RECONCILING PROPOSED PUBLIC INVESTMENTS IN AGRICULTURAL EDUCATION, INFRASTRUCTURE AND PRODUCTION IN NIGERIA, 1969 - 1985

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ABSTRACT

RECONCILING PROPOSED PUBLIC INVESTMENTS IN AGRICULTURAL EDUCATION, INFRASTRUCTURE AND PRODUCTION IN NIGERIA, 1969-1985

By

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Agricultural planning in developing countries often has encountered difficulties in integrating projects for agricultural education and investments in production. To improve agricultural planning, there is an urgent need for planning and research procedures which emphasize physical planning to reconcile the human and natural resource requirements of agricultural programs and projects. A major research study in Nigeria by the Consortium for the Study of Nigerian Rural Development has given the author an opportunity to focus on improved procedures for reconciling investments in agricultural production with investments in supporting services.

The objectives of this dissertation are

1. The development of a method for reconciling investments in agricultural production, education and infrastructure in developing countries with a) the capacity of the educational system to provide the necessary personnel, and b) the capacity of the economy through internal and external resources to finance both the educational and investment expenditures.

2. The application of this procedure to the programs and policies recommended by the Consortium for the Study of Nigerian Rural Development (CSNRD) for Nigeria over the 1969-85 period and the quantification of the manpower and financial consequences of three alternative strategies for

Nigerian agricultural development from 1969 to 1985.

The procedure developed for reconciling the necessary resource, manpower, and financial requirements of investments in agricultural production and infrastructure is called the reconciliation process. This procedure utilizes physical planning at both the farm and macroeconomic levels to determine the physical resource requirements necessary to implement agricultural programs and then to serve as a basis for determining the economic and financial feasibility of these programs. The method consists of the seven interrelated steps listed below and should be treated as a continuous and simultaneous process.

1. Gather background data.

2. Determine the investment program goals for production and infrastructure and determine educational program goals.

3. Reconcile educational and investment program goals.

4. Reconcile the integrated educational and investment goals with manpower requirements and the availability of trained manpower.

5. Determine costs and returns to the educational-investment package, and reconcile the social costs with social benefits.

6. Reconcile needed revenue with available revenue.

7. Interact with decision-makers and administrators to work out political balance and feasibility.

The reconciliation process outlined here has been used by the author in a CSNRD analysis of three alternative development strategies for Nigeria over the 1969-85 period. These strategies are Strategy I, a continuation of present trends and policies in Nigerian agriculture; Strategy II, a change to more favorable agricultural policies and programs; Strategy III,

a harsher, more exploitative agricultural policy than presently followed in Nigeria. The author devoted major attention to reconciling the investments in production and infrastructure for Strategy II to develop a set of programs with high payoffs for Nigeria that were both consistent and feasible.

The reconciliation process has demonstrated that the CSNRD recommended agricultural development Strategy II would be economically sound and financially feasible for Nigeria over the 1969-1985 period. The reconciliation procedure was used to determine the university and subuniversity agricultural manpower requirements for credit, research, extension services supporting export and food crop production campaigns, and teachers for universities and subuniversity agricultural schools. The procedure has shown that this manpower could be trained in existing institutions with only minor modifications in physical plant, curriculum, and number of teachers. Furthermore, by concentrating on assisting smallholders through production campaigns and eliminating government investments in direct agricultural production, the annual governmental costs of Strategy II during the 1970's would be less than in 1966, and only £1.5 million more annually by 1985. Production and price projections revealed that the total value added in agriculture under this strategy would be £242 million and £420 million greater annually by 1985 than from the other two strategies. Finally, the financial analysis has revealed that the present taxes on export crop output with strong disincentives on production could be eliminated or sharply reduced if only 4 to 6 percent of the projected increase in petroleum revenues could be used to finance agricultural programs. This amount would be about £4 million less by 1985 than the revenue which would be required from petroleum under a continuation of present trends. The use of

petroleum revenues under Strategy II would be needed to provide time to develop new sources of revenue from agriculture through new land and income taxes and increased excise taxes, which would be made possible by the higher farmer incomes under this strategy.

Strategy I and III, on the other hand, were shown by the reconciliation procedure to be both expensive and low return alternatives. The manpower requirements would be much less than under Strategy II, and would require a reduction in agricultural student enrollment in universities and technical agricultural schools from the 1966 level. Public expenditures under Strategies I and III by 1985 would be about £14 and £12 million more than Strategy II respectively. The total increase in GDP by 1985 under these two strategies, however, would be £420 and £515 million less than under the second strategy. Because of the low returns and high costs of these two strategies, it is unlikely that they could be followed until 1985 without being modified, perhaps haphazardly.

The usefulness of the reconciliation process has been demonstrated in the CSNRD study in Nigeria. The federal government and the new Nigerian states may find this reconciliation procedure helpful in their future agricultural planning. The reconciliation process also should be a useful planning technique in other developing countries.

RECONCILING PROPOSED PUBLIC INVESTMENTS IN AGRICULTURAL EDUCATION, INFRASTRUCTURE AND PRODUCTION IN NIGERIA, 1969-1985

By

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CHAPTER I

INTRODUCTION

The Problem

Developing countries are becoming increasingly aware that their rate of economic development must be accelerated if the desires of their citizens for employment and better incomes are to be realized. In the past 10-15 years, many developing countries have turned to development planning and formal development plans to stimulate their growth and development. The results, however, have been far from satisfactory. In analyzing development planning in over 100 countries, Waterson writes

> Even a casual examination of the results achieved from development planning in most less developed countries indicates that they are falling short of what is reasonable to expect. The record is so poor--it has been worsening in fact--that it has sometimes led to disillusionment with planning and the abandonment of plans. Even in India, a citadel of planning, planning has been under unprecedented attack. Indeed, participants in the United Nations Meeting of Experts on Administrative Aspects of National Development Planning, held in Paris in June 1964, went so far as to suggest that national development planning was in crisis.[1]

Waterson summarizes some of the difficulties in planning in four general categories.[2] First, inadequate information often led to unrealistic assumptions and the selection of over-ambitious targets

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[1]Albert Waterson, Development Planning, Lessons in Experience (Baltimore: Johns Hopkins Press, 1965), p. 4.

[2]Ibid., Chapters IV and VI.

(e.g. Morocco, Guinea, Bolivia, Nepal, Burma, Upper Volta). A second major difficulty was the lack of viable projects that had been properly prepared and investigated (e.g. Bolivia, Chile, Guatemala, Morocco, Phillippines). A third difficulty comprised inconsistencies and a lack of integration of economic and financial policies in planning (e.g. Nigeria, India, Pakistan). Finally, poor planning procedures, including improper use of econometric techniques and comprehensive planning, caused numerous difficulties (e.g. Burma, Ceylon, Bolivia, Ghana, Ethiopia, Indonesia, Morocco, Phillippines). Watson and Dirlam generally agree with Waterson in summarizing the most serious obstacles to effective development planning as lacks of basic information suitable for planning, appropriate projects, and qualified and motivated personnel.[3] These shortcomings emphasize that one of the greatest needs for improving development planning is sufficient research to 1) investigate and prepare sound projects and 2) to provide the background information for preparing consistent and feasible plans.

Research is needed especially in the agricultural sector, where variations in yields, the heterogeneous nature of ecological zones of production, and the ubiquity of small producing units all make agricultural planning much more complex than planning for the industrial sector. Research for agricultural planning in many developing countries, however, has been poorly coordinated and focused on a limited range of

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[3]Andrew M. Watson and Joel B. Dirlam, "The Impack of Underdevelopment on Economic Planning," Quaterly Journal of Economics, Vol. 79, (May, 1965), p. 194.

agricultural investment projects. Frequently little attention has been given to agricultural education and other supporting services. Only a handful of less developed countries (LDC's) have had comprehensive agricultural sector studies completed for them and many of these studies have been hampered in their usefulness for agricultural planning by important omissions and internal inconsistencies. Little research has been conducted to insure consistency between the natural resource, financial, and educational requirements of investment programs and projects. Manpower and educational studies have often concentrated attention on the educational institutions and their capacities and have devoted inadequate attention to the demand for trained manpower needed to plan and implement investment projects. Likewise, economists who have analyzed directly productive investment projects in agriculture have stressed financial aspects while underplaying physical planning in terms of human and natural resource requirements. At the macro-economic level, too little attention has been devoted to changes over time in the distribution and allocation of costs and returns. Almost no research has been conducted to see if adequate revenue would be available to be allocated to the appropriate agencies responsible for the development programs.[4]

To improve agricultural planning, procedures urgently need to be

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[4]Two examples of comprehensive studies in Nigeria which include some of these shortcomings are The International Bank for Reconstruction and Development, The Economic Development of Nigeria (Baltimore: Johns Hopkins Press, 1955), and the Food and Agriculture Organization of the United Nations, Agricultural Development in Nigeria, 1965-1980 (Rome: FAO, 1966). These two studies are discussed in greater detail in the literature review.

developed for reconciling investments in agricultural production with investments in agricultural infrastructure such as extension services, credit and research. A major research study in Nigeria has given the author an opportunity to focus on improved procedures for reconciling investments in agriculture production with investments in supporting services. Hopefully, this analysis will be of help to planners both in Nigeria and in other LDC's.

Since 1966, the Consortium for the Study of Nigerian Rural Development (CSNRD) has been conducting an agricultural sector analysis to aid Nigeria in its growth and development.[5] This comprehensive analysis included studies organized under five major subprojects:

1. The economics of university level agricultural education.
2. The economics of subuniversity level agricultural education.
3. The economics of public and private investment (including marketing).
4. The economics of agricultural research.
5. The economics of agricultural credit.

The purpose of the CSNRD analysis is to evaluate and make recommendations to both the U.S. and Nigerian governments for Nigerian rural development. CSNRD has outlined three alternative development strategies to differentiate between possible routes for Nigerian agricultural development over the 1970-85 period. These strategies are: Strategy I--a continuation of present policies, Strategy II--policies more favorable to the agricultural sector, and Strategy III--harsher, more exploitive

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[5]Contract no. AID/afr-264.

policies and programs than presently found in Nigeria. Projections have been developed by CSNRD researchers to quantify the consequences of each strategy over the 1970-85 period in terms of growth, employment, and foreign exchange earnings.

The five CSNRD subprojects have investigated the broad range of agricultural development problems frequently encountered in LDC's. Like most other research studies, the individual studies contained no mechanism to provide consistency among the subproject recommendations or to investigate their overall financial feasibility. The research outlined in this dissertation was undertaken to reconcile the investments proposed under the CSNRD recommended Strategy II and to identify possible weaknesses and imbalances in the other two strategies.

Objectives

The general purpose of this dissertation is the development of an improved procedure for reconciling investments in agricultural production with investments in agricultural infrastructure, with special emphasis on manpower and financial requirements.

The specific objectives of this study are

1. The development of a method for reconciling investments in agricultural production and infrastructure in developing countries with a) the capacity of the educational system to provide the necessary personnel, and b) the capacity of the economy through internal and external resources to finance the expenditures for both the educational and investment expenditures.

2. The application of this reconciliation process to the CSNRD recommended programs and policies in Nigeria and the quantification of

the manpower and financial consequences of three alternative strategies for agricultural development from 1969 to 1985.[6]

Review of Literature

A comprehensive review of the literature on agricultural planning is presented by Gittinger.[7] The review of literature which follows will briefly spotlight the general literature on planning and agricultural development research, and then concentrate on literature on agricultural planning in Nigeria.

Development literature includes very little material on the requirements, organization, and coordination of development research. Many of the specialized texts on development planning treat the planning process as if all necessary information were available and all the investigations and adjustments of costs, returns, and organization of programs and projects were the responsibility of the planners themselves, rather than their relying on researchers for any of this information.[8]

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[6]This process, of course, will draw heavily on material and projections provided by other members of the CSNRD research team.

[7]J. Price Gittinger, The Literature of Agricultural Planning, Planning Methods Series No. 4 (Washington: Center for Development Planning, National Planning Association, 1966).

[8]See Albert Waterson, op. cit.; Herman M. Southworth and Bruce F. Johnston, eds., Agricultural Development and Economic Growth (Ithaca: Cornell University Press, 1967); Wolfgang F. Stolper, Planning Without Facts: Lessons in Resource Allocation from Nigeria's Development (Cambridge: Harvard University Press, 1966); and to a lesser extent, W. Arthur Lewis, Development Planning: The Essentials of Economic Policy (New York: Harper and Row, 1966). In the case of Nigeria which Stolper discusses, considerable "preplanning" research was undertaken although this is not explained adequately in his book.

Lewis and Myrdal have recently made important contributions to the general planning literature with reference to agricultural planning research. Lewis emphasizes the need for both micro and macroeconomic data for planning.[9] Lewis stresses the need for plan preparation to begin simultaneously at both the individual project level and at the macroeconomic level, and then be reconciled. Myrdal criticizes the heavy emphasis on financial aspects of planning and strongly urges planners to devote more attention to analysis of the physical relationships in planning.[10] This type of planning is described by Myrdal as physical planning and must preceed financial planning because it examines the natural resource, manpower, and other input requirements that are necessary to implement projects. Physical planning may also provide projections of physical production in the various sectors of the economy to serve as a basis for estimating future income and tax revenues. Both physical planning and reconciling macroeconomic and farm level data will be stressed in the reconciliation procedure developed in this dissertation.

The specific literature on research for agricultural planning is very limited. Szczepanik considers research as one of several steps basic to agricultural planning.[11] These steps include formulation of objectives and preplanning targets, research, formulation of development

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[9]W. Arthur Lewis, op. cit. p. 147.

[10]Gunnar Myrdal, Asian Drama, an Inquiry into the Poverty of Nations, Vol. III (New York: Twentieth Century Fund, 1968) pp. 1919-1923.

[11]E. F. Szczepanik, "Agricultural Development Programs: Principal Steps in Formulation," in Agricultural Planning Course, 1963 (Rome: FAO, 1964) pp. 13, 47.

policies and measures, formulation of investment schemes and projects, programming, implementation, and evaluation. Mosher summarizes seven research priorities for agricultural planning.[12] These are farm operations, technological change and risks of innovation, urban market development, education, rural community development schemes, the organization and administration of agricultural institutions, and the relationships of agricultural production and rural welfare. Clark reviews in detail the research studies which were commissioned for Nigeria's 1962-68 plan.[13] Clark's list of preplanning research studies for Nigeria, however, includes only one preplanning research project connected with agriculture, a physical hydrological survey.

Some guidelines for the orientation of agricultural development research in LDC's are spelled out by Schickele, DeWilde, and Eicher. Schickele emphasizes the need for farm management research for development planning since information on how farms operate and are organized is necessary for the development and successful implementation of many agricultural programs in LDC's.[14] Schickele, however, should have given more attention to farm level research rather than just farm management research as the former would include relevant research

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[12]Arthur T. Mosher, "Research Needed on the Development Process for Agriculture" in Economic Development of Agriculture, Iowa State University Center for Agricultural and Economic Development (Ames: Iowa State University Press, 1962).

[13]Peter Bently Clark, "Economic Planning for a Country in Transition: Nigeria", in Planning Economic Development, ed. by Everett E. Hagen (Homewood, Ill.: Richard D. Irwin, 1963).

[14]Rainer Schickele, "Farm Management Research for Agricultural Planning", in Agrarian Revolution and Economic Progress, (New York: Praeger, 1968).

on forms of farm organization in addition to private smallholder farms. DeWilde advocates farm level research to identify critical bottlenecks in labor, equipment, and economic incentives.[15] He writes

> Agricultural research must be largely oriented to the requirements of the small family farm which is characteristic of African agriculture. Research should not be understood simply as the technical and scientific work carried out on agricultural experiment stations. It must be more broadly conceived as including all types of studies and investigations that produce innovations which farmers will consider feasible and rewarding. It must be concerned with all the factors, socio-economic as well as technical, which condition the receptivity to change at the farm level.[16]

Eicher emphasizes the need to consider the interrelationships between modern inputs and complementary investments in irrigation, feeder roads, and pesticides, and the interrelationship between agriculture and other sectors of the economy.[17] He also emphasizes the need for farm level data on profitability of farmer investments as well as macro research on the effects of trade, education and pricing policies.

The general programming of the steps in planning is discussed by Stolper, Ojala, and Lewis. Stolper lists a 14 step procedure which was followed in Nigeria.[18] This procedure involved assembling data on programs, revenues, and expenditures to facilitate planning. Further

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[15]J. C. DeWilde, "Making Agricultural Research Relevant to African Farmers", in Conference on Agricultural Research Priorities for Economic Development in Africa, Vol. III, The Abidjan Conference (Washington D.C.: National Academy of Science, 1968).

[16]Ibid, p. 176.

[17]Carl K. Eicher, "Economic Research for African Agricultural Development", in Conference on Agricultural Research Priorities for Economic Development in Africa, Vol. III, The Abidjan Conference (Washington D.C.: National Academy of Science, 1968).

[18]Wolfgang F. Stolper, op. cit., pp. 46-49.

examination focussed on finances, the regional distribution and implications of capital expenditures and revenues, and matching available resources to needs. All breakdowns were to have been phased. Ojala presents 10 steps in agricultural programming.[19] The first six steps involve defining objectives, reviewing population, trade, etc., stocktaking of agriculture development information, and assessing prospects for agricultural development, demand, and output. Next, targets need to be set and policies and projects chosen. Since the first tentative results are likely to contain inconsistencies, successive approximations must be made for satisfactory balance. The final step is implementation and review. Lewis identifies four constraints to general development: natural resources, manpower, physical capacity of the capital goods industries, and finances. He then gives examples on how to work out balances and development plans for these constraints.[20] Lewis also treats the balancing process as a series of successive approximations. Stolpher, Ojala and Lewis all stress the important point that initial targets must be considered tentative and that adjustments to achieve balance and consistency need to be worked out as successive approximations. However, they stress planning within the framework of adequate primary and secondary data, with the responsibility of examining this data being placed entirely on planners. Consequently, they do not emphasize the need for research or the contribution in analyzing data that can be made by researchers working

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[19]E. M. Ojala, "The Programming of Agricultural Development," in Agriculture and Economic Development, ed. by Herman Southworth and Bruce Johnston (Ithaca: Cornell University Press, 1967) pp. 554-555.

[20]Arthur Lewis, op. cit., Chapter III.

closely with planners. The procedures presented by these authors also focus on the macroeconomic level and consequently underplay the complementarity between educational services and investments at the project level. None of the authors examines specifics of staffing or training manpower for agricultural projects.

Agricultural Planning in Nigeria

Development planning in Nigeria began under colonial rule shortly after World War II when all British administrators of colonies were requested to submit 10-year development plans. This request produced A Ten Year Plan of Development and Welfare for Nigeria, 1946 which was in reality a collection of disjointed projects.[21] In 1951 this program was amended and published as A Revised Plan of Development and Welfare for Nigeria, 1951-56.[22]

In 1953 a World Bank economic mission conducted a comprehensive, multisector analysis of the Nigerian economy to provide recommendations about future economic development, including general recommendations for agricultural development.[23] Many of the recommendations were incorporated by the regional and federal governments into their 1955-60 development plans. These plans, however, were not well coordinated and gave low priority to the development of agriculture. Export crop expansion was encouraged to raise revenues for general development,

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[21]Government of Nigeria, A Ten Year Plan of Development and Welfare for Nigeria, 1946 (Lagos: Government Printing Office, 1946).

[22]Government of Nigeria, A Revised Plan of Development and Welfare for Nigeria, 1951-56 (Lagos: Government Printing Office, 1951).

[23]The International Bank for Reconstruction and Development, The Economic Development of Nigeria (Baltimore: Johns Hopkins Press, 1955).

rather than the improvement and expansion of the agricultural sector.

The implementation of Nigeria's regional plans from 1955 to 1960 encountered many bottlenecks, ranging from inadequate public services to a lack of trained manpower. The difficulties experienced in implementing the 1955-60 regional plans made obvious the need for improved coordination of planning. With independence approaching in 1960, Nigeria chose to coordinate their policies and programs through a nationally integrated development plan and established more efficient planning organizations. Numerous surveys were conducted to gather data, including the important Economic Survey of Nigeria in 1959.[24] The 1955-60 plans were also extended to run through 1962. The final plan preparation required approximately a year and a half for the preplanning surveys and a year for the plan formulation.

In 1962, The National Development Plan, 1962-68,[25] was launched. The First National Plan was actually composed of five sub-plans. Initially one sub-plan was provided for each of the three regional governments and one for the federal government. Later, with the creation of the Mid-western State, a fifth sub-plan was added. Top priority in the 1962-68 plan was given to agricultural and industrial development and the training of high and intermediate level manpower.[26] Growth of Gross Domestic Product was to be increased from 3.9 to 4.0

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[24]National Economic Council, Economic Survey of Nigeria, 1959 (Lagos: Federal Government Printer, 1959).

[25]Federation of Nigeria, National Development Plan, 1962-68 (Lagos: Federal Ministry of Economic Development, 1962).

[26]Ibid, p. 22.

percent per year.

Early in the plan Helleiner spotlighted some problems which he thought might prevent Nigeria from achieving the targets set forth in the plan.[27] These problems included a failure to start quickly, shortfalls in foreign aid, employment pressures and the high rate of population growth, and the administrative costs arising from the establishment of the Mid-western Region. Dean later pointed out that the Nigerian economy had indeed achieved the 4 percent rate of growth in GDP up to the outbreak of hostilities in 1966; but that deficient executive competence, insufficient foreign aid, and political corruption had severely restricted the implementation of the plan.[28] Lewis also criticized planning in Nigeria for failure to develop and provide adequate programs for the private sector (especially for small farmers), machinery for implementing the public sector programs, sufficient evaluation and public participation in decision making. Lewis also deplored excessive political intervention in the making of economic decisions.[29]

In the 1962-68 plan, the planning for the agricultural sector was done in a very haphazard manner and unrelated to a national

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[27]Gerald K. Helleiner, Peasant Agriculture, Government, and Economic Growth in Nigeria (Homewood: Richard D. Irwin, 1966) p. 364.

[28]E. R. Dean, "Nigerian Plan Implementation, 1962 to 1968" Paper presented at Michigan State University, July 10, 1968. A more thorough evaluation of the 1962-68 plan is provided by Dean in his forthcoming book on the plan.

[29]W. Arthur Lewis, Reflections on Nigeria's Economy Growth (Paris: Development Center of OECD, 1967) pp. 38 and 39.

agricultural policy, despite the very high priority given to agricultural development. There are several major criticisms of the agricultural planning effort for the 1962-68 plan. First, except for volume and value data on export crops, the agricultural planning proceeded with only fragmentary data, especially at the farm level. By the time the plan was formulated, no research was available to agricultural planners, even though the long list of preplanning surveys undertaken included such less important items as a careful study of the Lagos Island Sewerage System.

Planners in Nigeria recognized the need for additional assistance to plan for agriculture and commissioned a team of 16 experts from the Food and Agriculture Organization of the United Nations to study agriculture and provide recommendations for development. Unfortunately the team did not arrive until after the plan had been formulated; the FAO final report was not published until 1966.[30] Some other planning-type research was conducted during the plan by individual government economists, the Economic Development Institute (EDI), the Rural Economic Research Unit (RERU), and The Nigerian Institute for Social and Economic Research (NISER), which was allocated £ 200,000 from the federal government during the 1962-68 plan.

The second criticism of agricultural planning in Nigeria is its poor coordination of agricultural policy. Under the 1954 constitution, primary responsibility for agricultural development had been placed under regional control. The regional organization for agricultural

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[30]Food and Agriculture Organization of the United Nations, Agricultural Development in Nigeria, 1965-1980, (Rome: FAO, 1966).

planning required coordination by, as well as advice, from the national planning team to develop an overall national policy. However, the national planning team did not contain a single agricultural planner, agricultural economist, sociologist or anthropologist. Also, the Federal Government appears to have exercised very little influence on agricultural policies at the regional level. This lack of involvement cannot be justified by the constitutional restrictions on federal executive responsibility for agriculture. Federal involvement in agricultural policy formation at the regional level was both necessary and possible. For example, the Federal Government's committment of £25 million to the regional governments for acceptable agricultural projects during the plan [31] provided an excellent opportunity to assist in agricultural planning at the regional level. The Federal Government, however, did not follow up on this opportunity. In brief, agriculture, which was the largest sector of the Nigerian economy and provided employment for 70-80 percent of the population, 80 percent of the foreign exchange earnings, and by far the largest sector share of GDP, received very inadequate attention in Nigeria's First National Plan, especially from the national planning team.

A third criticism of agricultural planning in Nigeria during the First National Plan is the poor choice of regional projects and the inadequate use of physical planning in developing these projects. The Northern Region's agricultural projects consisted mostly of irrigation schemes. No special programs were developed for improving

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[31]Federation of Nigeria, National Development Plan, 1962-68, p. 58.

production of the two major crops, groundnuts and cotton, although such minor projects as beekeeping were promoted. In the two southern regions, investments were wisely concentrated on the major export crops, cocoa, oil palm, and rubber. In these regions, the legetimate criticism is not so much which crops were chosen for promotion, but a criticism of the type of production units chosen. Some smallholder improvement schemes were prepared, but most of the emphasis was on capital intensive government plantations and farm settlements. In addition, many of the original targets had been made without adequate physical planning and were found later to be infeasible. An illustration of poor planning is the Eastern Region's rubber planting scheme which almost immediately scaled down its plan targets because of inadequacies of nursery facilities, manpower, soil types, and logistic support for extension services.

> A total of 1,170 acres of rubber was planted in 1962-63 out of 2,000 acres planned for the year, and during the second year (1963-64), 2,530 acres were planted out of an estimated target of 8,000 acres. Thus only 3,700 acres out of 1962-68 Plan target of 100,000 acres have been planted to date. The planned target has consequently been scaled down to a more realistic figure of 50,000 acres.[32]

Throughout Nigeria, the poorly selected and conceived projects came in part from political motives, but also resulted from the lack of good physical planning data on specific agricultural projects.

Nigeria's 1962-68 plan also can be criticized for the fragmentary nature of planning done for agricultural education. Along with

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[32]Ministry of Economic Planning, First Progress Report--Eastern Nigeria Development Plan, 1962-68 (Enugu: Government Printer, 1964).

agriculture, top priority in the 1962-68 plan was given to education for high and intermediate level manpower. In this category, agricultural education services and training were promoted and expanded. Unfortunately these programs were developed, as were agricultural investments, with inadequate research information and coordination. Insufficient attention was devoted to an examination of the interdependence of educational services and new agricultural investments, and too much reliance was placed on broad ratios of extension workers to farm families, especially in the north. The original recommendations on general education in the 1962-68 plan were based on the Ashby Commission Report[33], which omitted specific recommendations on manpower training for agriculture. Consequently R. W. Rowat was later commissioned to study agricultural education services. Rowat's 1964 report reviews the educational institutions serving agriculture and attempts to establish some guidelines for training staff for extension, veterinary, and other technical services in agriculture.[34] Rowat's guidelines were based on the ratios of 1 extension worker to 1000

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[33]Federal Ministry of Education, Investment in Education: The Report of the Commission on Post-School Certificate and Higher Education in Nigeria (Lagos: Government Printer, 1960).

[34]R. W. Rowat, The Development of Education and Training in the Field of Agriculture and Related Subjects in Nigeria (Rome: FAO, 1966). Two other studies for general education were also undertaken late in the plan by external agencies, but they do not give specific attention to agricultural education needs. These two studies are Nigerian Human Resource Development and Utilization (New York: Education and World Affairs, 1967), and A. Callaway and A. Musone, Financing of Education in Nigeria (Paris: UNESCO, International Institute for Educational Planning, 1968). Both of these publications give useful information on the organization and financing of general education institutions in Nigeria.

farm families in the south and 1:2000 in the north. These ratios give general magnitudes of educational requirements, but they do not give enough attention to the details of manpower requirements and the payoffs of extension services for specific programs and investment schemes to provide guidelines for staffing specific programs.

The major research for agricultural development during the 1962-68 plan was provided by the FAO research team, which was requested by the government of Nigeria to provide long-term perspectives and recommendations for agricultural development through 1980.[35] The FAO team prepared a rather well developed, comprehensive agricultural sector analysis which concentrates primarily on agricultural investments but also considers agricultural education services and other agricultural institutions. The FAO report presents detailed data on per acre cost and returns. The FAO team recommended large scale development schemes for cocoa, rubber, and oil palm, that exceed the initial programs undertaken by the regional governments in the 1962-68 plan. Strong points of the report are the projections of the consequences of these investments through time. Unlike some comprehensive agricultural sector studies, the report also presents useful guidelines for staffing production schemes. The recommendations for developing general extension on the other hand, are based on Rowat's ratios[36] and are not sufficiently related to investment programs.

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[35]Food and Agriculture Organization of the United Nations, op. cit.

[36]R. W. Rowat, op. cit.

The FAO report is very helpful in agricultural planning. Its omissions, however, reduce its usefulness to Nigeria. The major criticism of the research procedure followed by the FAO team is no check was made to insure that their recommendations were balanced and consistent both within agriculture and with the rest of the economy. For example, the report does not examine the total demand for Nigerians with extension training to determine if sufficient numbers can be trained to fill all the necessary positions, including those for the tree crop schemes. The report also does not develop the aggregate overall costs and returns of the tree crop schemes which, together with other agricultural expenditures, must be known to determine if the total programs are financially and economically feasible. The report further fails to analyze sources of tax revenue alternative to taxes on export crops. The last consideration is very important because of the recent discovery and exploitation of large supplies of petroleum.

The FAO report appears to be much more concerned with programs than policies. It is also biased towards tree crops and towards the southern areas where tree crops can be grown. Considerably more research and discussion of northern agricultural development beyond the three pages for cotton and six pages for groundnuts should have been included in the report. Furthermore, outside of a very good chapter on farm settlements, the report was uncritical of government investment schemes such as processing, plantations, etc. CSNRD used the 1966 FAO study as its point of departure. Hence, we shall now return to discussion of the CSNRD study.

The CSNRD Agricultural Sector Analysis

The CSNRD study was an interdisciplinary, comprehensive agricultural sector analysis undertaken from 1966 to 1969. It was financed by USAID and carried out by a number of American universities and governmental agencies under the name of The Consortium for the Study of Nigerian Rural Development (CSNRD). This study was undertaken to provide recommendations for improving Nigerian agriculture. As the study evolved cooperative links were established between CSNRD researchers and Nigerian institutions such as the Federal Ministry of Economic Development, Federal Ministry of Agriculture and Natural Resources, National Universities Commission, Federal Department of Agriculture, NISER and the EDI.[37]

The research work reported in this dissertation was undertaken to reconcile the resource, manpower and financial requirements of agricultural production and infrastructure programs outlined in the CSNRD study. Most of the specific information needed for the reconciliation work in this dissertation was taken from CSNRD publications or developed with CSNRD researchers, because previous investment and educational studies in Nigeria have been too general to use in physical planning for the agricultural sector. The primary source of information for this dissertation is the CSNRD final report.[39] Many CSNRD

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[37]The CSNRD final report has been accepted by the Government of Nigeria.

[38]Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, CSNRD publication No. 33 (East Lansing: The Consortium for the Study of Nigerian Rule Development, 1969).

subproject publications also have been used.[39] Much of the fiscal data is from budgets of the Nigerian state and federal governments.

