

RESOURCE ALLOCATION IN AGRICULTURAL RESEARCH
IN KENYA

PART I: FINDINGS AND RECOMMENDATIONS

A REPORT PREPARED FOR THE NATIONAL COUNCIL
FOR
SCIENCE AND TECHNOLOGY

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P R E F A C E

In its report on Science and Technology for Development, the National Council for Science and Technology (NCST) makes a number of observations regarding agricultural research in Kenya. It is observed that the effective use of appropriate types of technology is crucial to the success of rural agricultural development and that such innovations have proved to be the most powerful tools for increasing the productivity of the available resources. The report further indicates that although such innovations have enabled Kenya to double her agricultural output over the past twenty years as in the case of hybrid maize and dairy, no research breakthroughs are currently available to facilitate similar quantum jumps. It is therefore considered imperative, in the prevailing difficult economic situation throughout the world, that every effort be made especially in developing countries to direct the limited research resources to areas of priority need, especially those which offer the best input-output advantage. Towards this objective the study reported here was launched as a special investigation by the NCST to provide an insight in the current system of resource allocation to and within Kenya's agricultural research system and to suggest ways and means of improving the system of resource allocation and management to increase efficiency.

Although the study, which was launched in 1980, took a much longer time than originally expected due to the complexity of the system and lack of systematic documentation, the report contains a number of recommendations whose implementation should greatly improve the efficiency of agricultural research in Kenya. It is emphasized that the views expressed in this report reflect only the findings of the team of consultants and do not necessarily coincide with those of the NCST or any other government agency. The report is in two parts. Part I contains the main body of findings and recommendations while Part II describes in detail the computer system developed for registration of projects and programmes.

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CHAPTER 1 - INTRODUCTION

1.1 The establishment of the National Council for Science and Technology (NCST) in 1977 required that the Council advise on a rational system for the allocation of research resources according to well identified priorities, objectives and the absorptive capacity of the institutions. In order to meet this overall objective, two major studies were commissioned by the NCST in the area of agricultural sciences in collaboration with the Agricultural sciences advisory Research Committee (ASARC). The first study, which is the subject of this report, was designed to evaluate existing systems for allocation of resources especially finance and manpower and suggest possible improvements. The financial assistance for conducting this study was provided by the International Development Research Centre (IDRC) and NCST. The second and complimentary study was the ISNAR/NCST mission (2 members of this study were part of this mission) which investigated the details of management and content of agricultural research programmes and the overall organization system for agricultural research. The ISNAR findings were presented to NCST in February, 1982 and are frequently referred to in this report.

a) Objectives of the study

1.2 Specific objectives of this study were:-

- (a) A description and assessment of the infrastructure and coordinating capability for agricultural research;
- (b) Determination and assessment of the criteria used in the existing process of resource allocation for agricultural research;
- (c) Determination of the level of financial and manpower resources allocated to various agricultural commodity programmes and research stations;
- (d) A comparison of the level of manpower and financial resources allocated to various commodity programmes with other quantitative criteria which measure the importance of the commodity in the country as a whole;
- (e) Determination of the relative ratios of budgetary provisions between salaries and wages on the one hand, and operational costs on the other, and to determine the appropriateness of these ratios and the degree of flexibility for transfer of funds from one item to the other; and,
- (f) Determination of other resource allocation characteristics that seem relevant to the study.

b) Methodology

1.3 The data used in this study were mainly from primary and secondary sources. The primary data source was gathered through questionnaires designed and largely administered by the authors of this report. The data gathered was mainly on financial and manpower resources and on research programmes and projects. Financial data collected included personal emoluments, recurrent and development expenditure, while manpower data included academic qualification, and length of service.

1.4 For programmes and projects information was sought in order to establish the names of programmes and projects, the names and qualifications of research and technical personnel undertaking them. The amount of personnel time and of financial resources to the programmes and projects was assessed.

1.5 In addition data on specialized scientific equipment basically on quantities and condition were to be collected.

c) Design and Administration of Questionnaires

1.6 After a long time of discussion, three types of questionnaires were designed. Two of the questionnaires were designed to help generate information on institutional and project resources. The third questionnaire aimed at gathering information on the management system of research resources. It took the team 5 months to design these questionnaires and develop an appropriate computer coding system (i.e. questionnaires were pre-coded) to facilitate information storage, retrieval, and analysis.

1.7 The intention right from the start was to have a complete census of the financial and manpower resources in all major research institutions. Consequently questionnaires on institutional resources were distributed to all major research stations while those on projects were sent to all stations with on-going projects. Questionnaires on management system were sent to a sample of 40 respondents covering major research institutions. These respondents ranged from directors of stations to junior research officers. The data collected here included mainly the impressions gained by researchers on existing management system of research resources.

1.8 The administration of these questionnaires to all institutions proved a difficult and time-consuming exercise, especially since most of the research staff were not used to compiling such information. The research institutions also play a significant role in liaison, extension, and other services whose demands on the institutions resources are both highly variable and difficult

to quantify. In general the response obtained was satisfactory considering the difficulty in compiling the information requested. The completeness of answers also varied with the questions asked and this is discussed in chapters 4 and 5.

CHAPTER II

THE CHARACTERISTICS OF THE AGRICULTURE SECTOR

2.1 The economy of Kenya like those of many developing countries is dominated by agriculture. The contribution of agriculture to the GDP has remained fairly constant as indicated in Table 2.1. In 1970 this contribution stood at 33.1 per cent of the GDP while in 1979 it was 34.4 per cent. Agriculture further supports over 80 per cent of the country's population and it also accounts for the bulk of Kenya's exports. For example coffee and tea dominate agricultural exports, contributing around 30 and 13 per cent respectively in 1980 (Jamieson, 1981).

2.2 This continued contribution by agriculture to the economy has been despite a lack of pari-passu expenditure on the part of the public sector. Table 2.2 breaks government expenditure on agriculture into recurrent and development expenditures. This table indicates that agriculture's share of total government expenditure has been falling but its share of development expenditure has remained fairly stable.

a) The Structure of Agriculture

2.3 Dualism continues to characterize Kenya's agriculture i.e. small and large-scale farms. The majority of agricultural population are largely small-scale farmers, growing staple food crops for their own subsistence and little surplus for the market. A substantial number of small-scale farmers are now, however, producing cash and food crops for domestic as well as export markets.

Table 2.1 GDP BY SOURCE AT CURRENT PRICES, 1970 and 1979

	1970	1979	1970	1979
	Kf,000		Percentages	
Agriculture, forestry and fishing	173.0	679.0	33.1	34.4
Mining and Quarrying	2.4	5.0	0.5	0.3
Manufacturing	62.2	249.8	11.9	12.6
Electricity and Water	12.0	42.3	2.3	2.2
Construction	62.4	117.5	5.1	5.9
Wholesale and Retail				
Trade, Hotels and Restaurants	55.8	209.2	10.7	10.6
Transport and Communications	40.8	114.7	7.8	5.8
Government services	76.5	290.3	14.7	14.7
Other services	72.8	267.2	13.9	13.5
Total GDP at factor cost	521.9	1,975.0	100.0	100.0

Source: Economic Survey, Central Bureau of Statistics,
Ministry of Economic Planning and Development 1980.

Table 2.2 GOVERNMENT EXPENDITURE ON AGRICULTURE AND ITS RELATIONSHIP
TO TOTAL GOVERNMENT EXPENDITURE, (1963 TO 1982)

Year	Gross Recurrent Expenditure on Agriculture KE	% Total Recurrent Expenditure	Gross Development Expenditure on Agriculture KE	% Total Development Expenditure
1963	4,312,725	8.1*	1,638,412	10.8*
1964	3,014,125	3.7*	2,246,770	14.0*
1965	4,652,093	6.3*	2,637,540	14.1*
1966	4,721,750	5.5*	3,409,570	15.4*
1967	5,163,521	5.2	3,716,199	13.8*
1968	7,093,775	6.0*	3,667,391	13.4*
1969	8,202,013	7.0*	4,096,355	13.2*
1970	8,780,782	5.5*		
1971	10,229,700	8.5	6,779,331	12.0
1972	11,978,126	8.6	7,784,302	11.2
1973	13,522,000	8.8	7,548,306	11.1
1974	12,924,006	7.0	21,375,240	24.2
1975	12,515,347	5.4	21,720,577	16.0
1976	13,957,867	4.7	21,676,187	17.0
1977	18,791,571	5.2	27,858,982	14.1
1978	22,380,336	5.0	32,535,226	12.6
1979	23,567,433	5.0	36,884,589	15.0
1980	31,023,930	5.0	32,814,083	11.0
1981	24,975,250	4.0	33,303,307	10.0
1982	25,462,650	3.0	40,645,363	11.0

Source: ¹1963 - 1978 : Figure taken from Jamieson's study on Resource Allocation to Agricultural Research in Kenya From 1963 to 1978, unpublished Ph.D Thesis, University of Toronto, 1981.

1979 - 1982 Figures taken from Development Estimates and Estimates of Recurrent Expenditure, Government Printer.

*These figures represent the percentage that government expenditure on agriculture, net of appropriations in aid, is of total net government expenditure. The remaining figures are gross figures including appropriations in aid.

The large-scale sector comprises mainly of mixed farms and plantations. Some of these large farms are being sub-divided due to population pressure, thus the existing dualism is declining in favour of small scale farm holdings.

2.4 The high population pressure is not only leading to sub-division of large scale farms but has also led to immigration to semi-arid and arid areas of the country. The new migrants who come mainly from high potential areas attempt to replicate the agricultural practices in their former environments, with limited success. The implication of this on research is that research will have to develop appropriate technologies for intensive farming in high and medium potential areas to absorb a higher population and appropriate technologies for dryland farming to sustain the increasing immigrant population.

b) Crop Production

2.5 The major food crops include maize, wheat, beans, fruit and vegetables. Maize is the major staple food crop in terms of total area under the crop and its value. Other food crops comprise mainly of cassava, sweet potato, cowpea, pigeon pea, sugarcane, sorghum, millet, potatoes and rice. The recognised necessity for marginal semi-arid/arid areas to increase food production has brought into focus the importance of food crops especially sorghum, millet, potatoes, rice and cassava. Export crops are mainly coffee, tea, pyrethrum, fruits, vegetables and sisal.

