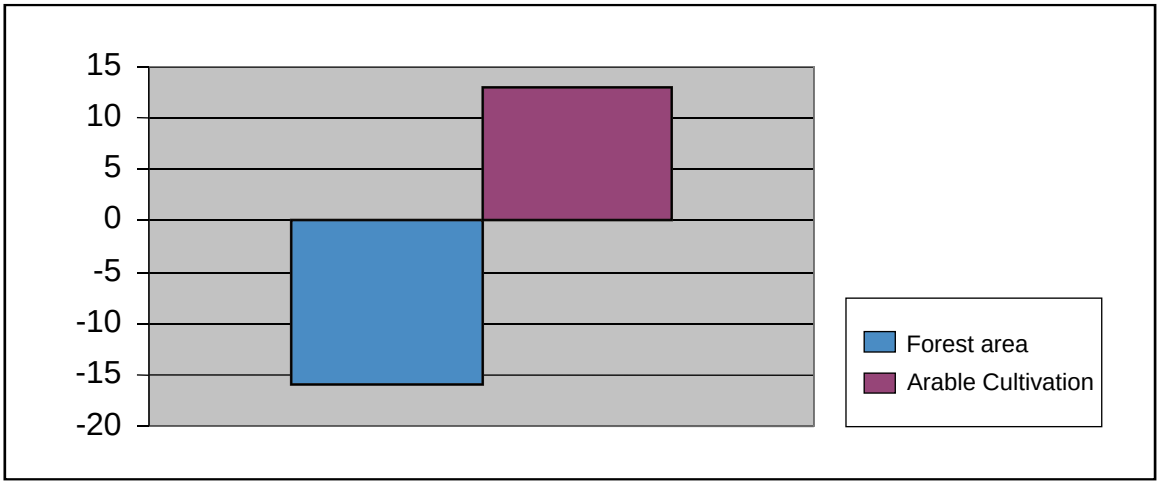
7 FORMECU. 1998. Assessment of Land Use and Vegetation Change in Nigeria. Main Report. Forestry Management, Evaluation and Coordinating Unit,

The stagnation or decline of yield and disproportionate trends of output and productivity growth reveal policy and institutional failures in the crop sub-sector.

10.1 The Pattern of Agricultural Growth has exacerbated Land Competition and Conflicts

The expansion in agricultural land has aggravated competition between cropland and forest, and between cropland and rangeland. For instance, analysis of the land use and vegetation change data in Nigeria (1976/78 - 1993/95) shows that while area under forest declined by 16%, area under arable cropland increased by 13%.

Fig. 25: Change in forest area vis-à-vis arable land 1978-1995 (%)



Source: Derived from FORMECU (1998).

The apparent competition between forest and cropland can be attributed to the fact that the pressure to increase outputs has over the years led to the expansion of cultivation into forest. Increased land productivity and integrated land management systems would help to avoid simplistic forest clearance (agricultural extensification) for increasing agricultural outputs. For example, if the national average yield of cassava were 20 mt/ha, the current annual output of about 34 million tonnes would be obtained from about 1.7 million ha compared to 3.1 million ha that is currently cultivated. Ironically, past agricultural policies and programmes seemed to have led to increased outputs through expansion in land under cultivation rather than by increased productivity.

Further dimension of the un-sustainability of current agricultural growth is the growing competition between rangeland and cropland. Arable farming has increasingly encroached stock routes and traditional grazing areas leading to growing conflicts between pastoralists and arable farmers, dwindling grazing resources and threat to the livestock sub-sector.

11.0 Policy Imperatives for Sustainable Agricultural Growth through Better Management of RNRs

11.1 Productivity Improvements is Indispensable for NEEDS and MDGs

The key challenge of Nigeria's agricultural strategy is to stimulate and sustain agricultural growth through increased productivity, not through expansion in cultivated area. Nigeria faces a clear and direct challenge to increase and sustain yields in crops, livestock, forest and fishery. Related to this challenge is that of enhancing the domestic and international competitiveness of RNR-based sectors. If current trends continue, agriculture will not be able to meet its expected social and economic responsibilities for driving economic growth and poverty reduction. The situation can only be reversed through policy and institutional reforms to develop the sectors and promote sustainable management of RNRs.

