Country Progress Report No.R2/P1

Requirements for Strengthening Postgraduate Research Training in Agriculture and Veterinary Medicine: a Contribution to Kenya's Manpower Development for Agricultural Research

University of Nairobi

International Service for National Agricultural Research

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Of the thirteen centers in the CGIAR network, ISNAR is the only one which focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on organization, planning, manpower development, staff requirements, financial and infrastructure requirements, and related matters, thus complementing the activities of other assistance agencies. Additionally, ISNAR has an active training and communications program which cooperates with national agricultural research programs in developing countries.

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1. INTRODUCTION

Kenya is predominantly an agricultural country, and crop and animal production have played, and will continue to play, a major role in the economy of the nation. These primary production activities provide food, energy, local and foreign exchange incomes, and employment for a vast proportion of the population, and raw materials for the growth and development of manufacturing industries. Kenya's success in productive agriculture over the years has depended largely on the results of research and the adaptation, application and generation of improved production technologies. With increasing human population pressure on land and other resources, the challenge which Kenya now faces is to extend increased productivity in agriculture to the areas of medium to marginal potential and to smallholder units, and improve further the efficiency of production in the high potential areas. Most of these can be achieved only through the application of relevant results generated from effective research work carried out by a growing cadre of well-trained and resourceful research scientists, adequately supported and operating in a scientific and policy environment conducive to productive work.

In furtherance of Kenya's objective of strengthening agricultural research as a key contributor to national agricultural development, ISNAR (International Service for National Agricultural Research) was invited in 1981 to undertake a review of the national agricultural research system. The report of that review mission led to the identification of manpower development and training as one of the critical and priority areas for attention. An intensive study of the specific needs and requirements by a Manpower Study Team in 1982 provided a comprehensive manpower and training plan which if executed would enable Kenya to train and redeploy about 374 serving scientists who need research-oriented training and the necessary additions during the next five years. Kenya's NCST (National Council of Science and Technology), on behalf of the Government of Kenya, with further assistance from ISNAR has from these two reports prepared a proposal for manpower development and training for agricultural research over the next 10 years. The proposal has been well received by all sections of the agricultural research system, notably the Ministry of Agriculture, the Ministry of Livestock Development, the Agricultural Research Institutes, the University of Nairobi, and the Ministry of Regional Development, Science and Technology. Following the approval of the proposal by inter-ministerial meetings and consultations with relevant agencies, it was decided that the proposal which comprises two projects, a fellowships and Training Project and a University of Nairobi Postgraduate Training Support Project, should be further developed to provide the detailed requirements for the second project with a focus on improving the capacity of the University of Nairobi to contribute more significantly to manpower development and training for the agricultural research system.

At the request of the Vice-Chancellor, University of Nairobi, ISNAR provided a staff member, Professor T. Ajibola Taylor, and a Consultant, Professor J.A. Laing, to serve with Professors D.N. Ngugi and G.M. Mugera, nominated by the University of Nairobi, as a joint study team to assess and quantify these requirements. The study was undertaken in Nairobi, Kenya from 15 - 25 August, 1983 and the report finalized in the Hague, Netherlands in September, 1983. This report presents the findings of the joint study team and forms the basis of the draft sub-project for incorporation into the main proposal for manpower development and training for Kenya. The main proposal is expected to receive assistance from a consortium of Donors which has indicated support for Kenya's agricultural research and development.

2. TERMS OF REFERENCE

The following terms of reference were agreed for the joint study team.

(i) To assess and quantify the physical, personnel, equipment, research and other needs of the Faculties of Agriculture and Veterinary Medicine, University of Nairobi for postgraduate development in the next five to ten years, so as to enable it to cope with the qualified manpower production required for Kenya's national agricultural research system.

(ii) To cost these requirements and suggest a time frame for implementation of measures to strengthen the two faculties.

(iii) Based on the findings, to prepare a draft sub-project for postgraduate support and development which will be an integral part of the 'Kenya Manpower Development and Training Proposal'.

3. CURRENT SITUATION AND FUTURE PLANS

3.1 The Faculty of Agriculture

The Faculty of Agriculture, University of Nairobi, was established with five departments (Agricultural Economics, Crop Production, Applied Plan Sciences, Entomology and Soil Science) and a field station in 1970. Before 1970, most Kenyans had received their basic University training in agriculture at the Makerere University College which then served the three countries of the East African Community (Uganda, Kenya and Tanzania). In the 13 years since its establishment the Faculty has grown in terms of students, staff, organization and academic programs and now comprises 7 academic departments:

- Department of Agricultural Economics
- Department of Agricultural Engineering
- Department of Food Science and Technology
- Department of Soil Science
- Department of Crop Science
- Department of Forestry
- Department of Range Management.

In addition, the Department of Animal Production is a constitutent department of the Faculty of Agriculture as well as of Veterinary Medicine.

Student intakes steadily increased from 41 in 1970/71 to 151 in the 1981/82 session, and about 180 students are expected to enrol in degree programs in agriculture in October 1983. With growth and organization, the Faculty has diversified its undergraduate programs and introduced postgraduate programs in 1973. Apart from the basic degree program of B.Sc. (Agriculture), it now offers B.Sc. degrees in Food Science and and Technology, Agricultural Engineering, Forestry, and Range Management. The output of agricultural graduates for Kenya's agricultural research and extension services has also steadily increased from 40 who graduated in 1973 to 136 in 1981. Table 1 presents the numbers of B.Sc. graduates trained in the Faculty of Agriculture during the period 1970-81 and details of yearly enrolments and employment statistics are given in Annex I and II.

Table 1. Numbers of B.Sc. graduates trained in the Faculty of Agriculture 1970-81

I. B.Sc. AGRICULTURE

Year	No. Admitted	No. Graduated		Failures	Total Graduated
		Men	Women		
1970/71	41*				
1971/72	42*				
1972/73	41	38	2	1	40
1973/74	41	39	2	-	41
1974/75	40	35	5	-	40
1975/76	54	48	6	-	54
1976/77	42	34	8	-	42
1977/78	68	51	14	3	65
1978/79	63	47	15	-	63
1979/80	70	49	21	-	70
1980/81	90	67	23	-	90
				Sub-Total	505

II. B.Sc. FST

1975/76	8	6	2	-	8
1976/77	10	5	4	1	9
1977/78	9	7	2	-	9
1978/79	16	14	2	-	16
1979/80	20	15	5	-	20
1980/81	19	14	2	3	16
				Sub-Total	78

III. B.Sc. FORESTRY

1979/80	10	8	-	2	8
1980/81	13	12	1	-	13
				Sub-Total	21

IV. B.Sc. AGRICULTURAL ENGINEERING

1978/79	10	6	-	4	6
1979/80	14	13	-	1	13
1980/81	19	17	-	2	17
				Sub-Total	36

V. Total Number of Graduates Trained in the Faculty:

B.Sc. Agricultural	505
B.Sc. Food Science and Technology	78
B.Sc. Forestry	21
B.Sc. Agricultural Engineering	36
Grand Total	640

* These were the first and second intakes at the opening of the Faculty.

But it is widely recognised that there is still a great shortage of agricultural graduates in Kenya, and as recently as 1978, a comprehensive manpower survey of sub-professional and professional agricultural manpower needs, for both the public and private sectors of Kenya's agricultural industry, indicated a requirement level which is about double the present output of about 150. The Faculty is therefore under a strong urge to expand further and diversify its undergraduate programs, and to focus more especially on such critical areas of need as in forestry, animal production and range management. Projected numbers of undergraduates to provide for these needs up to 1990/91 are presented in Annex X.

Comtemporaneously with the needs for increased numbers and types of agricultural graduates for the agricultural industry, has been felt the even greater need for higher level (postgraduate) training for those to man the research divisions of the Ministries, the Research Institutes, parastatals and other organizations and agencies in the total agricultural research system of Kenya. The Faculty responded to this need in 1973 by the introduction of Masters of Science degree programs in Agronomy, Animal Production, Plant Pathology, Agricultural Economics, Soil Science and Plant Breeding, and new M.Sc. programs in Food Science and Technology and Agricultural Engineering, as well as a postgraduate diploma in Irrigation and Soil Conservation, have been introduced more recently. The staff establishment and staff structure provided for these programs in the departments constituting the Faculty are shown in Table 2.

