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NIGERIAN AGRICULTURE AND THE CHALLENGES OF THE 21ST CENTURY

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ABSTRACT

This paper has x-rayed Nigerian agriculture and highlighted the problems that have constrained performance. To the casual observer, it would appear that Nigerian agriculture has done well in spite of the problems. After all, it is said that over 70 million Nigerians (about 70 percent of the population) derive their livelihood from agriculture.

For those of us who have the responsibility of studying and operating the system, the danger signals should be clear. The first danger signal is that the productivity of agriculture has not grown but has declined in some sectors: consequently Nigeria has been unable to feed its population. The second danger signal is that the population is growing rapidly at the rate of about 3 percent which surpasses the rate of growth of food production. The third is that our foreign exchange earning is declining such that we cannot afford to supplement local food production with imports. The three factors have combined to cause acute food scarcity which is currently felt more in spiralling food prices than in non-availability of food. This is why currently, the average salary earner spends an unduly large proportion of the monthly take-home pay on food alone.

If agricultural productivity does not increase considerably in the next decade, and our foreign exchange earning capacity continues to decline as it has done in the past two decades, while the population continues to grow at the current rate, then Nigeria will face a situation of absolute food scarcity. The giant of Africa may be forced to go cap-in-hand begging for food aid. The prospect of this occurring necessitates that action should be taken to transform Nigerian agriculture fast as we make efforts to reduce our population growth rate. Agricultural professional organisations and institutions must rise to the occasion to ensure the sustained and efficient production of food, a resource of critical importance to the security and integrity of Nigeria. Cognisant that Nigeria, the Giant of Africa, has immense human and material resources, it therefore has the potential to utilize these as envisioned "to achieve food security, produce raw materials for industry and raise the level of foreign exchange earnings" and make Nigeria "Africa's leading economy". The challenge is ours.

1. INTRODUCTION

The agricultural sector of any developing economy performs the primary role of provision of food and fibre; food to nourish the populace and fibre to feed the industries. Of major concern to man is the assurance of food supplies at reasonable costs. The concern stems from the critical role of food in the sustenance of human life and the liberation of energies for creative and active healthy growth. In this connection, the expectation especially since independence, has been that Nigerian agriculture should perform the principal task of providing adequate and well-balanced food supply for the growing population. It should be emphasized that the need for providing adequate food supply at reasonable cost goes beyond the farm sector. If food supplies to the modern sector does not keep pace with the sector's demand for labour, the modern sector would have to consume a large share of its output in feeding its labour force, thus reducing the surplus for capital accumulation.

Organised societies have evolved three basic ways to meet the existential imperative of providing adequate food supplies. One method is for the polity to rely entirely on its resources. This perhaps was the case with very primitive societies. Another approach is for the society to supplement its internal production with importation or acquisition of food from outside. This

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is the approach commonly adopted by most modern economies. Food importation however, is predicated on the availability of foreign exchange. Consistent shortage of foreign exchange had posed a major constraint to Nigeria and other developing economies and has necessitated inward looking and the drive towards self-sufficiency in food supply. The third option is predatory in nature, involving the control of the resources of others to ensure regular supply of one's needs. Imperialistic nations had recourse to this option in the colonial years.

Nigerian agriculture is also expected to ensure adequate supply of raw materials for domestic industries. Agriculture makes contributions to economic growth by purchasing some production items from other sectors, selling some of its products, not only to pay for the purchase of production items, but also to purchase consumer goods from other sectors. Additionally, agriculture transfers productive resources to other sectors. In this connection, agriculture is expected to contribute a major part of the capital needed to finance economic development. Through the transfer of capital and labour to non-farm activities, agriculture provides an investible surplus to support investment in other sectors. Agriculture can also be a source of capital formation in other sectors through simple lending of voluntary savings or through taxation in which the burden on agriculture is greater than the services provided by government to agriculture. This was the situation in the pre-and-early independence eras of the marketing board systems.

Agriculture is further expected to generate sufficient export earnings – the much needed foreign exchange for financing imports and general economic development. This again was a role Nigerian agriculture played creditably during the pre-and-early independence years. The present mono-cultural economy in which crude oil dominates Nigerian exports has made the nation susceptible to the vagaries of price fluctuations in the world oil market, and underscores the need to resuscitate agricultural exports.

Finally, agriculture must provide remunerative employment to rural farm workers and the unemployed urban and rural migrants who cannot be meaningfully absorbed in the industrial and service sectors.

The extent to which the Nigerian agriculture has been able to perform the above functions and its capacity to perform them is a matter for debate. The problem however, is that the challenge to perform these functions becomes undaunting in the face of the rapidly expanding population and the apparently declining resources of Nigeria. The problem nevertheless, provides the rationale for this paper, which aims at x-raying Nigerian agriculture to identify the lingering problems and suggest the way forward into the 21st Century.

2.0 THE CHALLENGES OF TRANSFORMING NIGERIAN AGRICULTURE

In a broad sense, the greatest challenge faced by Nigerian agriculture as we enter the 21st Century is the transformation of agriculture into a modern, commercial oriented and remunerative sector. Transformation should be seen not only in size and mode of operation but more concretely in terms of the achievement of the following:

i A substantial and rapid increase in food production to ensure that the people are adequately fed and to reduce food imports to only what cannot be produced locally. There is serious doubt that the existing production systems can be relied upon to provide enough food at affordable price for our fast growing population;

ii A rapid expansion of agricultural raw materials used in local industries, not only to increase capacity utilization of the industries but again, to reduce our dependence on imports. A clear indication of the failure of Nigerian agriculture in this regard is manifested in the increasing agro-industrial capacity under-utilization and the consequent high cost of production. High production cost not only denies the local populace access to agro-industrial products but make Nigeria's agro-industrial products uncompetitive in the world export market. Furthermore, increased output and domestic processing of agricultural raw materials should enhance the maximization of growth in value-added

and the generation of employment in the industrial sector.

iii Increased output of traditional export crops (such as cocoa, palm produce, rubber, groundnuts and cotton) to diversify the export base and enhance foreign exchange earning capacity to reduce the overbearing dependence on oil exports and save the Nigerian economy from the vagaries of price instability in the world oil market. Given the slow pace of industrial growth, there is no doubt that the fastest means of increasing the share of non-mineral exports in the total value of exports is by expanding agricultural production.

iv. Increased rural employment and incomes deriving from a boom in agricultural production and rising agricultural prices. The advantages of this occurrence are threefold. The first is that rural welfare is improved. The second is that markets are guaranteed for locally produced non-farm industrial products and thirdly, enhanced rural incomes should provide the needed fiscal basis for generating higher revenue for local governments.

Perhaps the daunting challenge confronting agriculture is captured, although not explicitly stated, in an expression that concludes subsection (g) under 'Vision Statement and Elements' in the Main Report of the Vision 2010 Committee. Sub-section (g) is titled "Africa's Leading Economy" and the statement goes as follows:

'Nigeria is well endowed with natural and human resources. The enabling environment shall be improved to enhance the exploitation of these resources. Nigeria shall become Africa's leading economy. The envisioned Nigeria shall be an industrial nation'.

The indications are that the transformation of Nigeria into an industrial nation can hardly be realistically achieved in the short to medium term. A vast proportion of Nigerians shall still derive their livelihood from agriculture in the next two decades. Thus, if Nigeria is to become the "leading economy" of Africa it has to be so with a vast proportion of the people still engaged in agriculture. The implication is that the absorptive capacity of Nigerian agriculture must be increased to enable it employ larger numbers of farm workers and thereby put idle people to work and reduce the overall levels of unemployment within he Nigerian economy. This is a daunting challenge considering the current state of both the agricultural and industrial sectors.

The rest of the analysis in this section is presented under two headings as follows:

i. The challenge posed by government policies; and

ii The challenge of transforming sub-sectors of agriculture.

2.1 The Challenge Posed by Government Policies

Policy-making and implementation appear to have been a majorsource of problem to agricultural development in Nigeria. For the purposes of our analysis agricultural policies may be examined under six government regimes as follows:

i. The Pre-Independence Era.
ii. The First Republic (1960-1966).
iii. The First Military Regime (1966-1975).
iv. The Second Military Regime (1975-1979).
v. The Second Republic (1979-1983).
vi. The Third Military Regime (1984 - 1999).

(i) The Pre-Independence Era

The need to briefly examine the pre-independence era stems from the fact that some of the agricultural policies and programmes were legacies carried over from he colonial era. Government policies and programmes in the colonial era focused on agricultural commodities (especially export crops) which generated extractable surpluses in agriculture. Regional Governments created development corporations as the principal instruments for intervention in agriculture. In the East and West the corporations established plantations in oil palm, cocoa and rubber. The emphasis on plantation agriculture was perhaps engineered by the need to address the growing problems of unemployment among young school leavers and the political motive of

creating visible projects. Government also undertook direct production projects apparently in an effort to bring a new impetus of modernization in agriculture.

In the North, the approach adopted in the colonial era was to attempt to transform smallholder production activities by providing extension.

In terms of concrete investment however, the emphasis in the pre-independence era was on social overhead expenditures and improvement in the provision of government services. On the average, the allocation to agriculture in the 1951-59 period was only 7.5 percent, 8.3 percent and 13.6 percent of the total government expenditure in the West. East and North, respectively. The relatively low allocation to agriculture was paradoxical, in view of the fact that agriculture, during the period, was the 'goose that laid the golden eggs', providing the engine of growth for the rest of the economy. The marketing boards enabled the government to extract surpluses from agriculture for the development of the other sectors of the economy.

(ii) The First Republic (1960-1966)

This period was controlled by the first post-independence civilian government. It is important to note here that the development of agriculture was still a primary responsibility of the regions as clearly indicated by both the 1953 and 1963 constitutions. What was a federal responsibility was agricultural research which was located in the Federal Ministry of Economic Development. A Ministry of Natural Resources was created in 1964 and agriculture was not clearly mentioned as one of the responsibilities of the new Ministry.