2.6 The production structure of these crops is also characterized by the dualism discussed earlier. Table 2.3 indicates the shares of large and small farms in total gross marketed production. The share of the small farms marketed production has increased from a low of 21.7 per cent in 1963 to over 53 per cent in 1980, thus surpassing the contribution of large farms. This trend indicates the growing importance of small-farms, which should also be reflected in allocation of resources to agriculture research. In the past agriculture research has tended to emphasize the large-scale farm sector. The reality would now dictate that agriculture research should give substantial attention to small-scale farms sector.

2.7 The other major difference between large farm sector and small farm sector is in the use of purchased inputs in their production processes. Small farms use relatively little purchased labour, machinery, fertilizers and agricultural chemicals compared to large-farms. Further, small farms practice multiple cropping in general while large scale farms practice monocropping.

Table 2.3 GROSS MARKETING PRODUCTION FROM LARGE AND SMALL FARMS,
1963 TO 1980 (CURRENT PRICES)

Year	Large Farms (K£ Million)	Small Farms (K£ Million)	Percentage share of small farms
1963	40.7	11.3	21.7
1964	35.7	24.6	40.7
1965	33.8	23.8	41.6
1966	35.9	32.7	47.5
1967	33.0	34.0	51.0
1968	34.4	35.8	51.0
1969	37.9	38.3	50.3
1970	41.2	44.2	51.7
1971	42.1	44.6	51.4
1972	50.3	55.6	52.5
1973	60.0	63.3	51.4
1974	73.4	75.0	50.6
1975	71.8	90.1	55.6
1976	124.5	127.9	50.7
1977	206.0	208.5	50.3
1978	147.2	186.2	55.8
1979	148.2	172.5	53.8
1980	168.8	192.3	53.2

Source: Various issues of Kenya Statistical Abstract and Kenya Economic Survey; Jamieson, *ibid.*

c) Livestock Production

2.8 Livestock production mainly consists of cattle, sheep, goats, pigs, poultry and camels; livestock products range from meat and dairy products to hides and skins, wool, and eggs. Beef and dairy are the principle products marketed. Table 2.4 shows the estimated distribution of livestock components in 1978.

2.9 The importance of livestock products to the economy might be underestimated because much of the meat, dairy products, and eggs do not enter the formal market. In fact Senga (1976) has noted that 75 per cent of the beef and most of the sheep and goats never reach formal markets, being consumed on the farm or sold locally. Although Kenya exported meat and dairy products in the early 1970s, it has now occasionally become a net importer of some of these products due to intermittent shortages caused mainly by drought, low relative prices of livestock products and the demands of the growing population and incomes.

2.10 The government has designed certain programmes aimed at increasing livestock production. These have included introduction and management of improved livestock breeds in the high and medium potential areas, stepped up control of animal diseases (e.g. rinderpest, foot and mouth diseases, and contagious bovine pleuropneumonia).

2.11 The high and medium potential areas are faced by acute shortage of arable land. This requires adjustment in livestock industry towards zero or minimum grazing systems. Such systems require intensification of efficient fodder production and emphasis on improved dairy cattle. Small stocks especially pigs, sheep, goats and poultry are being promoted.

2.12 Livestock development is also being promoted in the semi-arid and arid areas. This development will require major research inputs especially in development of appropriate breeds and management systems for the range areas.

Table 2.4 ESTIMATED LIVESTOCK POPULATION, 1978 ('000 Head)¹

<u>TYPE</u>		<u>NUMBERS</u>
Cattle		
Improved dairy cattle		1,127
Improved beef cattle		660
Improved zebu		8,460
Total		10,247
Sheep		
Wool sheep		500
Hair sheep		6,000
Goats		
Dairy goats		2
Meat goats		8,500
		15,002
Poultry		
Indigenous		15,020
Exotic		1,760
		16,780
Pigs		70
Rabbits		34
Camels		607
Donkeys		135

Source: Animal Production Branch, Annual Report, 1978.

¹Reliable Livestock statistics are difficult to get. The last livestock census was carried out in the mid-60s and is likely to be very much out of date.

d) Product mix

2.13 The small and large scale farm sectors continue to give Kenya a very diversified agricultural sector, producing a wide variety of food and cash crops. Table 2.5 indicates the value and share of total agricultural production of selected commodities. However, it must be emphasized that while the table gives a true picture on the value of cash crops like coffee, tea, cotton and pyrethrum, it highly under states the value of food crops such as maize and pulses whose substantial proportion of output is retained for consumption on the farm.

2.14 Although Kenya has a diversified agricultural sector, intermittent food shortages do occur. The value of imported food and live animals increased from K£9.7 million in 1970 to K£24.1 million in 1978, including some staple foods which the country was producing in sufficient quantities in the 1960s and at the beginning of 1970s (ISNAR, 1982). Table 2.6 indicates the trend of food imports from 1971 to 1979.

2.15 The variations in food production can be attributed to climatic factors, relative low prices of food crops and even more significantly the low yields obtained by small scale farmers. Agricultural research will have to play a significant role in stabilizing and improving production. The National Food Policy Paper (1981), and the National Livestock Development Policy Paper (1980), highlight the Government's concern with the need to increase output and productivity in both crops and livestock. The important role of agricultural research in this respect is well recognized.

e) Forestry, Fisheries and Wildlife

2.16 Forests, fish, wildlife form an important part of the national endowment of renewable resources important to agriculture and rural development. Their direct contribution to the GDP is small but they are important suppliers of the country's fuel, fodder, and pulp and they provide important sources of animal protein and income.

Table 2.5 VALUE OF PRODUCTION OF SELECTED AGRICULTURAL COMMODITIES AND COMMODITY SHARES IN 1964, 1970 AND 1976 (CURRENT PRICES)

	1964 K£'000	% of Total	1970 K£'000	% of Total	1976 K£'000	% of Total
<u>Food Crops</u>						
Maize	2,469	4.1	2,828	3.3	21,628	8.5
Wheat	3,528	5.9	4,994	5.8	12,047	4.8
Rice	291	0.5	724	0.8	2,641	1.0
Pulses	274	0.5	236	0.3	1,810	0.7
Potatoes	203	0.3	1,263	1.5	3,128	1.2
<u>Industrial Crops</u>						
Sugar-cane	1,490	2.5	3,509	4.1	9,618	3.8
Cotton (seed)	594	1.0	695	0.8	1,648	0.6
Barley	407	0.7	392	0.5	2,623	1.0
Tobacco	80	0.1	35	-	239	0.1
<u>Export Crops</u>						
Coffee	14,493	24.0	21,814	25.5	103,504	41.0
Tea	7,790	12.9	13,838	16.2	32,757	13.0
Sisal	6,691	11.1	1,715	2.0	4,112	1.6
Pyrethrum	907	1.5	1,477	1.7	3,919	1.6
Cashew Nuts	186	0.3	1,186	1.4	1,080	0.4
Coconuts	354	0.6	520	0.6	489	0.2
<u>Livestock Products</u>						
Milk (dairy products)	4,400	7.3	6,806	8.0	12,050	4.8
Beef	9,431	15.6	13,324	15.6	20,200	8.0
Sheep and goats	418	0.7	475	0.6	1,171	0.5
Pigs	496	0.8	750	0.9	994	0.4
Hides and skins	472	0.8	604	0.7	1,488	0.6
Poultry and Eggs	338	0.6	998	1.2	1,600	0.6
Unrecorded production	2,832	4.7	3,595	4.2	6,070	2.4
Total Production	60,322	100.0	85,396	100.0	252,375	100.0

Source: Kenya Central Bureau of Statistics, Ministry of Finance and Planning, Statistical Abstract, Government Printer, Nairobi, 1968, 1973, 1977; Jamieson, ibid 1981.

Table 2.6 IMPORTS - PRINCIPAL PRODUCTS 1971 - 79 (Tons)

Products Food	1971	1972	1973	1974	1975	1976	1977	1978	1979
Milk, dry	2,406	2,537	297	101	2,085	531	440	249	583
Fish and fish preparations	1,598	2,711	3,403	4,725	2,725	1,631	847	769	890
Wheat, unmilled	13,000	64,821	77,083	13,744	82,971	50	33,035	90,888	21,152
Maize unmilled	29,077	104	82	728	357	32	32	80	18
Rice not in husk	10,203	2,150	23	1,502	4	10,001	24	11	241
Malt	2,936	5,318	1,175	2,231	1,908	-	3,120	1,498	88
Fruit and Vegetables ⁺	36,395	15,992	13,398	4,938	8,131	5,358	1,638	3,477	2,079
Sugar (beet and cane) refined	71,747	103,816	77,485	70,703	12,709	45,501	36,308	46,112	12,504
Sugar confectionary	1,801	1,176	74	472	8	23	14	28	65
Chocolate products	426	304	177	220	170	13	41	25	10
Tea	8,119	5,697	3,844	2,979	3,025	4,148	5,740	7,763	8,597
Animal oils and fats	13,113	8,406	9,540	12,533	20,574	11,497	8,102	16,638	10,858
Vegetable oils and fats	23,983	23,413	23,286	20,059	14,678	39,097	45,786	52,398	47,121
Oils and fats, processed and waxes	4,110	4,998	5,475	5,095	3,633	4,708	3,795	1,276	669

Source: ISNAR (1982)

+ some goods classified under these heads are not included in this table because relevant quantities are not indicated against the value of such imports in the Annual Trade Reports.

2.17 Forests are important natural resource, they have significant industrial uses and ecological benefits. They are the principal domestic sources of fuel-wood and industrial wood.

2.18 The Government's main strategy is aimed at increasing the areas under forests especially in the semi-arid and arid areas and managing indigenous and planted forests as an integral part of land use and development. The role of forestry research is recognized in this endeavour especially in the areas of afforestation techniques, breeding, protection, agro-forestry and soil and water management.