It is significant that the postgraduate program although supported and recognized by the University and the national agricultural establishments, has not received specific allocation for its healthy growth and development. The Faculty has developed the postgraduate programs more or less from its own initiatives and the limited resources allocated to it principally on the basis of its undergraduate programs. It has also done this with the support and assistance of some external funding agencies; notable amongst these are the Rockefeller Foundation, the Netherlands Government, the Government of Switzerland, the World Bank, ODA, NORAD, CIDA, and other countries and agencies.

The Faculty has benefitted from more than 80 postgraduate scholarships in support of the M.Sc. programs, especially in Agricultural Extension, Agricultural Economics, Crop Science and Soil Science. Assistance in this regard and in the general support of postgraduate programs has come from DAAD, UNESCO-MIRCEN, USAID and IDRC.

Details of the Recurrent allocations to the Faculties of Agriculture and Veterinary Medicine during the period 1972/73 to 1982/83 are shown in Annex III. Apart from the year following the starting year and the decline in 1979/80, these recurrent allocations increased almost steadily from K£128,704 in 1972/73 to K£608,795 in 1982/83 at rates ranging from 4% to 40% per annum, but did not take into adequate account the increasing intakes in the basic B.Sc. agricultural degree program, the needs of the diversified programs, the increasing costs of maintenance of the teaching and research infrastructure, and the growing requirements for the postgraduate programs. Apart from technical assistance capital to programs such as Food Science and Technology, Agricultural Engineering, Soil Science and Crop Science, no specific capital allocations have been made for postgraduate training and expansion. The result of these arrangements is that postgraduate development at the University of Nairobi has remained at a fledgling stage, with limited resources, estimated at about 10% of total normal recurrent and capital allocations, devoted to sustaining the M.Sc. (course work and thesis) and

TABLE 2. Establishment and Staff Structure in the Faculty of Agriculture

Department	Professor/ Assoc. Professor		Senior Lecturer		Lecturer		Asst. Lecturer Tutonal Fellow		Total	
	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled
Agric. Economics	1	1	3	2	7	7	1	1	13	11
Agric. Engineering	1	-	2	2	5	5	1	4	9	9
Food Service & Tech.	1	-	2	1	7	5	-	4	10	6
Soil Science	1	-	2	2	5	5	-	-	8	8
Crop Science	2	1	7	7	10	6	-	13	19	14
Animal Production	2	-	4	4	8	4	-	3	14	8
Forestry	1	-	1	1	4	2	1	-2	6	3
Range Management	1	1	1	-	4	2	-	-	6	3
Total	11	3	22	19	48	36	2	17	85	58

the limited number of Ph.D. candidates (thesis only) who can be supervised by the more senior academic staff. The only recognised capital allocation to the postgraduate program is the one fully-occupied block of residence for postgraduate students of the Faculties of Agriculture and of Veterinary Medicine located at Kabete. It must also be pointed out that staff/student ratio calculations have never taken the postgraduate load into account.

Despite these observed limitations, the staff and leadership of the Faculty have shown great enthusiasm for postgraduate development and have struggled along to produce increasing numbers of M.Sc. and Ph.D. holders (Table 3). Details of postgraduate enrolments (full-time and part-time) are given in Annex VIII. Other M.Sc. programs are planned (e.g. M.Sc. Horticulture) and are under consideration by the Senate of the University. The Faculty can claim to have trained and educated a large proportion of professional men and women who now serve Kenya as research scientists, teachers, advisors and administrators in agricultural research, extension and development, and in the rest of the agricultural industry.

Within the modest means of the Faculty for postgraduate development, viable and relevant research programs have been developed and pursued in such areas as food legume improvement, production and protection; biological nitrogen fixation; vegetable crop improvement; food processing etc. The successes achieved in these programs initiated and promoted by Kenyan scientists have attracted substantial support and grants from the Rockefeller Foundation, USAID (CRISP), UNEP, UNESCO, the National Academy of Science (USA), and also the Kenya National Council for Science and Technology. It is largely due to these types of support that the Faculty has managed to sustain a strong tradition for agricultural research at a time of general decline in research support funding from internal University sources.

A frequently-quoted consequence of these inadequate provisions for postgraduate training in the Faculty, and also in Veterinary Medicine, is the unduly long time that M.Sc. and Ph.D. programs have taken in many cases. Our observations and discussions showed that apart from inadequate physical and material provision for postgraduate training <u>per se</u>, other reasons, including the return of postgraduate students to their regular employment before the full completion of the requirements for the postgraduate degree; personal and domestic diversions in a local environment; lack of incentive to complete postgraduate requirements as promotion prospects in the employing agencies did not depend on this; inadequate facilities for off-campus supervision and follow-up; and sometimes administrative bottlenecks in thesis preparation and examination, largely account for these delays.

The Faculty is located on 10 hectares of ground on the Kabete campus, about 13 kilometers from the Main Campus and Central Administration of the University of Nairobi; the Faculty of Veterinary Medicine is also located on the same campus. Parts of the physical facilities of both Faculties are located at a third campus - Chiromo which is about 3 km from the Main University Campus and comprises laboratories and lecture rooms for introductory courses for agricultural and veterinary students. At Kabete, the faculty maintains a teaching and experimental field station and farms on 300 hectares, and more recently has acquired, through the Ministry of Agriculture, a yet undeveloped range management field station at Kibwezi, 160 km from Nairobi.

Table 3. Postgraduate Output - Faculty of Agriculture

M.Sc. Agricultural Extension

Commenced	1973/74	No. registered :	10
Postgraduate output	9		

M.Sc. Marketing

Commenced	1974/75	No. registered :	33
Postgraduate output	27		

M.Sc. Agric. Economics

Commenced	1977/78	No. registered :	32
Postgraduate output	15		

M.Sc. Plant Breeding

Commenced	1976/77	No. registered :	24
Postgraduate output	12		

M.Sc. Plant Pathology

Commenced	1977/78	No. registered :	30
Postgraduate output	7		

M.Sc. Agronomy

Commenced	1977/78	No. registered :	18
Postgraduate output	17		

M.Sc. Soil Science

Commenced	1975 - 76	No. registered :	22
Postgraduate output	5		

Postgraduate Diploma in Irrigation & Soil Conservation

Commenced	1976/77	No. registered :	57
Postgraduate diploma output	41		

Ph.D. Programs

Commenced	1973/74	No. registered :	14
Ph.D. output	10		

Total output:	M.Sc .	:	92
	Ph.D.	:	10
	Postgraduate Diploma	:	41

A total of 19,365 sq.m of lecture rooms, laboratories and workshops valued at $4,518,500 is available to the Faculty on the Kabete campus (Annex VI); this includes 1,594 sq.m of newly completed classrooms, laboratories and offices for Forestry and Range Management, and 1,806 sq.m of undergraduate library extension.

The Faculty maintains very close cooperation with the Ministries of Agriculture, Livestock Development, Environment and Natural Resources, the Reseach Institutes and the National Council for Science and Technology.

The Ministries are the main sponsors and consumers of the products of the postgraduate programs and have played a major role in the conselling on areas of priority and approaches in postgraduate training. More recently, and with decreasing resources for research from central University funds, the NCST has funded and supported research undertaken by the academic staff of the Faculty on priority problems in the country. Collaboration with the Ministries in problem-oriented research is encouraged through staff and postgraduate student research undertaken in agricultural research stations located throughout the country and in different ecological zones, although this is often hampered by limited travel and research support funds.

There was very limited capital development in the Faculty of Agriculture in the period 1975 - 81, despite the introduction and gradual development of a postgraduate program. But in the past two years and with the assistance of the World Bank, new physical facilities comprising lecture rooms, staff offices, laboratories and an undergraduate library extension (a total of 5,206 sq.m) have been completed at a cost of Ksh.7 million and is ready to be equipped and occupied (Annex VI). Even this development only represents urgently needed expansion for the undergraduate teaching, laboratory and study facilities, especially for the relatively new departments of Range Management and Forestry and the increasing numbers of undergraduates in all the other departments.

3.2 The Faculty of Veterinary Medicine

The Faculty was established in July, 1962 and is located on two sites at Chiromo and Kabete. At Chiromo there are the departments of Anatomy, Animal Physiology, and Biochemistry: and at Kabete, Clinical Studies; Public Health Pharmacology and Toxicology; Pathology and Microbiology; and Animal Production. The department of Animal Production which belongs to both the Faculties of Veterinary Medicine and Agriculture, contributes to teaching in both, but is administered by the Veterinary faculty.