Preview of Following Chapters

Chapter II describes the method and technique to be used in reconciling manpower and financial needs through time and includes a summary of the steps in the reconciliation process. Chapter III presents background data on Nigerian agriculture pertinent to the manpower and financial reconciliations in later chapters. Chapter IV presents three alternative strategies for agricultural development in Nigeria and identifies the production and infrastructure priorities under each strategy. Chapter V reconciles the manpower requirements of the investment and infrastructure programs with the capacities of the educational system. Chapter VI examines the financial aspects of the CSNRD programs. Costs and returns under the three alternative development strategies are compared in this chapter, and the needed and available revenue are reconciled to determine financial feasibility. The final chapter summarizes the reconciliation procedure and its usefulness in Nigeria and in other LDC's.

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[39]CSNRD publications on agricultural education include James M. Kincaid, Jr., Strategies for Improvements of Agricultural Extension Work and Subuniversity Agricultural Training in Nigeria, CSNRD publication No. 8 (East Lansing: CSNRD, 1968) and James S. Long, Analysis of the Needs and Resources for University Education in Agriculture in Nigeria, CSNRD publication No 28 (East Lansing: CSNRD, 1969). A CSNRD publication summarizing public and private investment is C. K. Laurent, et al., Agricultural Investment Strategy in Nigeria, CSNRD publication No. 26 (East Lansing: CSNRD, 1969). CSNRD credit and research publications include H. Bauman, C. Connoly, and John Whitney, A Situational Report of Agricultural Credit in Nigeria, CSNRD publication No. 3 (East Lansing: CSNRD, 1966) and Omer W. Herrmann, Nigerian Agricultural Research: Review and Recommendations, CSNRD publication No. 22 (East Lansing: CSNRD, 1969).

CHAPTER II

PROCEDURE AND METHODOLOGY

The research procedure in this dissertation consists of two interrelated parts. The first part involves developing a systematic method for providing manpower and financial balances among investments in agricultural production and infrastructure through time. Throughout this dissertation, this method will be called the reconciliation process. The second part of the research procedure uses the reconciliation process in non-computer simulation to develop and quantify through time the varying consequences of following three alternative development strategies for Nigeria as outlined by CSNRD.

This chapter is divided into three sections. The first section describes the reconciliation process in a general framework for use in sector analyses in developing countries. The second section presents reasons for using projections and/or simulations in Nigeria and in sector studies for developing countries in general. It also discusses the development of projections based on careful physical planning, and summarizes their usefulness in quantifying the consequences through time of alternative programs and policies. The third section summarizes the research work necessary to carry out the reconciliation process and develop the projections for Nigeria.

The Reconciliation Process

The reconciliation procedure described in this chapter was originally developed for use within the framework of the CSNRD agricultural sector analysis for Nigeria. Since the CSNRD study is similar to other sector studies, the method should have wide usefulness and applicability. The procedure presented in this section, therefore, should be useful in other developing countries as well as in Nigeria.

The reconciliation process presented here is a method for working out the necessary balance and consistency in research studies for development planning. The process begins by identifying and correcting inconsistencies in projects at the farm level and then integrates bottom up and top down planning research by aggregating and building consistent recommendations at the macroeconomic level. This process involves adjusting the programs and policies at successive levels until all the levels are balanced, and right actions[1] or goals that are balanced, consistent and feasible can be chosen for the overall program. As the imbalances at one level of the study are reconciled, a new set of tentative goals and targets for the programs and policies can be developed which are more consistent and feasible than the previous ones. These new goals and targets in turn must be adjusted until they are reconciled at a still higher level with additional possible development constraints (e.g. requirements and availability of resources, manpower, income and revenue) to develop again a new set of tentative goals that are more

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[1]C. I. Lewis, The Ground and Nature of the Right (New York: Columbia University Press, 1955).

consistent and balanced with respect to the overall plan than the previous ones. This process must be carried out until all the imbalances and inconsistencies in the various levels or component parts of the research study are worked out. If the goals worked out at one level are shown to be infeasible at higher levels of reconciliation, adjustments may have to be made in all the previous steps and the entire process rerun until finally all the levels are balanced.

The reconciliation process for investments and education is a very important part of development planning as the interrelationships of the educational and investment projects require consistency between them for overall success. Furthermore, the reconciliation process provides a method of investigating the financial feasibility of development plans with regard to the competition among investments for the limited funds in agriculture and in other sectors of the economy.

The reconciliation methodology helps insure consistency and balance in comprehensive studies, and may be summarized in seven steps for use in these broad studies. The methodology also is useful in bringing together individual, uncoordinated research studies and balancing their recommendations; but it may require more than seven steps to coordinate and revise scattered data. Seven steps form the reconciliation work in comprehensive research studies and are outlined below. In these steps, the term reconcile generally means "adjust the various parts until they are reasonably balanced, consistent, and feasible." This reconciliation involves also the establishment of

new sets of tentative goals for programs and policies in each step as each inconsistency is worked out. These adjustments are the bases for steps 3 through 7 below where each successive step must be reconciled with the programs and policies worked out as tentative goals in the preceeding steps. This reconciliation needs to be worked out for relevant future time periods in order to determine the total consequences of the proposed policies and programs.

1. Gather background data.

2. Determine program goals for the investments in production and infrastructure and determine the educational program goals.

3. Reconcile educational and investment program goals.

4. Reconcile the integrated educational and investment goals with manpower requirements and the availability of trained manpower.

5. Determine costs and returns to the educational-investment package, and reconcile the social costs with social benefits.

6. Reconcile needed revenue with available revenue.

7. Interact with decision makers and administrators to work out political balance and feasibility.

The reconciliation procedure must be treated as a continuous, simultaneous process, even though it is discussed separately as seven steps. Because of the interrelation of the education and investment programs, for example, the establishment of initial investment priorities depends on and also influences the educational priorities, and vice versa. In a similar fashion, the future availability of funds influences the kinds of education and investment

programs which can be carried out. Likewise, political feasibility and interaction with decision-makers must be considered throughout the process, rather than as the final step. By reconciling all these parts or levels in development plans and studies, a more consistent interrelated set of recommendations can be produced which gradually eliminates or changes those aspects of the education-investment programs shown to be inconsistent or unreasonable. Furthermore, by performing the reconciliation through time, the consequences of alternative programs may be quantified in output projections or other measurements which in turn can serve as criteria for selecting the programs. The development of projections is examined in greater detail in the next section of this chapter.

The seven steps are presented in greater detail below. It is not necessary that one person perform all the steps when the reconciliation process is used in comprehensive studies. Several steps can be the work of team members specializing in these problems and integrating their findings in the overall plan or study. The final goals in these steps, however, will be influenced greatly by the overall reconciliation work as inconsistencies and infeasible proposals are uncovered.

1. Gather background data. This initial step is essential to all practical research and is a prerequisite for the reconciliation work cited here. Available data must be mobilized and stock-taking surveys and research studies conducted to provide additional information needed for planning. The surveys and research studies must be organized to gather basic farm level data as well as

information at more aggregate levels. Important variables to be studied should be population characteristics, the nature of past production, manpower and manpower skills, education and related institutions, and distribution systems. Study should also focus on such variables as incentives to produce, social systems, important values, and public expenditures and revenue. Finally, all these variables, and those in the following steps, must be considered in terms of the constraints of political and financial realities within the country.

2. Determine the program goals for the investments in production and infrastructure and determine the educational program goals. The procedure in sector analyses often has been to conduct fairly independent and unrelated investments and educational studies. From these studies, separate program goals for education and investment have been developed by evaluating various possible investments or educational services according to specific criteria established by the separate research teams for selecting programs. These program goals generally have tended to be unrelated or only slightly related to each other. These unrelated goals therefore really represent first approximations, and they should be further revised to include the interrelatedness of the education and investment projects. Establishing these initial program goals, however, is probably essential in working out later goals that incorporate the interrelation of education and investments. Setting these goals, therefore, has been included as a separate step in the reconciliation process.

In determining these first approximation goals, researchers

analyze investments in view of normative concepts of good and bad along with non-normative facts such as production response to determine right actions. The analysis should investigate both investments in 1) marketing and production and 2) in supporting services such as research, credit, and education. The analysis should include the specific investment costs and return calculations for the programs. The same sort of analysis also is needed in educational services for identification of right actions or educational goals. The educational teams should examine such aspects as the nature and operation of the educational systems, the kinds of educational services needed, and the capabilities of trained personnel in view of the "goods" being sought and the "bads" being avoided in order to arrive at a tentative set of acceptable educational goals.

3. Reconcile educational and investment program goals. The establishment of unrelated or only slightly related educational and investment goals as final overall program goals is one of the problems of recent development plans mentioned in the introductory chapter. It is necessary to integrate these separate goals so they support each other if the overall goals are to avoid bottlenecks. Consequently, the initial and separate educational and investment goals need to be related in a still broader way in this step and in following steps and subjected to other criteria for selection to determine the goals for the entire program.

To reconcile investment and education goals, the investment and educational teams must work together to identify within the investment teams' framework those variables which have educational implications.

These variables should include the kind, size and location of investments by commodity, together with any special skill requirements. The proposed means and units of production should be specified, such as unmechanized small farmers versus large plantations with tractors. Supportive service requirements such as research and credit need to be specified, together with the system of incentives and taxes affecting production. Finally, measures of physical output from the investments need to be calculated for later use in measuring returns to the programs.

At the same time, the education and investment teams must study the investment programs and projects proposed by the investment team to determine the types of educational and training services that are critically needed to break key bottlenecks in the investment programs. Similarly, institutions must be selected to develop the human resources to eliminate the key bottlenecks for specific investment programs, and to provide such supporting services as credit, market information, research, etc. The quality and quantity of manpower needed to staff the investment programs and institutions and the specifics of staff training must next be determined. In working out the balances between the educational and investment priorities, researchers must give consideration to the training level and content needed for each type of service to be provided, the location and type of training (e.g. formal education versus in-service training), and the prerequisite level of formal education and experience for admission to the training institutions. Geographic distribution, political barriers, and tribal representations also may be important.

By considering the interrelation of these educational

and investment programs, researchers can establish a consistent set of goals. If the investment and educational teams are well coordinated, their initial program goals can incorporate the necessary education and investment interrelationships. Under such circumstances, Step 2 and 3 could become a single step. However, educational and investment teams usually specialize in their own specific problems without even being part of a larger research organization such as CSNRD.

4. Reconcile the integrated educational and investment goals with manpower requirements and the availability of trained manpower. After determination of the kind and number of staff personnel needed for the integrated investment and educational programs, the total training requirements for each type of trainee must be established. This calculation should include new positions and replacement allowances for promotions, drop outs, and deaths. To insure that sufficient manpower would be available to staff specific projects, it is necessary to compute the manpower requirements for each level of training for all sources of employment in both the public and private sector. These requirements then must be reconciled with the present educational system's capacity to train such manpower and to provide enough people with satisfactory prerequisite education for admission to these training institutions. Changes or expansions in the present educational system may be necessary to provide the required manpower, or else the investment program goals developed in Step 3 may need to be adjusted to a level that can be satisfactorily staffed.

5. Determine costs and returns to the educational-investment package, and reconcile the social costs with social benefits. This step requires the calculations of the costs and returns of the educational and investment programs to a) see if the increased production can generate enough social benefits for rural and urban people to justify the total expenditures on education and production and the choice of these projects over other projects, and b) serve as a basis for determining financial and political feasibility in the next two steps. Both the costs and returns should be projected through time for the relevant planning period, since it is unlikely that all the costs and returns will occur in the initial year. Production programs for annual crops may require only short evaluation periods because these programs often can quickly reach the desired targets within a few years. Tree crop planting schemes, research, and livestock breeding programs, however, may require much longer periods for evaluation, because there is often a lag between initial expenditures and benefits which may continue for many years.

The costs to the education-investment programs should be derivable from government budgets and the education and investment studies, or developed as needed. Both the direct production and investment costs, and those for supporting services such as education and research, should be included. Allowances for inflation may be necessary if strong inflationary pressures exist.

The calculation of the returns to the investment-education package involves two kinds of projections. The first projections are those for the physical output expected from the production

programs, listed in Step 3 of the reconciliation process. The second projections are price projections, which together with physical output projections, are necessary for calculating the value of the returns to the proposed programs. In calculating returns, care must be taken to specify what kinds of returns should be measured. Depending on the situation and needs of the country, the most important measurement could be total income, government revenue, or foreign exchange earnings. Non-monetary returns should be considered as well. Examples of these are the distribution of income and resource ownership, employment, the slowing of excess migration to cities, and political stability.

Two measurements are necessary from the cost and return calculations. The first is the relative level of returns in relation to costs, and the second is the absolute levels of each. The first measurement indicates profitability, and determines economic feasibility and justification. The second measurement is necessary for reconciling needed and expected revenue in Step 6. The absolute level of total costs determines the required revenue while the future level of income and foreign exchange is necessary for computing potential revenue. The relative level of returns in relation to costs is most useful in evaluating the kind and content of programs and policies to be promoted, while the absolute level of costs and returns is more useful in determining their size.

In making the cost and return calculations researchers must recognize that education and modern inputs tend to be complements when provided together in balanced programs. Cost and return calculations

therefore should not be made separately for education and investments in programs where they are highly complementary. Rather, education and the inputs for the investment programs probably will have to be treated as a set of complementary inputs with cost and return calculations performed only for this set of inputs. This treatment is necessary because the most efficient way to combining complementary inputs is in the proportions of their complementarity. When so combined, additions of one input without increasing the others yield little or no increase in product, and are largely wasted. Good or perfect complements therefore should be treated as a single set of inputs and increased only in the proportions of complementarity. The relevant costs thus become the cost of a set of inputs combined in compelmentary proportions rather than the individual costs of each input.

Similarly, an individual return to one input of a complementary set cannot be computed in isolation because no return would be forthcoming if the other inputs were absent. Fertilizer, for example, will increase corn yields only if the user knows its value and how to use it. The knowledge on how to use the fertilizer is likewise only useful if the fertilizer is available. Since these two inputs are quite complementary, they can be treated as a set to compute a return on both the education and the physical inputs together, rather than attempting to calculate a separate return on each. This complementarity of education with production inputs has received token recognition but has been largely ignored by educational

economists in their efforts to determine a unique return to education.[2] Because economists often have not treated education and production inputs as complements, they have uncovered a wide range of returns to education, which have depended on the inputs used with education and the proportion of the total returns arbitrarily attributed to education.

The treatment of education and modern inputs of production as a set of complementary inputs is especially relevant where investment and education research teams have identified in Steps 2 and 3 the kinds and levels of educational and investment programs that are complementary and the reconciliation process has been used to provide the necessary balance for these inputs to be combined in the proportions of their complementarity. Comparison of costs and returns of the educational and investment programs therefore necessitates computation of both the costs and returns of production investment, education, and such other complementary supportive services as research and credit, as a composite package rather than as separate inputs.

6. Reconcile needed revenue with available revenue. This step is required to determine the financial feasibility of the education and investment programs through time. This involves projecting the amount and distribution of government and private revenues that can and will be made available for meeting the expenditures for education,

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[2]See T. W. Schultz, Economic Value of Education (New York: Columbia University Press, 1963). In Chapter IV, Schultz summarizes numerous studies attempting to develop unique returns of schooling to an individual or aggregately to a country, rather than developing returns to the individual(s) together with any necessary non-human complementary inputs.

production projects, and supporting services. For the public sector, one must consider the present share of government revenues allocated to these categories, and the bargaining position of these institutions for receiving future allocations. Future revenues therefore must be estimated, including any forseeable changes in the amounts, sources and distribution. Changes in revenue arising from increased production, new tax structures, external aid, or exploitation of mineral or oil deposits are examples.

Private sector investments depend on profitability and the political climate. Private investments tend to be highest in production while agricultural business firms also may invest heavily in input distribution and marketing services. Private firms may also provide some educational services. Profitability calculations and risk measurements are usually the most useful measurements for this sector.

In making projections for future revenue allocation for both the public and private sectors, a good understanding of the political process and close interaction with political decision-makers is essential. The interaction with decision-makers is discussed in the next step.

7. Interact with decision-makers and administrators to work out political balance and feasibility. This final step is often overlooked by researchers studying specific investment or educational problems but is absolutely necessary if the ultimate goal of the research is the implementation of recommended agricultural policies and programs. Both the researcher and policy maker must interact to mobilize, clarify, and analyze both normative and non-normative

information to decide what is the right action or goal. This interaction also is a way of getting political and administrative originality and creativity into the process.

This step involves exchanges with development planners, decision-makers in the public ministries, and other important officials to discuss the program and policy goals developed in the previous steps and choose those goals which are politically and administratively feasible, or to make the necessary modifications in infeasible programs. This discussion also may involve officials of international organizations or foreign countries if outside support is needed. In this step, the researcher's primary responsibility is to provide all these people with accurate data on the kinds of recommended programs and policies, their size or extent, and supportive data on manpower, costs, returns, and revenue.

Summary of the Reconciliation Process

The seven interrelated steps in the reconciliation process provide an effective procedure for working out necessary balances and feasibility checks in development plans and studies. This reconciliation process involves taking educational and investment goals and background data and developing from them interrelated investment and educational goals. These goals next must be tested at successively higher levels for consistency with manpower training capacities, financial returns, available revenue, and political acceptability. As each imbalance and inconsistency is uncovered in each successive step of the process, the program must be adjusted and rerun through the entire process as often as necessary until all the bottlenecks are worked out and new

goals can be established that are more balanced than the previous ones. Gradually the inconsistencies at all levels can be reconciled and final goals for the overall program can be established which are balanced, consistent, and feasible.

The reconciliation procedure can help correct imbalances and consistencies in developmental research. The effectiveness of research for planning, and consequently the use of the reconciliation process, however, are dependent on the proper research orientation toward the study of normative and non-normative information and the correct use of research techniques. These two problems are discussed in the next section.

Conceptual Problems in Agricultural Development Research

In Nigeria, and in developing countries generally, there are two broad conceptual problems to which researchers must address themselves if they are to use the reconciliation process effectively to assist in agricultural development. The first problem involves the choice of studying normative as well as non-normative data and information. The second problem involves the choice of proper research techniques to analyze and quantify the data studied.

A proper research orientation is very important for development research. Both normative and non-normative considerations are necessary in the study of practical problems of improving agriculture in developing countries. Quantitative non-normative data are necessary to describe the nature of the agricultural sector and its interrelationships with the rest of the economy. Normative concepts are required as criteria for evaluating programs so that right actions or goals

can be developed. Researchers often are asked to predict and explain the normative as well as non-normative consequences of alternative problems and policies. Furthermore, decision-makers in developing countries consider both the non-normative characteristics and the good or bad consequences of programs when formulating and implementing agricultural policy. They often depend, in part, on researchers for this kind of information. Consequently, the agricultural development researcher who addresses himself to both the normative and non-normative is more effective in researching relevant problems and interacting with decision-makers than one who does not. A researcher concerned only with the positive or non-normative neglects many relevant considerations and fails to provide decision-makers with critical information.

The choice of proper research techniques is also very important. In many cases, researchers choose techniques which attempt to maximize the difference between returns and costs or to maximize GDP. In agricultural development research, however, the preconditions for using pure maximizing models are often absent. In order to maximize, it is necessary to combine all the relevant goods and bads into a single variable such as profit or utils. Furthermore, this single variable must behave in such a way that the mathematical second order conditions for maximization are met. In studies to improve the agriculture sector of a developing country, these conditions often are nonexistent, initially at least. Usually there is no single variable that can serve as a satisfactory common denominator to be maximized. The problems of sector development are too complex to lump all the relevant "goods" and "bads" into GDP, utils, profit, or some other "catch all"

variable. In addition there are serious questions as to whether institutional, technical, and educational changes ordinarily meet the mathematical second order conditions for maximization, at least in the range relevant to developing countries.

The problem of non-Pareto better adjustments is a special case of not being able to determine a common denominator. This problem is very important in developing countries because many times the only relevant adjustments are non-Pareto better, whereby no one can be made better off without making someone worse off. Maximization models are unable to handle this problem satisfactorily because the lack of interpersonnally valid utility measurements prevents the establishment of common denominators necessary for maximization. However, decision-makers are not always seeking Pareto-better solutions nor will they be satisfied with them alone. As Johnson points out, "Even if there are no Pareto-better policies, there may still be fairly strong evidence that certain solutions in which some persons lose and others gain are superior to other solutions in which some persons also gain and some also lose."[3]

Another problem implicit in using pure maximizing models is that not all researchers and decision-makers may agree on the same decision-making rules or "basis for choice" for defining what is the right action or goal. In the face of risk and uncertainty, decision-makers in developing countries may wish to define right actions in terms of

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[3]Glenn L. Johnson, "Factor Markets and Economic Development" in Economic Development of Tropical Agriculture, ed. by W. W. McPherson (Gainesville: University of Florida Press, 1968).

minimaxing or satisficing solutions rather than maximizing averages. Under these circumstances, it may be necessary to use research techniques that provide for the use of alternative "bases for choice" or decision-making rules.

In summary, pure maximizing models are inappropriate for handling many of the important problems in agricultural development when the necessary preconditions for maximization are absent or if alternative decision-making rules exist. As a consequence of these problems with pure maximizing models, some researchers have chosen as an alternative to use simulation which may or may not maximize. Newell and Simon define simulation as "a method for analyzing the behavior of a system by computing its time path for given conditions and given paremeter values."[4] This definition includes both computer simulation and the kind of hand-calculator simulation often used to develop quantitative projections.

Simulation is useful because it provides a speedy method of examining many alternative policies and their consequences through time so that decision-makers may interact with researchers in choosing policies they feel will lead to right actions and goals in view of both the important normative and non-normative considerations. Furthermore, by simulating alternative policies through time, researchers and decision-makers are not forced to make choices involving a single, unrealistic common denominator necessary to maximize a single function.

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[4]Allen Newell and Herbert Simon, "Simulation," The International Encyclopedia of the Social Sciences, ed. by David L. Lills, Vol. 14 (New York: MacMillan and Free Press, 1968) p. 262.

Simulation also can be used when the mathematical second order conditions for maximization are absent and when alternative decision-making rules exist. Although simulation may be considered as nonmaximizing because it does not specifically attempt to determine a single maximizing solution, it still may be used to develop and examine the consequences of alternatives that are much better than others. In doing so, simulation may allow decision-makers to choose rationally what they feel is a maximum.

Non-computer simulation and projections were chosen by the CSNRD research team to study the Nigerian agricultural economy because the simulation method was well adapted to the CSNRD research needs and because the problems with alternative pure maximizing models previously discussed limit their usefulness in studying the overall Nigerian agricultural sector. Simulation is well suited to developing the programs to be included under each of the three alternative strategies outlined by CSNRD and to quantifying quickly their consequences through time. Simulation can be used effectively to study both normative and non-normative data. Simulation also can easily incorporate the steps of the reconciliation process defined in the first section of this chapter. In fact, the reconciliation provess can be used in either simple (hand-calculator) or computer simulation to both 1) uncover inconsistencies and develop manpower and financial balances, and 2) trace through time the outcomes of various programs.

Sinple, hand-calculator simulation and projections were chosen by CSNRD rather than computer simulation because it was felt that sufficient time was not available to build the necessary "soft ware" for computer simulation. Thus, CSNRD dealt with only three alternative

strategies for only three future points in time. Computer simulation would have had the advantage of greater computer capacity and could have investigated many more alternatives. However, with just three alternatives and three time periods, the computer programing would still have been substantial. The simple simulation calculations for the three alternatives also allowed flexibility for normative and non-normative judgements from researchers and policy makers that were not easily quantified and which would have required complicated programing for use on computers not available in Nigeria. Either simulation procedure, however, would depend on the researcher for design and innovation in setting up the projections or computer programs and in identifying the important variables to be studied.

The Research Procedure

This dissertation has required six months' work in Nigeria as a member of the CSNRD research team and an equivalent amount of time at Michigan State University. In Nigeria, the primary emphasis was on learning about Nigeria, gathering data, and interacting with Nigerians, CSNRD researchers, and USAID personnel. The author was stationed in the capital city of Lagos where, as a CSNRD team member, he was in close contact with USAID and Nigerian officials. He also was able to travel frequently in the Western state, and visited all six northern states through three extensive automobile trips in that area. Because of the war, no travel was scheduled in the former Eastern Region or the Mid-western State. However, other researchers had experience in these areas and considerable general information and research

materials were available on investments and educational services.

At the time of the authors arrival in Nigeria, the CSNRD research team had been conducting research throughout Nigeria for two years and had collected numerous other studies for reference use. The two CSNRD agricultural education projects had developed considerable material on the operation and organization of educational training and service institutions, general needs and capabilities of trained manpower, and the cost and enrollment of the schools. The investment teams had identified several investments and schemes with potential high payoffs, as well as ones to be avoided with low payoffs. Considerable information was available on the nature and effects of the present marketing and taxation systems, together with recommendations for improving them. The CSNRD credit and research team also had gathered data on the nature of present credit and research programs, plus future requirements and possible organizations.

In order to perform the reconciliation work through time outlined in the first section of this chapter, the author had to gather additional data throughout western and northern Nigeria to supplement the material provided by CSNRD and available from other sources. Several trips were taken in the Western state and the six northern states to 1) develop general impressions of agriculture in these states, 2) visit agricultural education institutions and gather information on agricultural training in universities and subuniversity technical schools, 3) survey private employment of trained agriculturalists, 4) investigate new agricultural policies and programs proposed by the new states, and 5) survey state agricultural ministry staffs and

evaluate public manpower requirements for agriculture.

The list of firms sampled in the survey on private agricultural business firms was obtained from the Industrial Directory[5] and from persons familiar with other business firms. Data were gathered through personal interviews with managers and personnel officers. Sequential sampling techniques often were used, whereby those business firms requiring no specialized agricultural training were sampled only until conclusions would be reached about their operations and manpower requirements. Questions were aimed at determining the nature of private investments, manpower needs, salaries, expected expansion of operations, and restrictions to expansion. Data also were gathered on the level of training required and provided by private sector employers.

The data on state agricultural programs and manpower needs were obtained through personal interviews with the chief officers in the agricultural ministries. The people contacted were primarily in the agricultural services (heavily crop extension oriented) and veterinary divisions, but other divisions such as irrigation and cooperatives were also included. Questions were asked for clarification of existing agriculture programs, staff size, composition and utilization, and future priorities for programs and manpower use.

Additional data also were needed on the distribution and the total costs of overall programs, foreign exchange, farmer incomes, tax revenues, and GDP. These data were obtained from state and old

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[5] Industrial Directory 4th Edition, 1967 (Apapa: Federal Ministry of Information, 1967).

regional budgets, the state and federal Ministries of Finance, and calculated by CSNRD researchers.

The new data gathered from the surveys and budgets have been utilized with the other research data available to CSNRD to work out specific recommended policies and programs and to show the consequences of following three alternative development strategies. Non-computer simulation has been used to develop projections for 1970, 1975, and 1985 to quantify the consequences of the strategies through time.

The reconciliation procedure outlined in the first part of this chapter has been generally followed for the CSNRD recommended policies (Strategy II) to work out manpower and financial balances in the programs. As inconsistencies were uncovered, programs were revised and costs, revenue requirements, etc. were changed again and again until a final balanced set of suitable programs was developed. The seventh step on working out political feasibility, however, has not been carried out in this dissertation, but is presently being undertaken in Nigeria by other CSNRD members. In this dissertation, only first approximations of political feasibility have been discussed, and these have been based on past experience with Nigerian political decisions. These first approximations are based on the assumption that the 1966 (pre war) level and allocation of expenditures and revenues also would be feasible politically in future years. The evaluation of the feasibility of amounts greater than the 1966 level has been based on the size of the difference, political appeal of the programs, economic return and importance, and the availability of revenue. Calculations

also have been made to insure that enough revenue could be available to pay for these programs and that these expenditures would not place too heavy a burden on nonagricultural tax sources.

Strategies I and III have been simulated in much the same manner as the recommended one, except that the emphasis was on what would happen under these strategies without reconciling their bottlenecks. The reconciliation process has been used for these strategies only to expose weaknesses and inconsistencies, and no final reconciliation adjustments were made to develop balanced strategies. Had this been done, Strategies I and III would have been modified toward Strategy II.

The Development of Projections

Projections have been used throughout the next chapters of this dissertation and also in the CSNRD final report to quantify the results and requirements of the investment and educational programs for future time periods. The projections developed in this dissertation have been set up using 1966 as the base year and examine physical production, manpower, the costs of programs, and the needed and expected revenues by 1970, 1975, and 1985. The projections, together with other CSNRD projections including national accounts and the financial returns to the education—investment program, have been the primary source of data for performing the reconciliation work to 1985. These projections are vital in providing the needed quantitative data. However, as CSNRD points out

> It should be stressed that projections of this type cannot be highly objective statistical forecasts to which probabilities of different-sized errors can be attached. Nigerian data are not good enough for that (nor for that matter, are those of the developed countries). More importantly, historical data on

agricultural economies are not very relevant for projecting how those economies would perform if modernized.[6]

The general criteria for establishing these projections are based upon the following tests for objectivity:

1. Consistency--the projections must be consistent among themselves and with experience with the variables in the projections.

2. Clarity--the projections are clear if they can be understood and communicated from one person to another.

3. Workability--this is a pragmatic test which asks if the projections are representative of what can happen and useful for solving problems.

The projections have been developed through physical planning by taking specific proposals with respect to educational services and investments in production and infrastructure and deciding what can be done and by whom, rather than through the use of simplistic supply and demand elasticities or the use of simplistic ratios of extension workers to farm families. The projections on physical output, for example, were calculated from changes in acreage and yields that could be expected from specific programs and their payoffs, rather than derived from supply curve estimates or simplistic ratios. Simplistic historical ratios of extension workers to farm families have been rejected because of their lack of applicability to specific modern programs. The use of simple supply elasticities has been rejected because the problems

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[6]Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, CSNRD publication No. 33 (East Lansing: CSNRD, 1969) p. 62.

of asset fixity, imperfect knowledge, and lags in production after planting tree crops nearly eliminates their applicability in Nigeria.[7]

By giving specific attention to programatic details in developing these projections, the manpower and financial requirements and the benefits of the various programs can be calculated through time. These projections, therefore, become useful in establishing criteria for selecting programs and present the necessary quantification of the requirements and payoffs for policy implementation. In addition, these projections are very useful in differentiating between the outcomes of alternative strategies for development, such as the three strategies outlined by CSNRD.

The results of the reconciliation work and the projections developed for the three strategies are given in Chapters V and VI. In these chapters it is important to note that the figures cited are the final calculations, which for Strategy II are also the reconciled figures. Some of the adjustments necessary to complete the reconciliation work for Strategy II also are summarized in Chapter IV.

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[7]For a more complete discussion of the rejections of the use of simplistic supply elasticities see Glenn L. Johnson, et al., op. cit., pp. 39-40.

CHAPTER III

THE NIGERIAN AGRICULTURAL ECONOMY--ITS IMPORTANCE AND CHARACTERISTICS

The Importance of Agriculture in the Nigerian Economy[1]

As in most underdeveloped countries, agriculture is Nigeria's most important economic activity. Agriculture directly supports about four-fifths of the estimated population of 60 million and generates over half of the national income. Until the recent development of the petroleum industry, agricultural exports accounted for over 80 percent of all foreign exchange earnings as shown in Table 1. Agricultural exports also have been a major source of tax revenue, amounting to £20-25 million annually in recent years. In 1965-66, before the civil war, approximately £15.4 million or 10 percent of federal revenues came from agricultural products through export taxes. An additional £4.5 million was collected as produce purchase and other taxes for regional governments, and about £4 million was collected as marketing board trading profits. In late 1967 and in 1968, world prices for cocoa were very high, and the Western Nigeria marketing board trading profits from cocoa alone amounted to £10-15 million.