11.2 Agriculture-friendly macroeconomic policies are essential

Like in many sub-Saharan African countries, the RNRs sector in Nigeria is structurally weak compared to other economic sectors. Over the years, macroeconomic distortions have resulted in adverse domestic terms of trade against RNRs, relative to other sectors. In the circumstance, compensatory measures are needed to safeguard productivity, incomes and RNRs-dependent rural livelihoods. Intervention areas include credit and interest rates, price parity and private investment flows. The predominance of short-term credit and high interest rates in formal finance institutions do not match the financing requirements of RNRs investments, hence the need for tailored credit programmes for RNRs sector. There is large scope to increase the outreach, targeting and impact of the Agricultural Credit Guarantee Scheme Fund (ACGSF), the Interest Draw-Back Scheme, the Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) and the agricultural credit schemes of the various state governments.

11.3 Sustainable RNRs require substantial private sector investments

Despite being the dominant economic sector, RNRs sector has the poorest capital accumulation and the lowest quality of private sector investment. Statistics on national capital formation shows that land development (proxy for agricultural capital formation) stagnated at 12-14% of total capital formation in the 1990s. The poor quality of private sector investments in agriculture is indicated by the fact that primary agricultural production companies constitute less than 3% of the total count of companies in the Nigerian Stock Exchange. These reflect the low-investment trap that plagues RNRs – the dominance of smallholder producers operating low-input, low-technology and low-productivity systems.

There seems to an implicit assumption that the agricultural sector can grow and develop without substantial good quality public and private investments. Ironically, sustainable RNRs management cannot be achieved without huge investments in land development, working capital and post-harvest infrastructure – storage, processing and preservation. Since agriculture cannot grow without significant private sector investments and given that NEEDS identifies inadequate incentive framework as one factor limiting private sector participation in agriculture, it is proposed that the existing incentive framework be reviewed and aligned to stimulate greater quantum and quality of private sector investments in agriculture.

11.4 New capacities and incentives for agricultural entrepreneurship are Inevitable

Improved quality of human capital in agriculture can be achieved by nurturing new capacities in agricultural entrepreneurship. This is necessary to evolve a younger, more vibrant and market-oriented generation of RNRs producers. Components of this challenge include developing commodity value chains to provide viable economic space for new enterprises, through enterprise incentives, investment forums and market facilitation as well as developing functional links between agricultural education and practice. Sustainable RNRs growth cannot be realised if agricultural employment continues to be relegated as a last-resort option, which is fit only for old, illiterate, poor persons.

The agricultural population is aging as average age of the labour force in agriculture is estimated at about 48-60 years. Quality of agricultural education is low – an assessment of curriculum content and training modules in Faculties of Agriculture of some Nigerian Universities shows deficiency in entrepreneurship content, vocational exposure and professional orientation. There is a paucity of entrepreneurship-oriented courses that prepare students for enterprise formation, agribusiness management and risk-taking. Without an agricultural educational system supplying the requisite skills, knowledge, competencies and attitudes for agricultural entrepreneurship, the private sector role will remain a mirage. Economic and social signals and incentives should be rationalised to make private agricultural investments more competitive and attractive to young entrepreneurs. In line with the acknowledgement in NEEDS that the land tenure system hinders private sector participation in agriculture, it is crucial to introduce land reforms for new agricultural producers in order to improve access and security of tenure.

11.5 Develop agribusiness and transparent markets to stimulate investments

The agribusiness-cum-market sector is perhaps the weakest link in Nigeria's RNRs development. Low level of agribusiness development and weak markets for RNRs are principal constraints to private sector investments for improving productivity and competitiveness. The bulk of RNRs output are self-consumed or sold with little or no value-added, indicating the poor state of agribusiness. Agribusiness and market development bears win-win effects for the economy. It engenders the shift from traditional, subsistence and less efficient to modern, market-oriented, more productive farming systems. It

correlates strongly with private sector development and enhanced entrepreneurship in RNRs. Agribusiness development promotes employment and enterprise investments through longer commodity value-chain economies. This leads to broadened demand for RNRs outputs and encourages productivity improvements in the farm sub-sector. Market development including efficient and effective regulation of quality, grades and standards, market facilitation, improved access to price, supply and demand information and better market infrastructure can trigger higher quality of private enterprise in RNRs development.