The Faculty's undergraduate courses lead to the degree of Bachelor of Veterinary Medicine (B.V.M.). There are a number of courses leading to the Master of Science degree (M.Sc.). Candidates may also study for the degree of Doctor of Philosophy (Ph.D.). Between 1962 and 1970 students were prepared for the degrees of the University of London first, and later for those of the University of East Africa. When the University of Nairobi was established in 1970 it took over the Faculty and its work.

From 1970 to 1979 the number of graduates has been:-

B.V.M.	541
M.Sc.	27
Ph.D.	11

At the beginning the buildings, equipment etc. were meant to serve an entry of about 40 students per annum. The intake has, however, been gradually increased to about 90, but without what is considered by the staff as adequate improvement and development of facilities.

The curriculum follows the recommendation of the F.A.O. panel on Veterinary Education, the curriculum being 4 years with three extra vacation terms. The use of a 4 rather than 5 year course has led to congestion and it has been suggested that, in the interests of all, the courses should be extended to 5 years. This need not necessarily involve more staff because the same amount of instruction will be spread over one fifth more time. This should apply principally to the Clinical years and involve students' time spent in supervised practical experience rather than staff time spent in teaching. Some extra staff involvement is, however, probably inevitable if this takes place.

The Faculty is, as in Agriculture, administered by an elected Dean who holds office for 2 years and may be re-elected for a further 2 years. Three of the six departments - Clinical Studies; Pathology and Microbiology; Public Health, Pharmacology and Toxicology; - are larger and thought to need dividing.

The staff establishment and staff structure for the present departments constituting the Faculty are presented in Table 4.

Staff recruitment and retention is said to be difficult and it is thought that this is due to non-competitive remuneration and lack of promotion prospects. Since the Faculty was established it has, however, had very considerable subventions and support from overseas aid. This has come from the Universities of Glasgow, Giessen, Colorado (for 10 years) and Oslo (ending in 1984-5) etc. It is appreciated within the Faculty that aid at least in the shape of senior academic staff will be needed in the coming years both for under-graduate teaching and post-graduate training. Various overseas organizations have already been approached including Canada (short-term training), the U.K., Denmark and Czechoslovakia (Public Health).

The recurrent allocations for the Faculty during the period 1972/73 to 1982/83 are shown in Annex III. Apart from the decline of -6% in 1979/80, recurrent allocations increased almost steadily at rates varying from 4% to 30% per annum; these allocations however, were barely adequate for the current degree programs and the maintenance of the teaching and research infrastructure. No specific allocations for post-graduate development or for expansion of the existing infrastructure were made.

The Faculty has 200 hectares of land at Kabete, a total of 18,624 sq.m of lecture and laboratory space on the Kabete Campus funded by external donors, except for 1,594 sq.m from the original Makerere foundation, and 4,000 sq.m on the Chiromo Campus (Annex VII). These buildings are valued at Kshs. 324,000,000 ($24,000,000 approx.).

The non-movable research sheds, equipment, faculty farm, students' residence, staff houses etc. at Kabete are valued at Kshs. 200,000,000 ($14,814,814).

In 1969, there were 15 post-graduates. There are now 74 spread throughout the Faculty. There are M.Sc. courses in all departments taught and managed by the same staff as are responsible for the undergraduate courses. Some of these are solely taught courses and some incorporate research projects. No special provision has ever been made

TABLE 4. Establishment and Staff Structure in the Faculty of Veterinary Medicine

Department	Professor/ Assoc. Professor		Senior Lecturer		Lecturer		Asst. Lecturer Tutonal Fellow		Total	
	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled
Anatomy	1	-	3	2	5	1	-	2	9	5
Physiology	2	2	1	1	3	3	3	1	9	7
Animal Production	2	2	4	2	8	3	1	1	15	8
Pathology & Microbiology	3	2	6	4	10	8	-	4	19	18
Clinical Studies	3	1	7	5	12	9	10	7	32	22
Public Health										
Pharmacology & Toxicology	3	2	2	1	8	7	-	3	13	13
Total	14	9	22	13	45	31	12	16	97	73

for staff space, equipment or funds for post-graduate training. There is a University source of funds - the Deans' Committee, but it has never had at its disposal funds large enough for the postgraduate research needs of the Faculty and since the national financial crisis, it has had none. Money, however, has been available from sources external to the University, including the National Council for Science and Technology in Kenya and from bilateral and multilateral agencies abroad.

Between January, 1979 and July, 1983, 31 post-graduate students either completed their degrees or have submitted theses and have been examined or are ready for examination.

The following M.Sc. courses are offered:-

- Veterinary Anatomy and Histology
- Animal Production
- Diagnostic aids
- Instrumentaton in Biological Research
- Veterinary Pathology and Microbiology Special
- Applied Immunology

The following M.Sc. courses are planned and proposals on these have been submitted to Senate for approval:-

- Wildlife Management including fisheries
  (joint Vet. Pathology and Public Health)

- Animal Reproduction and Artificial Insemination (A.I.)
  (joint Physiology, Animal Production, Anatomy, Biochemistry, Pathology, Clinical Studies)

- Animal Physiology

A course for the degree of Master of Veterinary Public Health (M.V.P.H.) is offered by the Department of Public Health.

As in agriculture, it is claimed by many of those concerned that one disadvantage of the current Kenyan-taught or supervised M.Sc. courses lies in the fact that many students do not complete their courses within the required two or three years and that this compares unfavourably with the performance of students sent abroad. The same applies to some extent to Ph.D. candidates but it must be remembered that many of these are staff members who can be regarded only as part-time research workers.

The intake of students is about 90 annually and the average total in residence about 320. There is an establishment of 97 staff and the staff/student ratio throughout the faculty is recommended to be 1:5.6. This varies between departments and is much narrower in the para-clinical and clinical years. On average 70% of posts are filled. This widens the ratio accordingly.

The present 4 year professional degree course prepares students for general basic veterinary work. After this they all require further experience and training before they can be regarded as fully competent. But the system of training in practice during vacations will tend to make them fairly readily employable for general work. For research work, further training is necessary and only a relatively small proportion of first graduates are suitable for, or motivated towards, research. A larger proportion are suitable for the laboratory-based field investigational work which forms an important section of the Ministry of

Livestock Development's duties. These have to be found from about seventy five graduates annually together with those who will eventually become University staff members or will work in other agricultural and veterinary research centres in Kenya. No expansion of undergraduate output is planned (Annex X).

The animal disease and health aspects of agricultural research are relatively adequately covered by the output of veterinary graduates. Animal production research has, however, lagged behind and now that the major epidemic infectious diseases can be controlled and there are good prospects for the control of theileriasis, it is felt by many that university courses in animal production should be amplified so that more graduates are available to deal with the field problems and more attention is given to research. This has led to the view that an undergraduate degree of B.Sc. in Animal Production should be instituted. If the present plans were to be implemented this would lead to an annual production of 80 graduates per annum by 1987 or earlier depending on when teaching began and a possible output of 10-12 M.Sc. and 5-6 Ph.Ds. It would involve, it has been estimated, an increase of ten extra academic staff between now and 1988 together with support staff, physical accomodation, equipment, farm facilities and financial support for teaching and research. The costs so far have not been established. A development of this sort would place a very heavy load on the Department of Animal Production as it would at the same time have to maintain its contributions to teaching in both faculties. The future of this very worthwhile project is still undecided but the production of graduates trained for research in Animal Production need not depend on it but could be achieved in the short term by increasing the number of those with the M.Sc. degree in Animal Production who could be recruited both from those with the B.V.M. degree or the B.Sc. in agriculture. (See Section 4.8). The need to expand all types of work in animal production does however support the view that the department has special claims to be strengthened on the undergraduate as well as the post-graduate side.

The department of anatomy also has legitimate special claims for undergraduate teaching staff. It has suffered particularly from staffing difficulties, although it is one of the oldest departments, and at present is grossly under strength. It depends for senior staff on expatriates. Research depends on adequate training in basic fundamental subjects and it would be unwise to expect that the eventual veterinary graduate can readily become a competent research worker without adequate training in anatomy, histology and embryology. There is probably also some reason to think that teaching should be strengthened in biochemistry and related subjects because all applied disciplines are now so much dependent on this subject. Biochemistry is said by some to be a weak point in Kenya veterinary graduates, but the department is well staffed (as an independent department within the Faculty of Medicine) and the staff includes some with veterinary qualifications.