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[1]Much of the material in this chapter has been summarized from Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, CSNRD publication No. 33 (East Lansing: CSNRD, 1969), and was developed as a team effort rather than the work of any single individual.

Table 1. Value of Principal Exports from Nigeria, 1950-1967

Export Item	1950		1960		1962		1964		1966		1967	
	£000	Percent	£000	Percent	£000	Percent	£000	Percent	£000	Percent	£000	Percent
Cocoa	19.0	21.0	36.8	21.7	33.3	19.8	40.1	18.7	28.3	9.9	54.7	22.6
Oil palm products	28.8	31.9	40.0	23.6	25.8	15.3	31.7	14.8	37.8	13.3	13.8	5.7
Groundnut products	15.5	17.2	28.9	17.5	41.0	24.3	47.0	21.9	55.5	19.5	46.9	19.4
Rubber	2.8	3.1	14.2	8.3	11.4	6.7	11.0	5.1	11.5	4.1	6.3	2.6
Cotton	3.0	3.2	6.2	3.6	5.9	3.5	6.1	2.8	5.2	1.8	6.5	2.7
Other ag. exports	8.8	9.8	10.2	6.0	7.2	4.3	6.4	3.0	9.7	3.4	n.a.	n.a.
Subtotal agriculture	77.9	86.3	136.3	80.3	124.6	73.9	142.3	66.4	148.0	52.1	128.2	53.1
Petroleum	--	--	4.4	2.6	16.7	9.9	32.1	14.9	92.0	32.4	72.1	29.8
Other non-ag. exports	12.3	13.7	29.0	17.1	27.2	16.1	40.0	18.6	44.1	15.5	41.4	17.1
Total exports	90.2	100.0	169.7	100.0	168.5	100.0	214.4	100.0	284.1	100.0	241.7	100.0

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table III.1.

Characteristics of Nigerian Agriculture

The distribution of crop production is strongly influenced by rainfall and soil types. The principal ecological areas are shown in Figure 1. Of the major export crops, cocoa is mainly produced in the western moist forest, rubber in the central moist forest, and oil palm in all three moist forest zones, but mainly in the eastern zone. Groundnuts, and cotton are mostly grown in the dry and intermediate savannah areas. The chief food crops in the two northern ecological areas are guinea corn, millet, and some maize, although sugar cane, rice, vegetables and other fast growing crops are cultivated on flood lands along the rivers. In the four southern ecological zones, yams and cassava are the main crops, but maize, rice and fruits are also important.

Livestock production is carried on mainly in the northern states, as the prevalence of the tse-tse fly in the southern part of the country restricts livestock production in that area. Chickens and small goats, however, are found on most farms in the southern areas. The combined stock of all areas includes some 8 million head of cattle, 5.8 million sheep, 14 million goats, and 300,000-400,000 pigs. Most of Nigeria's sheep, cattle and goats are herded and grazed by nomadic Fulanis throughout the tse-tse fly-free areas of the northern states. Cow milk is sold throughout the north and each year a half million head are driven through tse-tse fly-free lanes to the southern areas of Nigeria and to Ghana.

The bulk of Nigeria's agricultural export and food output is produced on tiny plots of land by Nigerian peasant farmers. There

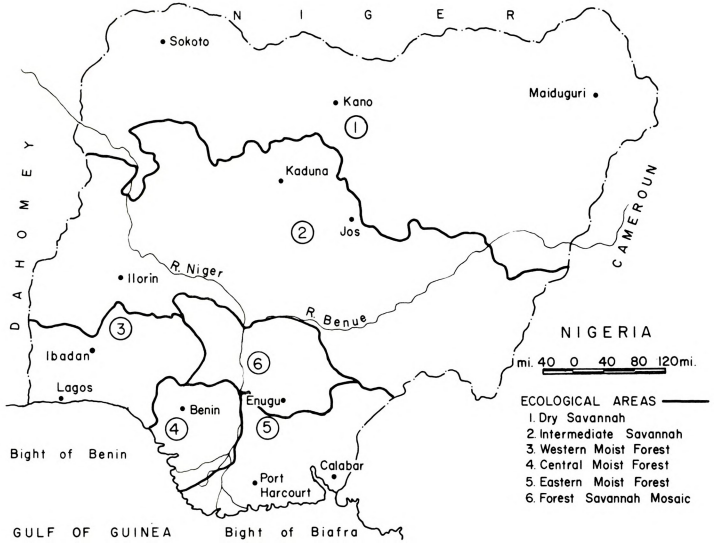

Figure 1. Ecological Zones of Nigeria

are about five million of these smallholders, who characteristically farm from two to ten acres of crops in the southern states, and eight or ten acres in the northern states. Intercropping is generally practiced whereby several crops are grown on the same land. Land often is rotated between periods of farming and idle use. Bush-fallow rotations are the major means of fertility maintenance and erosion control.

Farming techniques in both northern and southern areas are unsophisticated. The short-handled hoe is by far the most widely used farm implement. Recently ox-drawn plows and groundnut lifters have expanded in numbers in the tse-tse fly-free areas of the north, bot oxen use is still limited. Capital formation has been mainly from the labor of farmers, tree crops and traditional improvements. In the southern forest belt, much of the oil palm produced and even rubber is obtained from wild and semi-wild trees. Oil palm, major food crops, and groundnuts are produced by from one to two million growers. Cotton and cocoa are each grown by approximately 250,000 to 350,000 producers.

In general, land is abundant in Nigeria. Most of the land is controlled by villages or extended families, rather than by individuals. Long-term capital improvements on the land, such as planting tree crops, usually require communal approval and may involve sharing of the proceeds. Land for cultivation of annual food crops, on the other hand, is readily available and usually rent free. The modernization of agriculture has caused some modifications in the tenure system; some individuals have been able to obtain individual property rights

and titles to land for tree crop production.

With the abundance of suitable land in Nigeria, the greatest restriction on the expansion of output appears to be the low level of technology and economic incentives. The major cash crops are the export crops of cocoa, oil palm, rubber, cotton and groundnuts, all of which must be marketed through government controlled marketing boards. These crops, with the exception of rubber, are taxed heavily by the states and federal Nigerian governments through produce purchase taxes, export taxes, and marketing board trading profits. Only export levies are imposed on rubber when the price is above 18 pence per pound weight. As a results of this tax structure, Nigerian farmers often receive only 40-60 percent of the actual world price for these products. These low prices to farmers have reduced the profitability of cash crop farming, decreased incentives to expand output and adopt new technology, kept down the value of land and labor, and stimulated rural to urban migrations. The artifically reduced incomes of these farmers also have limited effective demand for goods produced in the nonagricultural sector and farm produced food crops.[2]

Food crop marketing is done through a network of traditional handlers who usually concentrate in village market places to sell their products. The traditional marketing system for food crops generally operates efficiently for small areas, but trade in food

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[2]This analysis on taxes, incentives, and production is based on observations and studies by the CSNRD research team and is summarized in Glenn L. Johnson, et al., op. cit., Chapters II and III.

crops between areas is limited. Gluts in one area may be accompanied by shortages in another, and differences in prices between large markets may not reflect transportation differences. The major bottleneck to expanding food crop production appears to be effective demand, as small increases in production output tend to break the price in Nigeria's thin food market.

The following excerpt from the CSNRD final report summarizes the performance of Nigerian agriculture:[3]

> Despite adverse tax treatment and pricing policies, growth of agricultural output in Nigeria compares favorably with that of many other developing countries. Since 1950, output of agricultural export products has grown at a compound annual rate of about 4.5 percent. Most of this growth has been accomplished by smallholders who pay heavy taxes on their export crops. However, the growth rate of export crops since 1963 has declined. The slow recent growth probably reflects the impact of the adverse treatment of Nigeria's private agricultural sector and the failure of its public agricultural sector in the area of direct production. Output of food crops has grown at about the same rate as pupulation. For the food crops, the increasing labor force has brought more land into cultivation to furnish the means for expanding output. Increased labor, modest purchases of fertilizer, pesticides and seeds, and additional land in crops have generated the growth of the export crops.

The Role of Government in Agriculture

The role of the Nigerian government in agriculture primarily has been the operation of marketing agencies, agricultural ministries, research centers, agricultural schools, and some large scale investments in direct agricultural production. Indirectly, the public

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[3] Ibid. p. 4.

sector also has developed an infrastructure of roads, rail lines, and port facilities to service agriculture.

Some of the most influential agencies in Nigeria are the produce marketing boards. The boards have been monopsony buyers of groundnuts, cocoa, oil palm, cotton, benniseed, soyabeans and several less important commodities for about 20 years. In recent years they have handled over £100 million annually. The marketing boards generally determine a fairly uniform price for each product shortly before the harvest season, and the actual collection and payment to the farmers is made through a network of licensed buying agents and their assistants. The produce is sold on the world market primarily through the related Nigerian Produce Marketing agency.

The primary function of the marketing boards originally was to stabilize producer prices. Gradually increased importance was placed on the collection of funds for developmental capital which has been used for both agricultural and nonagricultural development projects. The marketing boards have been quite successful in stabilizing prices and establishing produce grades, but also have had negative effects on agriculture.

> The boards have been severely criticized for inadequacies in management of their marketing functions, inadequate surveillance of the activities of the buying agents and produce inspectors and investment of resources in many poorly chosen development projects. Of even more importance is the role of marketing boards and governmental price and tax policies which have held down producer prices to farmers and thus restricted effective demand and producer incomes and depressed the values of production resources.[4]

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[4] Ibid., p. 3.

The Nigerian governments have assisted farmers through ministries of agriculture and related ministries which have provided crop extension services, livestock services, produce inspection, research, credit, and other assistance. Sprays and insecticides have been subsidized for use in cocoa production in western Nigeria and a large amount of fertilizers has been subsidized in the northern areas. In the southern areas, some work has been done to promote smallholder tree crop production. The southern governments also have attempted to develop farm settlements and government plantations. Because of excessive costs, political maneuvering, and poor location, however, these projects have been unsuccessful. The cost per farm settlement trainee sometimes has been as high as £5000[5] and some government plantations are estimated to be unable to cover variable costs, let alone developmental costs.[6]

For many years Nigeria has benefited from research centers located throughout the country. The major centers for the export crops are the Cocoa Research Institute of Nigeria at Ibadan, the Nigerian Institute for Oil Palm Research at Benin, the Institute of Agricultural Research at Samaru and the newly established Rubber Research Station at Iyanomo. Food crop research has been done at Moor Plantation, Ibadan, at Umudike in eastern Nigeria and at the

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[5]Dupe Olatunbosum, Nigerian Farm Settlements and School Leavers Farms--Profitability, Resource Use and Social-Psychological Considerations, CSNRD publication No. 9 (East Lansing: CSNRD, 1967).

[6]R. C. Saylor, A Study of Obstacles to Investment in Oil Palm and Rubber Plantations, CSNRD publication No. 15 (East Lansing: CSNRD, 1968).

Institute for Agricultural Research. In addition, some research is done by Nigerian universities and agricultural ministries. The total research expenditure in Nigeria in 1966 was about £4,000,000 but more senior scientists, funds and better coordination of research are needed.

Agricultural credit has not been very successful in Nigeria. To date, public credit programs have been fragmentary, expensive and ineffective. They have failed to serve the needs of the farming population and, in some instances, have been limited to collecting overdue loan repayments.

Nigeria's educational system is better developed than that of many developing countries in Africa. Before the outbreak of the civil war in 1966, four of Nigeria's five universities had agricultural faculties. The number of secondary schools is growing rapidly and universal primary education is a national goal. The distribution of schools within Nigeria is quite uneven, however, as a relatively larger number are located in the southern states.

Most people employed in agricultural services have been trained in specialized post-secondary school agriculture schools, rather than in universities. The subuniversity training institutions are summarized in Table 2. The most important schools have been those training crop extension workers, followed by those training livestock service personnel.

Present Employment and Training in Agriculture

The pattern of employment in the public agriculture sector is firmly established and quite well understood. Usually university

Table 2. Nigerian Subuniversity Agricultural Training Institutions

Type of school and level of training	Location[1]	Duration of training	Prerequisite education
Schools of agriculture (extension)			
Agricultural superintendent (AS)	Ibadan (W)	2 yr.	AA training
Asst. ag. superintendent (AAS)	Samaru (N)	2 yr.	"
	Umudike (E)	1 yr.	"
Agricultural assistant (AA)	Akure (W)	2 yr.	Secondary
	Kabba (N)	2 yr.	school
	Samaru (N)	2 yr.	graduate
	Umudike (E)	1 yr.	
Home economist	Ibadan (W)	2 yr.	"
	Samaru (N)	2 yr.	
Farm training centers (extension)	Northern		Primary school
Agricultural instructors (AI)	states	10 mo.	graduate
Animal health & husbandry schools			
Livestock superintendents (LS)	Ibadan (W)	2 yr.	LA training
	U. of Nigeria (E)	3 yr.	
	Vom (N)	2 yr.	
Livestock assistant (LA)	Ibadan (W)	2 yr.	Secondary
	Kaduna (N)	2 yr.	school
	Vom (N)	2 yr.	graduate
Forestry schools			
Forestry superintendent (FS)	Ibadan (W)	1 yr.	FA training
Forestry assistant (FA)	"	2 yr.	Sec. school grad.
Foresters	Naragute (N)	1 yr.	Pri. school grad.
Forest guards	"	6 mo.	"
Irrigation school			
Irrigation assistants	Sokoto (N)	2 yr.	Sec. school grad.
Farm institutes			
Young adults for careers in ag.	North	9 mo.	None
	West	2 yr.	"
Laboratory technology schools			
Technologists or superintendent	Kaduna (N)	2 yr.	Lab. tech. training
	Vom (N)	3 yr.	"
Technician	Kaduna (N)	2 yr.	Sec. school grad.

[1]The letters in parentheses stand for the location and area served by the training institution and represent the Western, Mid-western and Lagos States (W), the three eastern states (E), and the six northern states (N).

graduates hold the top administrative positions, although marketing positions are not always staffed by agricultural graduates. Beneath this level there are numerous positions staffed by crop extension and livestock personnel, some research and credit assistants, and development corporation employees with from one to four post-secondary-school years of training at specialized technical agricultural schools. The large remainder of workers are untrained or have had only superficial training for one or two months. Logistic support is given in the form of clerical work and sometimes transportation and housing.

Employment in the private agricultural sector consists mostly of untrained smallholder farmers and farm laborers and a few trained and untrained personnel hired by private firms. The nature of smallholder production already has been summarized in this chapter and will not be discussed further here. Employment and training requirements of private firms in agriculture, however, are not well understood and less well measured than employment and training in the public sector. Most private firms' investments in agriculture have been in 1) processing, distribution of agricultural supplies, and production of specialized crops and livestock throughout Nigeria, 2) in tanning, textiles, cotton ginning, and groundnut crushing in the six northern states and textiles in the Western state, and 3) in private plantations in the southern states. Because of the nature of their investments in agriculture, these firms will be referred to as agro-industry firms. Almost all of these firms are run by foreign expatriates, although some are owned jointly by expatriates and Nigerian development

corporations.

Presently the staffs of most of the agro-industry firms sampled in the Western and northern states consist of foreign expatriate managers, a few trained Nigerians, and a large cadre of semi-skilled or unskilled workers. This pattern also is followed in the Mid-western and eastern states although no survey was conducted in these states. Very few highly trained Nigerian agriculturalists were employed in the private sector in 1968, as shown in Table 3. Most of the people in Table 3 with university or subuniversity agricultural training were employed by firms either producing specialized crops or distributing agricultural inputs. Of these firms, the Nigerian Tobacco Company (NTC) is by far the largest employer of trained Nigerian agriculturalists. The NTC agriculturalists serve as private extension workers and quality control personnel in a successful, vertically integrated operation. On the input distribution side, large import companies employed university graduates and some subuniversity trained agriculturalists to act as area supervisors and salesmen for chemicals, feeds, and farm tractors and machinery. Other firms employing a few trained agriculturalists in 1968 or expressing a desire to hire them include breweries, processing firms, private plantations, and farms for vegetables, pigs and poultry. In the northern states the largest firms, which are engaged in textile manufacturing, groundnut crushing, cotton ginning, tanning, and handling hides and skins, do not employ trained agriculturalists. Instead they seek either unskilled laborers or those with mechanical skills like machinery operation and dying. The top management

Table 3. Private Sector Employment of Trained Nigerian Agriculturalists in the Western and Six Northern States of Nigeria, 1968

Level of training and area	Livestock	Agriculture	Food technology	Textile technology[1]
		Manpower numbers		
University graduates				
North	2	7	0	1
West	2	8	1	5
East[2]		7		
Subuniversity training				
North	10	43[3]	0	105
West	7	3	3	10
East	1	0		

[1]Incomplete sample. These employees require textile technology training (machine operation, dying, etc.) rather than agricultural training; only about one half of the textile firms were sampled.

[2]Staff reported as located in the eastern states by firms based either in the Western or northern states. No direct sampling was done in the eastern states or the Mid-western State.

[3]Includes 30 from tobacco schools.

Source: This survey of private sector employment was conducted in 1968 by the author. The firms sampled were chosen from the Nigerian Industrial Directory, 4th ed. 1967.

positions are staffed by foreign expatriates.

The few people in the private sector with agricultural training or mechanical skills have been trained chiefly by the private firms employing them. Most employees recieve on-the-job training while those requiring more sophisticated training in textile or leather technology usually are sent to Europe for 6 to 18 months training. The Nigerian Tobacco Company is the greatest exception; it trains its extension workers in Nigeria in its own subuniversity-level tobacco schools. With the expansion of the Nigerian university system, university graduates in agriculture recently have become available to the private sector, and many private companies are hiring them in small numbers.

Factors Restricting Employment in the Private Sector

Probably the most important factor restricting employment in the private sector is the present marketing and taxation system. The heavy taxation on the major cash crops reduces the profitability of their production and consequently 1) prevents trained agriculturalists from going into business for themselves, 2) reduces the demand for improved agricultural inputs, and 3) limits direct investment in private plantations and other production schemes for these crops. The low prices in turn require government distribution and price subsidies to get farmers to use fertilizer and chemicals, and discourage private industry from selling and distributing these inputs. Food processing and textile companies also are unable to integrate downward into production to improve the quality of the crops controlled by the marketing boards because all such produce must be sold only to the

boards. Finally, the typical Nigerian university graduates have a preference for public sector work because they assume it has greater security.

Agro-industry firms utilizing trained Nigerian agriculturalists, however, have been successful in production and processing of crops not controlled or heavily taxed by the marketing boards. Two good examples are tobacco and vegetables, where success of the Nigerian Tobacco Company and the Plateau Commodity Corporation respectively demonstrate that trained Nigerian agriculturalists can operate successfully in the private sector. Greater increases in private employment of trained agriculturalists would be possible if taxes and public input subsidies and distribution schemes were reduced or eliminated. Preference for employment in the public sector may continue, but good performance by the private sector and the recent filling of most existing government vacancies will increase the preferences of new Nigerian graduates for private employment.

Recent Political and Economic Changes In Nigeria Affecting Agriculture

Politically and economically Nigeria is undergoing the greatest changes in her history since independence. The most important changes are 1) the civil war, 2) the creation of 12 states, and 3) the exploitation of large petroleum reserves. The first event is the current civil war between the Federal Military Government and Biafra. This war is becoming long and costly, and has imposed tremendous hardships on both sides in manpower and property losses. When the end of the war comes, the reconstruction problems and the expenditures

needed to rebuild the destroyed property and develop new productive capacity will be substantial.

The four former political regions have been replaced by twelve smaller states, including three states in the former Eastern Region which is presently the battlefield of the civil war. Since their formal creation in 1966 many of the new state governments have shown remarkable progress and enthusiasm for establishing new government institutions and programs to serve their citizens.

Finally, the rapid expansion of petroleum production fortunately offers a vast potential for financing development and growth in Nigeria and should have a substantial role in financing the reconstruction period following the war and aiding development in future years. Pearson's careful analysis of Nigeria's petroleum industry indicates that government tax revenue from petroleum could increase to £200 million by 1973, or about eight times larger than present revenues from agricultural export crops.[7] In the next decade, petroleum production may account for as much as one tenth of total gross national product and ten times as much revenue as presently obtained from agriculture.

These changes, plus the pressing needs to improve income and employment levels in agriculture, present Nigerian planners with tremendous challenges and opportunities for developing agriculture. The political changes inherent in the new state structure and caused

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[7]Scott Pearson, "Nigerian Petroleum: Implications for Medium-term Planning", in Growth and Development of the Nigerian Economy, ed. by Carl K. Eicher, and E. Liedholm (East Lansing: Michigan State University Press, 1969).

by the civil war offer fresh opportunities for institutional and administrative changes that may never exist again for many years. The revenue available from petroleum may provide the means for rapidly modernizing agriculture and increasing incentives by allowing substantial reductions or elimination of the present tax structure on export crops.

CHAPTER IV

POLICIES AND PROGRAMS FOR INVESTMENTS IN PRODUCTION AND INFRASTRUCTURE IN NIGERIAN AGRICULTURE UNDER THREE ALTERNATIVE STRATEGIES FOR DEVELOPMENT: 1970-85

CSNRD investigators developed three broad development strategies to gain a wide perspective of the favorable and unfavorable alternatives for Nigerian agricultural development. These strategies represent respectively, 1) a continuation of present trends and policies in Nigerian agriculture, 2) a change to more favorable agricultural policies and programs and 3) harsher, more exploitive agricultural policies than presently followed in Nigeria. The purpose of this chapter is to summarize the agricultural production and infrastructure policies and programs under these alternative strategies. The policies and programs of the three strategies are the basis of the manpower and financial reconciliation work in the next two chapters.

The three alternative strategies for the development of Nigerian agriculture have been investigated by use of the reconciliation process described in Chapter II to uncover inconsistencies and imbalances among the programs and policies. The imbalances and inconsistencies for the CSNRD recommended policies and programs of Strategy II also have been reconciled according to the reconciliation process in order to develop overall manpower and financial consistency. The final reconciliation step to determine political acceptability is presently being undertaken in Nigeria by researchers, administrators, and decision-makers from Nigeria and other countries, but is not included as a part of this dissertation. For Strategy I and III, no attempt

was made specifically to reconcile the imbalances and inconsistencies because these two strategies do not represent balanced development approaches. The reconciliation process is useful in the disclosure of inconsistencies, strengths and weaknesses in these strategies rather than in reconciling inconsistencies. If the inconsistencies in these two strategies were reconciled, the strategies would have to be modified toward Strategy II and consequently would no longer represent the initial conditions of Strategy I and III.

The Three Alternative Strategies[1]

1. Alternative Strategy I: a continuation of present trends. This strategy has been included to show the probable effects of following Nigeria's present agricultural policies, as outlined in Chapter III. The assumptions of this strategy include a modest expansion in agricultural ministry services (primarily extension, veterinary, cooperatives, forestry, and produce inspection), although poor logistic support and lack of sufficient field work would continue to restrict the effectiveness of these services. Research efforts will increase slightly each year. Some limited programs for promoting smallholder production of tree crops would be undertaken in the southern states and a great variety of small, diversified projects would be promoted throughout Nigeria. Credit would remain expensive, inefficiently operated and meager. Export agriculture would

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[1]Summarized from Glenn L. Johnson, et al., Strategies and Recommendations of Nigerian Rural Development, CSNRD publication No. 33 (East Lansing: CSNRD, 1969), Chapter IV.

continue to be heavily taxed through the present taxes on export crop output, though some revenues would be returned to agriculture through services of the agricultural ministries, input subsidies, and other services. Government investments would continue to be focused on developing farm settlements and government plantations in the southern states and development of irrigation schemes would begin in the northern states. Food production and marketing would continue to be guided by the marketing mechanism, but marketing of export and import substitution crops would continue to be inefficient and hampered by corruption.

Employment in the public sector under this strategy would continue to require university agricultural degrees for a small number of positions, mainly administration. In addition, a considerable number of agricultural technical school graduates would be required for agricultural services. A large portion of the public sector staff, however, would be hired without specialized training. The majority of private sector personnel would remain unskilled. A small number would receive private training and a limited number of university and technical school graduates would be hired by agro-industry firms.

2. Alternative Strategy II: a change to more favorable policies and programs (the CSNRD recommendations). This strategy is a modification of present policies to make them more favorable to agriculture and is the strategy CSNRD researchers hope Nigerian decision-makers will choose to develop agriculture. It is based on intensive research by an interdisciplinary team over the 1965-1985 period and

has been developed into an overall set of balanced programs through the reconciliation process. The overall strategy recommended by CSNRD is twofold in nature.

> In the short run, we (CSNRD) recommend that Nigeria: 1) concentrate on the opportunities to expand agricultural export crop production and export earnings, (these opportunities arise out of restrictive pricing and taxation programs and marketing board practices which can be corrected), 2) distribute the resultant increases in income widely over a large number of rural people to provide the means of financing the expansion in production, to generate additional effective domestic demand for both farm and nonfarm products and to obtain a substantial increase in welfare for masses of her rural people.
>
> In the long run, our strategy involves much greater support for biological research to develop economically superior varieties of plants and animals. Here the need is particularly urgent with respect to food and feed crops, particularly the high protein food sources. Success in obtaining new biological technology will open up new opportunities particularly in the Savannahs of the middlebelt and northern areas to produce staple food and feed crops to supply the greater quantities which will be taken by domestic and foreign outlets at the lower costs of production and prices resulting from the improved technology.[2]

The investment recommendations for Strategy II are given in Table 4. CSNRD recommends that the estimated 5,000,000 smallholder Nigerian farmers be the central force for expanding commodity output over the 1970-1985 period because of their good performance in Nigeria in the past, even when heavily burdened with government taxes. Major emphasis therefore is placed upon smallholder campaign programs for increasing export crop production. The CSNRD investment and educational teams recommend that these campaigns be developed as a new package with new varieties, fertilizer and other inputs,

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[2] Ibid, p. 66.

Table 4. Strategy II: Type of Government Investment Activities Recommended to Facilitate Expansion of Nigerian Agriculture, by Commodity Groups in Nigeria, 1970-1985

Commodity group		
Export and import substitution commodities (e.g., cocoa, oil palm, groundnuts, sugar, cotton, kenaf)	Superior foods (e.g., rice, poultry, high lysine maize)	Staple foods and livestock (e.g., sorghum, millet, yam, wheat, cassava, cattle, sheep and goats)
Recommended Activity		
1. Organize and direct major commodity campaigns for cocoa, oil palm, groundnuts, and cotton	1. Organize and promote restricted production campaigns	1. Major government investments in research on plant and animal breeding to lower production costs by the 1975-1980 period
2. Invest in production of seedlings and in distribution of inputs--fertilizer, seeds, etc. until these services can be assumed by the private sector	2. Expand adaptive research on production and processing problems	2. Long term research on soil fertility, animal production, and animal diseases
3. Improve quality of technical assistance and expand credit to smallholders	3. Invest in human nutrition campaigns for both urban and rural people	3. Expand field research of fertilizer, animal power mechanization, farm level processing, etc.
4. Expand transport, feeder roads, port storage, etc.	4. Invest in joint public-private research to search for new markets in West Africa, Africa, and other nations for Nigerian agricultural products such as rice, livestock, etc.	
5. Improve competence of research staff at CRIN, NIFOR, etc.		
6. Expand research on rubber and initiate research on new crops--citrus, tea, etc.		

Source: Summarized from Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Chapters VI and VII.

and technical know-how being presented to the farmer to improve his production.[3] No specific production campaigns would be organized for food crops and livestock until research work has developed superior varieties of plants and animals, but diffusion of information on techniques and new varieties would be continued in a general extension framework. Research would be expanded as fast as available manpower would allow. Credit would be tied initially to the production campaigns and expanded to other agricultural production as state credit organizations become established. Export taxes and marketing board margins would be eliminated from the export crops, generally allowing farm prices to rise above recent levels, even after allowance was made for price effects of expanded production from the campaigns. Finally the government would phase out its investments in farm settlements and development corporation plantations, and restrict its investments in irrigation projects to those which clearly show high profitability.

The extension services would need to be expanded to support the production campaigns, as well as for continued general support of agricultural production. Extension education was chosen for these campaigns because extension is well suited for assisting smallholder production. In addition, an adequate base for extension services has already been developed in Nigeria. Extension work also provides

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[3]A summary of the acreage targets for the export crop production campaigns is given in Appendix A of this dissertation to provide a basis for calculating manpower and cost estimates in the next two chapters. The details and procedures for initiating these campaigns are outlined in the CSNRD final report, Glenn L. Johnson, et al., op cit., Chapter VII.

excellent opportunities for establishing demonstrations on farm land for food crops, and as such can adequately provide the educational services needed for both the export and food crop investments in the field. Qualitative changes in extension operations would be necessary, however, in order for the extension personnel to be effective in helping farmers improve their farming techniques.[4] These changes would include increases in incentives for good field performance, increases in the number of field staff, a higher percentage of trained field staff with eventual elimination of untrained personnel, and more logistic support for field operations. Changes in training have been recommended to decrease the time of training for agriculture assistants from two years to one year plus some time involved in gaining experience as an extension worker. It is also recommended that input distribution program be transferred to private firms. In addition, the phasing out of government farm settlements and plantations would release large amounts of capital funds and also some of the Ministries of Agriculture's trained staff for use in other work such as extension.

Strategy II would also promote the expansion of other agricultural services in addition to crop extension. Livestock training at the special livestock schools should continue, but changes in training priorities might be necessary if research were successful in providing the superior plant and animal varieties necessary to reorganize the present beef industry. Research and university faculties would

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[4]James M. Kincaid, Jr., Strategies for Improvements of Agricultural Extension Work and Subuniversity Agricultural Training in Nigeria, CSNRD publication No. 8 (East Lansing: CSNRD, 1968).

require sophisticated agricultural personnel with BSc and advanced degrees. Most BSc's would be trained in Nigerian universities, and overseas training should be relied upon for much of the post-graduate training in agriculture.[5] Research assistants could be trained in technical agriculture schools. Credit personnel would need a knowledge of agricultural production which could be gained from the agricultural schools and would also require some specialized training on credit. This specialized credit training could be given in special credit sessions at the technical schools of agriculture.

The educational system would need to train people for the private sector for the distribution and sales of agricultural inputs, direct production, and processing. This education could be provided effectively in the Nigerian universities and technical agricultural schools. Some of this training also could be provided by the private companies themselves.

3. Alternative Strategy III: a policy of taxing and controlling agricultural production severely while providing substantial agricultural services with the hope of generating substantial nonfarm development. This strategy can be illustrated by the agricultural policies in Argentina under Peron, in Ghana under Nkrumah, and in Guinea under Touré.[6]

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[5]James S. Long, Analysis of the Needs and Resources for University Education in Agriculture in Nigeria, CSNRD publication No. 28 (East Lansing: CSNRD, 1969).

[6]See Elliot J. Berg, "Socialism and Economic Development in Tropical Africa," Quarterly Journal of Economics, Vol. LXXVII, No. 4, (November, 1964), pp. 549-574, for an analysis of many of the important components of this kind of strategy. Berg also summarizes the difficulties in implementing this kind of strategy in Africa South of the Sahara.