It is also relevant to note that this was a period in which food production surpassed population growth and FAO projections indicated food surpluses in the 1970s. In the period 1960-1967, the output of export crops grew by 4-6 percent. The emphasis in the early independence period, therefore, was not on agriculture but on industrial development. The ideas of import substitution and the indigenisation of ownership of local industries were conceptualised during this period. The financial allocation to agriculture of all governments of the federation could not have been more than 7 percent of aggregate expenditure during the 1962-1968 period.

(iii) The First Military Regime (1966-1975)

Government policies and programmes were dictated by the civil war and the problems associated with it. By 1968, the financial resources of the Federal Government came under extraordinary pressure. Public debt servicing burden rose 57 percent above the 1965 level. The financial cost of resettling Nigerians fleeing from their places of displacement back to their regions of origin was staggering. The civil war that commenced in 1967 exerted even more pressure on government finances and the external reserves. One of the measures adopted to improve the financial situation was to hold down the rate of non-military expenditure.

With the end of the civil war in early 1970, government sought to accelerate economic growth by improving and expanding infrastructure.

Another landmark of the period was the emerging dominance of petroleum as a source of government revenue. Oil revenue which had started growing during the civil war expanded rapidly in the early 1970s (especially in 1973). Available data indicate that for the 1966 – 1975 period, agriculture received only 2.2 percent of total federal expenditure.

It should also be mentioned that the floodgate of imports opened during this period and was maintained until the early 1980s when depressed domestic prices accelerated the decline of local food production and contributed to the economic crisis that erupted in the early 1980s.

The neglect of agriculture not withstanding certain agricultural programmes initiated during this period deserve some mention. The National Accelerated Food Production Project (NAFPP) incepted in early 1973 in four States, was extended to all the States in 1977. The first set of the Agricultural Development Projects (ADPs) was established during the period in Funtua, Gusau and Gombe. The Chad Basin and the Sokoto- Rima Valley Authorities were also established during the period.

(iv) The Second Military Regime (1975-1979)

The first military regime (the Gowon Regime) was succeeded by another military regime (Murtala Mohammed/Obasanjo Regime), after what has been described as a 'palace *coup d'etat*'. During this period, the revenue accruing from petroleum continued to grow and the dependence of the economy on the oil sector deepened. Food imports were expanded even further. Agriculture appeared to decline while other sectors experienced considerable growth.

In 1978, oil prices fell drastically causing an equally drastic fall in government revenue. The fall in revenue continued into the 1980s and gave rise to a spate of policies which had varied effects on agriculture. Although government still placed a high premium on directproduction activities, some investments were made inthe development of extension services, distribution of improved inputs and the development of marketing facilities. A production incentive that gained prominence during the period was fertilizer subsidy. By 1976, the Federal government took over from the States, fertilizer procurement and distribution. Fertilizer subsidy was considered an avenue for channelling oil money into agriculture. Fertilizer subsidy, which was as high as 85 percent, became a major production incentive in the ADPs.

Since the regime's strategy for agricultural development emphasized direct government involvement in agricultural production, several parastatals were launched to undertake large-scale mechanized farming activities. Notable among the parastatals were the National Livestock Production Company, the National Grains Production Company and the National Root Crops Production Company. Government made substantial capital allocation to the companies without making any visible dent on the structure of agricultural production.

The River Basin Development Authority (RBDA) and the ADP systems also received a boost. The RBDAs created initially to provide irrigation water in the North grew from two in 1973 to thirteen in 1979, perhaps to satisfy the spirit of 'federal character'. The Federal Ministry of Agriculture was created in 1975 partly to administer the RBDAs. Suffice it to say that the huge investment in the RBDAs was not matched by increased yields or returns to farmers. Various analysts became critical of the projects. Poor performance necessitated the restructuring of the RBDA system a number of times and during the Structural Adjustment Programme (SAP) which started in 1986, the RBDAs were caught up in privatisation and commercialisation exercises.

The number of ADPs increased from three to seven between 1975 and 1979. It is estimated that a total of N2,342 million was sunk into the projects during the Third Development Plan period (1975-1979). There was rising pressure from the States to increase the scope of the ADPs not only in terms of the areas covered within the affected States but also in terms of the number of States included in the programme. Currently, State-wide ADPs have been established in all the States of the Federation, and the ADPs are the primary instruments for providing extension services to farmers nation-wide.

Another initiative of the third military regime was the Operation Feed the Nation (OFN) started in March 1976. The OFN was more of a campaign calling on all Nigerians to grow food on any available land even in the urban centres. Nigerians responded but the campaign was not sustained and the structure of farming was not affected in any visible manner. In 1977, the State marketing boards were replaced with National Commodity Boards.

It is noteworthy that the number of projects incepted, not withstanding the relative financial allocation to agriculture, reached its lowest level during this period. Agriculture received only one percent of total federal expenditure. The State governments did not do any better as they appeared to be more interested in funding roads, housing, stadia and other construction projects.

(v) The Second Republic (1979-1983)

Nigeria's imports of maize and rice increased from 9,000 metric tons and 2,000 metric tons in 1970 to 168,000 metric tons and 450,000 metric tons, respectively, in 1980. Wheat imports rose from 27,000 metric tons in 1970 to 1.5 million metric tons in 1982. By 1980, about 94 percent of Nigeria's foreign exchange earnings was

derived from oil exports. Consequently, when oil production dropped from 2.1 million barrels per day (b/d) in January 1981 to only 640,000 b/d in August, 1981, causing a drastic fall in revenue, significant shock waves reverberated through the heavily import dependent economy. Between 1980 and 1986, Nigeria's foreign exchange earnings dropped by about 74 percent while the debt burden increased by 124 percent. The acute shortage of foreign exchange quickly translated into the shortage of certain staples, and basic essential commodities and consequent rising food prices.

The first response of the Shagari regime was to enact the Economic Stabilization Act (ESA) of 1982. The measures included severe restrictions on the importation of food and other agricultural commodities and the prohibition of the exportation of food and other cash crops.

A major agricultural initiative of the regime was the Green Revolution Programme (GRP) which emphasized the expansion of the production of food grains through the provision of a generous supply of highly subsidized fertilizer and the development of irrigation facilities to provide water also at highly subsidized rates. The regime accordingly showed commitment to foster the development of the RBDA systems and not only to extend the ADP systems to every State, but to make them State-wide rather than enclave projects.

The achievements of the GRP did not match the fan fare with which the programme was launched. With increasing decline in government revenue and with the ministry-based extension system virtually dead in most States, the programme quickly fizzled out without permeating the grassroots.

It should nevertheless be emphasized that the Shagari regime raised the relative financial allocation to agriculture beyond the levels provided by the preceding regime. In 1981, the allocation to agriculture was about 13 percent of total government spending. However, actual disbursement of funds fell short of the allocation. Considerable proportion of actual spending went to the development of the water resources subsector where large capital projects abound and received preferential funding.

(vi) The Third Military Regime (1983 - 1999)

For the purposes of our analysis, the period from 1983 till 1999 is treated as a single regime even though there had been changes of the baton four times, from one military leader to another.

The tight monetary and fiscal policies of the ESA continued to prevail until mid 1986 when it became apparent that the existing policies had to be reinforced with more stringent measures.

The major objective of the fiscal policy under SAP was to achieve fiscal balance by reducing public expenditure and keeping budgetary deficits within 3 percent of GDP. However, some of the restrictive trade measures of the ESA were repealed or relaxed to liberalize trade. The number of commodities on the banned import list was reduced from 74 to 16. The agricultural commodities which remained banned were rice, corn, wheat, wheat products and vegetable oils. Prohibition of exports of some agricultural commodities (grains, tubers etc) imposed under the ESA was maintained.

Other macro-economic policies which had considerable effect on agriculture include the deregulation of interest rates and the foreign exchange policy which resulted in a massive devaluation of the naira. Agriculture had hitherto enjoyed concessionary interest rates for which the banks were said to be reluctant to lend to agriculture. The deregulation of interest rates was thus aimed at facilitating the flow of funds into the sector. Agricultural loans accordingly attracted higher interest rates. The indication however is that the expected increased inflow of funds into agriculture never materialised. The shortfalls in commercial banks lending to agriculture has widened and the trend in the annual loan disbursement to agriculture by the specialised institutions is discouraging (Abayomi, 1997).

The policy measures that were specifically directed at the agricultural sector were as follows:-

a. Abrogation of the commodity boards;
b. Closure or deprivation of public companies that engage in agricultural production;
c. Establishment of the Directorate of Food,

Roads and Rural Infrastructure (DFRRI), as a major instrument for fostering rural and agricultural development;

d. Increasing the budgetary allocation to the ADP systems as a major instrument for agricultural extension and development;

e. Completion of One Fertilizer Project and Savanna Sugar Project; and

f The proposal for a national programme to distribute producer inputs for the cultivation of corn and rice and to expand the output of palm produce to meet set targets.

In 1990, the National Agricultural Land Development Authority (NALDA) was established to make land available to people who would want to go into farming. NALDA received a take-off grant of N300 million and was given the mandate to acquire about 50,000 hectares of land in each State of the Federation to be prepared and made available to people for agricultural activities. For sometime, NALDA appeared to rule the waves.

Government has also experimented with other ways of financing agriculture and rural development. To promote exports of Nigeria's agricultural and manufactured products, the Nigerian Export Import Bank (NEXIM) was formally established in 1990 to provide pre-and post-shipment financing to indigenous exporters. The Federal Government has also enlisted the support of international financial institutions. Notable collaborative financial arrangements include Government/World Bank Second Livestock Development Project, Government/UNDP/FAO Livestock Grazing Reserve Development, Government/ADB/World Bank National Agricultural Research Project (NARP). Significant amounts of money have been spent under these and other projects.