It would be wrong to be complacent about the adequacy of current basic scientific training for future veterinary research workers. It is probably necessary to strengthen these basic subjects at least for the benefit of those who will eventually be trained for research. They might provide components at the beginning of any future M.Sc. courses, or intercalated special courses could be instituted although these are probably less useful than effective introductory M.Sc. courses.

In all the departments some research is being conducted to Ph.D. level by staff and post-graduate students in the traditional way without routine course work. Courses are taken when necessary e.g. in statistics. Taught M.Sc. courses are also offered and others are planned (see above). In 1983 there were 74 enrolments for post-graduate degrees, (46 full-time and 28 part-time). Fifty one of these were for M.Sc. and 23 for Ph.D. In the period 1970 to 1980 a total of 32 M.Sc. and 16 Ph.D. degrees were awarded in the Faculty.

4. REQUIREMENTS FOR POST-GRADUATE STRENGTHENING AND EXPANSION

The analyses and considerations of the present combined facilities and programs of the Faculties of Agriculture and Veterinary Medicine indicate basic needs for strengthening and expansion in the areas of:

(i) Physical facilities
(ii) Staffing
(iii) Staff Development
(iv) Research support funding
(v) Teaching and research equipment
(vi) Library resources
(vii) Collaboration with extra-University institutions, and
(viii) Curriculum reform and development.

These considerations are discussed briefly below and conclusions and recommendations made to ensure strengthening as appropriate to obtain a more effective and significant contribution from these two Faculties to Kenya's overall manpower development for agricultural research. Unless some of the constraints identified in these analyses and considerations can be overcome there seems little prospect that initiators of original research on Kenyan agricultural problems can be nurtured in adequate numbers at any level in these two faculties. In the first place it seems the situation can be redressed only with outside aid but in the long run the capacity should be provided and staffed by Kenyans with assured national support.

The overall postgraduate development and expansion considered and agreed as necessary will require marked and consistent improvement in the recurrent estimates provided by the University to the two Faculties during the project period. Annex IV presents some provisional estimates based on a 20 per cent increase on the estimated recurrent for 1982/83 for the base year 1984 and 15 per cent annual increases over the 5-year period of specific postgraduate support. These are indicative figures which should be revised and updated as the program develops but should take into account the needs for support for the existing staff, extra manyears of senior academic staff, positions for staff development fellows, and the maintenance expenses for additional infrastructure and equipment essential for postgraduate research training. The projected numbers of undergraduates, especially in agriculture, presented in Annex X will also have a substantial claim on the resources to be provided from these recurrent estimates projections. The estimates may also be taken as indicative of the University of Nairobi's probable support for postgraduate development and expansion in the Faculties of Agriculture and Veterinary Medicine.

4.1 Physical Facilities

At present there are buildings and land which provide enough space to accomodate the undergraduate courses, although with some difficulty in the Faculty of Agriculture. If all established posts were filled by permanent staff there would be little difficulty in maintaining existing courses. Equipment is adequate but there are inadequate resources in many cases for maintaining it. There is little specific provision for post-graduate work and research and, as the dual-support system operates in Kenya, most finance for research tends to come from outside the university and principally from overseas aid.

Up till now, no provision has been made in either Faculty to accomodate specifically those students undergoing post-graduate training and doing research. This is in spite of the fact that post-graduate numbers have built up to current figures of 170 for Agriculture and 74 for Veterinary Medicine, and projections indicate average annual intakes of 60 and 50 respectively in the next five years. This situation has led to crowding of people and equipment in laboratories and other facilities meant for staff research and undergraduate teaching, and thus to some frustration and inefficiency. A total of 22,624 sq.m of laboratory and office space is currently provided for 350 undergraduates, 170 academic staff and post-graduate students in the faculty of Veterinary Medicine and 19,365 sq.m for about 430 undergraduates, 170 post-graduates and 110 academic staff and technicians in the faculty of Agriculture. As indicated earlier, the only specific facility built for post-graduate students is a 90 room post-graduate hall of residence which is also now overcrowded and badly needs extension or addition. The recently completed Range Management/Forestry complex plus the undergraduate library extension will only serve to improve the facilities for teaching and study in these new disciplines and mainly for undergraduates, but the investment of Kshs.7 million involved could be seen as an indication of Kenya's commitment to expand teaching and research facilities at Kabete, an effort which, but for the economic situation, could certainly have been extended to the post-graduate facilities. The total complex even now must be regarded as totally inadequate for the present post-graduate load and will depreciate badly, with possible loss in quality of trained post-graduate students, if post-graduate numbers increase without marked improvement in the physical facilities.

It is recommended that this space situation be at least mitigated by providing specific buildings to accomodate the present post-graduate numbers plus minimum planned increases. This can be done economically and efficiently by constructing a multi-purpose post-graduate facility for the two Faculties on the Kabete site. Such a facility should contain laboratories, tutorial and seminar rooms to accomodate post-graduate students from both Faculties and provide individual or shared accomodation, in bays or open cubicles, which students can identify as their own but which does not cut them off completely from others. The building should also contain post-graduate common room facilities and be situated conveniently close to the other buildings of both faculties. Its function will be to provide physical accomodation for post-graduates for research and study and an environment in which they can mix freely with staff and their colleagues and have opportunities to discuss their work and exchange ideas. The facilities for free and spontaneous discussion between those working in different but related disciplines and with members of the academic staff form the bases of mutual understanding and future collaboration. They also provide an atmosphere for current efficiency in study and contribute materially to smooth organization.

It is recommended that these physical facilities should consist of:

		Area
2	Large laboratories for Agriculture (Crops & soils)including preparation rooms	1,200 sq.m
1	Large laboratory for Animal Production	900 sq.m
2	Large laboratories for Veterinary Medicine (including preparation rooms)	1,200 sq.m
4	Tutorial/Seminar rooms	360 sq.m
1	Common Room	300 sq.m
	Total	3,960 sq.m

In addition to this facility, it is suggested that a post-graduate/research library be provided. This is discussed below in Section 4.4 (Library Resources), in view of the fact that this can be achieved separately by simply adding a floor to the recent library extension. The additional resources required to make such a library function as a resource centre for study, research and teaching are also discussed there.

Provision of the physical facilities envisaged in this recommendation and others below cannot depend solely on outside aid and must entail some University contribution. The new building erected to accomodate the Departments of Range Management and Forestry is part of the current expansion program and has been built by the University with a loan to the Government of Kenya from the World Bank. This might be brought into the Kenya contribution when considering the provision of funds for the new physical facilities.

The total space required is estimated as 3,960 sq.m (excluding the post-graduate/research library) and at the currently accepted average Kenyan building costs of Ksh.2,800 per sq.m will cost about Ksh.11,088,000 (US$ 924,000). Provision should be made for inflation at accepted Kenya rates for a period to cover the construction and equipping of such a facility.

4.2 Staffing

The staffing situation in the two Faculties is characterised by:

a) lack of very senior academic staff who could take leadership roles in postgraduate development and expansion in most of the departments;
b) instability of staffing because many of the expatriate staff are usually on short contracts;
c) a heavy load of undergraduate teaching;
d) lack of specific consideration and specific allocation of staff time for post-graduate supervision;
e) occurrence of many unfilled posts; and
f) a tendency to substitute tutorial fellows for established staff positions.

These characteristics have persisted because, although many of the departments had received technical assistance in the past, no consistent staff development plans had been executed to replace such technical assistance staff and establish a predominantly Kenyan staff base in the various departments. For example, out of the 86 academic staff in the faculty of Agriculture in 1982, 32 (or nearly half) are expatriates;

comparable figures for the older faculty of Veterinary Medicine are 7 out of 81 but even here many unfilled posts exist with little prospects of being filled by qualified Kenyans.