CSNRD points out that "This strategy is followed by many countries and often purported to be the enlightened result of careful planning; however, it represents essentially a considerably more negative strategy for agriculture than Nigeria presently follows."[7] It assumes that Nigeria will pursue policies of cheap food for the urban-industrial consumers and maximum short-run extraction of income from agricultural to finance government sponsored projects and, possibly post war reconstruction. Direct public investment would be in such projects as resettlement schemes, uncoordinated research centers, service organizations with large staffs of civil servants to serve agriculture, and publically manage marketing facilities. Harsher taxation policies would be applied to export agriculture and additional governmental policies imposing price ceilings, resource allocation controls, and food rationing would cause the production, distribution and consumption of both food and export crops to be placed under the control of government agencies. Support for agricultural research and education would be about the same or lower than under Strategy I but would be less effectively organized. Priorities of Strategy III would be on staple food production first, and export crops last.

Strategy III calls for a large government bureaucracy to staff and maintain control of the large number of government projects. Educational policies under this strategy would be similar to Strategy I,

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[7]Glenn L. Johnson, et. al., op cit. p. 61.

although employment of trained agriculturalists in the private sector would be greatly restricted, and many more nonagriculturally trained and untrained people would be employed in the public sector.

The effects on export crop production of following the investments outlined under these three strategies are projected to 1985 by commodity in Tables B.1 to B.5 of Appendix B of this dissertation. These tables are the basis for computing the foreign exchange earnings, farmer incomes, and government revenue from export crops, as summarized in Tables C.1 to C.5 of Appendix C, which in turn are used in Chapter VI in determining economic and financial feasibility of the three strategies. The physical production tables in Appendix B also serve as guidelines for establishing manpower requirements for agriculture in Chapter V.

CHAPTER V

MANPOWER FOR NIGERIAN AGRICULTURE

The purpose of this chapter is the determination of the quality and quantity of trained manpower needed in agriculture under the three strategies and the investigation of the feasibility of training the manpower within the time and financial constraints facing Nigeria. The educational services required for the three strategies, summarized in Chapter IV, show that manpower would be needed with three levels of training:

1. Subuniversity diploma or certificate training is required for most agricultural extension and livestock personnel and some personnel for other agricultural ministry departments, development corporations, research, credit, and the private sector. With the exception of livestock service personnel, (who are trained at special livestock schools) these people should be trained in the present schools of agriculture or farm training centers (for agricultural instructors in the northern states only).

2. University B.Sc. training is needed for top level positions in agricultural ministries, marketing, credit, research, university education, development corporations, and private industry. Most of the required people with B.Sc. degrees can be trained by the faculties of agriculture in Nigerian universities.

3. University MSc. and Ph.D. degree people are needed by the agricultural university faculties and research organizations. These

may be trained both in Nigeria and overseas.

Two conditions must be satisfied to assure that the needed personnel could be trained. First, sufficient people must be available with the prerequisite education necessary to enter the institutions providing the training. Secondly, the present institutions must have either sufficient capacity to train the needed manpower or can be modified sufficiently to provide this training. In Nigeria, the first condition should present no problem as sufficient people appear to be available with the education prerequisite to enter the agricultural training institutions. Entry into both the universities and most of the subuniversity technical schools requires a secondary school education (high school level). Presently there are numerous secondary school leavers in the southern states looking for employment and advanced training. In the northern states, there are fewer secondary schools and graduates, but sufficient numbers of graduates are available to fill the positions in agriculture requiring university or subuniversity training. The agricultural instructors of the extension staffs in the northern states need only a primary school education and should present no training problems as there are enough primary school graduates to fill these positions. The second condition of sufficient training capacities in the agricultural education institutions will be examined in this chapter by determining the necessary staff numbers and training requirements, and then reconciling the total training requirements with feasible outputs from the corresponding training institutions for each kind and level of training.

Subuniversity Training

This section will examine only the training requirements for subuniversity graduates from the technical agricultural schools (presently called Ministry Schools of Agriculture) as most of the subuniversity trained personnel needed for the three strategies will require training in these institutions. Subuniversity training in institutions other than the technical agricultural schools (livestock, forestry, irrigation) should continue. This type of training, however, will not be examined in this dissertation as no major increases in the needs for these services are projected and the present schools providing this training should be able to supply the manpower needed in future years.

Agricultural extension personnel trained in crop production form the most important staff category requiring training in the technical agricultural schools under all three strategies. They are especially important for the CSNRD programs (Strategy II) because of the heavy emphasis on production campaigns and direct assistance to smallholder farmers.

The staff positions for extension workers are given in Tables 5 to 7 for the three alternative strategies.[1] The entire extension staff has been listed in these tables to give a complete picture of its size and composition. In addition to the agricultural superintendents (AS), agricultural assistants (AA), and agricultural instructors (AI-north only) requiring technical agricultural training,

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[1]Much assistance in projecting the employment and training for subuniversity trained agriculturalists was provided by James M. Kincaid, Jr.

Table 5. Strategy I: Employment of Total Agricultural Crop Extension Staff, Nigeria by Area and Staff Category, 1966 and Projections for 1970, 1975, and 1985[1]

Area and year	Agricultural officer (AO)	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer or agricultural instructor (FO/AI)	Total
	Manpower numbers				
Western and Lagos States					
1966	54	109	244	611	1,018
1970	60	123	275	688	1,146
1975	70	143	319	797	1,329
1985	94	192	429	1,071	1,786
Mid-western State					
1966	14	47	156	230	447
1970	16	53	176	259	504
1975	19	61	204	300	584
1985	26	82	274	403	785
Eastern states					
1966	74	156[2]	653[2]	395	1,278
1970	83	156[2]	653[2]	445	1,337
1975	96	203	852	516	1,667
1985	129	274	1,145	692	2,240
Northern states					
1966	34	155	400	835	1,424
1970	38	174	450	939	1,601
1975	44	202	520	1,086	1,852
1985	59	271	700	1,461	2,491
Total Nigeria					
1966	176	467	1,453	2,071	4,167
1970	197	506	1,554	2,331	4,588
1975	229	609	1,895	2,699	5,432
1985	308	819	2,548	3,627	7,302

[1] Projected at 3 percent net increase per year.

[2] Not increased because of the high loss of staff likely in the eastern states.

Table 6. Strategy II: Employment of Total Agricultural Crop Extension Staff, Nigeria by Area and Staff Category, 1966 and Projections for 1970, 1975, and 1985[1]

Area and year	Agricultural officer (AO)	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer[2] or agricultural instructor (FO/AI)	Total
	Manpower numbers				
Western and Lagos States					
1966	54	109	244	611	1,018
1970	65	109	615	243	1,032
1975	67	107	1,110	145	1,429
1985	69	157	1,713	60	1,999
Mid-western State					
1966	14	47	156	230	447
1970	16	47	295	93	451
1975	18	52	544	60	674
1985	24	67	760	25	876
Eastern states					
1966	74	156	653	395	1,278
1970	84	169	750	516	1,519
1975	100	170	1,438	115	1,823
1985	105	191	2,500	60	2,856
Northern states					
1966	34	155	400	835	1,424
1970	50	205	619	1,200	2,074
1975	85	265	817	2,056	3,223
1985	105	252	1,337	1,249	2,943
Total Nigeria					
1966	176	467	1,453	2,071	4,167
1970	215	530	2,279	2,052	5,076
1975	270	594	3,909	2,376	7,149
1985	303	667	6,310	1,394	8,674

[1] These figures include moderate staff allowances for food and feed production campaigns from 1976-1985.

[2] Field overseers are used in southern states while agricultural instructors are employed in the northern states.

Table 7. Strategy III: Employment of Total Agricultural Crop Extension Staff, Nigeria by Area and Staff Category, 1966 and Projections for 1970, 1975, and 1985[1]

Area and year	Agricultural officer (AO)	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer or agricultural instructor (FO/AI)	Total
	Manpower numbers				
Western and Lagos States					
1966	54	109	244	611	1,018
1970	49	98	220	550	917
1975	57	114	255	637	1,063
1985	77	153	343	852	1,425
Mid-western State					
1966	14	47	156	230	447
1970	13	42	140	207	402
1975	15	49	162	240	466
1985	20	66	218	321	625
Eastern states					
1966	74	156	653	395	1,278
1970	67	140	588	355	1,150
1975	78	162	682	411	1,333
1985	105	217	917	552	1,791
Northern states					
1966	34	155	400	835	1,424
1970	31	139	360	751	1,281
1975	36	161	418	871	1,486
1985	48	215	560	1,167	1,990
Total Nigeria					
1966	176	467	1,453	2,071	4,167
1970	160	419	1,308	1,863	3,750
1975	186	486	1,517	2,159	4,348
1985	250	651	2,038	2,892	5,831

[1] Projected at 10 percent reduction in staff by 1970 and 3 percent net increase per year thereafter.

the table includes agricultural officers and field overseers. The agricultural officers require university degrees and will be considered later under university education. The field overseers require no formal training.

The staff positions and the training requirements in the following tables have been calculated for three training areas because the technical agricultural schools were originally organized to serve these areas. These areas represent 1) the six northern states, 2) the Western, Lagos and Mid-western States, and 3) the three eastern states.

In Table 5 the staff positions for Strategy I have been calculated by increasing each staff category by 3 percent per year. This rate of growth is consistent with a continuation of the present trends in the extension services and follows approximately the present population growth rate.

Extension staff requirements for Strategy II, shown in Table 6, have been calculated on the basis of 1) the number of persons necessary to staff the recommended export crop production campaigns together with 2) enough staff to provide suitable general extension work, including food crop promotion. Instead of expanding staff numbers by some general desired ratio of extension workers to farm families, CSNRD researchers determined how many extension workers would be required to serve effectively the recommended programs. In staffing the campaigns for export and import substitution crops, CSNRD researchers gave consideration to the size of the program, the number of farms, the number of years the farmers would be in the program, and the

anticipated problems in getting farmers to adopt the new technology.[2] Initially, the extension workers would concentrate on working with the most responsive farmers. One extension worker would begin working with about 50 responsive farmers in the groundnut and cotton campaigns and about 40 responsive farmers for tree crops. As the campaigns gained momentum and the farmers gained more experience with the new technology, each extension worker could work with more farmers, reaching a maximum of about 250 farmers per extension worker in the cotton and groundnut campaigns and 90 farmers in the tree crop campaigns.

Under Strategy II, CSNRD recommends strong efforts to expand field staff numbers and to provide them with better training and logistic support. The field overseers in the southern states would be quickly upgraded through training and the category eliminated. The majority of agricultural instructors in the northern states would be upgraded after 1975. Nearly all of the overall increase in staff would be in the categories of agricultural assistants and agricultural instructors for field work. A manpower analysis has not been carried out for the production campaigns, but would be required if new biological research developed new technology for food crops, livestock and nutritionally superior food production. However, some extension workers for these campaigns have been included in the manpower figures covering 1975 to 1985. Additional manpower for these campaigns could be trained by the present Nigerian agricultural education

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[2]See Appendix E for the staffing requirements for the export crop campaigns.

system if adequate financing were forthcoming.

Strategy III manpower requirements are given in Table 7. These requirements are based on a 10 percent decrease in the extension staff by 1970 followed by 3 percent per year increase in each staff category from 1970 onward. This staffing pattern is consistent with an unfavorable agricultural policy that would freeze present positions until 1970, allowing for no staff increases or promotions during this period. A normal attrition rate of 3 percent per year then would reduce staff members by about 10 percent by 1970. Indications of adopting this policy already have been given by some of the new states.

Training Requirements

The projections of training requirements for subuniversity crop extension personnel have been calculated in Table 8 through 10 for the three strategies. These calculations are based upon new staff positions needed for the extension services, and include allowances for a 3 percent per year rate of replacement. Promotions also have been included as all AS's and AAS's must come from the AA category, and many AA's can come from the FO or AI category. Because of the civil war, a 35 percent replacement of the extension personnel for the eastern area has been assumed for the 1966-1970 period only, with 3 percent per year used thereafter.

Graduates from the technical agricultural schools would be needed for non-extension positions in the public sector and for private employment in addition to the extension service work. In Tables 11 to 13 the total overall training requirements for technical agricultural graduates are projected for the three alternative

Table 8. Strategy I, Subuniversity Agricultural Crop Extension Technical Manpower: Employment (1966) and Projected Employment and Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer, or agricultural instructor (FO/AI)	Total
	Manpower numbers			
Western, Lagos, and Mid-western States				
1966				
Staff employment	156	400	841	1,397
1967-70				
Staff employed by 1970	176	451	947	1,574
New positions	20	51	106	
Staff upgrading[1]	0	40	0	
Replacement[2]	20	51	106	
Total training requirement	40	142	212	394
1971-75				
Staff employed by 1975	204	523	1,097	1,824
New positions	28	72	150	
Staff upgrading	0	56	10	
Replacement	28	72	150	
Total training requirement	56	200	310	566
1976-85				
Staff employed by 1985	274	703	1,474	2,451
New positions	70	180	377	
Staff upgrading	0	140	50	
Replacement	70	180	377	
Total training requirement	140	500	804	1,444
Eastern states				
1966				
Staff employment	156	653	395	1,204
1967-70				
Staff employed by 1970	156	653	445	1,254
New positions	0	0	50	
Staff upgrading	0	55	0	
Replacement	55	228	138	
Total training requirement	55	283	188	526
1971-75				
Staff employed by 1975	203	852	516	1,571
New positions	47	199	71	
Staff upgrading	0	74	20	
Replacement	27	112	71	
Total training requirement	74	385	162	621
1976-85				
Staff employed by 1985	274	1,145	692	2,111
New positions	71	293	176	
Staff upgrading	0	142	50	
Replacement	71	293	176	
Total training requirement	142	728	402	1,272

[1] Refers to upgrading requiring additional educational training in agriculture.

[2] Three percent replacement per year for all areas and years except 35 percent for 1967 to 1970 for the eastern states.

Table 8. (continued)

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer, or agricultural instructor (FO/AI)	Total
		Manpower numbers		
Northern states				
1966				
Staff employment	155	400	835	1,390
1967-70				
Staff employed by 1970	174	450	939	
New positions	19	50	104	
Staff upgrading	0	38	0	
Replacement	19	50	104	
Total training requirement	38	138	208	384
1971-75				
Staff employed by 1975	202	520	1,086	1,808
New positions	28	70	147	
Staff upgrading	0	56	20	
Replacement	28	70	147	
Total training requirement	56	196	314	566
1976-85				
Staff employed by 1985	271	700	1,461	2,432
New positions	69	180	375	
Staff upgrading	0	138	60	
Replacement	69	180	375	
Total training requirement	138	498	810	1,446
Total Nigeria				
1966				
Staff employment	467	1,453	2,071	3,991
1967-70				
Staff employed by 1970	506	1,554	2,331	4,391
New positions	39	101	260	
Staff upgrading	0	133	0	
Replacement	94	329	348	
Total training requirement	133	563	608	1,304
1971-75				
Staff employed by 1975	609	1,895	2,699	
New positions	103	341	368	
Staff upgrading	0	186	50	
Replacement	83	254	368	
Total training requirement	186	781	786	1,753
1976-85				
Staff employed by 1985	819	2,548	3,627	6,994
New positions	210	653	928	
Staff upgrading	0	420	160	
Replacement	210	653	928	
Total training requirement	420	1,726	2,016	4,162

Table 9. Strategy II, Subuniversity Agricultural Crop Extension Technical Manpower: Employment (1966) and Projected Employment and Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer, or agricultural instructor (FO/AI)	Total
	Manpower numbers			
Western, Lagos, and Mid-western States				
1966				
Staff employment	156	400	841	1,397
1967-70				
Staff employed by 1970	156	910	336	1,402
New positions	0	510	-505	
Staff upgrading[1]	0	26	434	
Replacement[2]	18	79	71	
Total training requirement	18	615	0	633
1971-75				
Staff employed by 1975	159	1,654	205	2,018
New positions	3	744	-131	
Staff upgrading	0	37	91	
Replacement	23	196	40	
Total training requirement	26	977	0	1,003
1976-85				
Staff employed by 1985	224	2,473	85	2,782
New positions	65	819	-120	
Staff upgrading	0	177	76	
Replacement	76	599	44	
Total training requirement	141	1,595	0	1,736
Eastern states				
1966				
Staff employment	156	653	395	1,204
1967-70				
Staff employed by 1970	169	750	516	1,435
New positions	13	97	121	
Staff upgrading	0	75	50	
Replacement	58	228	138	
Total training requirement	71	400	309	780
1971-75				
Staff employed by 1975	170	1,438	115	1,723
New positions	1	688	-401	
Staff upgrading	0	29	347	
Replacement	25	164	54	
Total training requirement	26	881	0	907
1976-85				
Staff employed by 1985	191	2,500	60	2,751
New positions	21	1,062	-55	
Staff upgrading	0	100	25	
Replacement	61	591	30	
Total training requirement	82	1,753	0	1,835

[1] Refers to upgrading requiring additional educational training in agriculture.

[2] Three percent replacement per year for all areas and years except 35 percent for 1967 to 1970 for the eastern states.

Table 9. (continued)

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer or agricultural instructor (FO/AI)	Total
		Manpower numbers		
Northern states				
1966				
Staff employment	155	400	835	1,390
1967-70				
Staff employed by 1970	205	619	1,200	2,024
New positions	50	219	365	
Staff upgrading	0	77	98	
Replacement	22	60	122	
Total training requirement	72	356	585	1,013
1971-75				
Staff employed by 1975	265	817	2,056	3,138
New positions	60	198	856	
Staff upgrading	0	106	150	
Replacement	35	107	244	
Total training requirement	95	411	1,250	1,756
1976-85				
Staff employed by 1985	252	1,337	1,249	2,838
New positions	-13	520	-807	
Staff upgrading	0	80	600	
Replacement	78	321	495	
Total training requirement	65	921	288	1,274
Total Nigeria				
1966				
Staff employment	467	1,453	2,071	3,991
1967-70				
Staff employed by 1970	530	2,279	2,052	4,861
New positions	63	826	-19	
Staff upgrading	0	178	582	
Replacement	98	367	331	
Total training requirement	161	1,371	894	2,426
1971-75				
Staff employed by 1975	594	3,909	2,376	6,879
New positions	64	1,630	324	
Staff upgrading	0	172	588	
Replacement	83	467	338	
Total training requirement	147	2,269	1,250	3,666
1976-85				
Staff employed by 1985	667	6,310	1,394	8,371
New positions	73	2,401	-982	
Staff upgrading	0	357	701	
Replacement	215	1,511	569	
Total training requirement	288	4,269	288	4,845

Table 10. Strategy III, Subuniversity Agricultural Crop Extension Technical Manpower: Employment (1966) and Projected Employment and Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer or agricultural instructor (FO/AI)	Total
	Manpower numbers			
Western, Lagos, and Mid-western States				
1966				
Staff employment	156	400	841	1,397
1967-70				
Staff employed by 1970	140	360	757	1,257
New positions	-16	-40	-84	
Staff upgrading[1]	0	3	0	
Replacement[2]	19	46	93	
Total training requirement	3	9	9	21
1971-75				
Staff employed by 1975	163	417	877	1,457
New positions	23	57	120	
Staff upgrading	0	46	0	
Replacement	23	57	120	
Total training requirement	46	160	240	446
1976-85				
Staff employed by 1985	219	561	1,173	1,953
New positions	56	144	296	
Staff upgrading	0	112	0	
Replacement	56	144	296	
Total training requirement	112	400	592	1,104
Eastern states				
1966				
Staff employment	156	653	395	1,204
1967-70				
Staff employed by 1970	140	588	355	1,083
New positions	-16	-65	-40	
Staff upgrading	0	39	0	
Replacement	55	228	138	
Total training requirement	39	202	98	339
1971-75				
Staff employed by 1975	162	682	411	1,255
New positions	22	94	56	
Staff upgrading	0	44	0	
Replacement	22	94	56	
Total training requirement	44	232	112	388
1976-85				
Staff employed by 1985	217	917	552	1,686
New positions	55	235	141	
Staff upgrading	0	110	0	
Replacement	55	235	141	
Total training requirement	110	580	282	972

[1] Refers to upgrading requiring additional educational training in agriculture.

[2] Three percent replacement per year for all areas and years except 35 percent for 1967 to 1970 for the eastern states.

Table 10. (continued)

Area, year, employment, and training needs	Agricultural superintendent, asst. ag. supt. (AS + AAS)	Agricultural assistant (AA)	Field overseer, or agricultural instructor (FO/AI)	Total
		Manpower numbers		
Northern states				
1966				
Staff employment	155	400	835	1,390
1967-70				
Staff employed by 1970	139	360	751	1,250
New positions	-16	-40	-84	
Staff upgrading	0	3	0	
Replacement	19	46	95	
Total training requirement	3	9	11	23
1971-75				
Staff employed by 1975	161	418	871	1,450
New positions	22	58	120	
Staff upgrading	0	44	0	
Replacement	22	58	120	
Total training requirement	44	160	240	444
1976-85				
Staff employed by 1985	215	560	1,167	1,942
New positions	54	142	296	
Staff upgrading	0	108	0	
Replacement	54	142	296	
Total training requirements	108	392	592	1,092
Total Nigeria				
1966				
Staff employment	467	1,453	2,071	3,991
1967-70				
Staff employed by 1970	419	1,308	1,863	3,590
New positions	-48	-145	-208	
Staff upgrading	0	45	0	
Replacement	93	320	326	
Total training requirement	45	220	118	383
1971-75				
Staff employed by 1975	486	1,517	2,159	4,162
New positions	67	209	296	
Staff upgrading	0	134	0	
Replacement	67	209	296	
Total training requirement	134	552	592	1,278
1976-85				
Staff employed by 1985	651	2,038	2,892	5,581
New positions	165	521	733	
Staff upgrading	0	330	0	
Replacement	165	521	733	
Total training requirement	330	1,372	1,466	3,168

Table 11. Strategy I, Total Manpower from Technical Schools of Agriculture: Employment (1966) and Projected Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Areas, years, and staff category	Agricultural crop extension[1]	Other public sector	Private	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
Western, Lagos, and Mid-western States					
Staff employed in 1966					
AS & AAS	156	31	2		54
AA	400	123	26		197
FO	841	n.a.	n.a.		n.a.
Total	1,397	154	28		
New trainees, 1967-70					
AS & AAS	40	8	1	49	12
AA	142	30	10	182	46
FO	212	n.a.	n.a.	212	n.a.
Total	394	38	11	443	
New trainees, 1971-75					
AS & AAS	56	10	5	71	14
AA	200	45	29	274	55
FO	310	n.a.	n.a.	310	n.a.
Total	566	55	34	655	
New trainees, 1976-85					
AS & AAS	140	27	8	175	18
AA	500	110	42	652	65
FO	804	n.a.	n.a.	804	n.a.
Total	1,444	137	50	1,631	
Eastern states					
Staff employed in 1966					
AS & AAS	156	10	2		28
AA	653	94	38		206
FO	395	n.a.	n.a.		n.a.
Total	1,204	104	40		
New trainees, 1967-70					
AS & AAS	55	3	1	59	30[2]
AA	283	23	15	321	161[2]
FO	188	n.a.	n.a.	188	n.a.
Total	526	26	16	568	
New trainees, 1971-75					
AS & AAS	74	3	6	83	17
AA	385	34	27	446	89
FO	162	n.a.	n.a.	162	n.a.
Total	621	37	33	691	
New trainees, 1976-85					
AS & AAS	142	8	8	158	16
AA	728	85	50	863	87
FO	402	n.a.	n.a.	402	n.a.
Total	1,272	93	58	1,423	

n.a. - not applicable as field overseers in the southern states require no formal agricultural training. The field overseer figures for extension were included to indicate staffing patterns.

[1] Taken from Table 8.

[2] The output figures for the eastern states for 1967-70 represent an average for the two years 1969 and 1970 only.

Table 11. (continued)

Area, years, and staff category	Agricultural crop extension	Other public sector	Private	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
Northern states					
Staff employed in 1966					
AS & AAS	155	12	3		19
AA	400	60	15		133
AI	835	56	10		272
Total	1,390	128	28		
New trainees, 1967-70					
AS & AAS	38	3	1	42	11
AA	138	16	13	167	42
AI	208	15	6	229	57
Total	384	34	20	438	
New trainees, 1971-75					
AS & AAS	56	5	5	66	13
AA	196	22	31	249	50
AI	314	20	25	359	72
Total	566	47	61	674	
New trainees, 1976-85					
AS & AAS	138	10	7	155	16
AA	498	55	47	600	60
AI	810	51	34	895	90
Total	1,446	116	88	1,650	
Total Nigeria					
Staff employed in 1966					
AS & AAS	467	53	7		101
AA	1,453	277	79		536
FO/AI	2,071	56	10		272
Total	3,991	386	96		
New trainees, 1967-70					
AS & AAS	133	14	3	150	53
AA	563	69	38	670	249
FO/AI	608	15	6	629	57
Total	1,304	98	47	1,449	
New trainees, 1971-75					
AS & AAS	186	18	16	220	44
AA	781	101	87	969	194
FO/AI	786	20	25	831	72
Total	1,753	139	128	2,020	
New trainees, 1976-85					
AS & AAS	420	45	23	488	50
AA	1,726	250	139	2,115	212
FO/AI	2,016	51	34	2,101	90
Total	4,162	346	196	4,704	

Table 12. Strategy II, Total Manpower from Technical Schools of Agriculture: Employment (1966) and Projected Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Area, years, and staff category	Agricultural crop extension[1]	Other public sector	Private	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
Western, Lagos and Mid-western States					
Staff employed in 1966					
AS & AAS	156	31	2		54
AA	400	123	26		197
FO	841	n.a.	n.a.		n.a.
Total	1,397	154	28		
New trainees, 1967-70					
AS & AAS	18	8	3	29	7
AA	615	30	33	678	170
FO	0	n.a.	n.a.	0	n.a.
Total	633	38	36	707	
New trainees, 1971-75					
AS & AAS	26	10	12	48	10
AA	977	145	125	1,247	249
FO	0	n.a.	n.a.	0	n.a.
Total	1,003	155	137	1,295	
New trainees, 1976-85[2]					
AS & AAS	141	27	22	190	19
AA	1,595	310	232	2,137	214
FO	0	n.a.	n.a.	0	n.a.
Total	1,736	337	254	2,327	
Eastern states					
Staff employed in 1966					
AS & AAS	156	10	2		28
AA	653	94	38		206
FO	395	n.a.	n.a.		n.a.
Total	1,204	104	40		
New trainees, 1967-70					
AS & AAS	71	4	0	75	38[3]
AA	400	40	14	459	226[3]
FO	309	n.a.	n.a.	309	152[3]
Total	780	44	14	838	
New trainees, 1971-75					
AS & AAS	26	3	14	43	9
AA	881	134	122	1,137	227
FO	0	n.a.	n.a.	0	n.a.
Total	907	137	136	1,180	
New trainees, 1976-85[2]					
AS & AAS	82	8	22	112	11
AA	1,753	285	215	2,253	225
FO	0	n.a.	n.a.	0	n.a.
Total	1,835	293	237	2,365	

n.a. - not applicable as field overseers in the southern states require no formal agricultural training. The field overseer figures for extension were included to indicate staffing patterns.

[1] Taken from Table 9.

[2] Moderate staff allowances have been made for food and feed production campaigns from 1976-1985.

[3] The output figures from the eastern states for 1967-70 represent an average for the two years 1969 and 1970 only. The average annual output figure for field overseers was included to quantify these temporary positions under Strategy II in the eastern states from 1967-70 only.

Table 12. (continued)

Area, years, and staff category	Agricultural crop extension	Other public sector	Private	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
Northern states					
Staff employed in 1966					
AA & AAS	155	12	3		19
AA	400	60	15		133
AI	835	56	10		272
Total	1,390	128	28		
New trainees, 1967-70					
AA & AAS	72	5	2	79	20
AA	356	23	20	399	100
AI	585	23	5	613	153
Total	1,013	51	27	1,091	
New trainees, 1971-75					
AA & AAS	95	7	17	119	24
AA	411	135	118	664	133
AI	1,250	35	62	1,347	270
Total	1,756	177	197	2,130	
New trainees, 1976-85[2]					
AA & AAS	65	15	29	109	11
AA	921	280	246	1,447	144
AI	288	79	263	630	63
Total	1,274	374	538	2,186	
Total Nigeria					
Staff employed in 1966					
AA & AAS	467	53	7		101
AA	1,453	277	79		536
FO/AI	2,071	56	10		272
Total	3,991	386	96		
New trainees, 1967-70					
AA & AAS	161	17	5	183	65
AA	1,371	93	67	1,531	496
FO/AI	894	23	5	922	305
Total	2,426	133	77	2,636	
New trainees, 1971-75					
AA & AAS	147	20	43	210	43
AA	2,269	414	365	3,048	609
FO/AI	1,250	35	62	1,347	270
Total	3,666	469	470	4,605	
New trainees, 1976-85[2]					
AA & AAS	288	50	73	411	41
AA	4,269	875	693	5,837	584
FO/AI	288	79	263	630	63
Total	4,845	1,004	1,029	6,878	

Table 13. Strategy III, Total Manpower from Technical Schools of Agriculture: Employment (1966) and Projected Training Requirements, Nigeria by Training Area and Staff Category, 1967-1985

Area, years, and staff category	Agricultural crop extension[1]	Other public sector	Private	Training requirements: Total for period	Average annual during period
	Manpower numbers				
Western, Lagos, and Mid-western States					
Staff employed in 1966					
AS & AAS	156	31	2		54
AA	400	123	26		197
FO	841	n.a.	n.a.		n.a.
Total	1,397	154	28		
New trainees, 1967-70					
AS & AAS	3	0	1	4	1
AA	9	1	6	16	4
FO	9	n.a.	n.a.	9	n.a.
Total	21	1	7	29	
New trainees, 1971-75					
AS & AAS	46	9	4	59	12
AA	160	36	22	218	42
FO	240	n.a.	n.a.	240	n.a.
Total	446	45	26	517	
New trainees, 1976-85					
AS & AAS	112	22	6	140	14
AA	400	88	39	527	53
FO	592	n.a.	n.a.	592	n.a.
Total	1,104	110	45	1,259	
Eastern states					
Staff employed in 1966					
AS & AAS	156	10	2		28
AA	653	94	38		206
FO	395	n.a.	n.a.		n.a.
Total	1,200	104	40		
New trainees, 1967-70					
AS & AAS	39	0	1	40	20[2]
AA	202	1	14	217	109[2]
FO	98	n.a.	n.a.	98	n.a.
Total	339	1	15	355	
New trainees, 1971-75					
AS & AAS	44	3	7	54	11
AA	232	27	19	278	56
FO	112	n.a.	n.a.	112	n.a.
Total	388	30	26	444	
New trainees, 1976-85					
AS & AAS	110	5	5	120	12
AA	580	68	37	685	69
FO	282	n.a.	n.a.	282	n.a.
Total	972	73	42	1,087	

n.a. - not applicable as field overseers in the southern states require no formal agricultural training. The field overseer figures for extension were included to indicate staffing patterns.

[1] Taken from Table 10.

[2] The output figures for the eastern states for 1967-70 represent an average for the two years 1969 and 1970 only.