2.19 Although Kenya has a potential annual yield of 150,000 tons of fish from over 10,000 km² of freshwater lakes, 3,200 km of rivers, 640 of marine coast, and several streams and fishponds, fisheries contribute minimally to the GDP. Kenya is a net importer of fish and fish products. The current strategy emphasises the exploitation of these resources so that fish production would make some impact on employment and nutrition. Here again fisheries research is expected to play an important role especially in the development of mechanized trawling; the improvement of traditional fishing, and the management of its resource base; the improvement and provision of on-shore facilities; and the production of inland fish farming. Research should also determine our potential of fish production in Lake Victoria and Indian Ocean. Current estimates are based on insufficient information.

2.20 Wildlife is important as a source of income especially in foreign exchange and to a small extent as a source of food. The foreign exchange earning capacity of wildlife has dominated policies for its conservation and utilization. However, it has now been realized to certain extent that there are opportunity costs of the other non-wildlife activities, such as ranching and agriculture in the same wildlife locations thus creating a conflict of goals. The objective now is to maximise returns on wildlife while minimizing the costs of wildlife development to other sectors.

2.21 The research strategy in the wildlife conservation and management department focusses on the provision of baseline data for planning and management on wildlife resources and their habitats. The research strategy should also address itself to ways and means of minimizing conflict between various users of resources in wildlife areas.

CHAPTER III

INSTITUTIONAL STRUCTURE FOR AGRICULTURAL RESEARCH

a) Evolution of Agricultural Research

3.1 The importance of agricultural research to support Kenya's agricultural development was recognized by the colonial Government as early as the first decade of the twentieth century. Research institutions were established to solve specific farmer's problems and also to provide innovations needed to support development programmes that the Government wanted to promote. In response to these requirements the Government established the first multi-disciplinary research institution in crops, the Scott (now National) Agricultural Laboratories in 1903. This institution dealt with plant introduction and evaluation, and addressed itself to problems associated with soil fertility, plant breeding and the control of plant diseases and pests. Crops investigated included tobacco, coffee, horticultural crops, maize, wheat, pyrethrum, sisal and pastures.

3.1 Research institutions were decentralized when it was realized that various crop commodities could only be successfully produced in specific agro-ecological zones. Thus the Plant Breeding Station was established in 1927 to undertake research in maize and wheat for the large scale farm sector owned by European settlers. The High Level Sisal Research Station was established in 1937 to meet the needs of the large sisal estates around Thika. The pyrethrum and Horticultural Research Station was created in 1947 at Molo, and became responsible for research in temperate fruit trees and vegetables and also the centre for pyrethrum investigations because the cool night temperatures allowed prolific flower bud initiation and flowering throughout the year. The headquarters of horticultural research were transferred from Molo to the Horticultural Research Station at Thika in 1958 when the Fruit Growers Association, made up of European pineapple growers requested it.

3.3 The establishment of new research institutions followed the same pattern as the various agricultural crop commodities gained economic importance in the various agro-ecological zones. A Sugar Research Unit was established at Kisumu in 1948 to cater for the sugar growing belt in Nyanza Province. Research in coffee was transferred from the Scott Agricultural Laboratories in 1949 to the Coffee Research Station (later to become the Coffee Research Foundation) at Ruiru. In 1951 the headquarters of pasture research was transferred from the Scott Agricultural Laboratories to Kitale. Four years later (1955) a Maize

Improvement Unit was established at Kitale to develop maize hybrids for the large scale European settled areas and synthetic varieties for the African small holder sector.

3.4 The need for investigation of problems related to small scale agriculture in the "native reserves" led to the establishment of two General Investigation Centres namely the Coast Agricultural Research Station (1946) and Embu Agricultural Research Station (1952). The publication of the Surynnerton Plan (1955) gave rise to additional stations namely Western Agricultural Research Station (1956), Katumani Agricultural Research Station (1958) and Nyanza Agricultural Research Station (1963). Commodity Research stations were also established for the benefit of African growers, for example the Cotton Research Station at Kibos, the Mwea-Tebere Irrigation Research unit, Perkerra Irrigation Research Station, Ahero Rice Research Station and Nyandarua Agricultural Research Station.

3.5 Research in animal production initially concentrated on animal diseases and gained momentum with the establishment of Veterinary Research Laboratories at Kabete in 1908. Work at Kabete concentrated on diagnosis, control and eradication of livestock diseases and parasites and, later on vaccine development, testing and production. The Animal Husbandry Research Station was established at Naivasha in 1961 with responsibilities for improving dairy production in the Kenya Highlands, and the Range Research Station at Kiboko in 1971 to work on range ecology and to develop suitable animal production system for the rangelands. A number of regional investigation centres were also established to cater for local needs in livestock production such as the Kapsabet Animal Husbandry Research Station (1931), Grasslands Research Station, Molo (1947), Beef Research Station, Lanet (1969) and Mariakani Animal Husbandry Research Station (1967).

3.6 The British Government saw the need for the establishment of regional research institutions to investigate problems common to Kenya, Uganda and Tanganyika. Two of these institutions, the East African Veterinary Research Organization (EAVRO) and the East African Agriculture and Forestry Research Organization (EAAFRRO) were established at Muguga in Kenya in 1946 and 1951 respectively. The Tea Research Institute of East Africa (TRI) at Kericho was incorporated in 1951 as successor to the Research Department of the East African Tea Holdings, an organization of the large scale tea estates in Kenya, Uganda and Tanzania. The three institutions reverted to Kenya after the break up of the East African Community in 1977.

3.7 . The University of Nairobi (established in 1970) although principally a teaching institution, undertakes research in agriculture mainly in the Faculties of Agriculture, Veterinary Medicine and Science. Similarly, Egerton College, Njoro and the Faculty of Science at Kenyatta University College undertake research related to agriculture.

3.8 Kenya has relationship with some International Agricultural Research Centres (IARCS) funded by the Consultative Group on International Agricultural Research (CGIAR). The International Maize and Wheat Improvement Centre (CIMMYT) has a collaborative shuttle breeding programme in wheat and triticale with Kenya. CIMMYT maize germplasm bank has contributed to Kenya's maize breeding programme and CIMMYT is soon expected to establish an Eastern African maize breeding programme base in Kenya. The African Regional Programme of the International Potato Centre (CIP) has its headquarters in Nairobi. Kenya's - rice varieties are derived from germplasm developed at the International Rice Research Institute (IRRI) located in the Philippines. The International Livestock Centre for Africa (ILCA) has a major programme on monitoring of livestock production systems in Kenya and had, for a time, its headquarters in Nairobi. The International Laboratory for Research in Animal Diseases ((ILRAD) has its headquarters in Kenya. A centre serving tropical countries, the International Centre of Insect Physiology and Ecology (ICIPE) is located in Nairobi. It is clear from the foregoing that Kenya participates substantially in international agriculture research.

3.9 Private sector activities in agriculture research are rather limited. The research undertaken in this sector is adaptive in nature and supports the production activities of estate plantations, but results of their work are not made public. Such enterprises are the Kenya Cannery of the Delmonte Group based at Thika (horticulture) and the East African Tanning Estates Company at Eldoret with interests in wattle trees, maize and wheat. In Nairobi, the East African Industries has research interests in sunflower; Kenya Breweries in barley and the British American Tobacco Company (BAT) in tobacco. In addition, Wellcome Kenya Limited undertakes research in livestock drugs and vaccines.

b) Co-ordinating Capability for Agricultural Research

3.10 The evolution of agricultural research described in the foregoing section indicates that its management falls under different categories. These are:-

- (i) Government Ministries and Departments.
- (ii) Quasi-government bodies and parastatal organizations.
- (iii) University and Colleges.
- (iv) The private sector.

(v) International research organizations.

3.11 The largest research capacity in terms of finance, manpower and installed facilities is in the Government Sector. It is estimated that the Government funds 75 per cent of all agricultural research in the country. Four Ministries of Government are concerned, namely the Ministry of Agriculture (crop research), Ministry of Livestock Development (veterinary and animal production research), the Ministry of Environment and Natural Resources (forestry) and the Ministry of Tourism and Wildlife (fisheries). Resources allocated for research in this sector are channelled through the respective Permanent Secretary who is also the accounting officer. The Management of research institutions and allocation of resources are, however, the responsibility of the Directors of Research.

3.12 Research proposals made by individual scientists and research establishments are derived from the provisions of the development plan although, on some occasions, research workers envisage breakthroughs which could yield useful information and understanding in controlling technical problems. The Ministry of Agriculture has evolved a project approval system that provides some degree of coordination. This mechanism comprises of:

- (a) Provincial Agriculture Research Advisory Committee (PARAC) comprising of senior extension officers, farmers representatives and research workers proposing research programmes in the geographical area. In this forum the extension staff identify areas that require research attention and research workers propose research strategies to solve the problems. This approach provides a mechanism for coordination and consultations at the regional level
- (b) Specialist Agricultural Research Advisory Committees (SARAC) that deal with scientific disciplines or agricultural commodities on countrywide basis. These committees are composed of research scientists from various institutions (e.g. the University or other research stations) and other scientists actually carrying out research. Commodities such as maize, sugarcane, pyrethrum and horticulture, and disciplines such as soil science, plant pathology and agricultural entomology fall under the aegis of SARACS.

3.13 Research in Veterinary Sciences has a strong link with diagnostic and advisory services as well as the field disease control programmes. Disease reports from the field and from the Veterinary Research Laboratories mainly determine the research programmes to be undertaken. There is a strong collaboration between Veterinary Research Laboratories at Muguga and at Kabete. In 1980

a co-ordinating mechanism known as the Nairobi Cluster was established to co-ordinate veterinary research activities among national and locally based international research institutions.

3.14 Research programmes in institutions managed and funded by parastatal organizations appear better coordinated than those falling under Government ministries. Research proposals are scrutinized by research committees established by the Boards of Management and are funded on the recommendations of such committees. This ensures that individual research projects complement each other to form comprehensive research programmes.