Under these conditions, the Faculties cannot embark on a planned expansion of post-graduate programs and increase their contributions to manpower development for agricultural research in Kenya without some assistance at the senior academic staff level. It is therefore recommended that provision be made for a total of 50 man years of senior academic staff assistance during the first 5 years of the project. These should be of the rank of Professor, Associate Professor or Senior Lecturer and should be persons with considerable, and relevant experience in postgraduate supervision, research and curriculum development. It would be necessary for such senior visiting staff to have research programs which they could usefully pursue in Kenya and they themselves should be active and enthusiastic innovators. They would largely be assigned to post-graduate programs in the two faculties for periods of 2 - 3 years, and would therefore be able to take on and supervise M.Sc. and Ph.D. candidates as well as initiate and teach postgraduate courses. In view of the fact that some senior desirable persons in academic institutions abroad may not be available for such lengths of time, provision should be made for short term and/or repeated visits of 3 - 6 months duration for such persons to come to Nairobi to initiate postgraduate programs, teach specific high level courses or give seminars in identified areas of need and priority. It is intended that these visiting senior workers would come from developed countries or other developing countries which can afford to assist with such staff and that they would be engaged specifically on research training either through taught courses or research projects. Kenyan staff would be expected to maintain their current undergraduate teaching, although the temporary staff provided should be able to assist with some classes associated with their own specialities or which build essential foundations for specific postgraduate training; this latter involvement should however be only a minority responsibility. The exceptions are in the departments of Animal Production, Range Management, Veterinary Anatomy, and probably Biochemistry, where reinforcement of undergraduate teaching is considered necessary.

It is recommended that the distribution of the 50 man years should be as follows:

Faculty of Agriculture	-	20
Faculty of Veterinary Medicine (including two specifically for Vet. Anatomy and Biochemistry)	-	12
Animal Production	-	5
Range Management	-	5
Forestry	-	8
Total		50

The two faculties have had some experience in the establishment and operation of beneficial academic linkages with universities and research institutions in some developed countries e.g. United Kingdom, U.S.A., Norway, Netherlands, Switzerland, Finland, etc. In view of the needs of both faculties for steady streams of senior academic staff to strengthen the postgraduate programs and provide additional leadership in faculty

research, and in order to facilitate arrangements for staff development training abroad and locally, it is recommended that the faculties explore the possibilities of establishing links with university faculties and departments, or with a consortium of universities in some developed countries to assist in the provision of suitable visiting senior academic staff and provide opportunities for staff development. It is unlikely that one institution or one country would be able to serve the purposes of strengthening the postgraduate programs and manpower training in both faculties. It is therefore envisaged that a number of such links would be established. Attempts should, however, be made to simplify and coordinate the administration of these linkages through the respective Deans' Offices in order to avoid over-bureaucratization and inefficiency. This could be achieved by designating a team leader for the further planning and coordination of the entire program of postgraduate support and development for both faculties.

It is also important that the University should strive to retain and provide increasing channels of advancement for the Kenyan professional and academic staff of the Faculties. Such senior and more experienced staff will be the ones to relate most effectively to the visiting senior academic staff recommended in this program and to provide continuing guidance for the healthy development of strong postgraduate programs at the University of Nairobi in the long run.

4.3 Staff Development

The improvement in staffing recommended in 4.2 above can only be maintained if a vigorous staff development program is initiated and sustained in the two faculties during the project period. Although, various donor agencies have assisted in the training of academic staff as integral parts of separate projects in the past, there has been no consistent attempt to train academic staff for eventual positions in the departments in the two faculties. The University provision of Grants for Research and Conference Travels, which includes allocations for Staff Development (Annex VIII), are meagre when considered in the context of the overall University of Nairobi requirements. Very few staff in the faculties of Agriculture and Veterinary Medicine have benefited directly from these grants. The need for staff development is further emphasized by the presence of a large number of tutorial fellows who require further training in all departments, and by the occurrence of many unfilled posts.

It is recommended that a total of 52 staff development fellowships be provided during the Project period and allocated on the basis of the perceived needs determined in our discussions and analyses of the current and projected situation with the Heads of Departments as follows:

Faculty of Agriculture	-	24
Faculty of Veterinary Medicine	-	10
Department of Range Management	-	5
Department of Animal Production	-	5
Department of Forestry	-	8
Total		52

These staff development fellowships will be of 2 - 3 years duration for M.Sc. and Ph.D. courses, with about half of the number used abroad for training in specific and/or new areas of expertise and the rest in

Kenya for tutorial fellows, assistant lecturers or other staff in training grades and working on research projects with the existing and visiting senior academic staff. Provisions should include the possibility of some of these training fellows going abroad to do course work for 1 to 1 1/2 years as appropriate and as integral parts of their M.Sc. or Ph.D. training in Kenya.

This division between Kenyan and overseas studies should accelerate the training program because those who go abroad can be placed quickly on return to assist temporary visiting staff both with instruction and research. The University will need to ensure that established posts are retained or provided for such staff to guarantee their retention. This should be easy since the numbers proposed are well within the normal projected staff increments in the departments constituting the two faculties.

The Kenya Government organizations, the International Agricultural Research Centres in Nairobi, as well as other units within the University of Nairobi, should be able to assist with other facilities for training in Kenya.

The overall cost of the 52 fellowships would be $1,482,000.

Staff development can only be meaningful in the context of strong and developing postgraduate teaching and research if other staff levels apart from the academic staff benefit from local as well as overseas specialized training. Most of the departments in the two Faculties have one Chief Technician and a cadre of young technicians and technical and research support staff at lower levels. The effectiveness of these technical personnel in supporting vigorous programs of postgraduate teaching and research depends very much on the quality of their training and their exposure to and familiarization with research techniques under the guidance of experienced academic staff and in a research environment. Some of them have received general formal training in polytechnics in Kenya while others have been trained on the job. The majority, however, do not have training which is orientated towards research-support and have severe limitations in complementing and assisting the research work of academic staff and postgraduate students.

There is therefore an urgent need for the training of these technical research support personnel in all departments of the two faculties, covering areas of specialized research techniques; analytical and other research methods; field research organization and data handling; maintenance and repair of research and teaching equipment; research laboratory organization and management etc. Some of this training can be undertaken at international centres in Kenya and in other places in Africa and elsewhere e.g. ILRAD (Nairobi), ILCA (Addis Ababa, Ethiopia), ICIPE (Nairobi), IITA (Ibadan, Nigeria), ICRISAT (Hyderabad, India). In particular, the Faculty of Veterinary Medicine is urged to make full use of the opportunities offered for training at ILRAD and ICIPE in such areas as parasitology, immunology, entomology and physiology.

It is recommended that for the training of such research-support and technical staff there should be a total of 50 short-term fellowships (about 6 months duration each) provided. These would enable the Faculties to train their existing technical support staff over a period of five years so as to provide continuing strength and support to all field and laboratory aspects of the expanding research programs of the existing academic staff, visiting senior academic staff and postgraduate scholars. At an estimated cost of $6,000 per short-term fellowship the

total provision required over a period of 5 years will be $300,000 and would enable about 25 - 30% of the research technicians to receive specialized and research-oriented training in a wide range of research and training institutions pursuing relevant programs.

4.4 Research Support Funds (Recurrent Costs)

The University recognizes the cognate functions of teaching and research as essential in the faculties of Agriculture and Veterinary Medicine. But in recent times little or nothing in the way of research support funds have been available from the University; some external grants are obtained. Adequate research fund support is vital if the University is to maintain its proper role of training research workers. If it is starved of funds at the expense of other public agricultural institutions which are allowed to present students for postgraduate degrees, its capacity for research and scholarship will become progressively less. It would be wrong if the University were allowed to lapse into the situation where it is in effect only the provider of a rubber stamp for degrees given on work financed at public research institutions.

The build-up of senior academic staff, staff development fellows and postgraduate students pursuing vigorous research programs as envisaged in this program will require considerable funding support. The experiences of both faculties indicate that research grants from University sources are grossly inadequate and are likely to continue to be (see Annex IX). Furthermore research grants are not specifically geared to postgraduate research load or to perceived needs for postgraduate development and expansion. Such inadequacies have often led to restrictions in the nature of research undertaken and the inability of the faculties to relate adequately to the priority problems of the country without support from outside. Some assistance has been received from the Ministries of Agriculture and Livestock Development, from N.C.S.T., and from donor agencies, but these are often project-orientated and have failed to provide a solid basis for continuity in the development of postgraduate research programs.

It is important that the University be persuaded to make more reasonable allocations to research in agriculture and veterinary medicine and that the extra-university agencies currently supporting research in the two faculties be urged to continue and increase such support in the future. But in view of the planned expansion of the postgraduate programs it is recommended that some provision be made for research support funds. There will be 50 man years of senior academic staff and 52 counterpart staff development fellows and annual intakes of about 50 postgraduate students to be supported in the two faculties during the period of five years. It is estimated that at the rate of $4,000 per man year for visiting research staff collaborating with existing staff, $4,000 per unit of staff development fellowship and their Kenyan collaborators, and $1,000 per postgraduate student, the total requirements for research support funds would be about $850,000. Such research support funds could be allocated on the basis of operating senior visiting staff and their counterparts, staff development fellows and their supervisors, and postgraduate students in each department, with some operational flexibility that would encourage the sharing of resources.