Table 13. (continued)

Area, years, and staff category	Agricultural crop extension	Other public sector	Private	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
Northern states					
Staff employed in 1966					
AA & AAS	155	12	3		19
AA	400	60	15		133
AI	835	56	10		272
Total	1,390	128	28		
New trainees, 1967-70					
AA & AAS	3	0	1	4	1
AA	9	2	9	20	5
AI	11	1	5	17	4
Total	23	3	15	41	
New trainees, 1971-75					
AA & AAS	44	4	4	52	11
AA	160	17	23	200	40
AI	240	17	12	269	54
Total	444	38	39	521	
New trainees, 1976-85					
AA & AAS	108	8	6	122	12
AA	392	45	45	482	48
AI	592	40	22	654	66
Total	1,092	93	73	1,258	
Total Nigeria					
Staff employed in 1966					
AA & AAS	467	53	7		101
AA	1,453	277	79		536
FO/AI	2,071	56	10		272
Total	3,991	386	96		
New trainees, 1967-70					
AA & AAS	45	0	3	48	22
AA	220	4	29	253	118
FO/AI	118	1	5	124	4
Total	383	5	37	425	
New trainees, 1971-75					
AA & AAS	134	16	15	165	34
AA	552	80	64	696	138
FO/AI	592	17	12	621	54
Total	1,278	113	91	1,482	
New trainees, 1976-85					
AA & AAS	330	35	17	382	38
AA	1,372	201	121	1,694	170
FO/AI	1,466	40	22	1,528	66
Total	3,168	276	160	3,604	

strategies. In these tables, the training requirements for extension workers are taken from Tables 8 to 10. Like the extension requirements, the non-extension public sector and private sector training requirements were calculated by first determining the respective levels of employment and then calculating the training requirements for new positions, promotions, and replacement.

Employment projections for the non-extension public sector column have been derived for Strategy I by increasing the non-extension component of the agricultural ministries at 3 percent per year and taking 10 percent of this amount. These figures represent allowances for the small use of agriculture school graduates by the rest of the agricultural ministries, marketing boards, development corporations, and other public agencies. The non-extension public sector projections for Strategy II have been computed in similar fashion, except that additional manpower is included for the credit and research services. For Strategy III, the figures in this column represent 10 percent of the staff of the agricultural ministries which would have decreased 10 percent by 1970 and increased at a rate of 3 percent per year thereafter.

Employment projections for the private sector are based on agricultural school graduates needed for 1) private plantations, 2) agricultural supply and processing companies, and 3) private farming. In estimating the trained manpower needed for private plantations, one AA level person has been used for each 1,000 acres. The agricultural supply and processing firm calculations are based

on the survey conducted in 1968, reported in Chapter IV.[3] The calculations for private farming are based on the projected number of people who would find farming more productive than public or private employment.

Under Strategy I the private sector demand for subuniversity trained manpower would be chiefly from processing firms. Only a few people would be needed for supply firms, as the subsidy programs would prevent most large scale private input distribution. The continued tax burden on export crop output also would limit the profitability and extent of private plantation development and of private farming by agricultural school graduates. Under Strategy II, many more agricultural school graduates would find employment in these three areas. CSNRD recommends that public plantations and input distribution be phased into private hands, greatly increasing the private sector demand for trained manpower for plantation operation. The reduction in taxes and improved technology from research would promote further private investment, and encourage private production of export crops. If the agricultural schools are placed in the university centers, as recommended by CSNRD under Strategy II, private firms as well as the agricultural ministries could both obtain and have employees

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[3]This survey was conducted in the Western and all six northern states of Nigeria. It included nearly all the agricultural firms using trained agricultural manpower in these states listed in the Nigerian Industrial Directory, 4th ed., 1967.

trained at these schools.[4] With higher profitability in agriculture, private firms also could hire away employed extension agents and therefore instigate additional training at these schools for their replacements. Under Strategy III, input subsidy programs, harsh taxation policies, and governmental interference in marketing would virtually choke off private sector investments and any demand for trained agriculturalists.

Reconciliation

By comparing the 1966 output of technical agricultural school graduates with that required in future time periods for each training area, it appears that the 1966 capacity would be excessive for Strategy I and III but sufficient or nearly sufficient to satisfy the demand from CSNRD campaigns and programs under Strategy II from each area for all years to 1985. The 1966 output, however, was only 80 to 85 percent of maximum capacity. Under Strategy II, except for agricultural assistants in the Western, Mid-western and Lagos states in 1971-75, the required future output of subuniversity trained manpower for all time periods and for each category of staff would be less than the 1966 output or would not exceed it by 10 percent. This additional 10 percent could be achieved with the present facilities by utilizing space more efficiently and to maximum capacity, shortening the training course for agricultural assistants

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[4]See Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, CSNRD publication No. 33 (East Lansing: CSNRD, 1969) p. 114. Presently the schools are run by the agricultural ministries. Most enrollees are given civil servant appointments with salaries but are then bonded to work for the agricultural ministries for five years. This practice greatly restricts the use of these schools by the private sector.

from two to one year,[5] or utilizing untrained staff on a temporary basis. Training costs could be underwritten, being nearly the same as in 1966, or less if the training period for agricultural assistants were shortened.

In the Strategy II manpower calculations, moderate allowances have been made for private firms to send their employees to schools of agriculture or to hire extension agents. In the past, private firms have been very successful in training their employees and could expand this training as agricultural services and production become more profitable under the CSNRD recommendations. However, if the schools of agriculture become more accessible to non-government employees, private industry could use the schools more freely and hire the graduates. Thus, with greatly increased demand by the private sector for agricultural school graduates in response to possible higher product prices and new technological breakthroughs, the demands on the agricultural schools could exceed the expected levels.

Additional agricultural school graduates also would be required for production campaigns for food and feed crops and livestock production over the 1976-1985 period if new technology were forthcoming. About one-third to one-half of the crop extension workers listed in Table 6 for 1975 and 1985 have been proposed for use in such campaigns. In addition, much assistance in a livestock-feeding campaign would need to be provided by livestock specialists

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[5]This is a CSNRD recommendation. See Glenn L. Johnson, et al., op. cit., p. 114.

trained at separate livestock schools. Consequently, many of the personnel for these food, feed and livestock campaigns would be readily available or would require training in institutions other than the agricultural schools. It should be possible to train the additional manpower requirements for agriculture school graduates in these campaigns either with small expansions of present facilities or by shortening the required training time.

University Agricultural Training

The projected employment of university graduates in agriculture for the three alternative strategies is given in Tables 14 to 16, and is based on the assumptions previously elaborated in determining the demand for positions requiring subuniversity training.[6] Two sets of figures are given, one indicating the Nigerian staff (N) and one including foreign expatriates (T). Under Strategy I nearly total Nigerianization is assumed for the public sector, while Strategy III assumes total Nigerianization. These figures represent all agricultural degrees, and include both plant and animal specialists.

The largest number of university graduates would be required under Strategy II, with emphasis in the public sector on expanding the top level staff in most categories. Development corporations' plantation operations would be transferred to private firms wherever possible. The largest expansion would occur in the northern states because of their present small supply of high level manpower. Some

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[6]Much assistance in projecting the employment and training requirements for university graduates in agriculture was provided by James S. Long.

Table 14. Strategy I: Employment of University Graduates in Agriculture (BSc's, MSc's and PhD's) by Area and Type of Work in Nigeria, 1966 and Projections for 1970, 1975 and 1985

Year and area	Public sector																Private production		Processing firms & agricultural supply		Church missions		Total	
	Ministries[1]		Development corporations		Marketing[2]		Credit		Coops[3]		Universities		Research institutes		Total									
	N[4]	T[5]	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T
	Manpower numbers																							
1966 Western & Lagos	175	183	8	8	4	4	3	3			28	59	79	98	297	355	2	6	10	48		3	309	412
Mid-western State	43	45	4	4	2	2	3	3					5	7	57	61	1	5	4	22		1	62	89
Eastern states	160	166	8	8	3	3	8	8			12	29	34	47	225	261	3	13	6	24		9	234	307
Northern states	71	135	5	5	3	3					6	29	17	100	102	272	1	6	4	17		9	107	304
Total	449	529	25	25	12	12	14	14			46	117	135	252	681	949	7	30	24	111		22	712	1112
1970 Western & Lagos	209	217	9	9	4	4	3	3			40	80	88	103	353	416	2	6	13	62		4	368	488
Mid-western State	50	52	4	4	2	2	3	3					6	8	65	69	2	5	5	26			72	100
Eastern states	189	195	11	11	3	3	10	10			15	40	40	55	268	314	5	15	12	30	1	9	286	368
Northern states	100	158	6	6	3	3					6	29	23	107	138	303	1	6	10	27		9	149	345
Total	548	622	30	30	12	12	16	16			61	149	157	273	824	1102	10	32	40	145	1	22	875	1301
1975 Western & Lagos	253	261	10	10	6	6	5	5			55	74	98	105	427	461	6	10	20	65		4	453	540
Mid-western State	61	63	4	4	2	2	3	3			10	18	9	11	89	101	2	5	8	25			99	131
Eastern states	228	234	12	12	4	4	10	10	5	5	30	48	53	63	342	376	6	15	20	35	2	10	370	436
Northern states	124	188	9	9	3	3	2	2			15	40	31	111	184	353	1	15	29	50		9	214	427
Total	666	746	35	35	15	15	20	20	5	5	110	180	191	290	1042	1291	15	45	77	175	2	23	1136	1534
1985 Western & Lagos	354	357	10	10	6	6	5	5	5	5	70	92	105	110	555	585	7	13	38	95	1	5	601	698
Mid-western State	86	87	5	5	2	2	3	3			15	22	12	13	123	132	3	5	15	20			141	157
Eastern states	319	322	15	15	5	5	12	12	10	10	40	58	62	67	463	489	9	23	34	50	2	10	508	572
Northern states	183	256	10	10	5	5	6	6			35	54	51	120	290	451	2	24	58	95		10	350	580
Total	942	1022	40	40	18	18	26	26	15	15	160	226	230	310	1431	1657	21	65	145	260	3	25	1600	2007

[1] Federal level manpower has been included in the area totals on the basis of their place of training.

[2] Includes marketing boards, NPMC and miscellaneous marketing functions.

[3] Manpower figures for cooperatives in the northern states are included with the ministries and not in the total for cooperatives.

[4] Refers to Nigerian staff.

[5] Refers to Nigerian and expatriate staff.

Table 15. Strategy II: Employment of University Graduates in Agriculture (BSc's, MSc's and PhD's) by Area and Type of Work in Nigeria, 1966 and Projections for 1970, 1975 and 1985

Year and area	Public sector												Private production		Processing firms and agricultural supply		Church missions		Total	
	Ministries[1]		Development corporations		Marketing[2]		Credit		Coops[3]		Universities		Research institutes		Total							
	N[4]	T[5]	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T
	Manpower numbers																							
1966 Western & Lagos	175	183	8	8	4	4	3	3			28	59	79	98	297	355	2	6	10	48		3	309	412
Mid-western State	43	45	4	4	2	2	3	3					5	7	57	61	1	5	4	22		1	62	89
Eastern states	160	166	8	8	3	3	8	8			12	29	34	47	225	261	3	13	6	24		9	234	307
Northern states	71	135	5	5	3	3					6	29	17	100	102	272	1	6	4	17		9	107	304
Total	449	529	25	25	12	12	14	14			46	117	135	252	681	949	7	30	24	111		22	712	1112
1970 Western & Lagos	220	225	9	9	7	9	7	12			35	60	90	113	368	428	5	10	18	80	1	4	392	522
Mid-western State	53	55	4	4	4	5	3	5					8	10	72	79	3	6	7	20			82	105
Eastern states	203	207	11	11	7	9	7	12			15	30	32	57	275	326	8	18	20	40	2	9	305	393
Northern states	120	190	6	6	7	9	7	18			21	55	40	120	201	398	2	12	20	50		9	223	469
Total	596	677	30	30	25	32	24	47			71	145	170	300	916	1231	18	46	65	190	3	22	1002	1489
1975 Western & Lagos	243	250	4	5	11	14	16	19	15	15	45	70	100	119	434	492	15	17	50	125	2	5	501	639
Mid-western State	76	80	1	1	5	7	6	8	5	5			13	17	106	118	7	10	15	20			128	148
Eastern states	268	270	5	6	11	14	21	26	15	15	26	40	76	92	422	463	20	28	40	75	3	10	485	576
Northern states	225	290	5	6	11	15	17	32			39	70	85	156	382	569	15	30	75	110	3	10	475	719
Total	812	890	15	18	38	50	60	85	35	35	110	180	274	384	1344	1642	57	85	180	330	8	25	1589	2082
1985 Western & Lagos	318	320	4	5	18	22	25	28	20	20	66	75	160	180	611	650	22	28	110	200	3	6	746	884
Mid-western State	111	115	1	1	9	11	16	17	10	10			25	32	172	186	10	12	40	45			222	243
Eastern states	345	350	5	6	18	22	36	40	30	30	34	43	124	145	592	636	23	30	125	150	6	12	746	828
Northern states	400	420	5	6	20	25	48	60			65	82	151	200	689	793	55	70	200	250	6	12	950	1125
Total	1174	1205	15	18	65	80	125	145	60	60	165	200	460	557	2064	2265	110	140	475	645	15	30	2664	3080

[1] Federal level manpower has been included in the area totals on the basis of their place of training.

[2] Includes marketing boards, NPMC and miscellaneous marketing functions.

[3] Manpower figures for cooperatives in the northern states are included with the ministries and not in the total for cooperatives.

[4] Refers to Nigerian staff.

[5] Refers to Nigerian and expatriate staff.

Table 16. Strategy III: Employment of University Graduates in Agriculture (BSc's, MSc's and PhD's) by Area and Type of Work in Nigeria, 1966 and Projections for 1970, 1975 and 1985

Year and area	Public sector																Private production		Processing firms and agricultural supply		Church missions	Total	
	Ministries[1]		Development corporations		Marketing[2]		Credit		Coops[3]		Universities		Research institutes		Total								
	N[4]	T[5]	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	T	N	N	T
	Manpower numbers																						
1966 Western & Lagos	175	183	8	8	4	4	3	3			28	59	79	98	297	355	2	6	10	48	3	309	412
Mid-western State	43	45	4	4	2	2	3	3					5	7	57	61	1	5	4	22	1	62	89
Eastern states	160	166	8	8	3	3	8	8			12	29	34	47	225	261	3	13	6	24	9	234	307
Northern states	71	135	5	5	3	3					6	29	17	100	102	272	1	6	4	17	9	107	304
Total	449	529	25	25	12	12	14	14			46	117	135	252	681	949	7	30	24	111	22	712	1112
1970 Western & Lagos	199	199	9	9	4	4	3	3			50	65	87	98	352	378	2	6	10	52	4	364	440
Mid-western State	53	53	4	4	2	2	3	3			8	15	5	7	75	84	1	5	4	23		80	112
Eastern states	178	178	11	11	3	3	8	8			20	40	39	46	259	286	5	13	9	26	9	273	334
Northern states	90	146	6	6	3	3					12	35	29	100	140	290	1	6	4	21	9	145	326
Total	520	576	30	30	12	12	14	14			90	155	160	251	826	1038	9	30	27	122	22	862	1212
1975 Western & Lagos	240	240	10	10	6	6	5	5			70	75	96	98	427	434	2	5	15	65	4	444	508
Mid-western State	65	65	4	4	2	2	3	3			15	18	6	7	95	99	1	3	5	25		101	127
Eastern states	217	217	12	12	4	4	8	8	3	3	43	50	42	46	329	340	4	10	12	30	9	345	389
Northern states	155	180	9	9	3	3	2	2			35	52	59	94	263	340		8	12	32	9	275	389
Total	677	702	35	35	15	15	18	18	3	3	163	195	203	245	1114	1213	7	26	44	152	22	1165	1413
1985 Western & Lagos	320	320	10	10	6	6	5	5			92	92	103	103	536	536	2	6	20	75	4	558	621
Mid-western State	87	87	5	5	2	2	3	3			22	22	7	7	126	126	1	2	7	30		134	158
Eastern states	281	281	15	15	5	5	8	8	8	8	60	60	46	46	423	423	5	16	20	40	9	448	488
Northern states	253	253	10	10	5	5	6	6			60	60	94	94	428	428	1	16	20	45	9	449	498
Total	941	941	40	40	18	18	22	22	8	8	234	234	250	250	1513	1513	9	40	67	190	22	1589	1765

[1] Federal level manpower has been included in the area totals on the basis of their place of training.

[2] Includes marketing boards, NPMC and miscellaneous marketing functions.

[3] Manpower figures for cooperatives in the northern states are included with the ministries and not in the total for cooperatives.

[4] Refers to Nigerian staff.

[5] Refers to Nigerian and expatriate staff.

expatriates would be retained in public service if their skills and experience could not be replaced easily. In the private sector, however, most of the expansion would be in firms supplying agricultural inputs with subsidies eliminated and private firms taking over the supply functions. Some Nigerian graduates would be employed in processing firms and in production either for themselves or for private firms. Most of the increase in university graduates hired by the private sector would be in the northern states.

The training requirements for university graduates in agriculture under the three strategies have been calculated from the projected employment figures, and are presented in Tables 17 to 19. These calculations are made for the three university training areas recommended by CSNRD which correspond with the areas served by the universities in the Ibadan-Ife, Nsukka-Enugu and Zaria areas. The total training requirements comprise new positions, and replacement for a normal attrition rate of 3 percent per year. Because of the war in the eastern states, 35 percent of the 1966 staff in the eastern states was taken as the attrition rate in this area for the 1966-70 period alone, with the rate of the remaining time calculated at 3 percent annually.

Reconciliation

The projected average annual output requirements of university graduates in agriculture from 1967-1985 ranges from a high of 150-172 for Strategy II to a low of 25-105 for Strategy III. These requirements are considerably above the level of persons graduating in 1966 when some of the universities had been established for only a few

Table 17. Strategy I, Nigerian University Graduates in Agriculture: Employment (1966) and Projected Total Employment and Training Requirements by Areas in Nigeria, 1967-1985

Time period and area	Nigerian graduates employed at end of period	New positions	Replacement[1]	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
1966					
Western, Lagos and Mid-western States	371				
Eastern states	234				
Northern states	107				
Total	712				
1967-70					
Western, Lagos and Mid-western States	440	69	49	118	30[2]
Eastern states	286	52	82	134	67[2]
Northern states	149	42	15	57	15
Total	875	163	146	309	112
1971-75					
Western, Lagos and Mid-western States	552	112	74	186	37
Eastern states	370	84	49	133	27
Northern states	214	65	27	92	19
Total	1,136	261	150	411	83
1976-85					
Western, Lagos and Mid-western States	742	190	194	384	39
Eastern states	508	138	132	270	27
Northern states	350	136	85	221	22
Total	1,600	464	411	875	88

[1] Replacement at three percent per year except 35 percent for 1967-70 in the eastern states only.

[2] Represents two years output for the eastern states only.

Table 18. Strategy II, Nigerian University Graduates in Agriculture: Employment (1966) and Projected Total Employment and Training Requirements by Areas in Nigeria, 1967-1985

Time period and area	Nigerian graduates employed at end of period	New positions	Replacement[1]	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
1966					
Western, Lagos and Mid-western States	371				
Eastern states	234				
Northern states	107				
Total	712				
1967-70					
Western, Lagos and Mid-western States	474	103	51	154	39
Eastern states	305	71	82	153	77[2]
Northern states	223	116	20	136	34
Total	1,002	290	153	443	150
1971-75					
Western, Lagos and Mid-western States	629	155	83	238	48
Eastern states	485	180	59	239	48
Northern states	475	252	54	306	61
Total	1,589	587	196	783	157
1976-85					
Western, Lagos and Mid-western States	968	339	240	579	58
Eastern states	746	261	184	445	45
Northern states	950	475	210	685	69
Total	2,664	1,075	634	1,709	172

[1] Replacement at three percent per year except 35 percent for 1967-1970 in the eastern states only.

[2] Represents two years output for the eastern states only.

Table 19. Strategy III, Nigerian University Graduates in Agriculture: Employment (1966) and Projected Total Employment and Training Requirements by Areas in Nigeria, 1967-1985

Time period and area	Nigerian graduates employed at end of period	New positions	Replacement[1]	Training requirements: Total for period	Training requirements: Average annual during period
	Manpower numbers				
1966					
Western, Lagos and Mid-western States	371				
Eastern states	234				
Northern states	107				
Total	712				
1967-70					
Western, Lagos and Mid-western States	444	73	49	122	31[2]
Eastern states	273	39	82	121	61[2]
Northern states	145	38	15	53	13
Total	862	150	146	296	105
1971-75					
Western, Lagos and Mid-western States	545	101	74	175	35
Eastern states	345	72	46	118	24
Northern states	275	130	32	162	33
Total	1,165	303	152	455	92
1976-85					
Western, Lagos and Mid-western States	692	147	185	332	33
Eastern states	448	103	119	222	23
Northern states	449	174	109	283	29
Total	1,589	424	413	837	85

[1] Replacement at three percent per year except 35 percent for 1967-1970 in the eastern states only.

[2] Represents two years output for the eastern states only.

years and none of them had reached full enrollment. The future physical capacity of the Nigerian university system for agricultural graduates will vary considerably depending on how efficiently presently underutilized space and staff is used. However, at least 300 could be turned out annually with the present physical facilities. An output of nearly 200 graduates a year to accommodate Strategy II could be achieved through modest increases in teaching staff and even more graduates could be trained for possible food, feed, and livestock campaigns with little difficulty.

Summary

The employment of trained agriculturalists under the three alternative strategies has been computed in this chapter from 1966 to 1985 for the northern states, the eastern states, and the Western, Mid-western and Lagos States. The training requirements for these agriculturalists were next computed from the employment projections by calculating new positions and the vacancies caused by promotions and a 3 percent annual rate of replacement. Finally, the training requirements were compared with feasible outputs from the training institutions to determine if the needed manpower could be trained. This chapter focused on subuniversity technical agricultural school training and university training. Special emphasis was placed on reconciling the manpower requirements for Strategy II with the capacity of the Nigerian educational system to train the required manpower and the capacity of the Nigerian economy to finance the educational services.

The largest number of trained agriculturalists would be required under Strategy II to staff the export crop production campaigns and general extension services, expand credit and research, and to supply trained manpower for a rapidly growing private sector. The overall future demand for trained agriculturalists under this strategy, however, would appear to be well within the capacity of the training institutions. This chapter has shown that the necessary subuniversity level personnel for Strategy II could be trained in the existing technical agricultural schools (Ministry Schools of Agriculture) with only minor modifications in physical plant and curriculum. The projected average annual manpower training requirements under Strategy II for graduates from the subuniversity technical agricultural schools (AA's and AAS's) and training institutes (AI's in the northern states) would be less than the 1966 output or would not exceed it by 10 percent for all areas and years to 1985. The one exception would be AA's during the 1970-75 period in the Western, Mid-western and Lagos States, who could be trained in surplus AAS training facilities. There is sufficient excess capacity in physical facilities in the subuniversity training institutions to further provide training for additional manpower for possible food, feed and livestock campaigns in the late 1970's and early 1980's if needed. Some changes in extension organization would be necessary, however, as more incentives and logistic support would have to be provided for the expansion of field work required under this strategy.

In addition, the present faculties of agriculture in the four universities could easily provide the average annual output of 150-172

university agricultural graduates required throughout Nigeria under Strategy II to 1985 with no expansion in capital expenditures and only modest increases in teaching staffs. Post graduate training, however, might be needed from overseas institutions through at least the 1970's to meet the needs for research personnel and university faculty staffs. In conclusion, these findings show that the manpower needed for the production campaigns and other programs recommended under Strategy II generally could be trained in the existing training institutions. Consequently, the new states would not need to construct new training institutions as either the university or subuniversity levels.

The manpower requirements for trained agriculturalists under Strategy I and III would be much lower than under Strategy II. Consequently, there would be no difficulty in providing training for the needed manpower. However, if the Nigerian government followed the present agricultural policies (Strategy I) they soon would be faced with having trained agriculturalists in excess of job opportunities and cutbacks would be imperative in agricultural training. Even further cutbacks would be necessary under the harsher policies of Strategy III.

CHAPTER VI

FINANCING NIGERIAN AGRICULTURE

This chapter examines the overall economic and financial feasibility of the three alternative development strategies for Nigeria. It is divided into three parts. The first part of the chapter summarizes the public sector costs of the three sets of programs and policies. These costs are compared in the second part of the chapter with the agricultural income and foreign exchange earnings generated under each strategy to determine overall economic feasibility. The third section examines the future revenue requirements and the projected available government revenue for financing the three alternative strategies, and presents the reconciled financial figures for the Strategy II recommendations.

Public Expenditures

The three strategies for agricultural development in Nigeria would have wide differences in their public sector costs, total returns, and public revenue needs. The projected public costs of the three strategies are presented in Tables 20 to 22 for four geographic areas and the federal government. The estimates of public expenditures under Strategy I reveal the consequences of continuing the present agricultural policies which place strong emphasis on direct government investment. These estimates have been developed by increasing the recurrent expenditures for the agricultural ministries moderately at about 3 percent per year (the approximate population growth rate)

Table 20. Strategy I: Annual Government-Appropriated Public Sector Agricultural Expenditures in Nigeria by Areas, 1966 and Projections for 1970, 1975 and 1985

Area and Year	Agri. ministry recurrent (1)	Agri. ministry campaign outlay (2)	Farm settlements or irrig. schemes (3)	Other agri. ministry capital (4)	Total agri. ministry capital (5=2-4)	Development corp. plantations (6)	Mrktg. board subsidies (7)	Total agri. prod. expenditures (8=1,5-7)	University agricultural education (9)	Research (10)	Credit (11)	Grand Total agri. expenditures (12=9-11)
	£000 in 1966 prices											
Western and Lagos States												
1966	2,429	600	1,143	1,082	2,825	768	953	7,022	99	300	85	7,507
1970	2,732	500	1,200	915	2,615	800	600	6,747	150	300	85	7,282
1975	3,157	300	1,400	942	2,642	1,000	800	7,599	210	325	75	8,209
1985	4,251	200	1,600	942	2,742	1,000	900	8,893	300	350	120	9,663
Mid-western State												
1966	511	268	101	274	663	200	0	1,374	0	80	15	1,469
1970	575	150	200	274	624	300	100	1,599	0	80	15	1,694
1975	664	200	400	274	874	600	250	2,388	0	100	50	2,538
1985	894	200	500	274	974	700	350	2,918	0	120	60	3,098
Eastern States												
1966	2,596	785	994	1,299	3,078	1,654	0	7,328	200	241	30	7,799
1970	2,920	200	500	1,233	1,933	700	200	5,753	250	230	0	6,233
1975	3,375	500	900	1,233	2,633	900	300	7,208	290	260	75	7,833
1985	4,543	400	1,000	1,233	2,633	1,000	500	8,675	360	290	120	9,445
Northern States												
1966	3,209	0	0	1,938	1,938	0	430	5,577	125	688	0	6,390
1970	3,610	0	400	1,825	2,225	100	1,800	7,735	135	690	0	8,560
1975	4,171	0	600	1,825	2,425	100	4,000	9,696	210	700	100	11,706
1985	5,616	0	1,000	1,825	2,825	100	6,000	11,541	350	740	200	15,831
Federal												
1966	379	0	0	0	0	0	0	379	316	1,916	0	2,611
1970	426	0	0	40	40	0	0	466	350	2,000	0	2,816
1975	493	0	0	40	40	0	0	533	410	2,155	0	3,098
1985	663	0	0	40	40	0	0	703	500	2,400	0	3,603
Total												
1966	9,124	1,673	2,238	4,593	8,504	2,622	1,848	21,680	740	3,225	131	25,776
1970	10,263	850	2,330	4,287	7,437	1,900	2,700	22,300	885	3,300	100	26,585
1975	11,860	1,000	3,300	4,314	8,614	2,600	5,350	27,424	1,120	3,540	300	33,384
1985	15,967	800	4,100	4,314	9,214	2,800	7,750	32,731	1,510	3,900	500	41,641

Table 21. Strategy II: Annual Government-Appropriated Public Sector Agricultural Expenditures in Nigeria by Areas, 1966 and Projections for 1970, 1975 and 1985

Area and year	Agri. ministry re-current[2] (1)	Agri. ministry campgn. outlay[3] (2)	Farm settle-ments or irrig.[4] schemes (3)	Other agri. ministry capital[5] (4)	Total agri. ministry capital (5=2-4)	Develop-ment corp. planta-tions[4] (6)	Mrktg. board subsidies (7)	Total agri. prod. expen-ditures (8=1,5-7)	Univer-sity agri-cultural education[6] (9)	Research[7] (10)	Credit[8] (11)	Grand total agri. expendi-tures (12=9-11)
	£000 in 1966 prices											
Western and Lagos States												
1966	2,429	600	1,143	1,082	2,825	768	953[9]	7,022	97	300	86	7,507
1970	2,578	186	0	942	1,128	300	500	4,506	110	329	120	5,065
1975	2,955	600	0	942	1,542	0	0	4,497	170	371	0	5,038
1985	3,671	0	0	942	942	0	0	4,613	235	395	0	5,243
Mid-western State												
1966	511	288	101	274	663	200	0	1,374	0	80	15	1,469
1970	671	46	0	324	370	0	0	1,041	0	101	25	1,167
1975	847	320	0	324	644	0	0	1,491	0	121	0	1,612
1985	1,062	0	0	324	324	0	0	1,386	0	136	0	1,522
Eastern states												
1966	2,596	785	994	1,299	3,078	1,654	0	7,328	200	241	30	7,799
1970	2,836	168	0	1,323	1,491	0	0	4,327	192	293	30	4,842
1975	3,262	608	0	1,323	1,931	0	0	5,193	245	283	0	5,721
1985	4,163	0	0	1,323	1,323	0	0	5,486	300	463	0	6,249
Northern states												
1966	3,209	0	0	1,938	1,938	0	430	5,577	125	688	0	6,390
1970	3,768	200	0	1,925	2,125	0	1,800	7,693	205	757	0	8.655
1975	5,047	200	0	1,925	2,125	0	0	7,172	320	895	0	8,387
1985	5,731	0	0	2,025	2,025	0	0	7,756	380	979	0	9,115
Federal												
1966	379	0	0	0	0	0	0	379	316	1,916	0	2,611
1970	480	0	0	60	60	0	0	540	331	2,308	100	3,279
1975	660	0	0	60	60	0	0	720	365	2,782	622	4,489
1985	820	0	0	60	60	0	0	880	430	3,777	200	5,287
Total												
1966	9,124	1,673	2,238	4,593	8,504	2,622	1,848	21,680	740	3,225	131	25,776
1970	10,333	600	0	4,574	5,174	300	2,300	18,107	838	3,788	275	23,008
1975	12,771	1,728	0	4,574	6,302	0	0	19,073	1,100	4,452	622	25,247
1985	15,447	0	0	4,674	4,674	0	0	20,121	1,345	5,750	200	27,416

Footnotes for Table 21

[1]Excludes costs of marketing produce as these charges are deducted directly from sales revenue and do not require political appropriations. The 1966 base figures were taken from the former regional budgets.

[2]Recurrent expenditures for agricultural extension as well as a non-extension component. The extension component was calculated from the salaries necessary to pay the staff numbers in Table 6, including moderate allowances for food and feed crop campaigns from 1975-1985. The nonextension component generally includes administration, research, planning, irrigation, forestry, fishery and veterinary divisions. This component was increased yearly at 2 percent from 1966-1975 and 1 percent from 1976-1985 except in the northern states when it was increased at 4 percent from 1967-1970 and 5 percent from 1971-1975 to finance some of the costs of a livestock campaign. The nonextension component also includes the cost of sub-university training and state agricultural ministry research. The Federal Ministry of Agriculture expenditures have been increased to pay for expanded services which include a federal extension service, a development planning unit, a produce selling agency and a coordinating body for state agricultural ministry programs.