To appreciate the challenge posed by government agricultural policies, it is important to take a more critical look at the structure of government investments in agriculture. Available studies (e.g. Nwosu, 1995) have clearly shown that government investment is an important determinant of agricultural output in Nigeria. In other words, the level of expenditure on agriculture and its sub-sectors is crucial for promoting agricultural development. The relative allocation of financial resources to the sectors of the economy by the various regimes are detailed in Table 1. The high points of relative allocations to agriculture occurred during the civilian regimes. The proportional allocation to the sector was highest (4 percent of total expenditure)during the first republic (1960-1965), followed by the allocation (2.8 percent of total) in the second republic (1980-1983). The relative allocation to the sector was lowest (about 1 percent of total) during the second military (Mohammed/Obasanjo) regime. The average allocation to agriculture was 3.6 percent of total allocation for the two civilian regimes and only 1.8 percent for the three military regimes. On the whole, agriculture received 2.2 percent of the federal expenditure during the period 1960-1990.

The changes in other expenditure items are noteworthy. The expenditure on debt servicing rose from 3.3 percent in 1960-1965 to 26 percent in 1984-1990. It was the single largest expenditure item in the 1984-1990 period. The expenditure on social and community services declined from 31 percent in 1960-1965 to about 8 percent in 1984-1990. During the 1984-1990 period, administration (embracing general administration, defence and security) accounted for 15 percent of total federal expenditure while agriculture and economic services accounted for only 7.9 percent. The indication is that the increasing talk about revitalizing agriculture and other economic sectors was not matched with due priority in terms of the allocation of funds (See Table 2).

The problem of under-funding in agriculture was worsened by the fact that actual disbursement of funds always fell short of budgeted expenditure. Data on actual expenditure are difficult to find but the data in Table 2 show general underspending for agriculture and 'other economic sector' and overspending for administration and financial obligations.

Resource allocation within agriculture appeared to be uneven among the sub-sectors-crops, livestock, forestry and fisheries. The data in Table 3 show that the crop sub-sector has been highly favoured by all the regimes. On the whole, the crop sub-sector received about 80 percent of the total allocation to agriculture, followed by livestock (5.4 percent), forestry (1.6 percent) and

Table 1: Federal Government Financial Allocation to Sectors of the Economy

Period	Total Expenditure	Allocation to Various Sectors: Agriculture		Other Economic Services		Social and Community Services		Defence		Other Administration		Foreign Debt Servicing Requirement		Other Transfers	
	Amount (=N='m)	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total	Amount (=N='m)	% of Total
1960-65 Total	2091	90	4.3	376	18.0	651	31.1	144	6.9	355	17.0	70	3.3	405	19.4
Average	348	15		63		109		24		59		12		68	
1966-75 Total	25599	563	2.2	2875	11.2	2129	8.3	4625	18.1	2475	9.7	848	3.3	12084	42.2
Average	2560	56		288		213		462		248		85		1208	
1976-79 Total	43290	449	1.0	12660	29.0	5598	12.8	5369	12.3	3639	8.3	1714	3.9	14161	32.5
Average	10898	112		3165		1399		1342		910		428		3540	
1980-83 Total	57942	1630	2.8	14636	25.3	7291	12.6	5461	9.4	10690	18.4	4359	7.5	13875	23.9
Average	14486	408		3659		1823		1365		2673		1090		3469	
1984-90 Total	257565	5961	2.3	14402	5.6	21390	8.3	11468	4.5	26167	10.5	66964	26.0	110213	42.8
Average	36795	852		2057		3056		1638		3881		9566		15745	
1960-90 Total	386787	8693	2.2	44019	11.4	37059	9.6	27067	7.0	44226	11.5	73955	19.1	1507738	39.0
Average	12477	280		1450		1195		873		1430		2386		4863	

Source: Expenditure Figures were from CBN Annual Report and Statement of Accounts (Several Years)

Table 2: Financial Disbursement Relative to Budgetary Allocation

Sector of the Economy	BUDGETARY ALLOCATIONS AND ACTUAL EXPENDITURE: FIRST NATIONAL DEV. PLAN (1970-74)			SECOND NATIONAL DEV. PLAN (1975-80)			THIRD NATIONAL DEV. PLAN (1962-68)		
	Budgetary Allocation (=N='m)	Actual Exp. (=N='m)	Over-/Under-Spending (%)	Budgetary Allocation (=N='m)	Actual Exp. (=N='m)	Over/Under Spending (%)	Budgetary Allocation (=N='m)	Actual Exp. (=N='m)	Over/Under Spending (%)
Agriculture	183.52	105.06	-42.8	165.33	239.44	-9.8	2201.18	2107.0	-4.3**
Other Economic	748.98	528.18	-29.5	896.22	859.54	-4.1	18272.9	15080.2	-17.5
Social Services	321.45	167.58	-27.6	431.22	436.50	+1.2	3786.8	4048.0	+6.9
Regional/Environment Dev.	83.49	39.26	-53.0	141.54	178.93	+26.4	4144.1	3114.4	-24.8
Administration	96.18	207.05	+115.3	297.46	476.40	+60.2	4449.6	5084.1	+14.3
Financial Obligations	7.80	25.77	+230.4	18.96	45.98	+142.5	n.a	n.a.	-
Total	1353.6	1073.00	-20.7	2050.74	2236.77	+9.1	32854.6	29433.8	-10.4

Source: Adapted from the Development Plan documents

n.a.: Not available

*: Actual Expenditure figures for the Fourth Nation Development Plan are not available

**: + Denotes Overspending; - Denotes Underspending

Table 3: Share of Each Sub-Sector of Agriculture in the Allocation to Agriculture

PERIOD	CROP		LIVESTOCK		FORESTRY		FISHERY		OTHER	
	Amount (=N=m)	%of Agric	Amount (=N=m)	%of Agric	Amount (=N=m)	%of Agric	Amount (=N=m)	%of Agric	Amount (=N=m)	%of Agric
1970-75 Total	308	86.6	29	8.2	5	1.4	0.6	0.2	13	3.7
Average	51	14.4	5	1.4	0.8	0.2	0.1	0.03	2	0.6
1976-76 Total	128	28.6	28	6.3	7	1.5	2	0.5	284	63.2
Average	32	7.2	7	1.6	2	0.4	0.5	0.1	71	15.8
1980-83 Total	781	47.9	163	10	43	2.6	32	1.9	611	37.5
Average	195	12.0	41	2.5	11	0.7	8	0.5	153	9.4
1984-90 Total	5459	91.6	233	3.9	76	1.3	55	0.9	138	2.3
Average	780	13.1	33	0.6	11	0.2	8	0.1	20	0.3
1970-90 Total	6676	79.5	453	5.4	131	1.6	90	1.0	1046	12.5
Average	318	3.8	22	0.3	6	0.08	4	0.05	50	0.6

Source: As in Table 1

Table 4: Simple Measure of Technical Efficiency of Food Crop Production

Crop	Potential Yield Per hectare of Best Variety* (kg)	Average Yield per hectare in Nigeria (1995 and 1996)	
		Weight (kg)	Percentage of Potential Yield of Best Variety
Maize	5380.02	1293.55	24.0c
Sorghum	2241.68	1146.1	51.1c
Yam	45192.20	10613.15	23.5c
Rice	3362.51	1753.15	52.1c
Bambara Nut	2196.26	10666.05	
Cassava	40170.84	949.45	26.6c
Groundnuts	2219.26		42.8c
Sweet Potatoes	1746.39		
Melon	560.42		
Millet	2062.34	1075.00	52.1c
Cocoyam	11723.97	7378.00	62.9b

*"a" (Over 90 percent); "b" (60 - 90 percent); "c" (20 - 59 percent); "d" (Below 20 percent).

Source: Potential yield of best varieties and the classification criteria are derived from Olayide *et al*, (1972): Qualitative Analysis of Food Requirements, Supplies and Demands in Nigeria 1968 - 1985. Average yield per hectare in Nigeria for 1995 and 1996 are derived for Nigeria: Agricultural Statistics, FMANR, Abuja, Second Edition, Nov., 1997.

fishery (1.1 percent),in that order.

It is also important to note the following:

i. Until in recent years, government has emphasized large, capital intensive projects in its strategy for effecting agricultural development even though the agricultural landscape is dominated by smallholder farmers; and

ii. Government programmes have tended to change as one regime succeeds another. Every regime has tended to introduce something new by discontinuing earlier programmes leading to discontinuities.

2.2 THE CHALLENGES OF TRANSFORMING SUB-SECTORS OF AGRICULTURE

The challenges of the 21st Century should also be seen in the context of eliminating the major constraints that have hindered the growth and development of specific sub-sectors and manifested in the poor performance of the sub-sectors. Following the usual classification, the sub-sectors are crops, livestock, fisheries, forestry and environment. The approach adopted here is to provide by sub-sector some indication of performance and highlight the major constraints.

2.2.1 Crop Sub-sector

Three indicators of performance are provided in the crop sub-sector namely, the yield per hectare, the growth rate of major staples and cash crops and the overall index of crop production.

Yield per hectare is used as a measure of technical efficiency of food crop production by comparing the yields per hectare achieved in Nigeria in 1995 and 1996 with the potential yield of the best varieties of the crops. As the data in Table 4 indicate, except for cocoyam, the production of the other food crops belong to the "C" group of classification. There is certainly ample room for improving crop yield in Nigeria.

As the data in Table 5 indicate, virtually all the crops experienced a decline in production in the period 1975-1979. This period coincided with the peak of the oil boom and the attendant neglect of agriculture. The highest growth rates for most crops were attained during the period 1985-1989 which spanned the structural adjustment period. Rice and wheat production achieved spectacular increases during the period. Thereafter most crops maintained moderate growth rates. The crop that, on the average achieved the highest growth rate between 1975 and 1995 is cassava followed by wheat and rice in that order.

The overall index of agricultural production presented in Table 6 shows that crop production increased on the average by 4.5 percent, followed by livestock (2.8 percent), forestry (1.5 percent) and fisheries (-2.9 percent). The growth rates would appear to be a reflection of the relative budgetary allocations by government.