4.5 Teaching and Research Equipment (Capital Costs)

Both the Faculties of Agriculture and Veterinary Medicine are reasonably well-equipped with teaching and research equipment for undergraduate level teaching and concommitant research. In viewing the comprehensive lists of major equipment in the two faculties provided (lists retained on file) it was found that about 50% of these items of equipment are in proper working conditions but maintenance is far from adequate and essential spares are often lacking. The exceptions are the relatively new equipment in the Departments of Food Science and Technology and Agricultural Engineering. The demand for the fully functional items of equipment is exceptionally high and increasing. Postgraduate expansion is likely to aggravate the situation, unless additional equipment can be provided and the standards of repair and maintenance of existing equipment substantially improved. Equipment from donor sources have provided valuable additions to the basic equipment originally supplied for the principal teaching and research functions of the faculties, but constraints exist in securing prompt deliveries of essential equipment donated by various agencies. It is understood that the University often has great difficulties in securing the release of essential research equipment because it has to pay import duties even on items of equipment provided through donor assistance.

In the present financial circumstances of the University, funds are hardly available to pay duties on items of equipment ordered specifically for research or donated by bilateral agencies in support of research in the faculties. It is essential that the University should negotiate either for total or partial exemption from import duties for teaching and research equipment (essential/educational users' licence), or be permitted to receive such equipment from technical assistance agencies which will be allowed to import them duty free into the country. It seems counterproductive for a country to negotiate for equipment under technical assistance programs and for the institutions of that country to be unable to take advantage of such assistance because of self-imposed obtacles.

There is constant need for replacement of equipment in faculties that are 10 or 20 years old and for new and modern equipment for research. Equipment for research is at present not adequately financed by the University and the prospects for substantially improved provision for equipment to cope with the envisaged postgraduate research activity in this project cannot be considered good. In view of this situation and after consideration of the lists of requests for urgently needed equipment in both faculties it is recommended that a provision of $1,625,000 be made for research and teaching equipment over a period of five years. This would provide $812,500 for about 150 minor items of capital equipment costing less than $5,000 each and the remaining $812,500 for about 80 major items costing about $10,000 or more distributed among 13 departments in both faculties. There would be the need for some discrimination in such distribution because of varying departmental needs; such needs will need to be reviewed progressively during the five-year period and in relation to the evolving postgraduate research activities and demands.

4.6 Library Resources (Capital costs)

The present Kabete library was designed for undergraduate teaching and study in agriculture and veterinary medicine. Although located on the Kabete campus it is operated as part of the main University library and has no specifically allocated resources for coping with the growing

undergraduate and postgraduate programs in both faculties. It had become very crowded with increasing intakes and the services have continued to deteriorate because of inadequate provisions. The recent extension will only provide additional space for the larger numbers of undergraduates and for the new programs in Range Management and Forestry. Our discussions indicated that the provision for specific postgraduate research library accomodation was deferred in the recent construction exercise becasue of inadequate financing.

Library resources are considered very essential for the establishment of viable and vigorous postgraduate programs and for productive research by the growing academic staff of both faculties. The situation where there are no specific provisions for library space, facilities and materials for research and study, leaves much to be desired and does not augur well for the future expansion of the postgraduate programs in both faculties. The resources required would appear to include specific space for private research study and consultation; reference books, periodicals, journals and reprints, including back issues which are currently not available; human resources in terms of adequately trained library staff; a range of library equipment including audio-visual aids, photocopiers, duplicating machines, microfilm and microfiche readers and accessories etc.; facilities for utilization of computer-based information services; and resources for the documentation and dissemination of research results from the faculties.

The strengthening of the library resources at Kabete is considered a priority area in the development of programs supportive of the postgraduate research training in both faculties. It is therefore recommended that provision be made for the construction of the second phase of the library extension specifically as a research library. This would be in form of an additional floor in the present library complex, and we assured that there are adequate structural provisions for the execution of such an additional floor that would provide about 670 sq.m of space with carrels and other facilities for research and study. The estimated cost of this extension would be about $170,000. In addition, provisions should be made for the initial purchase of books, equipment microfiche readers, photocopiers, etc. This could be covered by the sum of $200,000, allowing about half of this amount for the basic stock of books and initial journal subscriptions for postgraduate research. The total requirements for the essential library resources would then be $370,000.

4.7 Collaboration With Extra-University Institutions

Kenya is particularly fortunate in the degree of development of its national agricultural research organizations and in the presence of a large and increasing number of international institutions. These have collaborated in the past and must assist in strengthening the basis of any Kenyan research-orientated training program. They can supply expertise in techniques, information services, familiarization of young people with research attitudes, and have many other invaluable attributes which must be used by an expanded postgraduate program at the University of Nairobi.

ILRAD is of outstanding importance because, apart from its own research and training facilities, it houses representatives of the other C.G.I.A.R.-supported centres. Since the inception of its training program in 1978, about 50 per cent of ILRAD's 23 postgraduate fellows training to M.Sc. and Ph.D. levels have been Kenyans. Five of these have completed their training under ILRAD or Kenya/ILRAD sponsorship. It is

clear that the strengthening of such collaboration in research training would be extremely useful to postgraduate development and expansion at Kabete. Positive steps should therefore be taken to further facilitate co-operation between ILRAD and the Faculties of Veterinary Medicine and of Agriculture, and to bring ILRAD as close to the University of Nairobi as possible. Some formal reciprocal relationships should be considered with a focus on strengthening linkages for postgraduate supervision and research-orientated training of technical support staff. Other centres in Kenya with which there could be meaningful and productive collaborative research and training are the ICIPE, ILCA, CIMMYT, CIP, ICRAF, KARI, KETRI and the research divisions in the Ministries of Agriculture and Livestock Development.

4.8 General Considerations

(i) In the current assessment of the requirements for strengthing postgraduate training in both faculties the curricula have not been looked at in any depth. It is considered, however, that periodic reviews of curricula should be encouraged to maintain the relevance of courses to the needs of the agricultural industry in general and to any future increased demands for university staff and agricultural research scientists.

It must be borne in mind that there is to be a B.Sc. degree course at Egerton College built on to the current diploma course, and any future plan of post-graduate training must take the requirements of Egerton College into consideration. The possible demands for staff in the projected second university, if and when it is established, must also be thought of. Both of these developments may have an effect on this project and its implementation.

The possibility of some agricultural diplomates entering into degree courses in the faculties and being given some credit for their diploma work requires thought, so that an agricultural education system evolves which encourages a flow from one category to another. At present no credit is given for those going from the Animal Health and Industry Training Institutes and Schools of Agriculture to Egerton College, or from Egerton College to the University. Diplomates are said to be weak in the basic sciences and to have to repeat first year subjects often but are satisfactory students thereafter. If credits are to be given, full information is necessary on the length and content of courses and the level and quality of the teaching, as well as on the possibility of offering remedial basic science courses.

(ii) If Egerton College takes on a degree program in agriculture as planned, care must be taken not to sacrifice diploma level man-power training in terms of numbers and quality. The reputable diploma level training provided by the College is an essential strength in the agricultural industry and research extension services of Kenya. It is therefore important that a situation which could result in structural and personnel imbalance in the agricultural services of the country be avoided.

(iii) Against the background of Kenya's requirements in the livestock industry there is a clear need for an M.Sc. in Animal Health and Production. This should consist of courses in animal production (including reproduction, nutrition, genetics and animal breeding

systems, environmental physiology, animal behaviour); principles of agricultural economics; systems of management, including programmes for the maintenance of health and control of disease; those aspects of microbiology, parasitology and immunology necessary for the understanding of the control of infectious disease; epidemiology, statistics, survey and field-trial techniques; the economically important diseases of farm animals and poultry, with special reference to herd and flock health problems under different systems of management; organization and administration of the control of animal disease, locally, nationally and internationally; and research projects based on animal health and production problems typical of Kenyan agricultural conditions.