[3]The campaign outlays for 1970-75 represent only the grants in kind incorporated in the production campaigns, while expenditures for personnel are included in the agricultural ministry recurrent costs. The cost of loans are included under credit.

[4]To be phased into private ownership and future expenditures curtailed.

[5]The 1966 level, except for a) reductions in capital expenditures for training schools and the Western State's cotton promotion program and b) increases of £100,000 annually for each area and time period for marketing facilities, except £200,000 for 1976-1985 in the northern states.

[6]Includes university research.

[7]Research costs are for agricultural research by Nigerian institutions. This figure includes the Institute for Agricultural Research and the Economic Development Institute, but excludes other research in the universities and all state agricultural ministry research. In addition to Nigerian research, the International Institute of Tropical Agriculture located in Ibadan would provide substantial annual appropriations for West African agricultural research.

[8]Credit costs represent operating losses only, and are only a small percentage of the loans made and outstanding.

[9]Includes grants for cocoa warehouse construction of £453,000.

Table 22. Strategy III: Annual Government-Appropriated Public Sector Agricultural Expenditures in Nigeria by Areas, 1966 and Projections for 1970, 1975 and 1985

Area and year	Agri. ministry re-current (1)	Agri. ministry campgn. outlay (2)	Farm settle-ments or irrig. schemes (3)	Other agri. ministry capital (4)	Total agri. ministry capital (5=2-4)	Develop-ment corp. planta-tions (6)	Mrktg. borad subsidies (7)	Total agri. prod. expen-ditures (8=1,5-7)	Univer-sity agri-cultural education (9)	Research (10)	Credit (11)	Grand total agri. expendi-tures (12=9-11)
	£000 in 1966 prices											
Western and Lagos States												
1966	2,429	600	1,143	1,082	2,825	768	953	7,022	99	300	86	7,507
1970	2,817	0	1,200	900	2,100	800	600	6,317	140	300	85	6,842
1975	3,380	0	1,400	700	2,100	1,200	600	7,280	200	300	85	7,865
1985	4,732	0	1,600	700	2,300	1,200	600	8,832	250	300	85	9,467
Mid-western State												
1966	511	268	101	274	663	200	0	1,374	0	80	15	1,469
1970	592	0	200	250	450	300	100	1,442	500	80	15	2,037
1975	710	0	400	250	650	700	200	2,260	100	80	15	2,455
1985	994	0	500	250	750	800	200	2,749	150	80	15	2,989
Eastern states												
1966	2,596	785	994	1,299	3,078	1,654	0	7,328	200	241	30	7,799
1970	3,011	0	600	1,200	1,800	500	200	5,511	240	241	30	6,022
1975	3,613	0	1,000	1,100	2,100	1,200	300	7,213	260	241	30	7,744
1985	5,058	0	1,000	1,100	2,100	1,300	300	8,758	300	241	30	9,329
Northern states												
1966	3,209	0	0	1,938	1,938	0	430	5,577	125	688	0	6,390
1970	3,722	0	400	1,800	2,200	300	1,400	7,622	135	688	0	8,445
1975	4,466	0	1,000	1,600	2,600	500	3,000	10,566	210	688	0	11,464
1985	6,252	0	1,600	1,600	3,200	500	4,000	13,952	350	688	0	14,990
Federal												
1966	379	0	0	0	0	0	0	379	316	1,916	0	2,611
1970	426	0	0	40	40	0	0	466	340	1,916	0	2,722
1975	493	0	0	40	40	0	0	533	390	1,916	0	2,839
1985	663	0	0	40	40	0	0	703	470	1,916	0	3,089
Total												
1966	9,124	1,673	2,238	4,593	8,504	2,622	1,848	21,680	740	3,225	131	25,776
1970	10,568	0	2,400	4,190	6,590	1,900	2,300	21,358	1,355	3,225	130	26,068
1975	12,662	0	3,800	3,690	7,490	3,600	4,100	27,852	1,160	3,225	130	32,367
1985	17,699	0	4,700	3,690	8,390	3,800	5,100	34,989	1,520	3,225	130	39,864

and slowly decreasing programs and services to encourage smallholder production. Expenditures on farm settlements and development corporation plantations have been kept near the 1966 level or slightly increased, and large-scale irrigation schemes have been introduced for the northern states without waiting for the development of superior food and feed crop varieties. These programs have been budgeted at high levels because 1) they have appeal to government officials since they include a package with housing, health care and other social amenities and can thus compete politically for petroleum and other revenues and 2) because adverse pricing policies will make it difficult for private smallholders and others to expand agricultural production. Input subsidies would be another large government expenditure as such subsidies would be necessary to induce farmers to use modern inputs, given adverse produce prices resulting from the continuation of the present taxes on export crop output. As a result of the higher costs of these programs, annual expenditures by 1975 under Strategy I would increase £7.6 million over the 1966 level, and increase £15.8 million by 1985.

Strategy II projected public expenditures would be the lowest of the three alternatives. The low level of expenditure under this strategy would be achieved by concentrating expenditures on high payoff areas and reducing them in areas where returns are low. The emphasis of public expenditures would be on direct assistance to small farmers, increased incentives for production, and expanded supporting services with an early transfer of responsibility for supplying modern factors of production to private hands. At the same

time, grants in kind and cash would be replaced gradually with credit which farmers would be able to repay through higher prices and profits. Public investments in direct agricultural production and most input subsidies would be curtailed. Thus, expenditures under this strategy would be redirected from farm settlements, government plantations, unviable development projects, and subsidies to recurrent expenditures for extension and livestock services, production campaign outlays and such supporting services as research, teaching, and credit. Since the savings in direct agricultural investments would be substantial, government-appropriated public sector expenditures under Strategy II would be less in 1975 than in 1966, and only £1.6 million more in 1985, despite the great expansion in agricultural output anticipated by that date.

Most of the overall increase in expenditures under Strategy II would occur in the northern states and in the Federal Government. In the southern states the expenditure levels for all years would be maintained at about or below the 1966 level, despite expenditure increases in expanded crop extension services, tree crop campaigns and expanded supporting services. This level of expenditures would be possible through reductions in other expenditures by switching from grants in the form of inputs to loans and by eliminating government plantations and farm settlements. Expenditures in the northern states would be increased because there would be no savings available from elimination of farm settlements and government plantations. However, the transfer of the input supply function to private companies and discontinuation of input subsidies after 1975

would eliminate these costs, which amounted to £1.8 million in 1968.

A modest level of expenditures for possible food, feed and livestock campaigns has been included from 1975-85 in the crop extension component of the agricultural ministries' recurrent budget projections as salaries and other campaign charges. (See footnote 2 of Table 21.) In addition, up to £.6 million has been budgeted annually from 1970-75 in the northern states to finance some of the costs of a livestock campaign. If the anticipated technological breakthroughs in food, feed and livestock research are substantial, the annual expenditures could be increased for these campaigns by £1 to £3 million. The potential payoffs from expanded food and feed crops and livestock production for domestic use and export are very great, however, and would easily justify the increased expenditures.

Expenditures under the still more adverse pricing and taxation policies of Strategy III would be used to expand government production and marketing control over agriculture and to finance a large government bureaucracy. The expenditures for farm settlements, public input-supply schemes, government plantations, and irrigation schemes (with and without payoffs) would be even greater than under a continuation of present policies. Recurrent and capital budgets for the agricultural ministries also would increase faster than under Strategy I at 3 to 4 percent annually as more jobs would be created for untrained and poorly trained personnel. Expenditures for research and credit would remain constant but would be utilized for projects less closely related to the production of high payoff commodities.

The extension service increasingly would be used to service government-controlled investment schemes. Large increases in public expenditures would be required for services of poorly-trained personnel, often engaged in low payoff activities. The increase in expenditures over the 1966 level under this strategy would amount to £6.6 million by 1975 and £14.1 million by 1985.

The Returns to Agricultural Investments

The returns to the agricultural investments under the three strategies can be measured in several different forms. Foreign exchange earnings, government revenues, and farmers' income from the export crops are given in Table 23 for the three strategies. Projected foreign exchange earnings and revenue from petroleum also are given in this table for comparison. A general summary of national income account projections is presented in Table 24 which includes the earnings from export crops,the total value added in agriculture from export, food and feed crops and livestock production, and the growth of GDP for the three strategies.

Cost and Return Comparisons among the Three Strategies

Comparisons of the costs and returns to the agricultural investments are necessary to evaluate the economic payoffs under the three alternative strategies. The total government-appropriated agricultural expenditures in 1966 were £25.8 million. Export earnings in that year from major agricultural crops were about £135 million, with farmers receiving about £85 million. The total agricultural value added in 1967 was £899 million from export crop, food, and livestock

Table 23. Projected Farmers' Income from Export Crops, and Foreign Exchange Earnings and Government Revenues from Export Crops and Petroleum, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
	£ million			£ million			£ million		
Foreign exchange earnings from agriculture	122	140	116	123	163	105	128	277	97
Projected government revenues[1]	24	17	26	24	-	23	23	-	19
Farmers' income from exports	66	83	59	66	117	54	68	192	50
Farmers' income from domestic use of export crops[2]	24	30	23	32	41	30	43	62	43
Farmers' total income from export crops	90	113	82	98	158	84	111	254	93
Projected export earnings from petroleum	- - -	275	- - -	- - -	500	- - -	- - -	550	- - -
Projected revenue from petroleum	- - -	100	- - -	- - -	220	- - -	- - -	240	- - -

[1] Government revenues from marketing board surpluses, producer purchase taxes and export duties from cocoa, groundnut products, palm products, and cotton only.

[2] Included here to show the effects of marketing board policies on the amounts of "export" crops marketing domestically. This includes oil palm, cotton, and groundnuts only.

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table V-2.

Table 24. Selected Components of National Income under Three Alternative Strategies in Nigeria, 1967 and Projections for 1970, 1975, and 1985

Item	1967	Strategy	1970	1974	1985
	£ million	Strategy number	- - - £ million - - -		
GDP at market prices	1731	I	2145	2882	4734
		II	2171	2991	5154
		III	2138	2835	4639
GNP at market prices	1697	I	1995	2627	4423
		II	2021	2734	4843
		III	1988	2580	4328
Consumption	1580	I	1939	2514	4038
		II	1945	2592	4396
		III	1941	2494	3957
Value added in agriculture and livestock	899	I	988	1138	1604
		II	1009	1207	1846
		III	981	1108	1418
Domestic consumption	791	I	862	1001	1446
		II	867	1033	1563
		III	862	987	1418
Raw materials	10	I	12	15	24
		II	12	16	29
		III	11	14	20
Agricultural exports	98	I	114	122	134
		II	130	158	254
		III	108	107	112
Value of agricultural exports	135	I	122	123	128
		II	140	163	277
		III	116	105	97

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table V.1.

production. The GDP in 1967 was £1731 million. By 1985 under Strategy I, government-appropriated public expenditures would be increased £15.8 million to £41.6 million, but exchange earnings would decrease slightly to £128 million and farmers' income from export crops would increase only slightly to £111 million. Total value added from agriculture would reach £1,604 million, with GDP reaching £4,734 million.

Under Strategy II government-appropriated public expenditures would increase by 1985 only £1.6 million, but export earnings would double to £277 million and farmers' income from export crops would triple to £254 million. The value added in agriculture would reach £1,846 million and GDP would reach £5,154 million.

Strategy III would produce the lowest total returns in agriculture. Government-appropriated public expenditures would increase £14.1 million to £39.9 million by 1985, but would be so mismanaged that export earnings would decline to £97 million and farmers' income from export crops would only increase to £93 million, despite increasing numbers of farmers. Value added from agriculture would increase to only £1,418 million and GDP would reach only £4,639 million.

Of the three alternative strategies, Strategy II is clearly superior because it not only cost less, but yields much greater returns than the other two strategies. Consequently, Strategy II may be described as a "more for less policy" when compared with Strategy I and III. Comparisons of the increases or decreases of costs and returns from the 1966 level alone show the economic feasibility of Strategy II.

Figure 2 shows that Strategy II policies and programs provide both the greatest relative and the greatest absolute returns to investment in agriculture. The differences in total returns under the three strategies by 1985 are especially striking. Strategy II would provide £149 to £180 million more foreign exchange annually from agricultural exports than Strategy I and III respectively and £143 to £161 million greater income for farmers from export crops. It also would contribute greater increases in the total value added in agriculture from livestock and export, feed, and food crop production than the other alternatives of £242 million to £428 million annually, excluding long-run programs of developing and using superior varieties and techniques for food, feed, and livestock production. The higher rural incomes under Strategy II also would have a spill-over effect into the nonagricultural sector, increasing income there by £178 and £87 million more than Strategy I and III. Altogether, by 1985 Strategy II would increase rural and urban incomes by £420 and £515 million more than would a continuation of present policies (Strategy I) or a switch to a harsher, more exploitative agricultural strategy (Strategy II). The increase in total income from Strategy II that is greater than the increase in incomes possible under Strategy I or III is nearly equal to the entire portion of GDP that would be provided by petroleum. The comparison emphasizes the merits adopting the Strategy II recommendations.

The above data on expenditures and returns do not include either the costs or returns to the food, feed or livestock production campaigns that Strategy II's long-run recommendations are expected to make socially and privately profitable in the late 1970's and 1980's. If the long-run research program is successful in providing the

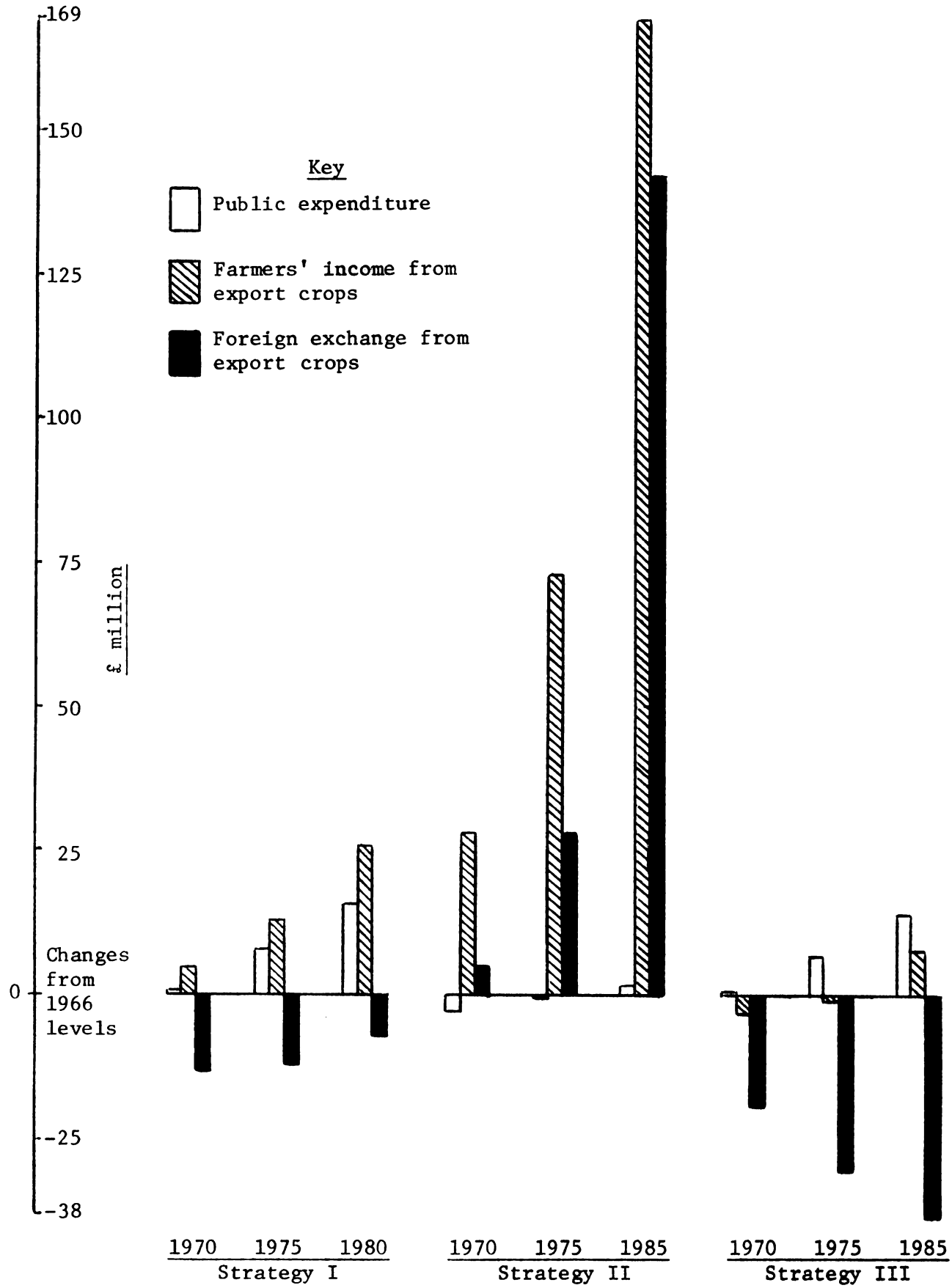

Figure 2. Changes in the 1966 level of Public Expenditure in Agriculture, and Farmers' Income and Exchange Earnings from Export Crops Under Three Alternative Strategies in Nigeria, 1970, 1975 and 1985

Source: Tables 20-23.

necessary technological breakthroughs, a small increase in annual expenditures (£1 to £3 million) could result in returns nearly equal to those from the CSNRD recommended export crop campaigns.

Prospects for Financing the Three Strategies

New sources of revenue other than the traditional revenue from export crops would be required to finance agricultural programs under all three strategies, except in the near future for the heavy taxation policy of Strategy III. New revenue sources would be needed because of 1) rapidly increasing program costs for both continuing present policies under Strategy I or shifting to the harsher Strategy III, and 2) the removal of direct taxes on agricultural export and import substitution crops under Strategy II. Projected annual public costs are compared with projected revenue needs and sources under the three strategies in Table 25. In this analysis it is assumed that revenues generated in agriculture would be available to finance agricultural programs. As shown in column 6, the largest additional revenue from new sources would be required for Strategy II because of the elimination of taxes on export and import substitution crops (column 4). By 1985 the needed revenue from new farm and nonfarm sources under this strategy would reach £25.4 million, but still would be only about £9 million greater than for Strategy I and about £7 million greater than for Strategy III.

Strategy II programs present the greatest opportunity for obtaining the revenue needed from new sources from within agriculture. As the production campaigns gain momentum, the increase in agricultural income would provide a basis for income taxes. The higher consumption

Table 25. Total Annual Government-Appropriated Expenditures, Needed Tax Revenues and Revenue Sources for Agricultural Programs Under Three Alternative Strategies in Nigeria, 1966 and Projections for 1970, 1975 and 1985

Strategy (1)	Year (2)	Total government-appropriated agricultural program expenditures (3)	Tax revenue from export crops[1] (4)	Other available revenue from 1966 sources[2] (5)	Additional Revenue Needed from New Sources			Percent of petroleum revenue to equal additional revenue needed from non-agricultural sources (9)
					Total (6)	Amount from new direct and indirect taxes on agriculture (7)	Amount needed from non-agricultural sources (8)	
		£000						Percent
	1966	25,776	24,000	1,776				
Strategy I	1970	26,585	24,000	2,000	585	0	585	1
	1975	33,384	24,000	2,000	7,384	1,000	6,384	3
	1985	41,641	23,000	2,000	16,641	2,000	14,641	6
Strategy II	1970	23,008	17,000	2,000	4,008	2,000	2,008	2
	1975	25,247	0	2,000	23,247	10,000	13,247	6
	1985	27,416	0	2,000	25,416	15,000	10,416	4
Strategy III	1970	26,068	26,000	2,000	-1,932[4]	0	-1,932[4]	0
	1975	32,367	23,000	2,000	7,367	1,000	6,367	3
	1985	39,864	19,000	2,000	18,864	0	18,864	8

[1] Consists of export and producer taxes and marketing board trading profits.

[2] Maintained at approximately the 1966 level and represents largely miscellaneous revenue from agriculture and non-petroleum sources.

[3] May be obtained from new, less damaging tax sources from agriculture such as land taxes and income taxes and such indirect taxes as excise and import taxes. The figures for Strategy I represent largely indirect agricultural taxes as there is too little income in agriculture to extract much more by direct taxes. Under Strategy III there also are no significant increases in indirect taxes because of lower consumption of nonagriculturally produced goods.

[4] Used to support the nonagricultural sector.

of taxable consumer goods by farmers also would provide an opportunity for indirect taxation through excise and import taxes. Taxes also could be directly assessed on agriculture. Strategy II recommendations do not oppose taxes on agriculture, but they do oppose direct taxes on agricultural output and on the prices of productive inputs because such taxes act as strong disincentives to production. When taxes are necessary, it is recommended rather that they be placed on income, the use of income, and on land to avoid disincentives for increasing production. Strategy II programs would increase the profitability of farming and would help establish land values and a market for land which, in turn, would provide the basis for land tax and collateral for credit. Thus, Strategy II policies and programs would be able to replace much of the revenue lost from the elimination of the traditional taxes on the output of agricultural export crops. This is shown in column 7 of Table 25, where £15 million could be provided annually from new tax sources in agriculture by 1985. Considerably more tax revenue could be extracted if Nigeria were efficient in setting up effective income and land tax systems.

Agricultural incomes under Strategy I and III, on the other hand, would be so small and heavily taxed that increased tax rates on export and import substitution crops would tend to decrease tax revenue by decreasing production rather than increasing revenue. Likewise, the low level of incomes would restrict the consumption of taxable consumer goods and thus dry up most of the indirect tax sources. In column 7 of Table 25, the small £1 to £2 million in additional tax revenue from new sources in agriculture under Strategy I represents revenue mainly from indirect taxes on consumer goods, since there would be too

little taxable income in agriculture to extract more by direct taxes. Under Strategy III, there would not be any significant increase in indirect taxes because of even lower rural incomes and lower consumption of nonagricultural goods than under Strategy I.

The new sources of agricultural revenue available under Strategy II and the lower public costs of this strategy should permit elimination of the present taxes on agricultural output while requiring by 1975 only £13 million in public revenue from nonagricultural sources. This amount is only £7 million more from nonagricultural sources than would be needed under either Strategies I or III by 1975. By 1985, the greater prosperity in agriculture under Strategy II could increase revenue from the new agricultural taxes to such an extent that Strategy II recommendations would require only £10 million in nonagricultural revenue, which would be £4 to 8 million less than required under the other strategies. Strategy II therefore would place the smallest burden on the nonagricultural sector of the three alternative strategies, and should be the most feasible financially. The total revenue from nonagricultural sources could be readily obtained as only 4 to 6 percent of the £220 to £240 million total projected petroleum revenues could provide this revenue. The levels of nonagricultural revenue required to finance agriculture under each strategy are given in column 8 of Table 25 and are compared graphically in Figure 3.

Raising the revenue needed under Strategy II from new sources in agriculture should present no major problems. Nigerians have had long experience in collecting local taxes and should be able to tax higher farmer incomes. Excise and import taxes would present no difficulty in collection as these would be passed on to the consumer

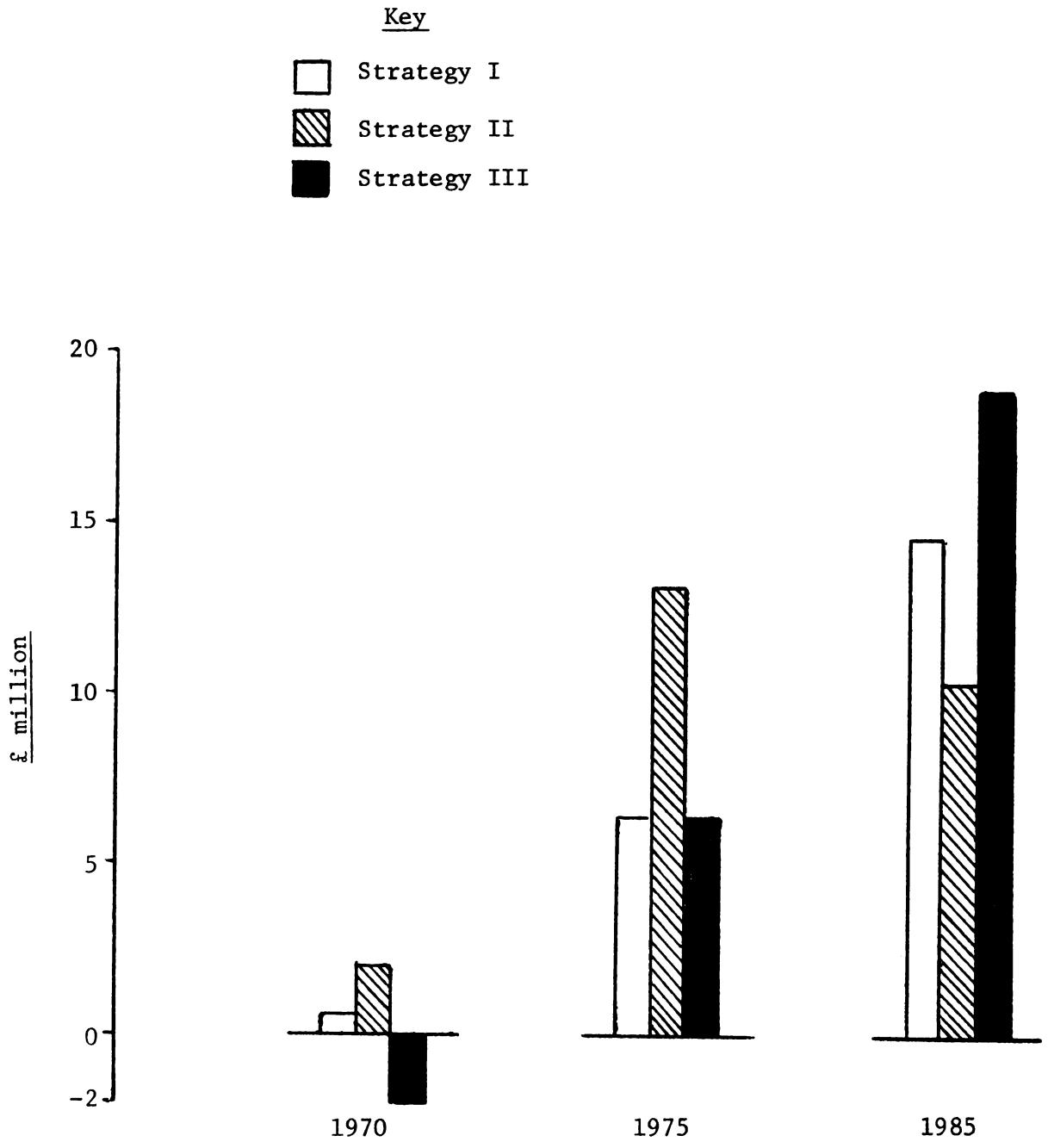

Figure 3. Revenue Required from Nonagricultural Sources to Finance Public Agricultural Programs in Nigeria, 1970, 1975 and 1985

Source: Table 25.

in the form of higher product prices. Nigerians have had experience with recently imposed income taxes in urban areas which should be invaluable in establishing a good income tax system in rural areas.

Enough revenue would be available to finance all the public programs recommended under Strategy II by 1985 if just the increase in the value added from agriculture that is greater than the increase under the other two strategies (£242 to £428 million more), were taxed at about 10 percent. However, the increased income in rural areas would have spill-over effects into the nonagricultural sector and would increase incomes there as well. Therefore, if taxes were placed on the entire increase in the value of GDP from Strategy II that is greater than the increase under the other two strategies (£420 to £515 million more), only about 5 percent would be needed. Alternatively, if the total of agriculture's income of £1,846 million by 1985 were taxed, only 1.5 percent would be necessary. Only 11 percent of petroleum revenues also would be adequate to cover the entire costs of Strategy II. In considering these new tax sources, it is essential that Nigerian decision-makers recognize that taxes on goods consumed by farmers and taxes on farmers' incomes are means of taxing agriculture, and that these taxes can be substituted for export taxes, produce purchase taxes and marketing board trading profits with much less disincentive on production.

The major difficulty in raising revenue for future use under Strategy II may arise from differences in resource endowments and the level of present and projected farm income between the southern and northern states. In the southern states, rural incomes are generally

higher and the tree crop economy lends itself more easily to possible land taxes than the annual crops in the north. Consequently, a greater percentage of the revenue from new sources in agriculture probably would come from the southern states. This means that the northern states would have to place heavier reliance for revenue on nonagricultural sources such as petroleum, especially since their program costs would increase considerably over 1966 levels rather than remain constant or decrease as would be the case in the southern states.

Under existing allocation procedures most of the petroleum revenues go to the Federal Government or to the state of origin as shown in Table 26. Since the northern states do not as yet have petroleum discoveries within their boundaries, they can count only on a very small allocation through the distributable pool and would be dependent on grants from the Federal Government in order to obtain future revenue from petroleum for financing agriculture and other development. These grants, however, should be available as the 4 to 6 percent of the total petroleum revenues needed to supply the entire additional revenue required from nonagricultural sources under Strategy II is considerably less than the 13 percent of total revenue that was allocated to agriculture in the 1962-68 development plan.

The financial feasibility of Strategies I and III also would depend on revenues from nonagricultural sources, since conditions under these strategies would present few opportunities for raising additional revenue needed for financing agricultural programs from within agriculture. The total amount needed from nonagricultural sources could be

Table 26. Approximate Petroleum Revenue Allocation in Nigeria, 1966 and Projections for 1970, 1975 and 1985[1]

Government	Source of petroleum	1966	1970		1975		1985	
	Percent[2]	£million	£million	Percent	£million	Percent	£million	Percent
Each northern state	0	1.5[3]	.6	.6	1.3	.6	1.4	.6
Lagos	0		.2	.2	.4	.2	.4	.2
Western	2	.9[4]	2.0	2.0	4.0	1.8	4.4	1.8
Mid-western	40	2.7	8.8	8.8	15.1	6.9	16.6	6.9
Rivers	50		10.5	10.5	17.9	8.1	19.8	8.2
Central Eastern	6	5.7[5]	2.8	2.8	5.3	2.4	5.7	2.4
South Eastern	2		1.1	1.1	2.1	1.0	2.3	1.0
Federal	0	4.4	71.6	71.0	167.4	76.0	182.4	75.9
Total	100	15.2	100.0	100.0	220.0	100.0	240.0	100.0

[1]These calculations are based on present allocation procedures for petroleum revenue. The most important sources of revenue are the petroleum profit tax, rents and royalties. All petroleum rents go to the state or origin while the entire petroleum profit tax goes to the Federal Government. Half of the royalties go to the state or origin, 15 percent to the Federal Government, and 35 percent to the distributable pool. In the distributable pool, each northern state receives 7 percent, Lagos 2 percent, Western 18 percent, Mid-western 8 percent, Rivers 5 percent, Central Eastern 17.5 percent and South Eastern 7.5 percent. The source of petroleum is therefore very important as the only direct source of petroleum revenues for states without petroleum discoveries or exploration within their borders is through the distributable pool.

[2]The percentage figures for the source of petroleum are based on 1968 estimates and may change considerably as new fields are discovered. The changes most likely would be in the southern states.

[3]Represents the entire Northern Region in 1966.

[4]Represents the entire Western Region in 1966.