Realising the potentials of agribusiness and market development to elicit improvements in agricultural productivity and supply response, several initiatives have been implemented or being currently implemented by the Federal Government and international development partners. These initiatives aim at providing business support services and incentives to improve product quality, farm-level productivity, value addition the efficiency of value chains. Current government programmes to address the situation include the Presidential Initiatives on Rice, Vegetable Oils, Cassava, Tree Crops, Livestock, Fisheries, Sugar and the Multi-Commodity Development and Marketing Companies. Programmes already implemented or underway to address agribusiness value chain and market development include outgrower schemes, USAID MARKETS, USAID DAIMINA, IFAD RTEP, CIDA's work on Soybean, DFID PrOpCom, WB MSME, FADAMA I & II, IITA – ICP, NESG – NEI, and others. While these initiatives have valuable demonstrative effects in selected commodities including rice, soybean, cashew, cassava, catfish, sesame, oil palm, sorghum, poultry, etc, they do not supplant the need for a coherent overall government strategy for developing commodity value chains in Nigeria. The lack of a national strategy for the development of value chains linking RNRs to industrialisation remains a drag on sustainable non-oil growth in Nigeria.

11.6 Improve national and sub-national statistics systems for tracking changes and performance of RNRs

The monitoring and evaluation of RNRs requires good quality data -adequate, reliable and timely data. Such data is useful for policymaking, programme development and research investigations. In the course of data collection for this analysis, the shortcomings of the data systems become obvious. Collection, processing and storage of RNRs data are not well-coordinated among the relevant MDAs. Besides being in arrears of many years, many MDAs have poor and outdated data storage, retrieval and dissemination systems. The Department of Planning, Research and Statistics (PRS) of the various Ministries lack adequate capacity to collect, process, organise data in accessible and useable forms. There is scope for the National Statistical Master Plan alluded to in NEEDS to address these weaknesses. At the national level, measures should aim at enhancing horizontal coordination of data systems between the PCU, the PRS of FMARD and the FOS (now National Bureau of Statistics). Between the state and federal levels, measures should target greater vertical coordination involving the States' ADPs, the PCU, the PRS of FMARD and the FOS. Capacity building and institutions strengthening are essential to achieve desired levels of coordination, in order to meet the growing

demand for high quality data by policymakers, private sector and civil society.

11.7 Strengthen research on RNRs sustainability

Research is essential to develop the RNR-based sectors. Currently, there are 18 national agricultural research institutes (NARIs), 6 on arable crops, 4 on forestry and tree crops, 3 on livestock, 2 on fisheries and I each on extension, processing and storage. Five international agricultural research centres including IITA, ICRISAT, IRRI, WARDA and ILRC have research stations located in different parts of the country. Recognising the weakness of the national agricultural research system, the federal government in 1992 launched a 7-year National Agricultural Research Project under the 15-year National Agricultural Research Strategy Plan – NARSP (1996-2010). The NARSP aimed at improving the organisation, coordination and management of the National Agricultural Research Systems (NARS) by enhancing the operational capacity of NARIs. Despite its promise, the NARSP has been marred by poor implementation. NARIs are weakened by shortage of funds, dilapidating infrastructure and poor coordination among themselves and lack of effective and sustained feedback/linkages with extension. Despite several institutional changes, there is yet no effective national agricultural research policy and stable institutional framework for prioritisation, funding, coordination and oversight of agricultural research[8].

The need to strengthen research on RNRs cannot be over-emphasised, as research produces more efficient technologies that can drive and sustain RNRs productivity. Nigeria's research institutes deserve better funding, greater accountability to end-users and stakeholders (government, farmers and extension), improved management and dynamic incentive structure in order to deliver innovations and products that can leverage greater private sector investments in agriculture. Besides, NARIs need to sharpen focus on sustainable land use systems including soil conservation technologies, agronomic practices, integrated land management and eco-regional production constraints and options. While a major challenge for Nigeria is sustainable land and water management, there hardly exists a coherent framework to focus research on resource management. For example, national agricultural research system is structured along commodity lines, and there is little attention to the eco-regional imperatives for sustainable resource management.