3.15 Research undertaken at the University is largely determined by individual scientists and the agency providing finances. Research projects are normally of short duration and financing may not be available to ensure follow up of promising lines. In some cases research projects may be related to or carried out in collaboration with other research institutions. Research proposals and funding are approved by the Dean's Committee in University funded projects. Other grants are negotiated by individual scientists but funds are channelled through the University.

3.16 International Agricultural Research Centre activities are governed by agreements entered into by IARC's and the Government of Kenya. Since most of the research activities are undertaken at Kenya research stations, the directors of stations are aware of what goes on in the IARC programmes and can avail themselves of publications and germplasm emanating therefrom.

c) Recent Developments

3.17 In 1977 Parliament enacted the Science and Technology Act which set up the machinery for advising the Government on all matters relating to the scientific and technological activities and research necessary for the proper development of the country, and for the coordination of research and experimental development. The machinery comprises of the National Council for Science and Technology (NCST) and Sectoral Advisory Research Committees (ARCs), one of which, the Agricultural Science Advisory Research Committee (ASARC) addresses itself to agricultural and allied sciences. The Act was amended in 1979 to facilitate the establishment of statutory research institutes, one of which is the Kenya Agricultural Research Institute (KARI).

3.18 Under the Act, NCST is required to determine priorities for scientific activities, to advise on the policies, to ensure the application of research

results, to advise on scientific requirements, to ensure cooperation and coordination of the various agencies and to advise generally on resource requirements for scientific activities. The Council has therefore the responsibility of coordinating activities for all scientific sectors at the national level.

3.19 Under the same Act ASARC is required to advise on the details of research programmes, the concomitant budget requirements, promotion and coordination of all types of research, and the application of research results. The Committee is also required to register research programmes, facilities and personnel in the country and to monitor relevant research undertaken outside Kenya, to advise on quinquennial programme of research, and to review annually progress in research. The mandate for ASARC covers all types of agricultural research, governmental or otherwise.

3.20 Research institutes are expected to execute research programmes based on priorities and advice provided by both NCST and ASARC.

3.21 The reorganization of the various Ministries in February 1982 assigns the responsibility for research policy and the administration of research institutes to the Ministry of Regional Development, Science and Technology. Subsequent administrative interpretation of the circular has clarified that ASARC will be a committee of NCST and that KARI will be administered by the Ministry of Regional Development, Science and Technology. The research related services such as diagnosis, soil survey, seed certification, and other advisory services will be administered by the consumer ministries. It has also been clarified that research facilities in the ministries of Agriculture, Livestock Development, and Environment and Natural Resources will eventually be part of KARI. Steps have been initiated to amend legislation to effect these changes.

3.22 KARI should avail itself of this opportunity to forge strong relationships with the operating ministries. It should establish dialogue with PRAC's and SARAC's to identify priority areas for research. On the other hand the participating ministries should take more interest in KARI, especially in the activities of its Board of Management and its scientific Committee in order to influence policies.

d) Sources of Funds for Agricultural Research

3.23 Government financing of agricultural Research for the period 1970-1979 is shown in table 2.1 (Wang'ati 1981). Expenditure on research rose from K£.391,507 to K£.7,101,672 at current prices during the ten year period. The proportion of GDP devoted to research rose from 0.08 per cent in 1970 to 0.35 per cent in 1979. The share of Agricultural research expenditure as a percentage of the

total national expenditure on research in the Government sector declined from 99 per cent in 1970 to 74 per cent in 1979.

3.24 The total Government expenditure in research (R&D) in all fields of scientific activities during the 1979-80 fiscal year amounted to K£.10,844,000 while the amount spent on other scientific and technical services (STS) was K£.94,382,000 (Muturi 1981, table 3.2). The ratio between R&D and STS was 1:8.7. Agricultural research accounted for 70 per cent of the total R&D funds.

3.25 The projected Government expenditure in agricultural research during the Fourth Development Plan (1979-83) period is indicated in table 3.3 (Muturi 1981). Projected expenditure is expected to rise from K£.6,462,000 in 1978/79 fiscal year to K£.9,470,000 in 1982/83. This provision is for Government owned institutions and does not include provision for parastatal funded commodity research, institutions (e.g. Coffee and tea), University research, private sector research or international research institutions.

3.26 Other sources of funding for agricultural research are derived from commodity marketing Boards and donor agencies. Research establishments supported by such Boards through annual levies do not have forward budgets. Research expenditure is determined from year to year and depends to a certain extent on the value of the marketed commodity in that year. It would appear desirable that such research establishments should develop forward budgets based on the planning period to facilitate better planning and utilization of research resources.

3.27 Donor support has, for the last 16 years, averaged about K£.1.2 million annually. A large proportion of this assistance is expended on expatriate personnel and smaller proportion on scientific equipment. Only relatively small amounts are spent on direct costs of research. As a result, most donor supported research activities place a heavy demand on counterpart funds and manpower resources, with obvious implications on locally funded research projects. It would appear desirable that externally supported projects should provide sufficient funds to meet operational costs. Where local counterpart resources are required, the principle of additionality should be applied.

Table 3.1 TOTAL AGRICULTURE RESEARCH EXPENDITURE AS A PERCENTAGE OF NATIONAL EXPENDITURE ON R&D AND AS A PERCENTAGE OF GDP

	<u>A</u>	<u>B</u>	<u>C</u>		
	GDP K£m	National Expenditure on Research (K£)	Expenditure on Agricultural Research	C/A (%)	C/B (%)
1970	512.51	396,607	391,507	0.08	99
1971	570.06	232,851	207,424	0.04	89
1972	666.22	1,422,138	1,405,711	0.21	99
1973	749.21	2,259,074	2,132,708	0.28	94
1974	907.63	3,031,945	2,901,101	0.32	96
1975	1057.22	3,287,108	2,931,955	0.32	89
1976	1278.10	4,259,433	3,668,383	0.29	86
1977	1640.65	8,279,410	5,726,292	0.35	69
1978	1788.41	8,936,422	6,374,553	0.36	71
1979	1974.97	9,509,032	7,010,672	0.35	74

Table 3.2 GOVERNMENT EXPENDITURE (K£'000) IN RESEARCH AND DEVELOPMENT
(R&D) AND SCIENTIFIC AND TECHNICAL SERVICES (STS) DURING
THE 1979 - 80 FISCAL YEAR

Type of Science	R & D		STS	
	Amount	% of total	Amount	% of total
Agriculture	7,611	70.2	41,074	43.2
Natural Resources	1,240	11.4	4,503	4.8
Medical	1,232	11.4	22,812	24.2
Industrial	557	5.1	18,263	19.4
Social	-	-	3,312	3.5
Physical	-	-	548	0.6
Other	201	1.9	3,870	4.1
Total	10,844	100.0	94,382	100.0

Table 3.3 AGRICULTURE RESEARCH BUDGET (K£'000) FOR GOVERNMENT RESEARCH ESTABLISHMENTS DURING THE 1979-83 PERIOD

Field of Research	1978/79	1979/80	1980/81	1981/82	1982/83	Total
Veterinary	612	576	616	647	726	3,171
Range	404	396	372	432	417	2,021
Animal Production	734	714	833	732	773	3,786
Crops	2,252	3,034	3,517	3,795	4,190	17,088
Soils and Seeds	297	230	236	285	310	1,358
Economics	280	660	780	800	700	3,220
Joint Services	1,583	1,771	1,946	2,142	2,354	9,796
Total	6,462	7,381	8,300	8,833	9,470	40,446

CHAPTER IV

CRITERIA USED IN RESOURCE ALLOCATION TO AGRICULTURAL RESEARCH

4.1 This chapter discusses the findings on criteria used in the allocation of resources to agriculture, livestock and forestry research. It shows how research priorities may be influenced or determined by the Development Plans, the initiatives of individual research scientists, the influence of foreign donors, response to problems and emergencies and by the influence of various pressure groups in the Kenyan Society.

a) Guidance of National Development Plans

4.2 Allocation of resources to research must be set within the framework of national objectives and constraints. The aspirations, goals and targets of the nation as laid down in various development plans should therefore influence the directions which research takes. A brief review of official policy statements in development plans covering the periods 1966 to 1970, 1970 to 1974, 1974 to 1978 1979 to 1983 indicates the importance attached to research by the Government of Kenya as a basis of increasing productivity and farm incomes. The 1979-83 Plan, for instance, sees technological change as a major driving force in agricultural and rural development. There are also indications that the evolution of government policy has been accompanied by some shifts in research priorities over time and particularly in the 1979 to 1983 period. The 1966 to 1970, 1970 to 1974 and 1974 to 1978 Plans stressed the importance of achieving a rapid economic growth while the 1979/83 Plan has adopted "alleviation of poverty" for its theme. This change from a growth oriented economy to a poverty alleviation focus has changed the orientation of research priorities. This change in research focus can be seen in terms of commodity focus, applied versus basic research, regional and agro-ecological orientation, farm-size related and biological, chemical and mechanical research. (Jamieson, 1981).

4.3 Kenya's first three development plans required research to be undertaken on "traditionally important agricultural products" such as maize, coffee, tea, wheat, pyrethrum and horticultural crops. In the choice of research projects priority was to be applied where returns in terms of income were expected to be highest. Nevertheless, diversification of research effort required the inclusion of new crops such as potatoes, oilseeds, legumes, range research and livestock enterprises such as dairy production, sheep, goats and beef

finishing projects. The Fourth Development Plan however, stresses the importance of crops which are suitable for dry areas such as sorghum and millets although research will nevertheless be continued on the traditional crops. Greater emphasis will also be given to mixed crop and livestock systems for the drier areas.

4.4 The first two development plans emphasized applied research. They argued that Kenya could ill-afford the allocation of substantial resources to basic scientific research. Rather the country should use results of basic research which is undertaken in other countries. The third Plan is silent on what the balance of applied and basic research should be while the 1979-83 Plan singles out basic research to be only important for the tea bush. This implies that a higher priority is still on applied research.