The expectations are that the crop sub-sector should have performed much better in view of the fact that close to 80 percent of government allocation went to the sub-sector. The results would appear to indicate that there are lingering problems which government policy and budgetary allocations have failed to resolve.

The sub-sector is characterised by a predominance of smallholder, subsistence farmers and a negligible number of commercial farms. The number of the large-scale, capital intensive and import dependent farms has declined even more in the face of rising interest rates and exchange rates that came with the deregulation of the economy.

Smallholder, subsistence farms have the following characteristic features.

(i) Small and sometimes uneconomic land holdings. It is said that farms below 10 hectares account for over 95 percent of agricultural production. Land situation has been worsened especially in the East by excessive fragmentation arising from the application of customary inheritance laws. The land situation is worsened by an unclear lands acquisition policy which hinders long term investment in agricultural land.

(ii) Use of rudimentary tools and equipment and cultural practices. The same age-long hand-tools: hoes, cutlasses, pick-axes, shovels, etc – are still in common use. Relatively few small-holders use tractors only when the hire fee is heavily subsidized by government. So, there exists a situation where after several decades of its introduction, the farmers cannot afford to hire tractors at economic rates talk less of owning them.

Table 5: Average Annual Output and Growth Rate of Major Food and Cash crops

Indicator/Crop	Annual Output in (1,000) Tons						Percentage Annual Growth Rate				
Food Crop	1970-74	1975-79	1980-84	1985-89	1990-96	Average	1975-79	1980-84	1985-89	1990-96	Average
Maize	938	599	950	3483	6194	2433	-20.9	19.9	56.6	5.7	15.3
Millet	3536	2555	2767	4321	4465	3529	-1.4	7.5	8.2	3.3	4.4
Sorghum	3476	2250	3670	4672	4379	3689	-1.6	13.6	10.6	2.3	6.2
Rice	404	314	155	1334	3146	1071	-10.8	5.4	94.2	2.5	22.8
Wheat	18	20	26	301	458	165	5.3	4.2	129.0	11.1	31.9
Yam	8559	6518	4898	6715	18263	8991	-11.2	-1.7	19.8	16.6	5.9
Cassava	3761	1766	2724	14542	20784	8715	-10.8	422.7	8.2	10.9	107.8
Cash Crops:											
Cocoa	246	180	133	229	401	238	-8.0	0.3	13.0	4.2	2.4
Rubber	66	59	52	188	202	113	-4.0	3.2	-2.1	12.6	2.4
Palm Oil	473	547	546	673	664	581	2.2	-4.8	12.1	3.5	3.3
Palm kernels	387	387	300	679	1027	516	-1.3	4.5	34.3	11.0	12.1
Groundnut	1427	557	530	877	1287	936	7.6	6.7	12.4	10.6	9.3
Seed cotton	291	242	57	157	332	216	-19.3	-41.3	17.8	13.6	-7.3

Source: Derived from data in: Nigeria, Agricultural Statistics, Time Series Data, published by Agricultural Statistics and Information Management Systems, Federal Ministry of Agriculture and Natural Resources, Abuja

Table 6: Index of Agricultural Production (1984 = 100)

Period	Crop		Livestock		Fisheries		Forestry		Aggregate	
	Annual Average		Annual Average		Annual Average		Annual Average		Annual Average	
	Index	% Change	Index	% Change	Index	% Change	Index	% Change	Index	% Change
1976-80	94.6	-1.7	79.6	-0.34	142.6	3.3	102.0	1.9	94.7	-1.3
1981-85	96.7	2.5	96.1	6.9	115.7	-14.5	102.8	-0.6	98.4	2.6
1986-90	147.2	11.8	112.3	3.1	77.7	5.7	110.3	2.6	135.3	9.1
1991-96	228.9	5.3	124.9	1.5	66.5	-6.0	126.1	1.9	185.6	7.4
Average	141.9	4.5	103.2	2.8	100.6	-2.9	110.3	1.5	128.5	4.5

Source: As in Table 5

(iii) Use of unimproved planting materials and lack of use of fertilizers. Most farmers still use unimproved seeds and planting materials. Farmers are aware of the need to apply fertilizers to improve the soil but the commodity is hardly available at an affordable price. Thus, the use of the vital commodity remains low and the age-old fallow system remains the major approach adopted to allow the soil to recuperate. The pressing problem, in many parts, is that population pressure has caused a drastic reduction in the length of fallow. The fact is that government policy has failed to transfer appropriate and affordable technology to the crop sub-sector and productivity has remained low.

(iv) Rudimentary storage facilities and preservation practices. The storage facilities used by smallholders are mere contraptions and the loss in storage has continued to be high. Lack of proper preservation and storage technology has meant that farmers are forced to sell their product at harvest time when there is a glut in the market and prices are at ridiculously low levels.

(v) Related to the point raised in (iv) above is the fact that there are literally no linkages between the small farmer and the agricultural processing and product transformation industries. Highly perishable commodities like tomatoes, vegetable, citrus, etc are lost annually because industries that could transform them into less perishable forms are non-existent or are not accessible.

(vi) Also related to (iii) above is the problem posed by inadequate infrastructure including a network of feeder roads that would facilitate the evacuation of farm produce to major consumption centres in the cities. The situation is such that some agricultural communities are cut off from major urban centres during the rainy season.

(vii) The farmers have continued to depend on nature especially with respect to moisture. The lack of irrigation facilities which would enable farmers produce all the year round is a major constraint. Without irrigation facilities, farmers remain idle for a considerable period of the year. Besides, the instability in production caused by extreme variability in weather conditions has been the cause of poor planning and loss of incomes by farmers.

(viii) As already indicated the farmers have largely continued to depend on nature for soil improvement. Nature can hardly do a good job especially where the fallow period has become so short or where erosion (another act of nature) has taken sustained toll of the soil.

(ix) Finally, smallholder subsistence agriculture is characterised by what many have described as the "vicious cycle" of low productivity, low incomes and low capital investment. Lack of investible funds has sometimes been blamed for the inability of smallholders to adopt new technologies. There is a pressing need to break the vicious cycle by providing adequate funds and technological support to smallholders.

In summary, in spite of decades of development planning and budgetary allocations, the crop sub-sector has not shown marked improvement and therefore productivity, the key to growth and development, is still very low. There are problems which appear to have become endemic and have remained untouched by budgetary allocations and plan implementation. These constitute a challenge which must be surmounted if crop production must move forward.

2.2.2 Livestock Sub-Sector

Two livestock production systems are evident. There is the 'traditional' or 'range'

production system and there is the 'modern' intensive ('ranch' or 'feeding') system. A great proportion (over 95 percent) of the livestock produced in this country derive from the range production system.

Range Production System:

Several problems are associated with range livestock production. The first is inadequate supply of water and feed (or pasture) especially during the dry season.

Table 7: Average Performance Features of Indigenous Cattle Breeds in Nigeria

	Average Mature Live Weight (kg)		Average Height at Withers (cm)		Age at First Calving (Months)	Milk Production (kg)		Length of Lactation (Days)
Breed	0		0	+		Per Location	Per Day	
A. Bos Indicus								
1. Azoak/gudali	425	854	132	126	27 - 46	515	2.14	240
2. Sokoto	523	833	137	127	36	907	3.46	262
3. Adamawa	502	865	128	120	36 - 48	821	4.10	200
4. Shuwa	375	275	137	126	45	1,134	3.78	300
B. Fulani								
5. White (Bunaji)	300		142	137	26 - 48	930	3.38	275
6. Red (Rahaji)	425	375	145	135	-	480	2.46	195
C. Intermediates								
7. Ketetau	317		9	-	44	-	-	-
D. Dob Tauru								
8. Kuri	-	800	150	-	36 - 43	918	3.82	240
9. Mitiri	200	158	104	97	30 - 48	190	1.27	150
10. Ndama	320	280	110	101	27 - 72	297	1.32	225

Source: I. O. Ngere: "The Role of Indigenous Breeds in Milk Production" In proceedings, Developing A Nigerian Dairy Industry, Loku and David West (Editors) Federal Livestocks Department, Lagos, 1980

During the oil boom of the 1970s, governments and some private individuals and organisations embraced the intensive livestock management system in an effort to accelerate production. Their efforts were evidenced in the rash of large-scale ranches and ruminant and poultry operations and the so called "back-yard" poultry. The ranches and feeding operations performed poorly and their contributions to livestock production remained insignificant. Cattle ranches and feeding operations suffered from inadequate supply of forage and high energy feeds, uncertain outlet for fed cattle and inadequate marketing infrastructure. The large-scale and "backyard" poultry operations suffered largely from escalating feed costs that followed the ban imposed on the importation of maize. The problem of commercial livestock production was exacerbated by high interest rates that came with the deregulation of the economy during the period of the structural adjustment programme. The primary problems are highlighted below.

(i) Problem Associated with Traditional

In other words, scavenging cannot be relied upon to provide adequate nutrients for optimal production. The second problem is the problem posed by disease (such as *trypanosomiasis* for cattle). Scavenging predisposes animals to disease infection and spread as well as to predation. The third problem is that under the range production system, breeding is uncontrolled and the danger of in-breeding is much higher.

In Eastern Nigeria, where a modified range feeding system is practiced for small ruminants, the grazing time is usually limited; the animal is confined or tethered and fed cut fodder. The problem is that small ruminants are poorly housed and poorly managed.

(ii) The problem of Low Productivity and Poor performance of Indigenous Livestock Breeds:

Indigenous breeds of poultry, cattle (see

Table 7), sheep and goats are said to mature late, weigh relatively less at maturity and produce smaller quantities of meat and milk. The low performance of indigenous breeds highlights the need to upgrade them through cross-breeding. Government response was to establish Livestock Investigation and Breeding Centres (LIBCs). The LIBCs appear to be more into fattening than breeding as they do not seem to be equipped to execute any meaningful research and breeding programmes. The need to commission a nation-wide livestock selection and breeding programme seems a *sine qua non* to livestock improvement in Nigeria.