11.8 Efficient and effective public agricultural services

Productivity cannot improve without increased use of more efficient inputs and technologies. Given the present distorted nature of inputs markets, there is need for reforms and deliberate measures to elicit greater private sector investments in procurement, distribution and marketing of fertiliser, herbicides and so on. Greater transparency, predictability and targeting of input subsidies will remove market

8 *World Bank, 2004. Nigeria: Strategic Options for Revamping Agricultural Research and Extension Services in Nigeria. Country Department 12, Africa Regional Office, August 2004.*

distortions and clarify the environment for greater private sector participation in inputs markets. Inadequate access to capital hinders private investments in land-improving, yield-increasing assets and more efficient technologies. Currently, only 10% of rural population is reached by formal financial institutions. It is estimated that small holders get only 5% of total agricultural credit, with the rest going to large-scale farmers who produce less than 10% of total agricultural output[9]. Innovations to rural finance are needed to improve access to credit and align supply of investible funds to RNRs peculiarities.

Total fertiliser use in the country, for example, is estimated at about 11.8% of economic demand and 4.5 % of potential demand from 1999-2000. Current fertiliser use is estimated at 0.5million tonnes/year much short of the potential put at 3-5million tonnes/year. Fertiliser procurement by the Federal Government declined from 1.3million tonnes in 1990 to less than 200,000 mt in 2002 and about 245,000mt in 2004, despite large expansion in cultivated areas recorded by many crops. It is not surprising therefore that fertilizer use decreased from 13 kg of nutrients/ha in 1989-1991 to 6 kg of nutrients/ha in 2002. Similarly, existing use of improved seeds/planting materials is put at 12% of potential demand. Nigeria can regain competitiveness in grains if fertiliser and other yield-increasing technologies are widely used. For example, it was estimated, that in 2000, Nigeria missed about 3 million tonnes of maize (valued at ₦31.1billion) due to fertiliser use shortfalls[10].

Low effective demand for modern inputs (fertiliser, hybrid seeds, herbicides, insecticides) and distortionary heavy public-sector involvement and non-transparent administration of inputs subsidy combine to discourage private sector participation in the production and marketing of agricultural inputs. The challenge faced by programme interventions in the country's agriculture is to build the demand base for modern agricultural inputs through credit and technology promotion schemes that are linked to markets. Increased private sector involvement in inputs production and marketing requires an enabling policy environment and infrastructure capabilities to assure good returns to investment.

Technology dissemination is crucial to promote the adoption and use of modern inputs, technologies and efficient farming systems, but extension system is weak and inadequate[11]. The state-level Agricultural Development Programmes, which are primarily charged with technology dissemination, require strengthening through capacity building and better funding to improve extension-farmer ratios and make extension services more effective and responsive to producers' needs. Overall, the key

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9. Shaib, B., Aliyu, A., and Bakshi, J. S. 1997. Nigeria: National Agricultural Research Strategy Plan [1996-2010]. Department of Agricultural Sciences, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.

10 Nagy, J. G. and O. Edun, 2002. Assessment of Nigerian Government Fertiliser Policy and Suggested Alternative Market-Friendly Policies. Report prepared for IFDC, Abuja.

11 Some states have as low as one extension agent per five thousand farmers

challenge is to improve the efficiency, accountability and outreach of agricultural services to farmers. An important principle is to promote competition in the provision of the services through expanded private sector roles.

11.9 Policy consistency, coordination and implementation

Inconsistency and discontinuity of policies and programmes threaten sustainable management of RNRs. It precipitates a hostile climate for private investments in agriculture. The experience of agricultural development policies in Nigeria is fraught with policy reversals and contradictions. Existing levels of policy and programme coordination do not match the interdependencies and linkages between the individual RNRs, for example, between crop cultivation and forest, cropland and rangeland. Poor management of intra-RNRs linkages can undermine growth and poverty reduction.