4.5 In terms of regional focus there has been a shift of priority in favour of arid and semi-arid areas. The 1979/83 Plan calls for special research and development programmes in order to develop viable mixed crop and livestock systems for the drier areas. The Coast Province is identified as another area where tree crop research will be emphasised.

4.6 There has been growing awareness that research should be more relevant to the needs of the small-scale farmer. The 1979-83 Plan calls for increased agricultural research appropriate for land use intensification in small holdings. The Plan requires that efforts should be made to ensure that innovations which are produced should be adopted in smallholder production. The Plan therefore recommends that research be undertaken on intercropping, smallholder dairy production and the development of a technology suitable for small-scale wheat production.

4.7 The 1970/74 Plan advocated for agronomic trials while the 1979/83 Plan calls for a higher priority to soil survey. Emphasis has also been placed on the need of economic analysis to support physical research. Research therefore should be farmer oriented by considering the socio-economic constraints. This would help to accelerate adoption of new innovations generated by research. In addition, the Plan calls for the incorporation of an agricultural economics capacity into the agricultural research service in order to assist in the design and implementation of research experiments and in monitoring adoption of research recommendations by liaising with farmers and extension service.

4.8 Overall the Plan calls for research projects to be evaluated within specific objectives. It states that in the allocation of resources preference

will be given to research which is likely to increase both employment and productivity. The Plan sets clear objectives against which research projects could be evaluated. While stressing land use intensification the Plan states that research should be geared towards the dictates of a land-scarce economy. "Specifically it will be based on modern biology and on the development of appropriate husbandry methods for the use of yield increasing inputs such as fertilizers" (Plan, pp 238).

4.9 Furthermore, the 1979/83 Plan identifies five specific research projects in the light of the new economic strategy and research priorities. These include:-

- i) Dryland Farming Research Project which is to be based at Katumani and specifically dealing with the problems of arid and semi-arid areas.
- ii) Natural Resources Conservation Project to be directed by National Agricultural Laboratories.
- iii) Agricultural Engineering Project to address problems of power cultivation machinery, processing, soil and water engineering.
- iv) Coast Crop Research Development Project to deal with tree crops in Coast Province, and
- v) Plant Protection Research Project to work on crop protection and stored products entomology. (Plan, pp. 236-7).

Such projects in the Plan are likely to influence the areas in which research projects are carried out. Indeed the importance of the Plan in the determination of research priorities was confirmed by responses obtained from research scientists. Eighty six per cent of the research staff interviewed reported that Development Plans are used to determine research priorities.

4.10 Whether the aspirations of the Plan are fulfilled and the projects implemented however, largely depends on the availability and competence of research personnel, equipment and finances. The Fourth Plan calls for greater investments of human and financial resources in the appropriate lines of research.

4.11 There is some evidence that shows that allocation of funds to implement the research objectives of the Plan have been made. Table 4.1 indicates the allocation of funds to projects that have been identified according to the research priorities of the Plan. Only one of the projects has shown a substantial change in financial allocation. In addition to the funds shown, the dryland research project at Katumani has been strengthened through personnel and financial

Table 4.1 ALLOCATION OF GOVERNMENT FUNDS TO SPECIFIC RESEARCH PROJECTS
IDENTIFIED IN THE DEVELOPMENT PLAN (KE)

Project	1979/80	1980/81	1981/82	1982/83
Plan Protection Research (Pest Control)	86,243	73,233	87,610	121,873
Dryland Farming Research	242,676	231,587	212,935	266,310
Coast Crop Research	10*	5,000	5,400	5,400
Agricultural Engineering Research	65,365	62,890	62,900	64,570

Source: Kenya Development Estimates for 1979/80, 1980/81, 1981/82, 1982/83.

* Token provision of £10 indicates that the Project has been recognised as appropriate but has not been sufficiently costed.

resources of the FAO and UNDP. More personnel have been provided for the Coast Research Station at Mtwapa and more pathologists and entomologists have been appointed for the plant protection research project.

b) Mid-Plan Modifications

4.12 Research priorities are likely to change as the implementation of development plan progresses, and as new and often more urgent problems arise. Such changes often lead to a re-evaluation of previous priorities. A good example is the publication of the Sessional Paper No.4, 1981 on Food Policy which highlighted issues and options for increasing national food production. In order to achieve broad self-sufficiency in food, the policy paper called for increased agricultural research on a wider spectrum of food crops. Emphasis was therefore shifted to identification of those traditional food crops e.g. sorghum and millets that may have been neglected and which could effectively supplement the maize and wheat food base by increasing crop yields and reliability in the more marginal rainfall areas. The publication of the National Livestock Development Policy Paper of June 1980 also called for intensification of research and development effort in animal production.

c) Individual Initiative

4.13 Within broadly defined priorities the final decision on the scope and objectives of individual research projects in agricultural research is left almost entirely to the research scientist himself. This is confirmed by 45 per cent of the research staff interviewed. It is therefore expected that the scientist has both the initiative and the competence derived from training and experience to determine the status of existing knowledge on the subject and the appropriate methodology and resources required to fill the information gaps. While the degree of initiative shown by scientists in the system is commendable, their capacity to generate, implement and complete research projects is often hampered by insufficient experience, guidance and to some extent incentives to get a piece of work completed. This is reflected in the large proportion of projects in a number of major research stations (Table 4.2) still without defined end point ten years after they were started. There are also many projects which have been wound up or abandoned without proper write up and publication, but these could not be easily registered in this exercise.

4.14 The choice of project though individual initiative is also often governed by the resources available - support staff, transport, equipment etc. rather than

by a long term well documented programme of research. It is also notable that most research stations do not even have financial provisions for library expenses, thus making it difficult for proper literature reviews and comparison of research results with similar activities elsewhere in the world. The challenge that comes from refereeing of manuscripts and the subsequent professional recognition arising from publication are therefore lacking and the quality of individual initiative is either reduced or in some cases misdirected. The level of training of research staff is another factor to be considered in this respect. The information presented in Table 4.3 shows that only one third of the research staff in the system have had formal postgraduate training up to at least MSc level and only one tenth have Ph.D.

4.15 It is therefore clear that if this method of determining research priorities is to be encouraged and developed, substantial effort is required in training research staff and providing them with an efficient scientific literature service. The leaders of research programmes and managers of research institutions who according to 80 per cent of the staff interviewed determine research priorities must be adequately qualified to provide the necessary guidance, leadership and continuous evaluation of progress in various projects. It is interesting that only 40 per cent of staff interviewed recognised involvement of programme leaders in project evaluation. In this connection, it was noted from the study that only four out of twenty three Directors and officers in charge of agricultural research institutions have Ph.D degrees. Although a number of long term projects with no end point are in fact breeding programmes, it is nevertheless necessary to introduce incentives which would encourage research staff to identify realistic objectives for specific projects within such programmes and to have such projects written up for evaluation at suitable intervals.

4.16 Further information from the survey indicates that 80 per cent of research scientists with Ph.D degrees are non-Kenyan. This is a clear indication of Kenya's dependence on foreigners for its agricultural scientists. This has also an important bearing on the need for future training of Kenya's agricultural scientists about 60 per cent of whom have only been trained at BSc level.

Table 4.2 NUMBER AND DURATION OF RESEARCH PROJECTS IN SOME OF THE MAIN RESEARCH INSTITUTIONS

Institution	No. of ongoing projects registered 1981	Total	Projects started in or before 1972		
			No. due for completion between 1980 & 82	No. due for completion later	
				Time defined	Time undefined
ARD/KARI	21	1	-	-	1
FRD/KARI	8	3	-	-	3
CRF	36	10	1	5	4
TRF	13	5	1	-	4
NARS Kitale	31	8	2	-	6
NSRS Kibos	3	3	-	-	3
PHRS Molo	11	2	-	-	2
NPBS Njoro	13	10	-	-	10
NAHRS Naivasha	11	5	1	1	-
NAL Nairobi	14	2	-	-	2
ARS Tebere	8	1	-	-	-
NARS Thika	27	1	-	1	-
RRS Kiboko	10	2	1	-	1
CARS Mtwapa	4	1	1	-	-
NDFRS Katumani	21	-	-	-	-

Table 4.3 : NUMBER AND ACADEMIC QUALIFICATIONS OF RESEARCH STAFF IN
VARIOUS INSTITUTIONS (1979/80)

Institution	Highest Qualification of Director or Officer In-Charge	Other Research Officers			Total
		PhD	MSc	BSc.	
KARI-ARD	PhD	3	30	15	49
CRF	PhD	3	11	6	21
TRF	PhD	1	2	1	4
NARS Kitale	MSc	5	4	37	47
WARS Kakamega	MSc	-	2	4	7
CRS Kibos	MSc	-	-	5	6
PHRS Molo	MSc	1	6	-	8
NARS Kisii	MSc	-	1	3	5
PHRS Molo	MSc	-	1	6	8
NPBS Njoro	PhD	3	3	-	7
NSQS Lanet	MSc	1	1	13	16
NAHRS Naivasha	MSc	-	3	4	8
BRS Lanet	MSc	-	1	1	3
ARS Nyandarua	BSc	-	-	1	2
PRS Tigoni	MSc	-	1	9	11
NAL Nairobi	MSc	1	19	39	60
ARS Embu	BSc	-	-	3	4
ARS Tebere	MSc	-	1	8	10
NHRS Thika	MSc	5	13	22	41
RRS Kiboko	MSc	5	3	7	16
CARS Mtwapa	MSc	1	1	10	13
NDFRS Katumani	MSc	7	2	11	21
TOTAL		35	105	205	367

d) Donor Agencies

4.17 Only 20 per cent of the research staff interviewed indicated that donor agencies play a prominent role in determination of research priorities. It has however been claimed often that donor influence is much stronger than this result would suggest. The true picture is indicated by the predominance of expatriate staff among the more senior ranks of research staff (PhD level) and the fact that donor agencies are strongly represented - often overwhelmingly - in the project formulation stages and evaluation missions. This is not necessarily a bad thing in the early stages of development provided the overall priorities are kept in mind, but the heavy counterpart demands of aid projects in terms of local personnel (albeit in the process of training) and operational resources can easily distort priorities. Looked at in another way, the fact that 80 per cent of the research staff interviewed did not recognise the role of donor agencies in decision making seems to indicate a low level of involvement of research staff in important policy matters. It is also significant that although most of the research institutions have benefited from donor assistance, the monetary value of such assistance is not normally known or documented at the institution level.

e) Direct Response to Problems (emergencies)

4.18 About 60 per cent of the research staff interviewed in this study recognise that research priorities are influenced by emergencies. Unfortunately it is not possible to assess from the available data the degree or frequency in which such decisions are made. On the positive side, this means that the research system does respond to some of the urgent needs of the agricultural sector for research geared to solving immediate problems. On the negative side, however, there is the danger that the long term objectives may not receive adequate attention both in programming and support. In this respect a serious confusion was observed among research personnel in the nature of activities referred to respectively as programmes and projects. The donor agencies have not helped much in this confusion since in order to conform to their preferred terminology in accounting and policies, even the long term activities lasting ten years or more are still referred to as projects. A donor assisted "project" can even be larger than the national "programme" and in a few cases e.g. sorghum and millets research there is no distinction between the donor project and local programme of research.