(iii) Problems Arising From Inadequate Veterinary Services and Infrastructure:

Veterinary clinics and vaccination units are few relative to the large number of animals and areas to be covered. The movement of large numbers of animals to vaccination units may not be feasible. Ideally therefore, the services should be provided where the animals are located. Lack of transportation to move veterinary health personnel has been blamed for failure to provide the services regularly to cattle rearers in their locations. In other words, since the clinics and vaccination units are not mobile, long distance usually puts the facilities beyond the reach of many livestock farmers. Motor vehicles are simply not available to enable health teams reach herdsmen and their flock on the vast range.

There is also the problem posed by the shortage of drugs and vaccines and vital equipment such as refrigerators for preserving vaccines and a dearth of qualified veterinary personnel. Thus, shortage of qualified personnel, the inadequacy of the number of clinics and vaccination units and the dearth of drugs and vaccines, means of transportation and other basic infrastructure have conspired to mar the effectiveness of the veterinary services delivery system in most States of the Federation.

(iv) Problems in Establishment of Grazing Reserves and Conflict between Pastoralists and Farmers:

The need to establish a well defined and adequately developed grazing reserves with properly marked-out stock routes has been recognised as essential to the settlement of transhuman pastoralists who hold over 85 percent of Nigerian's cattle population. As long as these reserves are not developed and the cattle farmers persuaded to use them, they will continue to walk their animals in search of water and pasture as well as incur the (sometimes fatal) wrath of crop farmers whose crops are destroyed by the animals.

(v) Problems Arising from Inadequate Marketing Infrastructure:

Long distance movement of animals on the hoof with the associated loses arising from shrinkage and death is commonly practiced. This practice should be discouraged, by making alternative modes of transportation cheap and reliable. Livestock movement by truck is reliable and fast but expensive. Increased use of the relatively cheaper railways should be encouraged by reducing the delay associated with shipment of livestock by rail. While shipment from North to South by truck would take about two days the same transaction would take seven to eight days by rail. The delay is due to congestion at the loading and off-loading points which are few in each State and the shortage of railway wagons resulting usually in a tussle for wagons among traders.

(vi) Livestock processing also poses a problem. There is usually not more than one or two abattoirs in each State, which more often than not, have facilities that do not function. Consequently large numbers of animals are slaughtered outside standard abattoirs.

Lack of modern processing facility has meant that useful by-products (e.g. blood meal) are not recovered. Yet the problem of scarcity of animal protein concentrates could be reduced through effective recovery and management of abattoir by-products. The general lack of cold storage facilities has also meant that animals are slaughtered on daily basis and that butchers are

forced to sell off their supplies each day. The issue of the poor sanitary state of the abattoirs is also of great health concern.

(vii) There is also the problem posed by the increasing competition between the leather industry and households in the use of hides and skins. Cow hide is processed into edible food in the South. The carcass of the goat is usually not flayed. The hair is simply burnt off. Given the low food value of hides and skins, their use as food items is wasteful relative to their use in the leather industry which should be discouraged.

To summarize the analysis of the livestock sub-sector, it should be emphasized that our animals are poorly bred, inadequately fed, poorly housed and predisposed to disease. There are also problems associated with marketing and the provision of veterinary services. Consequently, growth and development are delayed and performance is low. The system cannot be relied upon to provide adequate protein supply for the fast growing population as we enter the 21st century.

2.2.3 Fisheries Sub-Sector

Fish is indeed the most important source of protein in the South-eastern Zone. It is the most common and most affordable protein source. Nigeria is blessed with numerous water bodies and a long costline (about 853km).

In recent times however, fish production has been on the decline. Domestic production fell from 343,322 tonnes in 1991 to 180,495 tonnes in 1993 (Kwesmiju, 1996). Available data (see FMANR, 1997 p. 95) indicate that the index of fish production rose to about 135 in 1976, reached a peak of 153 in 1980, declined generally and reached a low of 64 in 1995. The data in Table 6 show that, on the average, fish production recorded a negative growth rate in the period 1976 - 1996. The performance of the fisheries sub-sector was the worst among the sub-sectors of agriculture during the period.

Fresh fish from local sources derive largely from deep sea fishing efforts of travelling companies and artisanal fishermen. The efforts have been hampered in recent years by the input price escalations that followed the deregulation of the foreign exchange rate. The prices of fishing inputs such as nets, ropes, anchors, hooks, outboard engines and boats have risen by as much as 200 percent. Available data (FMANR, 1997, p. 83) show that the number of trawlers and artisanal canoes (powered and non-powered) have been on the decline.

It should nevertheless be stressed that fishery resources are being depleted at an alarming rate owing to heavy water pollution, poor harvesting methods and over-fishing.

Another problem is that fish ponds are few as inland fish farming has really not caught on with the people. Moreover, poor management and the difficulty of procuring fish fingerlings have hindered the expansion of fish farming. Thus, the great potentials of fresh water fish production have remained largely unexploited.

There is an urgent need to revitalize domestic fish production so that it can play its major role in national development. For the avoidance of doubt, fish production will continue as a source of protein supply particularly, in the southern zones.

2.2.4 Forestry and Environment

Data on available forest land and the rate of deforestation appear scant. According to Mbakwe (1986), total forest land has been reduced from 36 million hectares in 1951 to about 15.20 million hectare in 1979.

Thus, within a period of 28 years forest land was reduced by about 58 percent, implying an average annual rate of deforestation of 2.1 percent. Most of the forest land according to the author was diverted to agricultural uses.

The rate of deforestation however, appears to have risen in recent years. According to Gana (1993), the current rate of forest exploitation and deforestation stands at about 3 - 5 percent or the equivalent of 250,000 - 350,000 hectares per annum. If the deforestation rates provided by Gana are taken together with the rate provided by Mbakwe, then Nigeria's forest land is being lost at an average rate of about 3.4 percent which translates to about 283,000 hectares per year.

The data in Table 8 indicates that a total of 136.2km (i.e. 13,620 hectares) of shelterbelt

Table 8: Targets and Achievements of Afforestation Project (AP) States Under Forestry II: 1987 – 1990

Target and Achievement	Seeding Production (No.)	Shelterbelt Establishment (km)	Contact Farmers (No.)
Bauchi			
Targets	828,000	95.0	2,100
Achievements	660,000	70.0	3,131
%	79.7	73.7	149.1
Borno			
Targets	2,570,000	175	9,000
Achievements	2,312,736	80	5,980
%	90.0	45.7	66.4
Kano			
Targets	4,526,000	265	16,800
Achievements	4,267,000	160	20,606
%	94.3	60.4	122.7
Katsina			
Targets	1,035,000	13.0	5,100
Achievements	1,260,000	14.0	5,050
%	121.7	107.7	99.0
Plateau			
Targets	2,500,000	N/A	16,000
Achievements	2,500,000	N/A	7,192
%	100	N/A	45.0
Sokoto			
Targets	2,200,000	250	10,500
Achievements	6,605,000	340	20,563
%	187.7	136.2	195.8

Source: Afforestation of Arid Zone of Nigeria Experiences and Lessons; Forestry Management, Evaluation and Co-ordination Unit Abuja by Papka 1994.

were established in various parts of Nigeria between 1987 and 1990 as part of the aforestation project (AP). A total of 13,620 hectares established in four years translates to an average of 3,405 hectares per annum. Thus, the recorded rate of aforestation is only 1.2 percent of the rate of deforestation.

The poor performance of the aforestation programme is not unconnected with the neglect of the forestry sub-sector in terms of budgetary allocation by government. As the data in Table 3 show the forestry sub-sector received only 1.6 percent of the total allocation to agriculture in the 1970 – 1990 period.

The problem of forestry nevertheless, goes beyond budgetary allocation. Nigerians have usually taken natural vegetation for granted, cutting, burning and clearing without much thought of the consequences or the need for regeneration. It is said that vegetation untouched by human hands probably no longer exists in Nigeria. Farming, logging, grazing, hunting, bush-burning, infrastructural development and the sheer pressure of human and animal population explosion have taken their toll on our natural vegetation and forest resources.

Generally, our people appear to be unaware of the fact that desertification, soil erosion, declining soil productivity, loss of farmland and flooding are some of the serious environmental problems resulting from loss of vegetation. They also appear to be unaware that loss of wildlife habitat and the diminished supply of "bushmeat" and extinction of plant and animal species are consequences of loss of vegetation. The responsibility, which every Nigerian must

accept, to check actions which decimate natural vegetation should become a matter for national public enlightenment campaign.

3.0 STRATEGIES FOR MEETING THE CHALLENGES OF AGRICULTURE IN THE 21ST CENTURY

The strategies for sustainable agricultural production must provide for the following

a. Ensure that smallholder farmers continue to raise crops/livestock/ fish in a more efficient and environmentally friendly manner;
b. Encourage the adoption of intensive livestock and fish production systems based largely on local input resources;
c. Enable farmers take advantage of biotechnology and other technologies of the time;
d. Increase the smallholder farmers' access to credit;
e. Proper administration of subsidies and other support activities
f. Provide necessary production and marketing infrastructures.

The emphasis on smallholder farmers is predicted on the conviction that such farmers will remain the mainstay of Nigerian agriculture in most of the 21st Century. Given the capital intensive and import dependent nature of large-scale agricultural production, the domestic prices of agricultural commodities would have to rise a lot higher to make large-scale production a viable and profitable venture especially, in the food crop sub-sector, without considerable subsidy from government. Yet, there is a limit to which food and farm produce prices can rise without generating violent reactions from the populace, especially the vociferous and politically powerful urban consumers. Thus, the recommendations focus on smallholders with the assumption that large-scale producers can easily adopt (or have already adopted) what is suggested or can easily take advantage of the favourable environment that is created.