The fact that poverty decline in the RNR-based sectors fell short of overall poverty decline (from 1996-2004), despite the improved agricultural growth performance of recent years raises concerns that agricultural growth may have been achieved at the expense of other poverty-reducing sectors such as forests. Were the counter-effect of deforestation to be upheld, it will challenge simplistic policy presumptions that agricultural growth reduces poverty and in fact corroborate the notion that the source of agricultural growth is equally important. Conflicts between agriculture and forest on one hand, and between crop and livestock on the other , need to be addressed if meaningful growth is to be achieved. Achieving growth through productivity gains is an imperative, not just for Fadama II and SPFS, but also for non-Fadama, non-SPFS producers. Improving cropland productivity and developing high yielding pastures/rangelands can minimize conflicts between arable farmers and nomads.

11.10 Irrigation Development and Water Management

Irrigation development and water management occupy central place in the RNRs growth strategy. The bulk of the country's irrigation potential is neglected, thereby denying the country huge economic benefits. The gains achieved under Fadama I and the projected benefits from Fadama II clearly demonstrate the critical role of irrigated farming and water management in upward shifts of productivity and incomes. Fadama I yielded economic rate of return of 40% compared to an estimated 24% at appraisal[12]. There is need to reappraise the irrigation development strategies of the federal and state governments to ensure local ownership, efficiency, viability and sustainability. There are currently many developed but non-functional irrigation infrastructure, particularly the RBDAs schemes. Public-private partnerships can be explored to resuscitate them and harness their potentials in a sustainable manner.

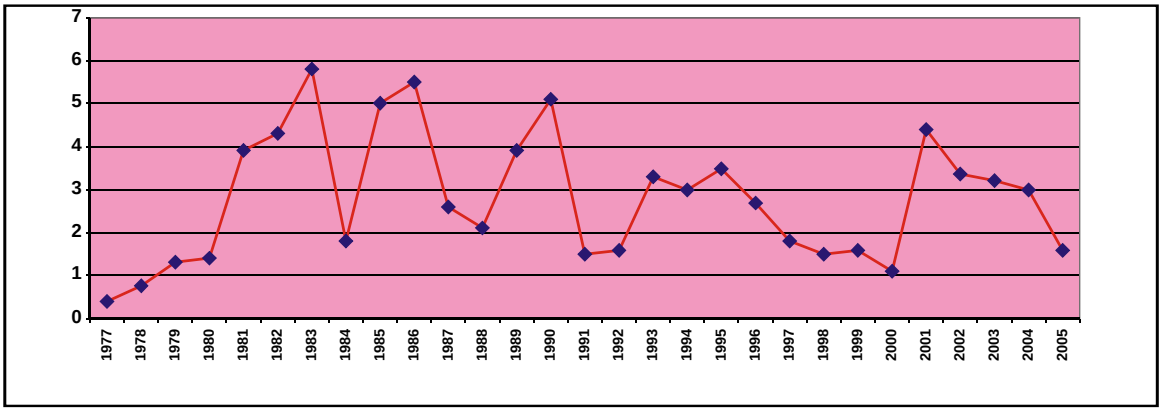
12 World Bank, 2003. Second National Fadama Project Description. Abuja.

11.11 RNRs funding should align to economic priority status

Public sector agricultural services in Nigeria, particularly agricultural research and extension, have suffered from funding instability and weak delivery systems. For example, government funding of the ADPs after the World Bank loan expiration became so acute, thereby threatening the sustainability of the ADP system, curtailing its outreach and effectiveness. Poor sustainability of agricultural research and extension funding is not limited to the ADP system. According to World Bank (2004b), the Agricultural Research Council of Nigeria and the National Science and Technology Development Agency which set research priorities and coordinate national research programmes do not have mandate to generate funds for their own financial and institutional sustainability.

Over the years, the percentage allocation of the federal government capital budget for agricultural research has been too incommensurate to agriculture's economic potentials and funding needs. The share of agricultural research in total agricultural budgets for the periods 1996-1998, 1998-2000 and 1999-2001 were 13.41%, 14.82%, and 12.42%, respectively, each constituting less than 1 percent of the country's agricultural GDP. In 2000, Nigeria's agricultural research and development (R & D) was only $0.38 for every $100 of agricultural output, this ratio was higher than the $0.16 level achieved five years earlier, but represents a big drop from the $0.66 in the late 1970s and $0.81 in 1981[13]. Currently, Nigerian government's funding for agricultural research is estimated at 0.02% of agricultural GDP, well below the average for Africa (0.85%). Diversified and sustainable funding for agricultural research and extension is therefore a critical need. Key options include private sector resource mobilisation, competitive funding, user financing and the decentralisation of funding to the sub-national levels of government – state and local governments. At the federal level, funding for agriculture has been very unstable as shown in Fig. 26.