[5]Represents the entire Eastern Region in 1966.

provided from only 6 to 8 percent of petroleum revenues. Consequently, these programs appear feasible from a standpoint of revenue availability. These strategies may be politically and socially infeasible, however, as Nigerian planners may hesitate to continue pumping funds into low-return agricultural programs which would likely lead to undesireable social and political consequences, such as accelerated rural to city migration and widespread farmer unrest.

Summary

This chapter has determined the public cost of agricultural programs under the three alternative strategies and compared these costs with income and foreign exchange earnings generated from agriculture to investigate the economic and political feasibility of the three strategies. The prospects for financing the three strategies also have been examined by comparing projected available revenues with the revenues which would be needed to finance the three strategies. Special emphasis has been placed on reconciling the programs recommended under Strategy II with the capacity of the Nigerian economy to finance them.

The programs and policies recommended under Strategy II would concentrate on assisting smallholder farmers through export crop production campaigns and general extension services, expanded research and credit, and increased incentives for production provided by eliminating the present produce pruchase and export taxes and marketing board trading profits on export crops. At the same time, grants in cash and kind would be replaced with credit. Public investments in

plantations and farm settlements and most input subsidies would be curtailed. Under Strategy I, moderate assistance would continue to be provided to smallholders. Large public expenditures, however, would continue for farm settlements, government plantations, and input subsidies, and irrigation schemes would be introduced in the northern states. The present taxes on export crops also would continue. Under Strategy III, taxes on export crops would be increased and government investments in agriculture would be larger than under Strategy I.

The findings of this chapter are that Strategy II is economically sound whereas the other two alternatives are very questionable. Total government-appropriated agricultural expenditures under Strategy II would be less in 1970 and 1975 and only £1.6 million more by 1985 than in 1966. These low costs would be due primarily to the large reductions in costs from the curtailment of public plantations, farm settlements, and input subsidies. Expenditures under Strategy I, on the other hand, would increase about £16 million over the 1966 level by 1985 and about £14 million under Strategy III. Strategy II would increase foreign exchange earnings and farmers' income from export crops alone by approximately £142 million and £169 million by 1985 respectively. These figures may be compared with Strategy I's small increase in farmers' income from export crops of only about £26 million, and decrease in foreign exchange from export crops of about £7 million by 1985. The corresponding figures under Strategy III would be an increase of about £8 million and a decrease of about £38 million. Considering all agricultural production (export crops and food, feed and livestock products), Strategy II would provide by 1985 for a

greater increase in the value added from agriculture of £242 to £428 million and a greater increase in GDP of £420 to £515 million than from Strategies I and III respectively. These figures omit the returns to any food, feed and livestock campaigns in the late 1970's and early 1980's which may be implemented if the research results under Strategy II materializes.

Finally, the reconciliation process has demonstrated the financial feasibility of the second strategy and outlined possible financial difficulties arrising from the other two strategies. The analysis is based on the assumption that revenues generated in agriculture will be available to finance agricultural programs. Furthermore, it is assumed that some petroleum revenues may be provided for agricultural investments which have high payoffs. The analysis has shown that the recommended Strategy II programs and policies could be financed even with the elimination of the present export and producer purchase taxes and marketing board trading profits on export and import substitution crops if a modest share of the projected increase in petroleum revenues could be channeled into agriculture. The low cost of the Strategy II programs would require less revenue than the two alternative strategies, and the higher farmer incomes would provide new revenue sources through excise, land, and income taxes which might be implemented in the late 1970's. With only moderate tax revenue from new sources in agriculture, Strategy II would likely require only £13 million from nonagricultural sources by 1975 and only £10 million by 1985. These figures are only £7 million more by 1975 than under Strategy I or III (these two strategies would

maintain the traditional taxes on export crops) and £4 to 8 million less by 1985.

The revenue needed from nonagricultural sources to finance agricultural programs should be obtainable for Strategy II, and even for I and III, because of rapid development of petroleum and high levels of expected future petroleum tax revenue (£220 to £240 million) fortunately providing a large new source of tax revenue for financing projects throughout Nigeria. For 1975 and 1985, only 4 to 6 percent of the total petroleum revenue could provide the additional revenue needed from nonagricultural sources for Strategy II. Most of the revenue from nonagricultural sources under this strategy, however, would be required by the northern states. Grants from the Federal Government to these states would be needed because of their large projected increases in annual expenditures and the small amounts of petroleum revenues that would be allocated directly to them through the distributable pool. From 3 to 8 percent of petroleum revenues would be required for Strategy I and III. Under all three strategies the nonagricultural revenue requirements would be considerably below the 13 percent of all revenues allocated to agriculture during the 1962-1968 development plan and would appear politically feasible. The low returns from the programs under Strategy I and especially III, however, might not justify politically the allocation of even 3 to 8 percent of petroleum revenues for these programs.

The details of the costs and returns and the revenue requirements under the three alternative strategies are further summarized along with manpower requirements in the next chapter. Chapter VII also summarizes the reconciliation procedure used in this dissertation and presents conclusions about its use in Nigeria.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

Agricultural planning in developing countries often has not been very successful. Research for agricultural sector planning is needed urgently because variations in agricultural yields, the heterogeneous nature of ecological zones of productions, and the ubiquity of small producing units all make agricultural planning much more complex than planning for the industrial sector. Research for agricultural planning in many developing countries, however, has been poorly coordinated, focused on a limited range of agricultural investment projects and has devoted little attention to agricultural education and other supporting services. In addition, little research has been conducted to insure consistency between the investment and educational requirements of programs and projects. Manpower and educational studies often have concentrated on educational institutions and their capacities and have devoted inadequate attention to the demand for trained manpower which is needed to plan and implement investment projects. Economists who have analyzed directly productive investment projects in agriculture frequently have stressed economic aspects of these projects while underplaying physical planning of human and natural resource requirements over time. At the macroeconomic level, inadequate research has been devoted to changes in the distribution and allocation of costs and returns of agricultural policies and

programs over time. Little research also has been undertaken to investigate the availability of sufficient revenue to finance the aggregate costs of agricultural programs and the feasibility of allocating this revenue to the appropriate agencies responsible for the development programs.

A major research study in Nigeria by the Consortium for the Study of Nigerian Rural Development has given the author an opportunity to focus on improved procedures for reconciling investments in agricultural production with investments in supporting services. Hopefully, the author's analysis will be of help to Nigerian planners in developing the second national plan and subsequent plans as well as planners in other developing countries.

The objectives of this study are

1. The development of a method for recondiling investments in agricultural production, education and infrastructure in developing countries with a) the capacity of the educational system to provide the necessary personnel, and b) the capacity of the economy through internal and external resources to finance both the educational and investment expenditures.

2. The application of this procedure to the programs and policies recommended by the Consortium for the Study of Nigerian Rural Development (CSNRD) for Nigeria over the 1969-85 period and the quantification of the manpower and financial consequences of three alternative strategies for Nigerian agricultural development from 1969 to 1985.

The procedure developed for reconciling the necessary resource,

manpower, and financial requirements of investments in agricultural production and infrastructure is called the reconciliation process. It emphasizes physical planning at both the farm and macroeconomic levels. The method which is summarized below, consists of seven interrelated steps which should be treated as a continuous and simultaneous process.

1. Gather background data. Available data should be mobilized and stock-taking surveys and research studies should be undertaken, if necessary, to provide additional farm level data as well as information at more aggregate levels.

2. Determine the program goals for investments in production and infrastructure and determine educational program goals. This step involves the formulation of initial goals for investment and educational programs. These goals then should be reconciled in the next step to incorporate the interrelation and complementarity of the investments and educational services. To determine the right actions or goals, educational programs and the investments in production in supporting services should be analyzed in view of both normative concepts of good and bad and nonnormative information.

3. Reconcile educational and investment program goals. This step involves close interaction between researchers analyzing investments and those analyzing educational services to identify goals which integrate the separate education and investment programs and take advantage of the complementarity of these programs.

4. Reconcile the integrated educational and investment goals

with manpower requirements and the availability of trained manpower. This step is necessary to determine the feasibility of training the required manpower. The total training requirements for the integrated education and investment programs to fill new positions and vacancies must be computed and then reconciled with the projected capacity of the educational system to train the required manpower.

5. Determine costs and returns to the educational-investment package, and reconcile the social benefits with social costs. This step requires the calculation of the costs and returns of the education and investment programs to a) see if the increased production can generate enough social benefits for urban and rural people to justify the expenditures on education and production and the choice of these projects over other projects, and b) serve as a basis for determining financial and political feasibility in the next two steps. It is necessary to compute the costs and returns to complementary inputs, such as educational services and new investments in agricultural production, as a set of inputs taken together rather than to compute individual returns to each.

6. Reconcile needed revenue with available revenue. This step is required to determine the financial feasibility of the education and investment programs through time. The revenue that is expected to be generated by the agricultural programs and available from other sources must be reconciled with the total revenue needed to pay for the programs.

7. Interact with decision-makers and administrators to work out political balance and feasibility. Interaction between researchers

and development planners, decision-makers in the public ministries, and other important officials is necessary to discuss the program and policy goals developed in the previous steps and to choose those goals which are politically and administratively feasible, or to make necessary modifications in infeasible programs.

In summary, the seven step process involves utilizing background data and the separate goals for educational and investment programs and developing new interrelated investment and educational goals. These goals then must be tested at successively higher levels for consistency with manpower training capacities, economic returns, available revenue, and political acceptability. As imbalances and inconsistencies are uncovered in each successive step of the process, the programs must be adjusted and rerun through the entire process until all the bottlenecks are worked out and new goals and targets can be established that are more balanced than the previous ones. Gradually the inconsistencies at all levels can be worked out and final goals and targets established for the overall program which are balanced, consistent, and feasible.

The reconciliation process has been used by the author in an agricultural sector analysis of Nigeria by CSNRD to investigate three alternative development strategies for Nigeria. Strategy I represents a continuation of present trends and policies in Nigerian agriculture, Strategy II is a change to more favorable agricultural policies and programs, and Strategy III represents a harsher, more exploitative agricultural policy than presently followed in Nigeria. Under Strategy I, moderate assistance would continue to be provided to smallholders.

Large public expenditures would continue for farm settlements, government plantations, and input subsidies, and large scale irrigation schemes would be developed in the northern states. The present taxes on export crops would also be continued. The programs and policies recommended under Strategy II would concentrate on assisting small-holder farmers through export crop production campaigns, general extension services, expanded research and credit. Incentives for expanding export crop production would be increased by eliminating the present produce purchase and export taxes and marketing board profits on export crops. At the same time, grants in cash and kind would be replaced with credit. Public investments in plantations and farm settlements and most input subsidies would be curtailed. Extension workers also would receive greater incentives and logistic support to improve the effectiveness of field work. Under Strategy III, taxes on export crops would be increased and government investments in agriculture would be larger than under Strategy I.

The author devoted major attention to reconciling the investments in production and infrastructure for Strategy II in order to develop a set of programs with high payoffs for Nigeria that were both consistent and feasible. In the other two strategies the reconciliation process was used only to point out strengths or weaknesses, and inconsistencies and bottlenecks. No attempt was made to reconcile these two strategies as this would have improved them in the direction of Strategy II and no longer would have represented the conditions of Strategy I and III.

The reconciliation process has shown in the CSNRD study that

the quality and quantity of trained agriculturalists required under all three strategies generally could be trained in the existing universities and subuniversity agricultural schools, including recommended Strategy II which would require nearly double the trained personnel as the other two strategies. The manpower requirements under Strategy I and III would be so low, however, that the present agricultural subuniversity and university institutions could quickly provide trained agriculturalists in excess of job opportunities, and reductions in agricultural student enrollments below the present level would be necessary.

The necessary subuniversity level personnel for Strategy II could be trained in the existing technical agricultural schools (Ministry Schools of Agriculture) with only minor modifications in physical plant and cirriculum as the future average annual manpower training requirements for graduates from the subuniversity technical agricultural schools (agricultural assistants and assistant agricultural superintendents) and training institutes (agricultural instructors in the northern states) would be less than the 1966 output or would not exceed it by 10 percent for nearly all areas and years to 1985. The one exception would be for AA's during the 1970-75 period in the Western, Mid-western and Lagos States, which could be trained in surplus training facilities for assistant agricultural superintendents. There also would be sufficient excess physical capacity at the subuniversity schools to train enough manpower for possible food, feed and livestock campaigns in the late 1970's and early 1980's if needed.

The present faculties of agriculture in the four universities also

could easily provide the average annual output of 150-172 university agricultural graduates required throughout Nigeria to 1985 under Strategy II without expansion in capital expenditures and with only modest increases in teaching staffs. Post-graduate training, however, might be needed from overseas institutions through part or perhaps all of the 1970's to train teachers and researchers for research institutes and universities.

The reconciliation process also has shown that Strategy II would be economically sound and financially feasible, whereas the other two alternatives would be very questionable economically and would likely face financial difficulties. The projected financial and economic aspects of the three strategies for 1975 and 1985 are summarized in Table 27. The financial analysis is based on the assumptions that revenues generated in agriculture will be available to finance agricultural programs and that future petroleum revenues will be so large that a small percentage of these revenues can be used for agricultural programs with high payoffs.

Strategy II would cost less and yield higher returns than either Strategy I or III in both the short and long run. In the short run, total government-appropriated agricultural expenditures under Strategy II would be £2.8 million less in 1970 and £.5 million less in 1975 than the 1966 level of expenditures. By 1975 these expenditures would be £7 to £8 million less than those under Strategy I or III. Also, by 1975 Strategy II would provide £40 to £58 million greater foreign exchange earnings annually and £60 to £74 million greater annual income for farmers from just export crops than would Strategy I

Table 27. Summary of Selected Projections of Returns, Costs and Revenue Under Three Alternative Strategies, Nigeria, 1975 and 1985

Item	Strategy I		Strategy II		Strategy III	
	1975	1985	1975	1985	1975	1985
	£ million		£ million		£ million	
Returns						
Total value added in agriculture	1138	1604	1207	1846	1108	1418
Total GDP	2882	4734	2991	5154	2835	4639
Increase in foreign exchange from export crops over the 1966 level	-12	-7	28	142	-30	-38
Increase in farmers' income from export crops over the 1966 level	13	26	73	169	-1	8
Costs						
Total	33	42	25	27	32	40
Increase over the 1966 level	8	16	-.5	1.6	7	14
Revenue						
Obtainable from traditional taxes on agricultural exports	24	23	0	0	23	19
Obtainable from new agricultural sources	1	2	10	15	1	0
Required from new non-agricultural sources	6	15	13	10	6	19

Source: Tables 20-25.

and III.

The comparisons between Strategy II and the other two strategies are even more striking in the long run. By 1985, total government-appropriated agricultural expenditures under Strategy II would be only £1.6 million more annually than the 1966 expenditures, and foreign exchange and farmer incomes from export crops alone would increase by about £142 million and £169 million respectively. Strategy I, on the other hand, would increase public-appropriated expenditures by £16 million by 1985. This strategy, however, would increase farmers' income from export crops by only about £26 million, and would decrease foreign exchange from export crops by about £7 million by 1985. The corresponding figures under Strategy III would be an increase in expenditures of £14 million, an increase in farmers' income from export crops of about £8 million and a decrease of about £38 million in foreign exchange from export crops. Considering all agricultural production (export crops and food, feed and livestock products), Strategy II would provide a greater increase in the value added from agriculture of £242 to £428 million and a greater increase in GDP of £420 to £515 million than Strategies I and III respectively by 1985. These figures omit the returns to any food, feed and livestock campaigns which may be implemented in the late 1970's and early 1980's if the research results under Strategy II materialize.

The reconciliation process has shown that the recommended Strategy II programs and policies could be financed even with the elimination of the present export and producer purchase taxes and marketing board profits on export and import substitution crops. The low cost of the

Strategy II programs would require less total revenue than the two alternative strategies, and the higher farmer incomes would provide an alternative means of taxes through excise, land, and income taxes which may be implemented in the late 1970's. With only moderate tax revenue from new sources in agriculture, Strategy II likely would require only £13 million from nonagricultural sources by 1975 and only £10 million by 1985. These revenue requirements would be only £7 more from nonagricultural sources than under Strategy I or III by 1975 and £4 to £8 million less by 1985, even though both Strategies I and III would maintain the traditional taxes on export crops. Because of the heavy tax burden on agriculture and low farm incomes under Strategy I and III, there would be little chance for raising much revenue from new sources in agriculture under these strategies.

The revenue needed from nonagricultural sources to finance agricultural programs should be obtainable for Strategy II, and even I and III as the rapid development of petroleum and high levels of expected future petroleum tax revenue (£220 to £240 million over the 1975-85 period) fortunately provides a large new source of tax revenue for financing projects throughout Nigeria. For 1975 and 1985 only 4 to 6 percent of the total petroleum revenue could provide the additional revenue needed from nonagricultural sources for agricultural development under Strategy II. This revenue would be needed primarily for Federal Government grants to the northern states, as the greatest increase in expenditures would occur in these states and their direct share of petroleum revenue would be very low. The 1975 and 1985 nonagricultural revenue requirements of Strategies I and III could be provided by allocating 3 to 8 percent of petroleum revenues

to agriculture. The nonagricultural revenue requirements under all three strategies, would be considerably below the 13 percent of all revenues allocated to agriculture during the 1962-1968 development plan and therefore would appear politically feasible. The low returns from the programs under Strategy I and especially III, however, might not justify politically the allocation of even 3 to 8 percent of petroleum revenues for these programs.

In summary, the reconciliation process has demonstrated that the CSNRD recommended agricultural development Strategy II is feasible for Nigeria over the 1970-85 period. The strategy II programs can be staffed and financed and are the kinds of programs that Nigerians have shown they can utilize.

Strategies I and III, on the other hand, are both expensive and low-return alternatives. Although the manpower and revenue probably would be available to support these strategies, it is unlikely that they could be followed until 1985 without being modified, perhaps haphazardly. The low farm incomes and rural unemployment resulting from these strategies likely would lead to undesireable social and political consequences, such as widespread farmer unrest and excessive migration to the cities. Furthermore, there is some question whether the continued low economic returns from these programs would generate enough political support for appropriation of the necessary revenue to continue these programs for long periods of time.

Conclusions

The results of this study have shown that the reconciliation process is an integral and necessary part of the agricultural planning process, as demonstrated in the CSNRD study in Nigeria. The technique examines and reconciles through time the manpower needs with the availability of trained manpower, costs with returns, and needed revenue with available revenue. In this process, inconsistencies, weaknesses, and crucial bottlenecks are identified and corrected. The procedure utilizes physical planning first to determine the physical resource requirements necessary to implement agricultural programs and then to serve as a basis for determining financial feasibility.

The reconciliation procedure has specifically demonstrated the soundness and feasibility of CSNRD recommended Strategy II for Nigerian agricultural development over the 1969-85 period. The method should be useful in agricultural planning in Nigeria, especially in the formulation of the second national plan in the early 1970's. The Federal Government and the new states may find the reconciliation procedure outlined here to be useful in their future agricultural planning. It also seems reasonable to conclude that the reconciliation process would be a useful planning technique in other developing countries and should be used in their agricultural planning as well.

For planners considering the use of this reconciliation process, several methodological conclusions emerge from this study. The reconciliation method described in this dissertation is essentially a technique for simple common-sense budgeting/balancing through time. The use of the procedure itself requires no complicated mathematical

techniques. The most important requirements for using this technique are common sense, practical knowledge and research data about the country and its agricultural sector, and a theoretical basis for predicting future outcomes and reactions to alternative policies. An important advantage of the reconciliation process is that it forces planners and researchers to view the development process as an integrated whole, rather than a series of isolated projects and programs.

The procedure is versatile, and easily adaptable to many types of models and research methods, including computer and noncomputer simulation. Noncomputer simulation, as used in this dissertation to develop projections, is recommended over computer simulation, at least until enough "soft ware" and "building block" components are developed to make it possible to simulate specific systems without heavy investments of time and money in the development of simulation. The reconciliation process also is not limited to studying manpower and financial requirements which have been emphasized in this study. The technique is flexible, and can be adapted readily to a wide range of problems facing planners.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books and Monographs

Aboyade, Ojetunji. Foundations of an African Economy, A Study of Investment and Growth in Nigeria. New York: Praeger, 1966.

Baldwin, K.D.S. The Niger Agricultural Project: An Experiment in African Development. Cambridge: Harvard University Press, 1957.

Bauman, H., C. Connoly, and John Whitney. A Situational Report on Agricultural Credit in Nigeria. (CSNRD No. 3) East Lansing: CSNRD, 1966.

Callaway, A. and A. Musone. Financing of Education in Nigeria. (African Research Monograph No. 15) Paris: UNESCO, International Institute for Educational Planning, 1968.

Cownie, John. Nigerian National Income Accounts: Historical Summary and Projections to 1985. (CSNRD No. 14) East Lansing: CSNRD, 1968.

Eicher, Carl K. and Carl E. Liedholm (eds.). Growth and Development of the Nigerian Economy. East Lansing: Michigan State University Press, 1969. Forthcoming.

Food and Agricultural Organization of the United Nations. Agricultural Development in Nigeria, 1965-1980. Rome: FAO, 1966.

Galletti, R., K.D.S. Baldwin and I.O. Dina. Nigerian Cocoa Farmers: An Economic Survey of Yoruba Cocoa Farming Families. London: Oxford University Press, 1956.

Gittinger, J. Price. The Literature of Agricultural Planning. (Planning Methods Series No. 4) Washington: Center for Development Planning, National Planning Association, 1966.

_____ Planning for Agricultural Development: The Iranian Experience. (Planning Experience Series No. 2) Washington: Center for Development Planning, National Planning Association, 1965.

Helleiner, Gerald. Peasant Agriculture, Government and Economic Growth in Nigeria. Homewood, Illinois: Richard Irwin, 1966.

Herrmann, Omer W. Nigerian Agricultural Research: Review and Recommendations. (CSNRD No. 22) East Lansing: CSNRD, 1969.

Industrial Directory 4th Edition, 1967. Lagos: Federal Ministry of Information, 1967.

International Bank for Reconstruction and Development. The Economic Development of Nigeria. Baltimore: The Johns Hopkins Press, 1955.

Johnson, Glenn L., et al. Strategies and Recommendations for Nigerian Rural Development, 1969-1985. (CSNRD No. 33) East Lansing: CSNRD, 1969.

Kincaid, James M., Jr. Strategies for Improvements of Agricultural Extension Work and Subuniversity Agricultural Training in Nigeria. (CSNRD No. 8) East Lansing: CSNRD, 1968.

Laurent, C.K. Agro-Industries in Nigeria. (CSNRD No. 25) East Lansing: CSNRD, 1968.

_____ Problems Facing the Fertilizer Distribution Program in the Six Northern States. (CSNRD No. 27) East Lansing: CSNRD, 1969.

Laurent, C.K., et al. Agricultural Investment Strategy in Nigeria. (CSNRD No. 26) East Lansing: CSNRD, 1969.

Lewis, C.I. The Ground and Nature of the Right. New York: Columbia University Press, 1955.

Lewis, W. Arthur. Development Planning: The Essentials of Economic Policy. New York: Harper and Row, 1966.

_____ Reflections on Nigeria's Economic Growth. Paris: OECD, Development Centre Studies, 1967.

Long, James S. An Analysis of the Needs and Resources for University Education in Agriculture in Nigeria. (CSNRD No. 28) East Lansing: CSNRD, 1969.

McFarlane, David and Martin Oworen. Investment in Oil Palm Plantations in Nigeria: A Financial and Economic Appraisal. Enugu: Economic Development Institute, University of Nigeria, 1966.

Myrdal, Gunnar. Asian Drama, an Inquiry into the Poverty of Nations. Vol. III New York: Twentieth Century Fund, 1968.

National Economic Council of Nigeria. Economic Survey of Nigeria, 1959. Lagos: Government Printer, 1959.

Nigerian Human Resource Development and Utilization. New York: Education and World Affairs, 1967.

The Oil-Rich Rivers State. Port Harcort: Information Unit, Office of the Governor, Rivers State, 1967.

Olatunbosun, Dupe. Nigerian Farm Settlements and School Leavers' Farms: Profitability, Resource Use and Social-Psychological Considerations. (CSNRD No. 9) East Lansing: CSNRD, 1967.

Oluwasanmi, H. A. Agriculture and Nigerian Economic Development. London: Oxford University Press, 1966.

Oluwasanmi, H. A. et al. Uboma: A Socio-Economic and Nutritional Survey of a Rural Community in Eastern Nigeria. Cornwall: Geographical Publications Ltd., 1966.

Oyenuga, V. A. Agriculture in Nigeria. Rome: FAO, 1967.

Purvis, Malcolm J. Report on a Survey of the Oil Palm Rehabilitation Scheme in Eastern Nigeria, 1967. (CSNRD No. 10) East Lansing: CSNRD, 1968.

Rowat, R.W. The Development of Education and Training in the Field of Agriculture and Related Subjects in Nigeria. Rome: FAO, 1966.

Saylor, R. G. A Study of Obstacles to Investment in Oil Palm and Rubber Plantations. (CSNRD No. 15) East Lansing: CSNRD, 1968.

Schultz, Theodore W. Economic Crisis in World Agriculture. Ann Arbor: University of Michigan Press, 1965.

_____ Economic Value of Education. New York: Columbia University Press, 1963.

_____ Transforming Traditional Agriculture. New Haven: Yale University Press, 1964.

Southworth, Harman M., and Bruce F. Johnston. Agricultural Development and Economic Growth. Ithaca: Cornell University Press, 1967.

Stolper, Wolfgang F. Planning Without Facts: Lessons in Resource Allocation from Nigeria's Development. Cambridge: Harvard University Press, 1966.

Waterson, Albert. Development Planning, Lessons in Experience. Baltimore: Johns Hopkins Press, 1965.

Official Government Documents

Archer, J.N. Educational Development in Nigeria, 1961-1970. Lagos: Government Printer, 1961.

Capital Estimates of the Government of Kwara State of Nigeria, 1968-1969. Kaduna: Government Printer, 1968.

Capital Estimates of the Government of the North-Eastern State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Capital Estimates of the Government of the North-Western State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Capital Estimates of the Interim Common Service Agency, 1968-1969. Kaduna: Government Printer, 1968.

Development Plan, 1962-68, First Progress Report. Kaduna: Government Printer, 1964.

Eastern Nigeria Development Plan 1962-68. Enugu: Government Printer, 1962.

Economics Department of the Premeir's Office. Western Nigeria Development Projects Analysis No. 1: Cocoa. Ibadan: Government Printer, 1965.

Estimates of Revenue and Expenditure of Eastern Nigeria for the Financial Year, 1966-67. Enugu: Government Printer, 1966.

Estimates of Revenue and Expenditure of Mid-Western Nigeria for the Financial Year, 1966-67. Lagos: Government Printer, 1966.

Estimates of Revenue and Expenditure of Mid-Western Nigeria for the Financial Year, 1968-69. Lagos: Government Printer, 1968.

Estimates of Revenue and Expenditure of Northern Nigeria for the Financial Year, 1968-68. Kaduna: Government Printer, 1967.

Estimates of Revenue and Expenditure of Western Nigeria for the Financial Year, 1967-68. Ibadan: Government Printer, 1967.

First Progress Report, Eastern Nigeria Development Plan, 1962-68. Enugu: Government Printer, 1964.

Guideposts for Second National Development Plan. Lagos: Ministry of Economic Development, 1966.

Investment in Education. The report of the commission on Post-School Certificate and Higher Education in Nigeria. Lagos: Government Printer, 1960.

Mid-Western Nigeria Development Plan, 1964-68. Benin City: Ministry of Internal Affairs, 1965.

Ministry of Agriculture and Natural Resources, Western Nigeria. Tree Crop Planting Projects. Ibadan: Government Printer, 1964.

National Development Plan, 1962-68. Lagos: Ministry of Economic Development, 1962.

National Development Plan Progress Report, 1964. Lagos: Federal Ministry of Economic Development, 1964.

Recurrent Estimates of the Government of Benue Plateau State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of the Federal Military Government of Nigeria, 1968-69. Lagos: Government Printer, 1968.

Recurrent Estimates of Kano State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of Kwara State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of the North Eastern State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of the North Central State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of the North Western State of Nigeria, 1968-69. Kaduna: Government Printer, 1968.

Recurrent Estimates of the Western State of Nigeria, 1968-69. Ibadan: Government Printer, 1968.

A Revised Plan of Development and Welfare for Nigeria, 1951-56. Lagos: Government Printing Office, 1951.

A Ten Year Plan of Development and Welfare for Nigeria, 1946. Lagos: Government Printing Office, 1946.

Western Nigeria Development Plan, 1962-68. Ibadan: Government Printer, 1962.

Western Nigeria Development Plan, 1962-68, First Progress Report. (Western Nigeria Official Document, No. 2 of 1964). Ibadan: Government Printer, 1964.

A White Paper on the Military Government Policy for the Reorganization of the Northern Nigeria Development Corporation. Kaduna: Government Printer, 1966.

A White Paper on the Northern Nigeria Military Government's Policy for the Comprehensive Review of the Past Operations and Methods of the Northern Nigeria Marketing Board. Kaduna: Government Printer, 1967.

Articles and Chapters in Books

Aboyade, O. "A General Critique of the Plan." Nigerian Journal of Economic and Social Studies, Vol. IV, No. 2 (July, 1962), 110-115.

_____ "Problems in Plan Revision." Nigerian Journal of Economic and Social Studies, Vol. III, No. 2 (July, 1965), 121-30.

Anschel, Kurt R. "Problems and Prospects of the Nigerian Rubber Industry." Nigerian Journal of Economic and Social Studies, Vol. IX, No. 2 (July, 1967), 145-59.

Ayida, A. A. "Contractor Finance and Supplier Credit in Economic Growth." Nigerian Journal of Economic and Social Studies, Vol. VII, No. 2 (July, 1965), 175-88.

Berg, Elliot J. "Socialism and Economic Development in Tropical Africa." Quarterly Journal of Economics, Vol. LXXVIII, No. 4 (November, 1964), 549-574.

Callaway, Archibald C. "Unemployment Among African School Leavers." Journal of Modern African Studies, Vol. I, No. 3 (September, 1963), 351-71.

Clark, Peter. "Economic Planning for a Country in Transition: Nigeria." Planning Economic Development. Edited by E. Hagen. Homewood, Illinois: Richard Irwin, 1966, Chapter 9.

Dean, E. R. "Nigerian Plan Implementation, 1962 to 1968." Paper presented at Michigan State University, July 10, 1968.

DeWilde, J. C. "Making Agricultural Research Relevant to African Farmers." Conference on Agricultural Research Priorities for Economic Development in Africa, Vol. III, (The Abidjan Conference) Washington D. C.: National Academy of Science, 1968.

Eicher, Carl K. "The Dynamics of Long-Term Agricultural Development in Nigeria." Journal of Farm Economics, Vol. XLIX, No. 5 (December, 1967), pp. 1158-1170.

_____ "Economic Research for African Agricultural Development." Conference on Agricultural Research Priorities for Economic Development in Africa, Vol. III, (The Abidjan Conference) Washington D. C.: National Academy of Science, 1968.

_____ "Effective Demand and Agricultural Planning." Ceres, (May-June, 1969).

Goldsworthy, P. R. "Responses of Cereals to Fertilizer in Northern Nigeria, In Sorghum." Experimental Agricultural, Vol. III, No. 1 (January, 1967), 29-40.