It should nevertheless be emphasized that the one to two hectare farms cannot take the Nigerian economy far into the 21st century. The trend in the 21st century should be towards increasing both productivity per unit area and consolidation of farms.

Smallholder farmers should be mobilized and organized into farm associations and co-operatives for the purposes of pooling farmlands, input procurement, access to the use of machinery and marketing of farm produce.

It should be stressed that one of the banes of the smallholder production system in Nigeria is the scattered and unorganised nature of the farm population. Because they are scattered all over the country, it is difficult to reach them with extension services and costly to administer the delivery of inputs (financial and others) to them.

The situation brings to the forethe need to give a boost to the co-operative system in Nigeria. Farm co-operatives should be revitalized where they are dormant and extended to places where they are non-existent. A major advantage of co-operativisation with respect to crop farms is that the critical land preparation stage can be done in common on contiguous plots. Other advantages include large-scale acquisition of inputs, increased access of farmers to and reduced cost of delivery of inputs (extension services, credit, subsidies, etc) provided by government, group marketing of produce and enhanced interaction between farmers.

It should be emphasized that co-operativisation is also applicable to livestock and fish production. Smallholders of ruminant animals in some communities are known to have pooled their animals under a few herdsmen with good results. Dairyproduction is also enhanced if a co-operative system of milk collection and marketing is adopted. Co-operativisation will enable communities to establish fairly large fish farm (aquaculture) which single individuals may not have the resourcesto finance and maintain.

3.1 Strategies For Sust ainable Crop Produ ction

Any strategy for achieving sustainable crop production by small holder

farmers in the 21st Century must in the minimum tackle the problems posed by the following:

(i) Increased access to land
(ii) Input supply;
(iii) Production and marketing infrastructure; and
(iv) Access to credit

Increased Access to Land

In the early 1970s, a few large-scale landholders emerged, some with holdings over 100 hectares. They obtained the land either through direct purchase of land from smallholders or through government grants of title to lands. Most of the so called large-scale farms never operated for more than a few years. It appears that agriculture was simply used by a few powerful and influential persons to acquire and register large tracts of land in their private names or those of their corporations.

The access to productive land of individuals who want to crop larger and economically viable units can be enhanced by government by acquiring and redistributing unused lands from large-land owners who have failed to use the lands effectively. In this connection, it is important to revisit the large tracts of land ceded to influential persons under the Land Use Act. Those lands that are not effectively used for agricultural production (as they were intended) should be re-acquired and redistributed to people who want to farm large holdings.

The concentration of large tracts of agricultural land in a few hands should be stopped and measures should be enacted to control land transactions and land speculation. The practice which is gaining ground especially in the East, whereby people simply buy up and keep unused, large areas of agricultural land from small farmers in peri-urban areas, in anticipation of urban growth and land price appreciation, should be halted. The smallholders whose lands have been acquired often do not make meaningful investment with the money received and in a short while have neither the money nor the land.

Input Supply Problems

The inputs that have proved critical to crop production are labour, planting materials, fertilizers and herbicides/pesticides.

(i) Labour Supply

Smallholder farmers depend largely on family labour, hiring labour to augument family labour during the peak of farming periods. In recent times, the availability of family labour has continued to diminish as family members migrate to urban centres. Consequent upon this, the cost of hired labour has risen. Availability of labour in agriculture that depends on hand tools is now seen as a major constraint to the expansion of farm size.

To overcome the problem posed by the scarcity of labour, it has been suggested that small farmers be mobilized and organised into groups. Such groupings would enable them pool their labour resources and hire the services of machinery which individuals cannot afford. These farm groups do exist especially in the North and parts of the West and appear to have been successful in solving the labour supply problems of their members.

By and large, the labour supply problem can only be solved by taking recourse to improved technology (mechanical and chemical). Mechanization of tedious aspects of farm operations such as land clearing and preparation, would provide a path to long-term solution. In this connection, it has to be emphasized that mechanization that is predicated on tractorization has not proved very useful to small farmers in our circumstance, especially in the East. There is the need for investment in the development and propagation of suitable and affordable intermediate technology, such as motorized hand equipment (e.g. land tiller) in the South and ox-drawn ploughs in the North. Timely accomplishment of the labour-intensive farm operation of weeding will call for increased use of herbicides, a culture which has not caught on in Southern Nigeria, perhaps, because of high price and unavailability.

(ii) Quality and Supply of Planting Materials

The generality of farmers are receptive to the

use of improved seeds and seedlings. However, the seed stock produced by our research institutes has not met the standards required to sustain the level of agricultural production envisaged for the 21st century. If the direction is to increase productivity on a unit area of land, rather than the uncontrollable clearing of more land, then the potential production of our seeds and seedlings must substantially increase. Reasonable targets will be to develop maize grain seeds with potential yields of 4 tons per hectare, cowpea - 2 tons/ha, soyabean - 2 tons/ha.Cassava - 30 ton/ha etc

Moreso, these seeds must be available at the right time. To achieve these goals, the Research Institutes and Universities must use modern tools for seed development while the private sector must be available to ensure large-scale production of top quality seeds and seedlings and ensure their availability to farmers, farmer groups, etc at the appropriate locations and time.

(iii) Supply of Fertilizers, and Agro-chemicals

It can be stated without fear of contradiction that Nigerian farmers have overwhelmingly adopted the use of fertilizers. The adoption rate for other agro-chemicals such as pesticides, fungicides and herbicides cannot be said to be widespread. The major problem faced by farmers with respect to the supply of fertilizer is that it is not available when required and that the price is not affordable. Also a single formulation of fertilizer is used in the whole country despite the different soil types. As has been said in many fora the adverse fertilizer supply situation is due to government monopoly of the procurement and distribution of fertilizers. Farmers should be able to go to local markets or neareby shops and pick up fertilizers in the required quantity and quality. The removal of subsidy on fertilizer and the commercialisation of the existing plants should remove the abuses on fertilizer distribution and ensure availability.

I wish to note that several State Governments are currently establishing fertilizer blending plants. I do not see these plants as helping the availability problem as long as they are run as public companies. The more exciting option is the development of organic fertilizer plants which have major advantages in enhancing agriculture and sanitation as well as in protecting our environment.

Of importance too is the fact that the quality of fertilizers must match the soil types of Nigeria. Consequently, fertilizer plants must provide appropriate formulations to meet the needs of specific soils. In the 21st century therefore, the farmers shall demand more specific rather than a general response to the problem of soil malnutrition.

On agro-chemicals, there are the problems of standards and quality control; problems of availability and of prices. Most agro-chemicals are imported and with the devaluation of the naira that followed the deregulation of the exchange rate, the prices have escalated. Agro-chemicals are critical to agricultural production and will even be more so with the more intensive production systems envisaged for the 21st Century. Agro-chemicals reduce insect and pest infestations and consequently increase yields and storage quality.

To ensure good quality agro-chemicals therefore, proper standards must be established and enforced. On a medium-to long-term basis, the Nigeria private sector must develop local industries to produce the required agro-chemicals. The Universities and Research Institutes must therefore accept the challenge to develop the standards and professional associations must lobby Government to enact these standards. To ensure sustained and proper use of agro-chemicals, Government must consider substantial subsidy to encourage farmers to use the chemicals.

It should be emphasized that the problems posed by the inadequacy of input supply contribute significantly to the problems of low crop productivity highlighted earlier. Another issue of critical importance is the soil factor. Most tropical soils are of fragile nature and break down after a few years of continuous cultivation even when the best of inputs and modern cultural practices are adopted. The thinking here is that the problem posed by the soil factor can be ameliorated and productivity raised considerably with the combination of increased use of modern inputs and the fallow system and/or appropriate crop rotation systems.

Development of Crop Production and Marketing Infrastructure

(i) Irrigation

A production facility that is critical to making crop agriculture remunerative is irrigation infrastructure. There is a pressing need to provide and use cost-effective irrigation schemes that would sustain year-round cropping. The successes achieved with the River Basin irrigation projects and fadama projects especially with the production of tomatoes, onions and other vegetables attest to the great benefits which could be derived if cost-effective irrigation facilities are developed and promoted for common use.

In this connection, irrigation facilities have been targeted almost exclusively in the North. The assumption appears to be that the rains are adequate for production in the South. Yet, farmers in most of the South produce only on crop each year and are forced into idleness for several months in the dry season. The erratic nature of rainfall in both distribution and quantity, which is bound to worsen with the much talked about global warming, has sometimes made nonsense of the best plans of farmers in the South. Rainfed agriculture alone cannot be depended on in any part of Nigeria if the objective of the increased crop production in the 21st century is to be realised.

To ensure widespread use of irrigation all over the country, emphasis should be placed on small-scale and medium-scale irrigation facilities which smallholders can operate and maintain, rather than large-scale engineering schemes. The area coverable by such large-scale projects is usually limited.

To complement efforts to achieve widespread adoption of irrigation, more funds should be allocated to research in irrigation agronomy, hydrology, irrigation engineering and irrigation seed technology. Also the concomitant down-stream effect of such projects must be monitored and addressed.

(ii) Crop Marketing Infrastructure

To facilitate the marketing of agricultural produce, emphasis should be placed on the following:

- The development of networks of all-season rural feeder roads to facilitate the evacuation of farm output and the delivery of farm inputs.

- The development and popularisation of efficient, on-farm storage facilities that would enable farmers hold their produce, to take advantage of inter temporal changes in price. In this connection, the development of the strategic grains reserve and buffer stock schemes linked to a private sector led agricultural commodity exchange market should be given greater attention. The scheme would relieve the pressure on farmers to sell at periods of glut as well as ensure decent prices for commodities.

- Related to the need to provide storage facilities is the equally pressing need to develop and popularize small-scale processing facilities for different crops. Such facilities would enable farmers transform primary products into other forms that have longer shelf-life or that would attract higher prices, thereby raising rural value-added to products. In this connection, efforts should also be directed at strengthening the linkage between the farm sector and the agro processing industries. This can be done by encouraging agro-processors to locate processing plants in the rural areas that are sources of their raw materials. Additionally, an effective rural market information dissemination system should be established to facilitate temporal and spatial arbitrage.