Fig. 26: RNRs share of federal capital budget (%) – 1977-2005



Source: Federal Government Budgets, various years

13 Beintema, N. M. and Ayoola, G. B., 2004. Nigeria. Agricultural Science and Technology Indicators. ASTI Country Brief No. 10, February 2004. IFPRI-ISNAR.

Such a funding pattern clearly does not befit the sector that is acknowledged to be central to growth and poverty reduction. Currently, agriculture share of federal capital budget (1.5%) falls even short of the Government of Nigeria's own target of 4% set by NEEDS. Statistics from the Central Bank of Nigeria reveals a disproportionate flow of funds and resources to RNR-based sectors – agriculture, forestry and fisheries. Sector distribution of commercial banks' total loans and advances shows that agriculture, forestry and fisheries was ₦242.2 billion compared to a total amount of ₦4, 339.4 billion, that is, 0.06 percent. The ratio of small-scale enterprises' loans to commercial banks' total credit averaged mere 8.35 percent in 2003[14].

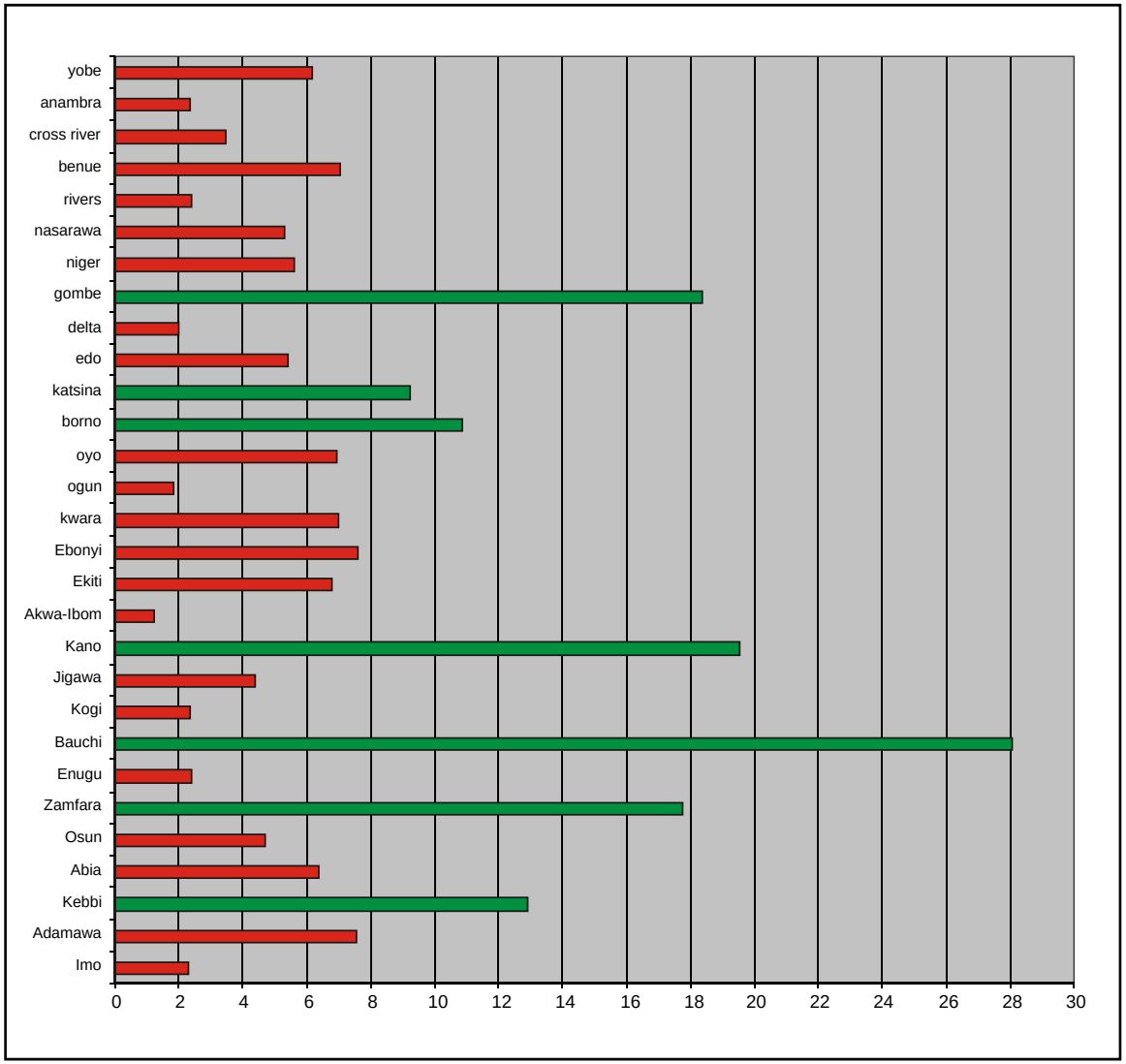
Agriculture, forestry and fisheries accounted for only 0.7 percent of total cumulative foreign private investment in Nigeria in 2003 compared to 25.6 percent for manufacturing and processing, and 34.6 percent for mining and quarrying. Fund sourcing from the formal sector is constrained by the generally high interest rates charged by banks, the unsuitable short maturity of bank loans and the predominantly informal character of small-scale producers. The acute low public agricultural investment is also exemplified by the fact that the total capital budgets for RNR-based sectors (agric, forestry and fisheries) were mere 1.3% and 2.8% of agricultural GDP in 2003 and 2004 respectively[15].