4.19 The participation of farmers in this type of priority determination requires some comments. Belshaw and Hall (1965) and Moser (1966) argue that the small scale producer does not bring adequate pressure to bear on agricultural research. Agricultural research therefore tends to be carried out inspite of

him/her rather than at his/her demand. The situation in Kenya provides for effective participation by farmers of commercial crops like tea and coffee who fund research directly through cess on marketed crop and are hence incorporated in the boards of management of research institutions. The monitoring system for livestock diseases ensures prompt response by the research services but no parallel communication has been developed in the area of livestock nutrition and management. The current food crops and forestry development plans, however, call for a central role of the farmer in research and that research should be oriented toward alleviating constraints on small-holder farming taking into consideration socio-economic conditions of the farmer. It has, however, proved difficult to organise direct participation by the large number of smallholders and the research system has tended to rely on the initiative and zeal of extension staff who are expected to bring farmers requirements in the Provincial Research Advisory Committees (PARAC). It is, however, doubtful that this machinery can voice adequately the priorities of farmers and it is important that additional systems involving at least some of the more enterprising farmers should be investigated at district level.

f) Value of Commodity

4.20 One of the objectives of the study was to determine the extent to which the value of commodity was used as criteria for determination of research priorities and hence allocation of research resources. The survey questionnaire therefore requested the research staff to indicate the level of production of commodities they were working on and the problems considered to limit production. Responses to these questions indicated that except in the case of soils where the emphasis is on conservation and improvement of fertility, the overriding concern is for improvement of yields per unit area or productivity of livestock. There was also no indication that the agricultural commodities had been placed in order of importance for purposes of research resource allocation.

4.21 The reason for the above situation may not be too difficult to find considering both the overall objective of alleviation of poverty (promotion of cash crops) and provision of basic necessities of food (food crops and livestock) energy and shelter (forestry). The cash value of these commodities (except cash crops) is difficult if not impossible to quantify and it is doubtful whether such information would be relevant in determination of research priority in a research system funded from the pool of government revenue. Social value of commodity would be the relevant criterion if it can be quantified. As indicated elsewhere in this report this need is to a certain extent satisfied when development plans and other production policies are used in resource allocation. Value of commodity

would also be difficult to use as a criterion in programmes and projects in areas such as farming systems which deal with overall improvement in farm productivity.

4.22 Value of commodity has, however, a role to play in determination of overall priorities by establishing the targets of desired production of particular commodities. Experience shows, however, that in many cases production can be increased substantially without further research if other production constraints, especially the unfavourable economics of inputs versus market value of production are removed. Research staff interviewed in this study confirmed this situation in the case of food crops and animal production. The available statistics on value of marketed production of various commodities are discussed in chapter 2 of this report. It is, however, appreciated that except for cash crops like coffee and tea, the value of marketed production is not a realistic indicator of actual production. There is, therefore, a pressing need to institute systematic farm surveys which would provide more realistic figures. Similar systematic surveys of natural resources such as land and water would also provide a basis for research into the economic utilization of such resources. Soil survey should therefore be accelerated.

CHAPTER VRESOURCE MANAGEMENT SYSTEM

This Chapter discusses the distribution of manpower and financial resources to the various research institutions.

a) Distribution of Research Personnel in research institutions

5.1 Table 5.1 shows the distribution of manpower in publicly funded research institutions. The information presented shows extreme variability in the number of research and technical support staff. This may be partly due to historical reasons but could also be as a result of lack of definite personnel establishment for each station. Apart from the parastatals CRF and TRI and KARI, the personnel establishment is held centrally in the Ministry and in the absence of programme budgeting, there is no obvious formula for allocation of research manpower.

5.2 NARS Kitale and NAL have been traditionally large stations with national mandate for major crops (maize and pasture) and scientific supporting disciplinary research (soil science, entomology etc.) respectively. The relatively large number of staff at Thika is partly due to donor projects, but Thika and NAL station also carry a number of extra staff on postgraduate training at University of Nairobi due to their proximity to Nairobi. Although Kiboko is a relatively new station, the level of staffing reflects the influence of a large donor project and its demand for counterpart staff. Prior to this project, the station had a very small staff.

5.3 The build up of staff at Mtwapa is in response to development plan for agriculture at the Coast. Almost all the research staff are fresh graduates with less than two years experience (1 Ph.D, 2 MSc, 10 BSc). The relatively low level of staffing at the major national research station at Naivasha and the subsidiary stations at Lanet and Nyandarua is a relection of the low priority accorded to animal production research in the past.

5.4 NPBS Njoro, which has a national responsibility for wheat, barley and oil crops has only a staff of 7 research officers, the same as a small regional station at Kakamega. A half of these staff are in fact expatriates. Although Tea is second to Coffee in value as a cash crop, the staffing of TRF is much lower than that of CRF since tea is still relatively free from major problems of plant diseases and pests. The status of personnel allocation to other commodities can be ascertained by examining specific research station for instance maize (NARS Kitale), pyrethrum (PHRS Molo), beef (NBRS Lanet), sugar (NSRS Kibos), rice (ARS Tebere), cotton (CRS Kibos) and Potatoes (PRS Tigoni). It is however, notable that the regional stations like Kisii, Embu, Mtwapa which should be able

Table 5.1 ALLOCATION OF TECHNICAL MANPOWER TO PUBLICLY FUNDED
RESEARCH INSTITUTIONS - 1979/80

Institution	Ecozone	No. of Research Projects	No. of R.O.	No. of Technical Support staff	Ration R.O: Technical staff
KARI-ARD	2	21	49	90	1:1.8
CRF	2	36	21	15	1:0.7
TRF	2	13	4	28	1:7.0
NARS Kitale	2	31	47	50	1:1.1
NHRS Thika	3	27	41	48	1:1.2
NAL Nairobi	2	14	60	106	1:1.8
NAHRS Naivasha	4	11	8	38	1:4.8
NPBS Njoro	2	13	7	25	1:3.6
NDFRI Katumani	3	21	21	30	1:1.4
PHRS Molo	2	11	8	30	1:3.8
WARS Kakamega	2	6	7	34	1:4.9
NSQS Lanet	2	6	16	43	1:2.7
NARS Kisii	2	21	5	24	1:4.8
BRS Lanet	2	8	3	5	1:1.7
ARS Nyandarua	2	3	2	10	1:5.0
PRS Tigoni	2	5	11	25	1:2.3
NSRS Kibos	2	3	8	24	1:3.0
ARS Embu	2	6	4	16	1:4.0
ARS Tebere	3	8	10	14	1:1.4
CRS Kibos	2	13	6	15	1:2.5
CARS Mtwapa	2	4	13	8	1:0.6
RRS Kiboko	5	10	16	33	1:2.0

to interact closely with small scale farmers on local problems at present command only one tenth of the total research personnel.

5.5 On the average, there are approximately three technical support staff for each research officer. However, this ratio varies very widely between institutions perhaps due to the rapid turnover of research officers while the support staff remain stable. The NCST in its Report on the Science and Technology for Development (1980) has recommended a ratio 1:5 but this is only achieved in 5 out of the twenty three institutions. The five stations which have achieved this ratio (TRF, Naivasha, Kakamega, Kisii, Nyandarua) have a very low number of research staff compared to other stations. This is therefore a reflection of shortage of both research scientists and technical support staff.

b) Administrative Personnel in Research Stations

5.6 Considering the small number of qualified research staff in agricultural research, their research output is likely to be affected by the amount of routine administration they have to do. Table 5.2 shows the level of administrative support for research staff in research institutions. The current ratio of administrative staff to research officers varies widely between 0.8 at Kitale and 6.2 at the Coffee Research Foundation. There is, therefore, no clear formula used for deployment of this important resource and an appropriate criteria should be developed through programme budgeting taking into consideration the overall capital investment in institutions which requires servicing.

c) Allocation of Financial Resources to Research Stations

5.7 Table 5.3 shows the allocation of financial resources to publicly funded research institutions. Except for the parastatal research institutions, which have very detailed financial reports, it was difficult to establish the actual expenditure on personal emoluments which are controlled centrally in the ministries. The directors of research institutions are not furnished with that information. Where figures are available, the personal emoluments account for nearly one half of total recurrent funds. Distribution among institutions is, however, much more variable. KARI-ARD at Muguga accounts for 35% of all operational funds but has no clear national responsibilities in terms of research programmes.