A course of this type will produce graduates who have been introduced to modern ideas on the control and management of health and production combined. Both Faculties can contribute and visiting lecturers should be drawn from the staffs of the Ministries of Agriculture and of Livestock Development and from other agricultural institutions in Kenya. In some fields of study such as the economics of health control, overseas help will at first be necessary. It has been found that courses of this sort are best organized as post experience courses and that students are especially receptive to instructors dealing with subjects with which they are concerned in their everyday work e.g. artificial insemination, feed formulation, grassland management, infectious disease control.

A course of this sort also introduces students to investigational and research methods and will produce a group capable of identifying and defining new problems in the field and sensitive to the need for research. Those students suitable for training to Ph.D. level or likely to develop into senior research workers in animal production and health can be singled out from those taking the course.

As both faculties would contribute to the teaching, and especially the Department of Animal Production which lies in both, the degree should be a joint one, if this is possible.

(iv) Based on our assessment of the reasons for delays in the examination and graduation of postgraduate candidates, it is suggested that postgraduate examination procedures may need both simplification and decentralization. This is a matter for Senate which should consider recommendations on the issue from both Faculties. It is believed that such decentralization could be done without sacrificing the academic quality and standards of the postgraduate degrees awarded in the Faculties of Agriculture and Veterinary Medicine.

5. TIME FRAME FOR IMPLEMENTATION

A time frame of five years is recommended for the implementation of the Postgraduate Support Project, with the suggested phasing indicated in Annex XI. This time frame and phasing are based on the assumption that visiting staff appointments and the initiation of building, provision of both research capital and equipment and recurrent support grants can be synchronized in year one. Thereafter staff development fellowships are phased to give continuous support to existing and visiting staff with

increased support as the project develops and staff trainees return from abroad or complete their postgraduate training at the University of Nairobi. In some cases there are sufficient man years for the number of visiting staff in post to be increased towards the end of the project. The reverse is the case in Veterinary Medicine where provision is made for support to preclinical subjects at the beginning of the project. In all cases allowances may be made to carry over some of the provisons into the 6th or 7th years as considered appropriate.

In operational terms, there will be no need to rigidly adhere to the suggested spread in Annex XI; some flexibility will have to be exercised in applying both the human and material resources to strengthen the postgraduate programs. Also time for short-term visiting staff would have to be found from the manyears as set out, the requirements depending on specific course planning, subjects or required expertise.

The strengthening of the postgraduate training capacity in the two faculties after the five years of the project would enable the University of Nairobi to play an increasingly significant role in the training of research manpower for the agricultural research system of Kenya in the remaining years of the 10 years of the overall proposal for agricultural research manpower development and training for Kenya.

6. EXECUTING AGENCY

Following the intensive inter-Ministerial meetings and consultations on this project as part of the proposal for manpower development and training for Kenya's agricultural research system, and in view of the fact that a number of donor agencies are expected to support the program, it is recommended that the National Council for Science and Technology (NCST) as a central government organization charged with the responsibility for coordinating research and scientific manpower development be the Executing Agency for the program. The Faculties would be expected to implement directly the project according to the phasing indicated in Annex XI. NCST as the Executing Agency may request the assistance of ISNAR in monitoring and evaluating the progress of the Postgraduate Program Support Project as well as the overall program for Manpower Development and Training for Kenya's national agricultural research system.

7. SUMMARY OF RECOMMENDATIONS

1. A multipurpose postgraduate building should be erected specifically to accomodate teaching and research activities of post-graduate students in the Faculties of Agriculture and Veterinary Medicine.

2. A post-graduate and research library should be built as an extension to the present library on the Kabete campus of the University.

3. Fifty man years of visiting senior academic/research staff should be provided to strengthen postgraduate supervision and research direction during the five-year period of the project.

4. There should be 52 staff training fellowships, each of 2 - 3 years duration, to provide a stable Kenyan staff base for postgraduate training and research in the two Faculties.

5. There should be 50 short-term training fellowships, each of about 6 months duration, for research support staff and technicians.

6. Research funds should be provided to support the joint work of existing, visiting and training staff over the five year period.

7. Funds should be provided to cover the capital cost of new equipment, books and other library resources required for the support of the strong postgraduate programs in the two faculties.

8. SUMMARY OF ESTIMATED COSTS OF REQUIREMENTS FOR THE UNIVERSITY OF NAIROBI POSTGRADUATE TRAINING SUPPORT

		U.S.$
1.	Multipurpose Post graduate building (laboratories, tutorials, seminars, etc.)	924,000
2.	Fifty man-years of visiting senior academic/research staff (for postgraduate supervision and research)	3,000,000
3.	Fifty-two staff development fellowships	1,482,000
4.	Fifty short-term training fellowships (for research support staff and other technicians)	300,000
5.	Research support funds	850,000
6.	Teaching and research equipment	1,625,000
7a.	Postgraduate and research library extension	170,000
7b.	Library equipment, books, etc.	200,000
	Total U.S.$	8,551,000

ANNEX I

UNDERGRADUATE STUDENT ENROLMENTS - FACULTIES OF AGRICULTURE AND VETERINARY MEDICINE

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Agriculture 1)	41	82	121	147	162	186	206	310	353	417	432	479	362
Veterinary Medicine 2)	225	241	261	282	304	291	291	319	308	311	354		
Total	266	323	382	429	466	477	497	629	661	728	786		

Note:

1) 1970/71 was commencement year of the Faculty of Agriculture.

2) Faculty of Veterinary Medicine had been in existence sonce 1962 and previously served Uganda, Kenya and Tanzania.

ANNEX II

EMPLOYMENT STATISTICS OF GRADUATES IN AGRICULTURAL AND VETERINARY MEDICINE

	1971/72		1972/73		1973/74		1974/75		1975/76		1976/77		1977/78		1978/79		1979/80		1980/81		1981/82	
	Teaching	Others	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O
Agriculture	18	40	22	98	33	113	37	151	37	159	46	186	52	210	68	241	69	314	82	315	82	304
Veterinary Medicine	61	202	65	242	69	248	69	271	70	272	76	285	84	284	90	247	97	260	86	242	86	274
Total	79	242	87	340	102	361	105	422	107	431	122	471	136	494	158	488	166	574	168	557	168	578

Note: Others are the ministries, Research Departments/Institutes and parastatal agencies in agricultural and livestock development.

Source: University of Nairobi Calander 1980/81.

ANNEX III

RECURRENT ESTIMATES - FACULTIES OF AGRICULTURAL AND VETERINARY MEDICINE

(Percentage Increase in brackets)

	1972/73 K£	1973/74 K£	1974/75 K£	1975/76 K£	1976/77 K£	1977/78 K£	1978/79 K£	1979/80 K£	1980/81 K£	1981/82 K£
Agriculture	128,704	184,740 (44%)	234,357 (27%)	242,887 (4%)	322,137 (33%)	358,552 (11%)	501,781* (40%)	488,229 (-2%)	544,497 (12%)	631,958 (16%)
Veterinary Medicine	316,691	341,030 (8%)	363,207 (7%)	378,618 (4%)	444,575 (17%)	468,071 (30%)	579,884 (23%)	540,944 (-6%)	704,681 (30%)	737,565 (5%)
Total	445,395	525,770	597,554	621,505	444,575	826,623	1,081,665	1,029,173	1,249,178	1,369,523

K£ = 20 Kshs.

12 Kshs. = 1$ U.S.

* Additional budgetting for new departments of Forestry and Range Management.

ANNEX IV

PROJECTED RECURRENT ESTIMATES - FACULTIES OF AGRICULTURAL AND VETERINARY MEDICINE

(Percentage Increase in brackets)

	1982/83* K£	1983/84 K£	1984/85 K£	1985/86 K£	1986/87 K£	1987/88 K£
Agriculture	685,152	834,182 (20%)	959,309 (15%)	1,103,205 (15%)	1,268,685 (15%)	1,458,987 (15%)
Veterinary Medicine	811,322	973,586 (20%)	1,119,624 (15%)	1,287,568 (15%)	1,480,703 (15%)	1,702,808 (15%)
Total						

K£ = 20 Kshs.

12 Kshs. = 1$ U.S.

* Estimated

Projections for 1983/84 to 1987/88 indicate modest provisional estimates for additional resources for expanded postgraduate programs starting in 1984.