There is high variability of agriculture share of budget across states. A sample of states shows that while average annual agriculture share of capital budget from 2002-2005 were 28.1% and 19.5% for Kano and Bauchi respectively, those for Imo and Enugu were 2.3% and 2.4% respectively.

14 CBN. 2003. Statistical Bulletin Vol. 14. Central Bank of Nigeria, Abuja.

15 Estimates were based on capital budgets of Federal Government and 28 States for which data were available. GDP figures were obtained from CBN Annual Report and Statement of Accounts 2004.

Fig. 27: Average RNR Share (%) of States' Capital Budget [2002-2005]



Source: State Government Budgets, 2002-2005. The bars in red indicate states where average RNRs share of capital budget is less than 8%.

11.12 Establish clear incentives for sustainable RNRs management

While strong agricultural performance (growth rates) may be achieved through productivity-enhancing measures, our analysis underscores the fact that sustainable agricultural growth hinges critically on the wise management of the RNRs base in a manner that conserves soil fertility, prevent land degradation and deforestation as well as promote good environmental stewardship. There should be a clear strategy of incentives which influence RNRs-based producers (such as crop and/or livestock farmers, herdsmen, foresters, fishermen) to adopt management practices for preserving the quality and integrity of the resource base - land/soils, forests, water. Targeted promotion of proven locally suitable soil and crop management practices as well as integrated land use systems is important to promote soil-conserving technologies and farm management practices that simultaneously increase productivity and enhance the quality of environmental resources. Land capability knowledge (analysis/planning) needs to be continuously updated and disseminated through Land Data Banks accessible to producers, in order to promote rational land use and prevent degradation.

Existing research-extension-farmer linkages should be harnessed to demonstrate and promote model land management practices, for example, soil-compatible rotation, relay cropping, soil enrichment, agroforestry, optimal water harvesting and use, soil erosion control, conservation planting and cultural methods, afforestation, tree planting/husbandry and so on. Given that community participation in forest and water resources management is crucial for sustainability, models of community-government partnership in sustainable forest management should be promoted by federal and state forestry policies and institutions. Poor synergy between policy instruments for agricultural growth and resource sustainability threatens sustainable agricultural growth.

11.13 Political will to develop RNR-based sectors is crucial

For many years, policies and programmes for RNRs did not translate into commensurate ground results, due largely to wrong policy design or bad policy implementation. Tremendous political will is required to establish the conditions for sustainable agricultural growth by unlocking the bottlenecks that prevented growth and competitiveness of agricultural sector. This entails fundamental reforms of agricultural policies and institutions and political will to implement the reforms on a sustainable basis. Overall, agriculture critical constituencies in both government policymaking and private sector.

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