5.8 The general level of support in terms of operational funds per research officer also varies widely. It is significant that the level of overall support per research officer in KARI-ARD, CRF and TRF is over £17,000 compared to an average of approximately £7,000 in other institutions. It would be useful to

Table 5.2 THE LEVEL OF ADMINISTRATIVE SUPPORT FOR RESEARCH STAFF IN
RESEARCH INSTITUTION

Institution	Research Officers	Administrative Staff (i)
KARI-ARD	49	97
CRF	21	130
TRF	4	15
NARS Kitale	47	39
WARS Kakamega	7	17
CRS Kibos	6	6
NARS Kisii	5	14
PHRS Molo	8	29
NPBS Njoro	7	17
NSQS Lanet	16	27
NAHRS Naivasha	8	27
BRS Lanet	3	22
ARS Nyandarua	2	16
PRS Tigon	11	15
NAL Nairobi	60	58
ARS Embu	4	13
ARS Tebere	10	13
NHRS Thika	41	41
PRS Kiboko	16	18
CARS Mtwapa	13	20
NDFRS Katumani	21	10
NSRS Kibos	8	25
	384	669

(i) Executive, Accounting, Clerical and Secretarial Staff.

Table 5.3. FINANCIAL ALLOCATION TO PUBLIC RESEARCH INSTITUTIONS
1979/80*

Institution	Research Officers	Personal	Operational	Total	Operational Funds R. K
		Emoluments	Costs		
		K£	K£	K£	
KARI-ARD	49	845,450	92,321	1,707,771	17,
CRF	21	336,711	36,278	702,989	17,
TRF	4	53,065	44,026	97,132	22,
NARS Kitale	47**	-	32,616	-	2,
NHRS Thika	41	50,946	66,720	157,666	2,
NAL Nairobi	60	-	34,816	-	2,
NAHRS Naivasha	8	-	31,612	-	20,
NPBS Njoro	7	23,694	34,611	58,325	4,
NDFRS Katumani	21	-	31,338	-	7,
PHRS Molo	8	49,088	59,257	108,345	7,
WARS Kakamega	7	-	44,731	-	9,
NSQS Lanet	16	98,661	71,917	170,578	4,
NARS Kisii	5	-	-	-	
BRS Lanet	3	-	42,887	-	14,
ARS Nyandarua	2	45,012	42,539	87,531	21,
PRS Tigoni	11	-	28,130	-	2,
NSRS Kibos	8	-	36,648	-	4,
ARS Embu	4	65,040	23,015	88,055	5,
ARS Tebere	10	32,957	31,535	64,512	3,
CRS Kibos	6	-	5,500	-	
CARS Mtwapa	13	122,493	59,325	181,818	4,
RRS Kiboko	16	-	30,520	-	5,

* - The funding of research at the University of Nairobi is not reflected in this Table.

** - Indicates information was not provided.

establish the reason for this discrepancy and to relate it to any differences in the quality of research carried out in these institutions. It is, however, significant that the current funding system for research institutions does not provide for adjustment of operational budget to match the number of research officers due to the high level of investment on infrastructure which must be maintained irrespective of the number of research staff.

d) Utilization of Funds by Research Stations in 1979/80

5.9 One of the objectives of this study was to determine the relative ratios of budgetary provisions between personal emoluments and operational costs, and to determine the appropriateness of these ratios and the degree of flexibility for transfer from one item of budget to the other.

5.10 In the attempt to achieve this objective the team analysed the detailed allocations of funds to research stations, and the actual expenditures for 1979/80 for the twenty-three major research stations. Out of the twenty three stations, twelve stations were able to provide financial data on most of the items of expenditure while nine stations were only able to provide incomplete data. Thus the team was faced by paucity of data as well as the conceptual problem of assigning various costs or expenditures to individual programmes or projects. However, the financial data available can still throw some light on the pattern of expenditure in the research stations in 1979/80. The allocation and utilization of funds by the National Plant Breeding Station, Njoro is presented in the Appendix as an example of the nature of the information provided.

5.11 In general the allocation of funds to research stations seemed inadequate. Out of the twelve stations with adequate financial data it was found that eight stations just managed to balance their expenditures and two stations had surplus funds. This situation of inadequate funding is perhaps a reflection of inadequate budgeting and needs to be corrected since it can culminate in projects and programmes being abandoned.

5.12 This global picture of inadequate funding across stations was further illustrated on examining a few major items of expenditure which had an important bearing on research efficiency. These included expenditure on transport, library, plant and equipment, replacement of transport and maintenance of stations.

5.13 Out of the twelve stations only one station indicated that it had adequate funding on transport. Since the main research objective by these stations is farmer-field oriented then inadequate funding on transport tends to render this objective difficult to attain.

5.14 Two stations out of the twelve had money allocated to library but even these two did not manage to spend the funds. It is hoped that this is not an indication of the low ranking of the role of a library as a provider of information to researchers. A poor library or lack of it is bound to frustrate research in any station.

5.15 Most stations experienced lack of sufficient funds for plant and equipment. This problem is further compounded by the inadequate maintenance and servicing of equipment and machines. Infact research stations lack sufficient skilled manpower to handle breakdowns of equipment.

5.16 Research stations further do not control funds for replacement of transport which are administered centrally. This means that the stations cannot decide on the frequency of renewal of their transport fleet. 'Vehicle grave yards' are a common sight in research stations just as in other government institutions.

5.17 The maintenance of stations is also affected adversely by lack of adequate funding. Out of twelve stations only two indicated sufficient funding for maintenance. This in turn tends to accelerate the deterioration of research facilities.

e) Actual Resource Management Practices

5.18 In order to get a clear picture on how research resources are managed, the team asked the following 13 questions to various scientists ranging from the Directors of research stations to research officers at various levels of seniority across all the research stations in the country, of which 29 scientists responded:

- (a) Who determines research priorities?
- (b) On what basis are priorities determined?
- (c) How are research funds allocated?
- (d) To whom are research funds allocated?
- (e) Are research funds considered adequate?
- (f) How are priorities re-assigned in the event of budget reduction?
- (g) How often are projects evaluated?
- (h) Who evaluates research projects?

- (i) How often are research staff evaluated?
- (j) Who evaluates staff?
- (k) How is the productive scientists rewarded?
- (l) How is the unproductive scientists dealt with?
- (m) How are the technical staff recruited, deployed and trained?

The responses obtained from the scientists interviewed are summarised in the following tables:

Table 5.4 Who Determines Research Priorities?

	Yes	No	% of Total answering Yes
Individual Scientists	13	16	45
Programme Leaders	23	6	79
To Management	10	19	34
Committee of Scientists and Management	24	5	83
Donor agencies	6	23	21
Others	2	27	7

5.19 From Table 5.4 it is clear that the impression at the station level is that research priorities are mainly determined by programme leaders and committees of scientists and management. They both determine 79 and 83 per cent or research priorities respectively. The donor agencies do not have particularly important role in determining research priorities according to staff responses.

Table 5.5 On What Basis are Priorities Determined?

	Yes	No	% of Total answering Yes
Response to Emergencies	17	12	59
Response to value of product	21	8	72
Potential for production	24	5	83
Import substitution	7	22	32
Foreign exchange earnings	14	15	48
Land utilization	16	13	55
Donor influence	5	24	17
Scientific advancement	14	15	48
Development Plans	25	4	86
Others	4	25	14

5.20 Table 5.5 shows that priorities on research are mainly based on development plans, potential for production of the commodity and in response to the value of product.

Table 5.6 How often are Research Funds Allocated?

	Yes	No	% of Total answering Yes
Quarterly	0	29	0
Half Yearly	22	7	76
Annually	14	15	48
Periods longer than one year	1	28	3

5.21 Table 5.6 shows that research funds are predominantly allocated half yearly. It is therefore difficult to plan research activities on a long term basis.

Table 5.7 To Whom are Research Funds Allocated?

	Yes	No	% of Total answering Yes
Individual Scientists	0	29	0
Project	10	19	34
Programmes	12	17	41
Sections	5	24	17
Stations	24	5	83

5.22 From Table 5.7 it is clear that research funds are mainly allocated to research stations. It is also clear that research scientists do not control money allocated to their individual projects. This tends to isolate individual scientists from resource management of the station level. This situation might be ameliorated if funds are allocated and controlled on project basis.

Table 5.8 Are Research Funds Allocated Considered?

	Yes	No	% of Total Answering Yes
Adequate	3	26	10
Adequate but Irregular	2	27	7
Inadequate	23	6	79
Very Inadequate	4	25	14

5.23 Table 5.8 indicates that as far as the scientists who responded are concerned the research funds allocated are inadequate.

Table 5.9 How are priorities re-assigned in Budget Reduction?

	Yes	No	% of Total Answering Yes
Some Projects suspended	13	16	45
Funds reduced proportionally on project	18	11	62

5.24 From Table 5.9 it would appear that in the event of budget reduction, reductions are made proportionally on projects. This is basically because funds are allocated to research stations rather than specific projects. It obviously then makes it difficult to reallocate funds on priority projects if these projects were not costed or budgeted for in the first instance as is usually the case. Moreover, the proportional reduction of funds across the board can result in poorer execution of research since remaining funds may be inadequate to permit the realization of original research objectives. A system of re-assigning funds on the basis of priorities should therefore improve performance.

Table 5.10 How often are Projects Evaluated?

	Yes	No	% of Total Answering Yes
Half-yearly	6	23	21
Annually	21	8	72
Every 2-3 years	3	26	10
Irregularly	10	19	34
No mechanism developed	2	27	7

5.25 Table 5.10 indicates that projects are mainly evaluated annually. This does not correspond with release of funds which is done half-yearly, but it must be borne in mind that funds are allocated to stations rather than to projects.

Table 5.11: Who Evaluates Research Projects?

	Yes	No	% of Total Answering Yes
Top Management (Employer)	4	25	14
Research Director	10	19	34
Programme Leaders	12	17	41
Standing Committees	23	6	79
Ad-hoc Committees	12	17	41
Others	2	27	7

5.26 Research projects at station level are evaluated by various people as Table 5.11 indicates. It would appear from the responses received that Standing Committees are the most important evaluators of research projects. These committees comprise of scientists from other stations and institutions such as the University of Nairobi. The Director of a particular station is usually the Secretary to the Standing Committee. Although the input of the committees is considered valuable there is no clear evidence that their views are well coordinated and fully considered in the allocation of research resources to projects and programmes (ISNAR, 1981).