3.2 Strategies for Sustainable Livestock Production

Efforts should be directed at enhancing:
(a) Strategies for making the small-holder more efficient; and
(b) Adoption of intensive production systems.

In discussing the above strategies, it is important to note that the traditional livestock prevalent in Nigeria have low genetic potentials; more so the local environment adversely affects their productivity. Consequently, there is the need to improve the genetic potentials of Nigerian livestock as well as improve on the management

and specific and general environments of the animals. There is a strong need therefore for local stock to be up-graded to increase the animal unit. This can be achieved through artificial insemination and cross breeding. In this regard, Government should provide top quality semen for free insemination to Nigerian ruminant animals. In southern Nigeria, a recommended first effort is to crossbreed the local small ruminant with larger small ruminant stock from Northern Nigeria. Results at the Federal University of Agriculture, Umudike show that this is possible and sustainable. In the areas of poultry production, there is need for the Universities and Research Institutes to develop highly productive and disease-resistant strains of poultry well adapted to the local environment and local feed stuff. Subsequently, the private sector must establish well-equipped hatcheries supported by grand parent and parent stock facilities designed and managed to provide good quality day-old chicks to prospective poultry farmers.

3.2.1. Strategies for Making the Small-holder More Efficient

(i) Providing Adequate Feed Supply

To address the problem posed by the inadequacy of feed supply, livestock farmers must be educated to take advantage of locally available feedstuff. The abundant crop residues, agro-industrial by-products and animal wastes if harnessed and properly processed would substantially meet the nutritional needs of animals. For example, chicken offal meal and blood meal have been used as protein sources in livestock feed (Ndifon, 1988; Njoku, 1985).

Also several browse plants such as *Leucaena* and *Gliricidia* have the potential to increase feed supply and quality if maintained as feed gardens (LCA, 1988; Teniola, 1990). In this connection, animal nutritionists are agreed that the adoption of intensive feed gardening and alley farming by smallholders would invariably improve feed supply (Gefu *et al*, 1994). In alley farming, the foliage of rapidly growing leguminous trees such as *Leucaena leucocephala* and *Gliricidia epium*, provides good quality forage for livestock as well as mineral-rich mulch for crop production.

Important agro-industrial by-products available in the Eastern agroecological zone of the country include: Palm Kernel Cake (PKC), fish offals, bone meal, cassava peel, rice mill offal, etc. If properly processed, agro by-products become feed sources especially for ruminant animals, pigs and poultry.

(ii) Provision of Better Vertinary Ser vices

The effectiveness of the delivery of veterinary services would be enhanced by:
(a) Increasing the number of clinics and vaccination teams;
(b) Increasing the number of veterinary personnel and improving the competence of available personnel;
(c) Ensuring that the relevant drugs, tools and equipment are available for work.

Livestock farmers have become aware of the benefits of veterinary services and desire them. Consequently, government could adopt a policy of cost recovery as a means of sustaining the services.

(iii) Increasing Access to Credit for Live stock Production

Increasing the farmers' access to credit should be part ofany strategy to sustain t h e production of smallholders. For livestock feed and drugs; production, processing and marketing equipment, etc.

(iv) Improving Livestock and Meat Marketing Infrastr ucture

Livestock marketing infrastructure appears to be rudimentary and largely inadequate.

i. Given the pervasiveness of the range production system, there is need to establish cattle stock routes which have adequate provisions for water, pasture and veterinary services and which would steer animals away from farmer's crops.

More efficient transportation systems should be adopted. Delays by rail transport could

be eliminated by increasing the loading and off-loading points on the rail and increasing the number of wagons provided for livestock movement.

The number of modern abattoirs in the urban centres should be increased. The facilities should be made functional to facilitate the recovery of available by-products (e.g. blood meal). The ideal situation would be to process livestock where they are produced and move the meat to consumption centres. This arrangement would require refrigeration facilities for rail and road transportation and cold storage facilities at the terminal markets. This idea could be regarded as the real livestock marketing challenge for the 21st century.

Establishment of livestock markets with adequate information systems is also a challenge which farmers in the 21st century must address.

3.2.2. Adoption of the Intensive Production System

Intensive production systems must be the strategy for commercial livestock production in the 21st Century. Intensive production has been commonly adopted for both poultry and pig production. Efforts should now be intensified to make farmers embrace the approach for ruminant production. As already indicated, intensive production systems require conducive housing, good feeding, provision of well programmed health care and efficient management systems.

For pig production, what should be emphasized are the following:
(i) Increased reliance on industrial by-products such as brewer's grain and spent yeast;
(ii) Efficient breeding practices aimed at eliminating inbreeding and enhancing heterosis;
(iii) Infusion of iron supplements to baby piglets.

For small ruminants the adoption of an intensive production system would require:
(i) Provision of cheap but strong housing;
(ii) Adequate feeding with available farm by-products, silage and hay with mineral supplements;
(iii) Maintenance of rigid prophylactic health care schedules.

In the 21st century, the special tastes of the Nigerian for *micro-livestock* will engender more intensive production of rabbits, Japanese quails, ducks, grass-cutters, snails etc. Universities and Research Institutes must therefore define cheap production protocols for these for the adoption of farmers.

3.3. Strategies For Sustainable Fish Production

The recommendations here are aimed at:
(i) Increasing the efficiency of artisanal fishing;
(ii) Promoting the development of aquaculture; and
(iii) Homestead fish production.

3.3.1 Artisanal Fishing

The problem of artisanal fishermen have already been identified as the escalating cost of inputs and problems of water pollution caused primarily by oil spillage. To reduce the burden of costs on the small producer, subsidy should be applied on selected inputs such as outboard engines, canoes and nets which constitute the major cost items for artisanal fishermen.

The issue of credit is also important for smallholder fish farmers. Financial institutions, government agencies, and Non-Governmental organisation (NGOs) like IFAD, which provide loans and facilities to artisanal fishermen should extend their services to all States in Southern Nigeria and other areas where artisanal fishing activities occur so that a majority of fishermen can benefit to enhance fish production.

3.3.2 Promoting Aquaculture

Development of inland fishery facilities should be encouraged and substantial subsidies granted for the development of ponds. Furthermore, the private sector must recognise the critical shortfall in fish fingerling supply and move in to meet the needs. To ensure sustained availability of fish fingerlings, fish feed production as well as fish gears and nets production should also be supported to ensure availability. The training of fish farmers in

disease control and treatment will also enhance productivity.

3.3.3 Homestead Fish Production

This is rearing of fish in small earthen ponds, concrete tanks andcages in homesteads. The development of homestead fish production should be aggressively promoted. The integration of fish production with animals (pig and poultry) or plants (rice, corn)has been found to enhance fish performance (Edwards, 1985). In this connection, fish farmers should be educated on the use of available agro-industrial by-products and animal wastes to meet the nutritional needs of fish. It is on record for instance, that maggots harvested from housefly-infested poultry waste have proved good feed for fish (J. O. Atteh, personal communication).

3.4 Strategies for Sust aining the Forest and Averting Env ironment al Degra dation

For the avoidance of doubt, the conservation of natural vegetation and the environment is a responsibility of both the government and the people. Deforestation should be seen as a serious ecological problem that should be monitored and redressed. Consequently, government should provide adequate funds for reforestation programmes. The paltry allocation of about 1 percent of the total allocation to agriculture devoted to forestry is a reflection of the lack of seriousness with which government has treated reforestation programmes and forestry development in the past. The need to increase significantly the allocation to forestry cannot be over-emphasized in view of the enormous erosion and desertification problems facing this country.

Government should also put in place policies which will minimize peoples' need to deplete natural vegetation. In this connection, the increasing dependence of households on fuel wood resulting from the scarcity of kerosene and cooking gas is a source of concern. The need to guarantee a liberal and regular supply of kerosene, cooking gas and coal for fuel seems essential to ensure the sustenance of the environment.

The campaign to increase the peoples' awareness of the need to conserve natural vegetation should be intensified. Tree planting by all and sundry should be encouraged through a liberal and heavily subsidized supply of seedlings of economic trees and soil regenerating plants.

In furthering attempts to protect the environment, conscious efforts must be made to sustain bio-diversity, promote the restoration of endangered crop species, protect the soil from erosion by use of natural resources (such as vetiver) as well as enhance the production of forest food resources (including snail, honey and mushroom production). In fact it is envisaged that snails, honey and mushrooms will be produced in intensive systems to meet yawning demands.

3.5 Issues Common to all Sub-sectors

Issues common to all the sub-sectors which deserve special mention here are farm mechanization, farm credit and agricultural extension.

3.5.1 Farm Mechanisation

It is considered important to highlight the need to develop an appropriate action plan for mechanization at the different levels of farm operation. The goals of agricultural mechanization in Nigeria are not clearly defined. Consequently, mechanization is conceptualised only in terms of tractorization. Mechanization of other farm operations such as harvesting, processing and storage are not given due emphasis. There is a pressing need to evolve a proper national agricultural mechanization policy that covers various aspect of farm operations in the production, processing and marketing of crops, livestock, fishand forestry resources.

3.5.2 Agricultural Credit

. Agriculture suffers considerable disadvantage in the competition for investible funds. The returns are low and slow. The risks of failure are high. Ordinarily, commercial financial institutions would not lend to agriculture. Yet,

as mentioned earlier, the vicious cycle of low productivity, low incomes and low investments has to be broken for Nigerian agriculture to perform effectively the roles ascribed to it.

In more recent time, the deregulation of interest rates and the rapid rise in interest charged on borrowed funds have drastically reduced, farmers' access to investible funds and hence the adoption of improved technologies.