Harbison, F. "From Ashby to Reconstruction: Manpower and Education in Nigeria." Growth and Development of the Nigerian Economy. Edited by Carl K. Eicher and Carl E. Liedholm. East Lansing: Michigan State University Press, 1969.

Helleiner, Gerald K. "The Fiscal Role of the Marketing Boards in Nigerian Economic Development, 1947-61." Economic Journal, Vol. LXXIV, No. 295 (September, 1964), 582-610.

Hogendorn, Jan. "The Origins of the Groundnut Trade in Northern Nigeria." Growth and Development of the Nigerian Economy. Edited by Carl K. Eicher and Carl E. Liedholm. East Lansing: Michigan State University Press, 1969.

Johnson, Glenn L. "Factor Markets and Economic Development." Economic Development of Tropical Africa: Theory, Policy, Strategy and Organization. Edited by W. McPherson. Gainesville: University of Florida Press, 1968.

Mosher, Arthur T. "Research Needed on the Development Process for Agriculture." Economic Development of Agriculture, (Iowa State University Center for Agricultural and Economic Development), Ames: Iowa State University Press, 1962.

Newell, Allen and Herbert Simon. "Simulation." The International Encyclopedia of the Social Sciences. Vol. 14. Edited by David L. Sills. New York: MacMillan and Free Press, 1968.

Ojala, E. M. "The Programming of Agricultural Development." Agriculture and Economic Development. Edited by Herman Southworth and Bruce Johnston. Ithaca: Cornell University Press, 1967.

Oluwasanmi, H. A. "Land Tenure and Agricultural Improvement in Tropical Africa." Journal of Farm Economics, Vol. XXXIX, No. 3, Part I (August, 1957), 731-38.

Pearson, Scott. "Nigerian Petroleum: Implications for Medium-Term Planning." Growth and Development of the Nigerian Economy. Edited by Carl K. Eicher and Carl E. Liedholm. East Lansing: Michigan State University Press, 1969.

Purvis, Malcolm J. "Annual Yield Variation in Oil Palm: Marketing Board Purchases in Eastern Nigeria, 1955-56." Journal of the Nigerian Institute for Oil Palm Research. Forthcoming.

Schickele, Rainer. "Farm Management Research for Agricultural Planning." Agrarian Revolution and Economic Progress. New York: Praeger, 1968.

Sklar, Richard L. "Nigerian Politics in Perspective." Government and Opposition, Vol. 2, No. 4 (July-Oct., 1967).

Stolper, W. F. "Economic Development in Nigeria." Journal of Economic History, Vol. XXIII, No. 4 (December, 1963), 391-413.

Schultz, Theodore W. "The Rate of Return in Allocating Investment Resources to Education." Journal of Human Resources, Vol. II, No. 3, (Sept., 1967).

Szczepanik, E. F. "Agricultural Development Programs: Principal Steps in Formulation." FAO Agricultural Planning Course, 1963. Rome: FAO, 1964.

Watson, Andrew M., and Joel B. Dirlam. "The Impact of Underdevelopment on Economic Planning." Quarterly Journal of Economics, Vol. 79, (May, 1965), 167-194.

Wells, Jerome C. "Government Investment in Nigerian Agriculture: Some Unsettled Issues." Nigerian Journal of Economic and Social Studies, Vol. VIII (March, 1966).

_____ "Issues in Agricultural Policy During the 1962-68 Development Plan." Growth and Development of the Nigerian Economy. Edited by Carl K. Eicher and Carl E. Liedholm. East Lansing: Michigan State University Press, 1969.

Welsche, Delane. "Response to Economic Incentive to Abakaliki Rice Farmers in Eastern Nigeria." Journal of Farm Economics, Vol. XLVII, No. 4 (November, 1965), 900-14.

APPENDICES

APPENDIX A

Acreage Targets for Strategy II Export Crop Production Campaigns

The export crop campaign acreage targets for oil palm and cocoa are given in Tables A.1 and A.2 on the next page. No large scale production campaign is recommended for rubber because of its low product price and relatively uneconomic competitive position with respect to oil palm, which can be grown on the same acreage. CSNRD researchers do recommend, however that Nigeria

1. Introduce the new crumb-processing technology to improve the quality of wild rubber and thereby increase producer incomes and foreign exchange earnings from wild rubber.

2. Launch a pilot rubber production-research campaign which would utilize improved (a) clones, (b) tapping techniques and (c) processing technology and

3. Strengthen rubber research at the Rubber Research Station at Iyanomo, Mid-western State.

The production campaigns for cotton and groundnuts would be located entirely in the northern states. The targets for these campaigns are given for the entire six states together, rather than by individual states, to allow for flexibility and development of these campaigns on an individual state basis. The target for groundnuts for the northern states is 20,000 acres in 1970 increasing to 170,000 acres in 1975. Cotton targets are 20,000 acres in 1970 increasing to 110,000 acres in 1975. In addition to acreage covered specifically in the campaigns, considerable other acreage should be improved as a result of improved producer prices under Strategy II and demonstration effects from farmers included in the campaigns.

Table A.1. Strategy II: Suggested Oil Palm Campaign Acreage, Nigeria, 1970-75

Year	Eastern states	Mid-western State	Kwara, Lagos and Western States	Total
		Acres		
1970	10,000	500	500	11,000
1971	20,000	1,000	1,000	22,000
1972	30,000	5,000	5,000	40,000
1973	40,000	10,000	10,000	60,000
1974	40,000	15,000	15,000	70,000
1975	40,000	20,000	20,000	80,000

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table VII.5.

Table A.2. Strategy II: Suggested Cocoa Campaign Acreage, Nigeria, 1970-75

Year	Western State	Mid-western State	Eastern states	Total
		Acres		
1970	10,000	2,500	3,000	15,000
1971	20,000	5,000	4,000	29,000
1972	20,000	5,000	6,000	31,000
1973	24,000	6,000	8,000	38,000
1974	28,000	7,000	8,000	43,000
1975	32,000	8,000	8,000	48,000

Source: Summarized from Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, p. 76.

APPENDIX B

Projections of Export Crop Production Under the Three Strategies

The projected effects on export crop production from following the three alternative strategies are given by commodity in Tables B.1 to B.5. The projections for Strategy II are based on the production campaigns discussed in the previous section, which have been checked for manpower and financial balances. The projections under Strategy I and III represent a much less vigorous effort to expand agricultural exports, especially through smallholder production. Under Strategy I, modest increases in cotton and groundnuts are projected with an eventual decline in the tree crop production as these trees become too old for maximum production. The Strategy II projections indicate large increases in cotton and groundnuts, together with increases in tree crop production resulting from planting more acres and taking better care of existing stands. Rubber production would decline as oil palm would be planted in its place. Under Strategy III, smallholder farmers would have little incentive and receive little help to increase production. Government production would be limited by inefficient management and production techniques. As a consequence, tree crop production would decline from neglect and age, and annual cash crop production would increase only slowly with population increases. Under both Strategy I and III Nigeria would switch from an exporter to an importer in cotton and palm oil.

TABLE B.1. Selected Aspects of Rubber Production Under Three Alternative Strategies, Nigeria, 1963, 1966, 1970, 1975 and 1985

Year and alternative strategy	Acres	Yield per acre	Total production	Price to farmers[1]	World price (f.o.b. Nigeria)
	1,000	pounds	long tons	£/tons	£/tons
1963	480	317	68,000	165	196[2]
1966	480	328	70,270	130	160
1970					
Strategy I	485	320	70,000	93	120
Strategy II	485	325	71,000	93	120
Strategy III	485	318	69,000	93	120
1975					
Strategy I	414	325	60,000	93	120
Strategy II	414	330	61,000	93	120
Strategy III	400	320	57,000	93	120
1985					
Strategy I	355	315	50,000[3]	93	120
Strategy II	355	345	55,000	93	120
Strategy III	320	300	43,000	93	120

[1] Tax levels for rubber under the three alternative strategies are given in Table C.1.

[2] 1961-65 average CSNRD calculations from FAO data.

[3] The 55,000-ton production output in 1985 is not a projection. It is a conservative estimate which may be substantially increased if Nigeria demonstrates an ability to adopt new rubber technology.

Source: The production figures in Tables B.1 to B.5 were developed by the author with CSNRD team members Robert Gray and Herbert Kriesel from production programs and responses anticipated under the three alternative strategies. The world price projections are closely correlated with price projections of the International Bank for Reconstruction and Development. This table also appears as Table VII.3 in Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985.

TABLE B.2. Selected Aspects of Cocoa Production Under Three Alternative Strategies, Nigeria, 1963, 1967, 1970, 1975 and 1985

Year and alternative strategy	Acres	Yield per acre	Total production	Price to farmers[1]	World prices (f.o.b. Nigeria)
	1,000	pounds	long tons	£/tons	£/tons
1963-67 average	1,200	427	229	50-116	150-220
1970					
Strategy I	1,200	427	229	100	170
Strategy II	1,200	463	248	120	170
Strategy III	1,200	409	219	92	170
1975					
Strategy I	1,200	467	251	95	160
Strategy II	1,275	513	292	138.4	160
Strategy III	1,200	386	207	92	160
1985					
Strategy I	1,200	450	242	95	150
Strategy II	1,515	643	435	128.4	150
Strategy III	1,250	364	187	92	150

[1] Tax levels per ton of cocoa under the three alternative strategies are given in Table C.2.

Source: See Table B.1. This table also appears as Table VII.1 in Glenn L. Johnson, et al., op. cit.

TABLE B.3. Selected Aspects of Oil Palm Produce Production Under Three Alternative Strategies, Nigeria, 1963, 1967, 1970, 1975 and 1985

Yield and alternative strategy	Acres	Yield per acre: oil	Yield per acre: kernel	Production: oil	Production: kernel	Domestic consumption: oil	Price to farmers: oil[1]	Price to farmers: kernel[1]	World price (f.o.b. Nigeria): oil	World price (f.o.b. Nigeria): kernel
	1,000	pounds		1,000 long tons			£/ton			
1963	5,600	206	160	495	400	350	42.0[1]	27.0[1]	81.5[1]	51.7[2]
1967	5,600	208	160	520	400	376	41.0	27.0	n.a.	n.a.
1970										
I	5,600	196	160	490	400	420	31.5	26.0	52	43
II	5,600	224	162	560	405	420	40.0	31.0	52	43
III	5,600	196	160	490	400	420	30.5	25.0	52	43
1975										
I	5,600	200	152	500	385	480	31.5	26.0	52	43
II	5,740	236	160	605	410	477	40.0	36.0	52	43
III	5,600	192	148	480	370	480	30.5	25.0	52	43
1985										
I	5,600	210	144	525	360	600	31.5	26.0	52	43
II	5,800	310	180	800	465	626	40.0	36.0	52	43
III	5,600	204	136	510	340	600	30.5	25.0	52	45

[1] Tax levels per ton of oil palm products are given in Table C.3.

[2] 1961-65 average. CSNRD computation from FAO figures.

Source: See Table B.1. This table also appears as Table VII.6 in Glenn L. Johnson, et al., op. cit.

TABLE B.4. Selected Aspects of Groundnut Production Under Three Alternative Strategies, Nigeria, 1963, 1966, 1967, 1970, 1975 and 1985

Year and alternative strategy	Acres	Yield per acre	Total production	Price to farmers[1]	World price (f.o.b. Nigeria)
	1,000	pounds	long tons	£/tons	£/tons
1963-64	3,100	705	991	30.0	59.3[3]
1966-67	3,700	777	1,291[2]	32.00	
1967-68	n.a.	n.a.	620	29 Grade I 27 Grade II	
1970					
Strategy I	3,330	740	1,100	27	53
Strategy II	3,500	765	1,200	27	53
Strategy III	3,275	710	1,040	26.2	53
1975					
Strategy I	3,500	800	1,250	27.0	53
Strategy II	4,080	880	1,600	37.0	53
Strategy III	3,400	720	1,090	26.2	53
1985					
Strategy I	4,125	900	1,600	27.0	53
Strategy II	5,830	1,330	3,200	37.0	53
Strategy III	3,650	760	1,240	26.2	53

[1] Tax levels per ton of groundnut products under the three alternative strategies are given in Table C.4.

[2] The average yield in 1966-67 was substantially above normal because of exceptionally favorable weather. A yield of around 700 pounds and production of about 1,000,000 tons are considered more realistic averages for the late 1960's.

[3] 1961-65 average price calculated from NPMC and marketing board data.

Source: See Table B.1. This table also appears as Table VII.8 in Glenn L. Johnson, et al., op. cit.

TABLE B.5. Selected Aspects of Cotton Production under Three Alternative Strategies, Nigeria, 1963, 1967, 1970, 1975 and 1985

Year and alternative strategy	Acres	Yield per acre in seed cotton	Production seed cotton	Imports of cloth (in lint equivalent	Lint: Export	Lint: Domestic	Price to farmers seed cotton[1]
	1,000	Pounds	-----	1,000 long tons	----		Pence/lbs.
1963	1,112	260	129	43	--	--	4.7
1967	1,284	260	149	23	19	32	4.6
1970							
I	1,200	260	139	21	6	40	4.9
II	1,500	300	200	21	21	46	6.2
III	1,100	255	125	21	2	40	4.8
1975							
I	1,325	280	165	20	--	55	6.9
II	1,600	400	285	10	14	81	6.2
III	1,150	270	139	23	-4	50	7.2
1985							
I	1,700	350	265	31	--	88	6.5
II	2,300	500	513	10	21	150	6.2
III	1,800	325	260	34	--	87	7.2

[1] Tax levels on cotton products under the three strategies are given in Table C.5.

Source: See Table B.1. This table also appears as Table VII.11 in Glenn L. Johnson, et al., op. cit.

APPENDIX C

Projections of Financial Returns from Export Crop Production Under Three Alternative Strategies

Table C.1. Rubber Projections Under Three Alternative Strategies: Payments to Farmers from Exports and Domestic Consumption, Government Revenues and Exchange Earnings, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
					£000				
Nongovernment revenues generated									
Payments to farmers[1]	6,510	6,603	6,417	5,580	5,673	5,301	4,650	5,115	3,999
Transportation and marketing	1,890	1,917	1,863	1,620	1,647	1,539	1,350	1,485	1,161
Government revenues									
Export duties[2]	--	--	--	--	--	--	--	--	--
Exchange earnings	8,400	8,520	8,280	7,200	7,320	6,840	6,000	6,600	5,160

[1]Under Strategy II, cost reductions in production and processing will increase the net income share of the payments to farmers over the share in Strategies I and III.

[2]There is no export duty when the price is less than 18d per pound.

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table VII.4.

Table C.2. Cocoa Projections Under Three Alternative Strategies: Payments to Farmers from Exports, Government Revenues and Exchange Earnings, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
					£000				
Nongovernment revenues generated									
Payments to farmers	22,900	29,760	20,148	23,845	40,413	19,044	22,990	55,854	17,204
Transportation and marketing[1]	4,946	5,357	4,555	5,422	6,307	4,471	5,227	9,396	4,039
Government revenue[2]									
Producer purchase tax	916	496	963	1,004	--	911	968	--	823
Export duties	4,695	1,612	4,927	5,145	--	4,957	4,961	--	4,207
Marketing board surplus	5,473	4,935	6,637	4,744	--	4,037	2,154	--	1,777
Total government revenues	11,084	7,043	12,527	10,293	--	9,605	8,083	--	6,807
Exchange earnings	38,930	42,160	37,230	40,160	46,720	33,120	36,300	65,250	28,050

[1]This item may include monopolistic income as well as costs of producing marketing and transportation services.

[2]Tax take per ton of produce (including marketing board trading profits) under Strategy I is calculated at the 1961-65 rate for all projections. Taxes under Strategy II are one-half the 1961-65 rate for 1970 and eliminated by 1975. Tax take per ton of product under Strategy III is increased by 10% over the 1961-65 average for all projections.

Source: Glenn L. Johnson, et al., Strategies and Recommendations for Nigerian Rural Development, 1969-1985, Table VII.2.

Table C.3. Palm Products Projections Under Three Alternative Strategies: Payments to Farmers from Exports and Domestic Consumption, Government Revenues and Exchange Earnings, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
	£000								
Nongovernment revenues generated[1]									
Payments to farmers from palm products exported	12,600	18,155	12,135	10,640	19,880	9,250	9,360	23,700	8,500
From domestically consumed palm products	13,230	16,800	12,810	15,120	19,080	14,640	18,900	25,040	18,300
Total payments to farmers from palm products	25,830	34,955	24,945	25,760	38,960	23,890	28,260	48,740	26,800
Government revenues									
Producer taxes[2]	2,462	283	3,578	2,477	--	2,608	2,535	--	2,686
Export duties[3]	2,120	1,053	2,320	2,040	--	2,146	1,908	--	1,972
Marketing board surplus	1,609	648	1,757	1,326	--	1,295	1,152	--	1,190
Total government revenues	6,191	1,984	6,655	5,843	--	6,049	5,595	--	5,848
Exchange earnings	20,840	24,695	20,840	17,595	24,286	15,910	15,480	29,043	14,620

[1]Transportation and marketing of exported palm produce not calculated.

[2]Produce purchase taxes and marketing board profits per ton of both palm oil and kernels under Strategy I are calculated at the 1961-65 average for all projections. These taxes are calculated under Strategy II at one-half the 1961-65 average for 1970 for kernels but then eliminated by 1975. No taxes are calculated for palm oil under Strategy II for any projections. Produce taxes and marketing board trading profits for both palm oil and kernels under Strategy III are increased by 10 percent over the 1961-65 average for all projections.

[3]Export duties are eliminated for palm oil exports for Strategies I,II and III for 1970, 1975 and 1985. Export duties for palm kernels under Strategy I are calculated at the 1961-65 average rate for all projections; at one-half the 1961-65 average rate for Strategy II in 1970 and then eliminated in 1975; and at 110 percent of the 1961-65 average rate for Strategy III, for all projections.

Source: Glenn L. Johnson, et al., op. cit., Table VII.7.

Table C.4. Groundnut Products Projections Under Three Alternative Strategies: Payments to Farmers from Exports, Government Revenues and Exchange Earnings, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
					£000				
Nongovernment revenues generated									
Payments to farmers from groundnuts and groundnut products exported	22,788	25,434	20,450	25,758	48,285	20,698	30,564	103,674	20,200
From domestically consumed groundnuts and groundnut products	5,454	5,454	5,292	6,345	8,547	6,288	8,505	11,470	8,384
Total payments to farmers from groundnuts and groundnut products	28,242	30,888	25,838	32,103	56,832	26,986	39,690	115,144	28,584
Transportation and marketing	15,193	16,956	14,115	17,263	20,880	14,225	20,377	44,832	13,880
Government revenues[1]									
Producer tax	1,181	1,319	1,206	1,335	--	1,212	1,584	--	1,186
Export duties	5,064	5,652	5,174	5,724	--	5,214	6,792	--	5,088
Marketing board surplus	506	565	517	572	--	521	679	--	509
Total government revenues	6,751	7,536	6,897	6,631	--	6,947	9,055	--	6,783
Exchange earnings	44,732	49,926	41,550	50,502	69,165	41,870	59,996	148,506	40,863

[1]Tax take per ton of product under Strategy I is calculated at the 1961-65 average rate for all projections. Taxes, including marketing board levies, are calculated for Strategy II at the 1961-65 average rate for 1970 but eliminated by 1975. The average 1961-65 rates are increased by 10 percent under the Strategy III projections.

Source: Glenn L. Johnson, et al., op cit., Table VII.9.

Table C.5. Cotton and Cotton Products Projections Under Three Alternative Strategies:[1] Payments to Farmers from Exports and Domestic Consumption, Government Revenues and Exchange Earnings, Nigeria, 1970, 1975 and 1985

Item	1970 Strategy			1975 Strategy			1985 Strategy		
	I	II	III	I	II	III	I	II	III
	£000								
Nongovernment revenue generated									
Payments to farmers from cotton exported	811	3,521	258	--	2,385	--	--	3,578	--
From domestically consumed cotton	5,430	7,714	5,242	10,428	13,082	8,976	15,735	25,560	16,765
Transportation & marketing[2]	--	--	--	--	--	--	--	--	--
Government revenues									
Producer tax[3]	14	10	14	16	--	15	27	--	28
Export duties	19	26	7	--	--	--	--	--	--
Exchange earnings	2,914	6,946	1,844	908	6,700	1,109	3,042	12,366	2,774

[1]No allowance has been made for a possible program to substitute domestic production for gray cloth imports.

[2]Not calculated.

[3]Taxes, including marketing board trading profits under Strategy II are calculated at one-half of the 1961-65 average rates for 1970 and eliminated by 1975. Tax take per ton of produce under Strategy I is calculated at the 1961-65 average rate for all projections. The average 1961-65 rates are increased by 10 percent under the Strategy III projections.

Source: Glenn L. Johnson, et al., op. cit., Table VII.12.

APPENDIX D

TABLE D.1. Agricultural Research Expenditures in Nigeria, 1966-1967

Type of research	Expenditures	
	Recurrent	Capital
	£	
Federal Only		
Federal Dept. Ag. Research	284,142	169,130
Federal Dept. For. Research	123,527	121,520
Federal Dept. Vet. Research	205,389	67,390
Federal Fisheries Service	69,586[1]	661,300
NISER	60,000[2]	
NSPRI	44,187[2]	
NIIR	92,660[2]	
NITR	176,450	
Commonwealth Forest Institute	1,520	
Commonwealth Ag. Bureau	8,970	
Rural Economic Survey	181,400	
Kainji Lake Research		97,000
Federal-Regional		
NIFOR	264,000	
CRIN	502,000	
Regional		
Western - MOA/Ag. research	157,240	6,000
Mid-western - MANR/Ag. research	16,830	12,000
Fertilizer research	4,000[2]	
Rubber Research Station	21,120[2]	
Eastern - MOA/Ag. research	75,080	60,000
Vet. investigation	6,490	
Research maintenance	25,000	
Minor crop research	--	40,000
Northern - Miscellaneous	10,350	
Universities		
University of Ibaden	64,988	
Ahmadu Bello University	5,620	
Inst. for Ag. research	595,150	35,000
ABU Vet.	n.a.	
University of Ife	13,750[2]	
University of Nusuka	28,000[2]	
EDI	59,365[2]	
Other		
FAO forest research	144,000[1]	
ILO	90,000	
IITA		
Total expenditures	3,533,914	669,340

[1] Estimate of 1966 expenditures.

[2] 1965 figures.

Table E.1. Strategy II: Extension Staffing for Smallholder Campaigns in Nigeria, 1966-1985

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratios	Field	Supt.	A.O.
								- - Positions - - - - -		
Oil palm Eastern states										
Existing programs	50,000 acres @5-10 A/farm	1962 to 1965	12,500	1,800	50,000	7,500	na	na	na	na
		1966	20,000	2,000	70,000	10,000	1:40	240	12	1
	War and reconstruction period	1967 to 1969	-	-	-	-	1:40	240	12	1
Campaign	Replanting or rehabilitation	1970	10,000	1,000	80,000	11,000	1:40 old 1:40 new	265	14	2
		1971	20,000	2,000	100,000	13,000	1:50 old 1:40 new	270	14	2

Source: James M. Kincaid, Jr., Strategies for Improvements for Agricultural Extension Work and Subuniversity Agricultural Training in Nigeria, Appendix D, Table D.10.

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
		1972	30,000	3,000	130,000	16,000	1:60 old 1:40 new	291	15	2
		1973	40,000	4,000	170,000	20,000	1:70 old 1:40 new	328	16	2
		1974	40,000	4,000	210,000	24,000	1:80 old 1:40 new	350	18	3
		1975	40,000	4,000	250,000	28,000	1:90 old 1:40 new	367	18	3
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension educational efforts to continue but at widening ratios of field workers to farmers with about 40,000 acres rehabilitated each year.)							
Oil palm Mid-western State										
Existing programs	No current rehabilitation scheme	1968	-	-	-	-	-	-	-	-

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
Pilot project	Replanting or rehabilitation	1970	500	50	500	50	1:25	2	-	-
		1971	1,000	100	1,500	150	1:25	6	-	-
Campaign	Replanting or rehabilitation	1972	5,000	500	6,500	650	1:40 old 1:40 new	24	2	-
		1973	10,000	1,000	16,500	1,650	1:50 old 1:40 new	38	2	-
		1974	15,000	1,500	31,500	3,150	1:60 old 1:40 new	66	3	-
		1975	20,000	2,000	51,500	5,150	1:70 old 1:40 new	95	5	1
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension educational efforts to continue but at widening ratios of field workers to farmers with about 20,000 acres rehabilitated each year.)							

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
Oil palm Western, Kwara, and Lagos States										
Existing programs	No current rehabilitation campaign	1968	-	-	-	-	-	-	-	-
Pilot project	replanting or rehabilitation	1970	500	50	500	50	1:25	2	-	-
		1971	1,000	100	1,500	150	1:25	6	-	-
Campaign	replanting or rehabilitation	1972	5,000	500	6,500	650	1:40 old 1:40 new	24	2	-
		1973	10,000	1,000	16,500	1,650	1:50 old 1:40 new	38	2	-
		1974	15,000	1,500	31,500	3,150	1:60 old 1:40 new	66	3	-
		1975	20,000	2,000	51,500	5,150	1:70 old 1:40 new	95	5	1

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								- - - Positions - - -		
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension educational effort to continue but at widening ratios of field workers to farmers with about 20,000 acres rehabilitated each year.)							
Cocoa										
Western State										
Existing programs	Rehabilitation	1967	na	na	na	na	na	60	3	1
	War and reconstruction period	1968 to 1969	-	-	-	-	-	60	3	1
Campaign	New planting or rehabilitation	1970	10,000	2,000	10,000	2,000	1:40	50	3	1
		1971	20,000	4,000	30,000	6,000	1:50 old 1:40 new	140	7	2
		1972	20,000	4,000	50,000	10,000	1:60 old 1:40 new	200	10	2
		1973	24,000	4,800	74,000	14,800	1:70 old 1:40 new	263	14	3

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								--- Positions ---		
		1974	28,000	5,600	102,000	20,400	1:80 old 1:40 new	325	17	3
		1975	32,000	6,400	134,000	26,800	1:90 old 1:40 new	387	20	3
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension education effort to continue but at widening ratios of field workers to farmers with similar acreage planted or rehabilitated as in 1975.)							
Cocoa Mid-western State										
Existing programs	Rehabilitation	1967	na	na	na	na	na	-	-	-
	War and reconstruction period	1968 to 1969	-	-	-	-	-	-	-	-
Campaign	New planting or rehabilitation	1970	2,500	500	2,500	500	1:40	13	1	1
		1971	5,000	1,000	7,500	1,500	1:50 old 1:40 new	35	2	1

Table E.1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers : farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratios	Field	Supt.	A.O.
								Positions		
		1972	5,000	1,000	12,500	2,500	1:60 old 1:40 new	50	3	1
		1973	6,000	1,200	18,500	3,700	1:70 old 1:40 new	66	4	1
		1974	7,000	1,400	25,500	5,100	1:80 old 1:40 new	81	4	1
		1975	8,000	1,600	33,500	6,700	1:90 old 1:40 new	97	5	1
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension education effort to continue but at widening ratios of field workers to farmers with similar acreage planted or rehabilitated as in 1975.)							
Cocoa Eastern states										
Existing programs	20,000 acres @4 A/farm	1962 to 1965	6,500	1,000	20,000	5,000	na	na	na	na
		1966	na	na	na	na	1:40	40	9	3

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
	War and reconstruction period	1967 to 1969	-	-	-	-	-	-	-	-
Campaign	New planting	1970	3,000	750	23,000	5,750	1:60 old 1:40 new	102	6	1
		1971	4,000	1,000	27,000	6,750	1:60 old 1:40 new	121	7	1
		1972	6,000	1,500	33,000	8,250	1:60 old 1:40 new	150	8	1
		1973	8,000	2,000	41,000	10,250	1:70 old 1:40 new	168	9	2
		1974	8,000	2,000	49,000	12,250	1:80 old 1:40 new	178	9	2
		1975	8,000	2,000	57,000	14,250	1:90 old 1:40 new	186	10	2

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
	Gradual shift from gov't sponsored campaign to private responsibility	1976 to 1985	(Extension education efforts to continue but at widening ratios of field workers to farmers with similar acreage planted or rehabilitated as in 1975.)							
Rubber										
Mid-western State										
Existing programs	No current rehabilitation scheme	1968								
Experimental and demonstrational program	Limited smallholder experimental & demonstrational program	1970 to 1975	1,000	150	1,000	150	1:25	6	-	-
			(A general extension program with existing smallholders would be continued.)							
		1976 to 1985	(Decisions about whether to initiate an intensive rubber campaign would be reached at the end of the 1970 to 1975 experimental - demonstrational program.)							

Table E.1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
								Positions		
Groundnuts Northern states										
Existing programs	General package approach reaching some of 1.7 mil. farmers, producing 1 mil. tons on 3 mil. acres.	1968	-	-	-	-	-	-	-	-
Campaign	Intensive program with relatively limited no. of farmers, with most emphasis in Kano and North Central States where 70 percent of groundnut production is concentrated.	1970	20,000	10,000	20,000	10,000	1:50	200	10	2
		1971	30,000	15,000	50,000	25,000	1:60 1 yr. 1:50 1st yr.	467	23	4
		1972	40,000	20,000	90,000	45,000	1:100 2 yr. 1:80 1 yr. 1:50 1st yr.	688	34	6
		1973	82,500	27,500	172,500	72,500	1:150 2 yrs.+ 1:90 1 yr. 1:50 1st yr.	939	47	8
		1974	82,500	25,000	255,000	97,500	1:175 2 yrs.+ 1:100 1 yr. 1:50 1st yr.	1032	51	9

Table E. 1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratio	Field	Supt.	A.O.
		1975	170,000	42,500	425,000	140,000	1:250 2 yrs.+ 1:125 1 yr. 1:50 1st yr.	1340	67	11
	This program would continue with much of supply functions assumed by private enterprise	1976 to 1985								
Cotton Northern States										
Existing programs	Cotton area program staffed with 22 supt.-level personnel	1968	-	-	1,200,000	600,000	-	-	-	-
Campaign	Intensive Extension effort with relatively limited no. of farmers in cotton growing special emphasis in Gongola Valley of Northeastern State	1970	20,000	10,000	20,000	10,000	1:50	200	22	3
		1971	20,000	10,000	40,000	20,000	1:60 1 yr. 1:50 1st yr.	367	22	3
		1972	30,000	15,000	70,000	35,000	1:100 2 yrs. 1: 80 1 yr. 1: 50 1st yr.	575	29	5

Table E.1 continued

Commodity, area and program	Remarks	Date	New extension effort per year		Cumulative extension effort		Ratio of extension field workers to farmers	Cumulative extension campaign manpower		
			Acres	Farmers	Acres	Farmers	Ratios	Field	Supt.	A.O.
								-- Positions -----		
		1973	67,500	22,000	137,000	57,000	1:150 2 yr.+ 1: 90 1 yr. 1: 50 new	750	38	6
		1974	99,000	30,000	236,500	87,500	1:175 2 yr.+ 1:100 1 yr. 1: 50 1st yr.	1025	51	9
		1975	110,000	27,500	346,500	115,000	1:250 2 yr.+ 1:125 1 yr 1: 50 new	1020	51	9
	This program would continue with much of the supply function being assumed by private enterprise.	1976 to 1985								

Note: The staffing of the cotton and groundnut campaigns in the northern states may require a policy permitting qualified workers from one state being employed in another.