Table 5.12: How often are Research Staff Evaluated?

	Yes	No	% of Total Answering Yes
Annually	18	11	62
Every 2 years	0	29	0
Irregularly	7	22	24
No formal Mechanism	9	20	31

5.27 Table 5.12 shows that Research Staff are evaluated annually but it would also appear that a substantial number of the respondents thought that there is no formal mechanism for evaluating Research Staff.

Table 5.13: Who Evaluates Research Staff?

	Yes	No	% of Total Answering Yes
Top Management (Employer)	14	15	48
Research Directors	20	9	49
Programme Leaders	10	19	34
Special Committees	5	24	17
Others	0	29	0

5.28 It would appear from Table 5.13 that research staff are evaluated mainly by the Research Director and Top Management (Employer). Except in the two parastatals (CRF, TRF) charged with research responsibilities there are no Committees charged with responsibilities for evaluating research staff.

Table 5.14: How is the Productive Scientist Rewarded?

	Yes	No	% of Total Answering Yes
Accelerated Promotion	6	23	21
Special awards (Bonus)	0	29	0
Letter of Commendation	5	24	17
No action taken	19	10	66

5.29 Table 5.14 indicates that productive scientists are rarely rewarded. This would imply that scientists have no incentive to be productive. By this one should not only look at monetary incentives but also to such other morale boosting things like a letter of commendation to show appreciation of scientist's contribution.

Table 5.15: How is the Unproductive Scientists dealt with?

	Yes	No	% of Total Answering Yes
No promotion	14	15	48
Demoted	0	29	0
Transferred	8	21	28
Dismissed	2	27	7
No action taken	14	15	48

5.30 From Table 5.15 it would appear that nothing happens to unproductive scientists. This is discouraging because if productive scientists expect to be rewarded, the unproductive ones should be penalized. Taking no action to unproductive scientists will tend to demoralize others especially if they happen to be rewarded through an oversight.

Table 5.16: How are technical staff recruited, deployed and trained?

	Yes	No	% of Total Answering Yes
Only qualified staff recruited	12	17	41
Trained on the job at Employers' expense	22	7	76
Award fellowships a priority	8	21	28

5.31 Table 5.16 indicates that the respondents thought that majority of the technical staff recruited are mainly trained on the job at the employer's expense.

f) Response to the Questionnaire

5.32 The survey research was well received by the scientific community. Virtually, all research institutions cooperated and provided us with the type of information required whenever possible. Their enthusiasm however, was tempered by the inadequacy of the research resources allocation system which seems to be organized to meet the needs of the central administration rather than the stations. Nevertheless, it was particularly difficult to get information from the veterinary sciences.

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

a) General Conclusions

6.1 The objectives of this study were outlined in Chapter I. It was not possible to achieve all the objectives sufficiently due to constraints in time, manpower and the nature of the information required. The study however, was able to identify the critical constraints in the allocation of resources and the management of the research system.

6.2 It is noted from the study that by and large the national budget on R&D in agriculture is in keeping with the Development Plan and meets the expectation of at least 1% of the Agricultural GDP. There is, however, apparently no consistent procedure for establishment of priorities within programmes and projects and monitoring and control system to ensure that the resources so allocated are effectively utilised. In particular the survey has revealed that programme budgeting is only practised in the cash crop institutions which are more closely controlled by the boards of management. The research system is also very extensive, covering the whole country through 22 main research institutions. The numbers and level of training and experience of the research staff is, however, grossly inadequate and the attempt to spread them in all institutions has encouraged the spread of resources in many projects without adequate complements of research staff to ensure optimum returns. There is therefore urgent need to improve the quality and quantity of research staff through training. This need was also emphasized in the ISNAR (1981) report and a comprehensive manpower development plan is in progress. Since such an exercise will take time to produce the required manpower, it is proposed that the number of research projects be reviewed in relation to available resources.

6.3 The study has also revealed a high level of dependence on non-Kenyan scientists especially at the senior scientists' level. The study further revealed that although donor agencies contribution might be recognized at the national level; these resources from donor agencies are not adequately documented at the institutional level. It is also clear from the study that research staff in general are not involved in resource allocation to their projects and are not convinced that an effective machinery exists for evaluation of both projects and the output of individual scientists.

6.4 It would appear that the objectives of this study were ambitious. For example, it was not possible to identify the resources allocated to all agricultural commodities except for coffee, tea, cotton and sugar, since these are not budgeted for separately. There is also considerable overlap of resources both

manpower and finances between programmes and in the absence of programme based accounting system the programmes are not mutually exclusive on overhead costs.

6.5 Again except for cash crops mentioned above it was found absolutely difficult by researchers to assign value to the commodities they were working on. Furthermore it was not possible to get responses from all the institutions. It was also not possible to obtain meaningful information on specialized scientific equipment.

b) RECOMMENDATIONS:

(i) Documentation of Research Programmes and Projects

6.6 One of the important results of this study is the development of a centralized system of documentation of projects and programmes and an appropriate computer based system for storage, retrieval and analysis of such data. It is recommended that this system be perfected by the NCST and implemented not only for the agricultural sciences but to cover other fields of scientific research. The team noted the establishment of the National Documentation and Information Center in NCST which would provide a useful base for such a system.

6.7 In order to make this possible it will be necessary to introduce a uniform system of programme budgeting covering all research institutions. It is therefore recommended that a study be undertaken in consultation with research institutions to develop an appropriate programme budgeting systems.

(ii) Evaluation of Research Projects

6.8 Regular evaluation of research projects and programmes is vital for efficient allocation of resources to agricultural research. It is in this light that it is recommended that an appropriate mechanism be urgently developed to ensure that the recommendations of the specialist advisory committees are implemented and coordinated with the system of resource allocation. The role of ASARC within the NCST should be strengthened in this function.

(iii) Evaluation of individual Scientists

6.9 The effectiveness and productivity of research scientists is highly dependent on the incentives provided by the system. It is therefore recommended that an appropriate mechanism be established to ensure regular evaluation of the contribution of individual scientists coupled with a well defined criteria for rewards.

(iv) Registration of Scientific Equipment

6.10 Specialized scientific equipment constitute a substantial proportion of resources devoted to agricultural research. Given that these equipment are vital for research and also are foreign exchange intensive, it is recommended that a physical count of such equipment, their location, condition and degree of utilization be undertaken leading to an establishment of a central register against which fresh requests for similar equipments can be evaluated.

(v) Compilation of Production data in Agriculture

6.11 The level of production of various agricultural commodities in relation to anticipated requirements is a valuable basis for determination of overall priorities, especially between research programmes and hence resource allocation. Such information is, however, lacking and effort should be made by the relevant ministries to collect realistic production data through regular comprehensive surveys, and to encourage the use of this information in research budgeting. This requirement has also been emphasized in discussions on the implementation of the National Food Policy and deserves urgent attention.

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APPENDIX I

LIST OF ABBREVIATIONS USED IN THE TEXT

ARD	Agriculture Research Department
ARS	Agricultural Research Station
BRS	Beef Research Station
CARS	Coast Agriculture Research Station
CRF	Coffee Research Foundation
CRS	Cotton Research Station
FRD	Forestry Research Department
IDS	Institute for Development Studies
KARI	Kenya Agricultural Research Institute
NAL	National Agricultural Laboratories
NAHRS	National Animal Husbandry Research Station
NARS	National Agricultural Research Station
NDFRS	National Dryland Farming Research Station
NHRS	National Horticultural Research Station
NPBS	National Plant Breeding Station
NSQS	National Seed Quality Service
NSRS	National Sugar Research Station
PHRS	Pyrethrum and Horticultural Research Station
PRS	Potato Research Station
RRS	Range Research Station
TRF	Tea Research Foundation
WARS	Western Agricultural Research Station

APPENDIX II

AN EXAMPLE OF UTILIZATION OF FUNDS BY RESEARCH INSTITUTIONS

INSTITUTION CODE & NAME:- 067 NPBS NJORO - 1979/80

<u>CODE</u>	<u>ITEM</u>	<u>PROVIDED</u> K£	<u>USED</u> K£	<u>% USED/PROV</u>
000	PERSONAL EMOLUMENTS	20094	20094	100
050	HOUSE ALLOWANCE	3600	3600	100
100	TRANSPORT OPERATING EXPENSES	5000	5546	111
110	TRAVELLING AND ACCOMMODATION EXPENSES	7000	6522	93
120	POSTAL AND TELECOM. EXPENSES	—	—	—
140	ELECTRICITY, WATER AND CONSERVANCE	2455	1040	42
150	DRUGS SERA VACCINES AND PESTICIDES	400	390	98
151	PURCHASE OF LIVESTOCK	—	—	—
153	FARM INPUTS	5050	2663	53
154	TRAINING AND SEMINARS	—	—	—
160	FOOD AND RATIONS	—	—	—
172	UNIFORMS AND CLOTHING	900	535	59
173	LIBRARY EXPENSES	—	—	—
174	STATIONERY AND PRINTING	600	735	123
180	HIRING RENTS AND RATES	—	—	—
190	MISCELLANEOUS AND OTHER CHARGES	850	342	40
200	REPLACEMENT OF TRANSPORT	—	—	—
210	ADDITIONAL TRANSPORT	—	—	—
220	OFFICE EQUIPMENT	—	—	—

APPENDIX II - (Contd)

<u>CODE</u>	<u>ITEM</u>	<u>PROVIDED</u>	<u>USED</u>	<u>% USED/PROV</u>
		K£	K£	
222	PLANT AND EQUIPMENT	1000	945	-
250	MAINTENANCE OF STATIONS	14200	15913	112
302	NATIONAL COOPERATIVE TRIALS	-	-	-
340	GRANTS FOR COMMODITY RESEARCH	-	-	-
	TOTAL	61149	58325	95 .