To increase the dependability of the source of agricultural finance, the Federal Government created the Nigeria Agricultural Credit Guarantee Scheme which was designed to encourage commercial banks to lend to agriculture, by providing some guarantee against the risks inherent in agriculture. The scheme does not appear to have been successful, as commercial banks would rather pay fines for not meeting the guidelines on minimum credit to agriculture, than lend to agriculture.

The Nigerian Agricultural and Co-operative Bank (NACB) which is the apex agricultural finance institution does not appear to have done too well either. Suggested major sources of problem are lack of collateral by farmers and the discouragingly high rate of default on repayment. The thinking is that farmers across the country are not generally aware of the role of NACB as a source of agricultural credit. NACB has branch offices at State headquarters and as such is not accessible to farmers in the rural areas. There is a pressing need for the NACB to open up branches at the local government headquarters if it must reach the farmers. To reduce the problem of high rate of default, NACB should also undertake the function of savings' mobilization such that farmers who receive credit can also save with the bank. Linking credit delivery to savings' mobilization may become a key factor to success.

Funds made available to agriculture through government policy are crucial to agricultural growth and development. In this connection it is necessary to stop the lip services paid to agriculture. If agriculture is truly the mainstay of the Nigerian economy, then budgetary allocation to agriculture in absolute and relative terms should reflect that.

It should be emphasized that given the slow and low rate of returns in agricultural production, the sector needs some form of subsidy to survive. Even in the most advanced countries, agriculture has always been sustained through a system of subsidies. In Nigeria, subsidy was only applied to fertilizer supply. The problem was that subsidy tended to accrue to middlemen rather than genuine farmers. There is now a pressing need to re-examine the issue to determine the many other areas where subsidy is required, the levels of subsidy and the mode of administration of the subsidies to ensure that they reach the farmers and not unintended beneficiaries.

3.5.3 Agricultural Extension System

The current agricultural extension system completely sidetracks local government authorities who statutorily have responsibility for it. Also, the current system has very few extension agents (EAs) each with a responsibility for a very large number of farmers. This, therefore makes the EAs ineffective and unavailable to farmers when required. The system is furthermore constrained in support facilities available to the EAs.

Cognizant of the anticipated level and intensity of agricultural production in the 21st century, it is important to have an extension system capable of effectively and efficiently delivering research findings to farmers while adequately responding to the needs of farmers. To achieve this, the current extension system must be reorgainsed to ensure that responsibility for actual extension work devolves to the local government authorities (LGAs) and funding for extension should also be provided at that level. The new system must be sensitive to the changes in the farm structure with more Co-operative Farms and Farmers' Associations having specialised needs. Consequently, the current unified extension system may give way to subject-matter specialists who will more effectively respond to the specialised needs of the farmers. It is expected also that the ADP system at the State level will concentrate efforts in ensuring appropriate University/Research Institute linkages and procurement of new and tested technologies from them as well as in ensuring that the extension agents are adequately

provided for in terms of support facilities and mobilization. The system also recognizes that the Federal Agricultural Co-ordinating Unit (FACU), working with the Federal Department of Agriculture will continue to liaise with bilateral and multi-lateral agencies and co-ordinating the workings of the ADPs and the entire extension system.

The current extension agents are often School Certificate and National Diploma graduates. There is an urgent need for the training and re-training of these agents as well as the infusion of graduates into the extension staff corp. All added, the extension agent is the link between the source of new technologies and the farmer. Consequently, his role is critical in the agricultural production scheme. Such an agent must therefore be adequately motivated to ensure the highest level of performance.

4.0 RESEARCH AGENDA

The transformation of Nigerian agriculture calls for research in various aspects of agriculture. Besides solving current problems, research should provide the basis for the important shifts that must be made. This section, therefore highlights what are considered important issues for research to enable Nigerian agriculture cope with the challenges of the 21st Century.

The overall objectives of agricultural research are to ensure improvement in and sustainability of agricultural production. Accordingly, agricultural research must be relevant to the needs of the farmers in the agro-ecological zones. It must also be environmentally friendly in concept and execution. Given these broad objectives agricultural research must have specific features.

4.1 Crop Research

Crop research should give proper recognition and focus to *the strategic cash crops* in the zone and ensure sustainability of production by providing good and improved seeds and seedlings (e.g. oil palm/cashew/cocoa/citrus/ soybeans). In this connection, the decline of the relative importance of Nigeria as a producer and exporter of palm oil and the need to revive the oil palm economy of the Eastern Zone calls for special consideration in the South-Eastern zone.

It is important to state that oil palm is the most productive oil producing plant in the world, producing more oil per unit area than any other plant. Palm oil is also the second most important source of vegetable oil in the world, next only to soybean.

Seed propagation has traditionally been the primary methods of raising oil palms, but the high variability of yield among seed-derived palms (ranging from 20 to 80kg/tree/year) lead to considerable unpredictability in yield and growth. Today, most major oil palm producing countries concentrate on clonal mass propagation through the new techniques of plant tissue culture to produce superior (elite) genotypes. Other crops of importance include:

i. The staples (such as cassava, cowpeas, rice, yams) vegetables (tomatoes, onions, etc.).
ii. Forest Food crops such as *avingea*, *ugba*, *ukwa*, and mushrooms and honey production.

Other areas of importance in crop research include agro-meteorology and soils.

Researching in agro-meteorology must emphasise developing the competence to monitor weather changes and particularly the effect of "global warning", ensuring effective use of rains and efficient application and expansion of irrigation facilities to complement the prevalent rain-fed agricultural system. Global warming, climatic change and environmental degradation present an unprecedented challenge to policy makers and researchers in Africa. Concerted efforts must be made to develop research capabilities in national institutions and in collaboration with regional and international organisations.

Research in soils must recognise the differences in the main agro-ecological zones. Research must recognise the problem of acid soils and fashion cheap means of resolving the problem. Furthermore, soil management research must recognise the fragility of local soils and the intensity of cropping and identify the most cost-effective crops for each zone. Also there is a need to design specific fertilizer formulations for the different soil types.

4.2 Livestock Research

This should give recognition and emphasis to the needs of strategic animals. Some of the pressing research areas for the different livestock types may be summarized follows (Njoku, 1998).

(a) • Cattle:
- Upgrading of local breeds;
- increases in efficiency and reproductive capacity;
- development of appropriate pastures;
- feedlots and fattening programmes;
- disease control.

(b) • Sheep and Goats:
- upgrading local breeds;
- achieving increase in twinning/ multiple birth and reducing lamb/ kid mortality;
- Developing cheap housing systems.

(c) • Pigs:
- popularisation of known productive breeds and strains;
- feed availability and quality enhancement;
- reduction of piglet mortality.

(d) • Poultry:
- more efficient management of local strains;
- supply of good and well adapted strains for higher meat and egg production;
- diversification into turkey, ducks and quails;
- feed availability and quality enhancement;
- reduction of mortality.

(e) • Forest Animals:
- Domestication and multiplication of popular forest animals e.g. grass cutters;
- better understanding of production requirements
- development of efficient delivery systems.

(f) • Animal Products:
- modes of handling of meat and other animal products;
- development and maintenance of quality and standards.

(g) • Biotechnology:

Scientists, with apt understanding of gene action, have developed biological systems that are more feed efficient, less disease prone and have excellent conformations. Ethical questions not withstanding, biotechnology offers the opportunity for developing higher and more nutritious feed/grazing materials as well as more efficient production of vaccines for increased disease resistance.

4.3 Natural Resources

4.3.1 Forest Resources

In forest resources management, areas of research emphasis should include:-
- Bio-diversity;
- Conservation;
- Forest food resources (vegetables, e.g. *okazi*, *otaziri* etc; crops/fruits; livestock (e.g. grass cutters);
- Studies in snails behaviour, nutrition, disease and management.

4.3.2 Fisheries

Important areas of fish research include:
- provision of adequate numbers of fish fingerlings;
- fish nutrition, physiology and disease control;
- studies in shell fish culture particularly of fresh water prawns;
- research in fish/crop and fish/ livestock combinations to achieve cost-effective systems;
- Biotechnology – the practices of sex inversion seed production as well as ginogenesis are recent technologies which enhance the quality of fish size and weight. These are some areas of

biotechnology research in which Nigerian scientist should take greater interest.

4.4. Environment al Management

Research emphasis should be in:

a. Erosion and desertification control measures; Sheet and gully erosion have become major scourges in the eastern part of Nigeria. Multidisciplinary research to develop appropriate erosion hindering practices should be encouraged.
b. Maintenance and management of sustainable environment through the development soil stabilising crops
c. Ensuring availability of environmentally friendly crops, shrubsand trees.

5.0 OTHER AREAS OF RESEARCH

5.1 Agricultural Equipment and Technology Development

Development of agricultural equipment and technology targeted at reducing drudgery, that must be cost-effective, affordable, available and culturally acceptable.

5.2 Marketing

Research in marketing should be based on the understanding that a correct marketing strategy is a major facilitator to production. Such studies must provide support in the sensitisation and training of Nigerians to adopt marketing practices as well as provide information on other systems. For instance, researches must study the strength and weaknesses of the proposed Agricultural Commodity Exchange and Futures Market, price support systems, prices of last resort, etc. Briefly, research in agricultural marketing must be dynamic.

5.3 Extension, Socio- economic and Policy Research

Extension research should examine the ways and means of providing technical support to farmers on their farming activities to increase production efficiency and output. More specifically, extension research should devise more efficient means of providing new tested and culturally acceptable protocols, inputs and advice (including advice on marketing outlets) to farmers.

Research on socio-economic issues that affect agriculture is important. One area, which has gained increasing prominence in recent years is the role of women in agriculture. Research studies in this area must be directed at understanding how to empower women to make their contributions more efficient and with less drudgery through increased access to appropriate technologies, funds and land.

Research on how policies impact on agriculture is also important. One pressing area for research is the issue of subsidies. There is thus, a pressing need to determine the stage, level and modality for subsidizing Nigerian agriculture to ensure that farmers and people actively engage in production arethe major beneficiaries.

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