ANNEX V

ESTABLISHMENT AND STAFF STRUCTURE IN THE FACULTIES OF AGRICULTURE AND VETERINARY MEDICINE

Department	Professor/ Assoc. Professor		Senior Lecturer		Lecturer		Asst. Lecturer Tutonal Fellow		Total	
	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled	Estab.	Filled
AGRICULTURE										
Agric. Economics	1	1	3	2	7	7	1	1	13	11
Agric. Engineering	1	-	2	2	5	5	1	4	9	9
Food Service & Tech.	1	-	2	1	7	5	-	4	10	6
Soil Science	1	-	2	2	5	5	-	-	8	8
Crop Science	2	1	7	7	10	6	-	13	19	14
Animal Production	2	-	4	4	8	4	-	3	14	8
Forestry	1	-	1	1	4	2	1	-2	6	3
Range Management	1	1	1	-	4	2	-	-	6	3
Sub-Total	11	3	22	19	48	36	2	17	85	58
VETERINARY MEDICINE										
Anatomy	1	-	3	2	5	1	-	2	9	5
Physiology	2	2	1	1	3	3	3	1	9	7
Animal Production	2	2	4	2	8	3	1	1	15	8
Pathology & Microbiology	3	2	6	4	10	8	-	4	19	18
Clinical Studies	3	1	7	5	12	9	10	7	32	22
Public Health Pharmacology & Toxicology	3	2	2	1	8	7	-	3	13	13
Sub-Total	14	9	22	13	45	31	12	16	97	73
Grand Total	25	12	44	32	93	67	14	33	182	131

ANNEX VI

TEACHING AND RESEARCH PHYSICAL FACILITIES

FACULTY OF AGRICULTURE

		M^2
1.	Faculty of Agriculture old buildings (Depts of Crop Science, Soil Science Agricultural Economics, Lecture rooms, tutorial rooms, etc.	10,000
2.	Department of Agricultural Engineering	5,000
3.	Department of Food Science and Technology	
	New classrooms, labs and offices	710
	Pilot Plant	255
4.	Department of Forestry and Range Management (New buildings - classrooms, offices, etc.)	1,594
5.	Undergraduate library extension	
	Basement	336
	Ground Floor	800
	First Floor	670
Total		19,365*

* Estimated Cost: US$ 4,518,500

ANNEX VII

TEACHING AND RESEARCH PHYSICAL FACILITIES

FACULTY OF VETERINARY MEDICINE, KABETE 1983

	Space	Value in Kshs.
Pathology and Microbiology		
Donated by U.S.A.I.D.	4,675m^2	60,000,000
Large Animal Clinic		
Donated by Government of West Germany	3,265m^2	40,000,000
Small Animal Clinic		
Donated by Rockefeller Foundation	970m^2	10,000,000
Animal Production		
Built by Old Makerere University	925m^2	10,000,000
Nutrition Unit		
Donated by Government of Norway	720m^2	8,000,000
Poultry Teaching Unit		
Donated by Government of Norway	3,000m^2	10,000,000
Public Health, Pharmacology & Toxicology		
Donated by Government of Norway	3,000m^2	40,000,000
Department of Anatomy, Physiology and Biochemistry - Chiromo		
Donated by Rockefeller Foundation	4,000m^2	60,000,000
Old Large and Small Animal Clinic		
Built by Old Makerere University		
Cow Pens, Horse stables and Dog Kennels		
Donated by Freedom from Hunger Campaign of Different Countries	1,400m^2	20,000,000
TOTAL	22,624m^2	324,000,000
Non-movable equipment in the buildings donated by various organizations	Value	50,000,000
Research Sheds and Animal Stable		10,000,000
Faculty Farm		30,000,000
Students' Residential Accommodation		60,000,000
Staff Houses at Kabete		50,000,000
TOTAL		200,000,000
Total assets for Faculty of Veterinary Medicine - University of Nairobi		200,000,000
		324,000,000
TOTAL Kshs.		524,000,000

ANNEX VIII

POSTGRADUATE STUDENT ENROLMENTS (INCLUDING PART-TIME STUDENTS)

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Agriculture	7	7	26	39	66	68	103	153	172	196	188		
Veterinary Medicine	18	21	26	31	30	19	21	18	25	53	70		
Total	25	28	52	70	96	87	124	171	197	249	258		

ANNEX IX

UNIVERSITY OF NAIROBI - GRANTS FOR RESEARCH AND CONFERENCE TRAVELS (1977 - 1981)

(For the whole University; Faculties, Academic Departments and about ___ Academic Staff)

	Grants for Research & Conferences K£	Postgraduate Bursaries K£	Staff Development K£	Total K£
1977/78	60,000	125,000	60,000	245,000
1978/79	80,000	150,000	100,000	330,000
1979/80	80,000	150,000	100,000	330,000
1980/81	80,000	150,000	100,000	330,000
TOTAL	300,000	575,000	360,000	1,235,000

ANNEX X

PROJECTED NUMBERS OF UNDERGRADUATES - FACULTIES OF AGRICULTURE AND VETERINARY MEDICINE

	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Agriculture	185	225	265	305	345	395	445	495	545	600
Veterinary Medicine	340	340	350	350	350	360	360	360	360	360

ANNEX XI

PHASING OF PROGRAM OF POST-GRADUATE SUPPORT AND DEVELOPMENT

Year		1	2	3	4	5
Post-graduate building		Plans drawn, tenders accepted, building begun	Building completed by end of this year	Building occupied staffed and equipped and in use	Building in use	Building in use
Visiting staff in post						
Agriculture (20)		4	4	4	4	4
Vet. Medicine (12)		3	3	2	2	2
Range Management (5)		1	1	1	1	1
Animal Prod. (5)		1	1	1	1	1
Forestry (8)		1	1	2	2	2
(Tot. 50 man years)		10	10	10	10	10
Staff Development Fellowships						
Agriculture	Abroad	12	12	8	3	3
(72 man years)	Kenya	6	6	6	8	8
Vet. Medicine	Abroad	3	3	2	2	1
(28 man years)	Kenya	3	3	4	4	3
Range Management	Abroad	2	2	1	1	-
(13 man years)	Kenya	1	1	2	2	1
Animal Prod.	Abroad	2	2	2	1	-
(17 man years)	Kenya	2	2	2	2	2
Forestry	Abroad	4	4	3	2	1
(26 man years)	Kenya	2	2	3	3	2
		37	37	33	28	21
		(Provision for about 50% of the staff development fellowships to Ph.D. level (3 - 4 manyears)				
Support staff		20%	20%	20%	20%	20%
Research Support Funds ($17,000 per visiting staff years)		$170,000	$170,000	$170,000	$170,000	$170,000
Library		Plans drawn, tenders accepted, butilding begun	Building completed	Building in use	Building in use	Building in use
Library Equipment		-	-	$100,000	$100,000	-
Teaching and research equipment		$325,000	$325,000	$325,000	$325,000	$325,000
		With provision for carrying forward savings from year to year to cover expensive items				

ANNEX XII

A MANPOWER DEVELOPMENT AND TRAINING PROGRAM:

FOCUS ON STRENGTHENING THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

1. INTRODUCTION

In 1981, the National Council for Science and Technology (NCST), on behalf of the Government of Kenya, invited the International Service for National Agricultural Research (ISNAR) to carry out a Review of Kenya's National Agricultural Research System with a view to strengthening it. The Report (ISNAR R2) resulting from this Review identified a number of critical issues that need to be addressed urgently to enable Kenya to effectively face the challenging task of generating and employing improved technologies to increase its agricultural output, and attain the set goals of agricultural growth, poverty alleviation, productive agricultural employment and conservation of the country's national resources. The most important of these issues concern manpower development and training, organization, planning and management of agricultural research, and effectiveness of research/extension linkages to serve the large and increasing number of small-holder farmers. But by far the most important constraint identified was the quality and quantity of agricultural research personnel available to plan, organize, and execute the research programs, and to deliver the improved technologies so critically needed for the continuation and strengthening of the agricultural development process in Kenya. The consideration of these recommendations have led to the development of the present proposal which aims at providing a framework for mobilizing the necessary assistance to enable the country to upgrade its present research staff and to train and rapidly deploy additional trained agricultural manpower for effective and productive generation, adaptation and utilization of improved technologies. The Government believes that this is an urgent necessity for accelerated agricultural development and over the long term for the establishment of a strong and relevant base for manpower development, training and productivity in the agricultural sector of the country's economy.

2. BACKGROUND*

Agriculture plays a major role in the economy of Kenya by providing food, energy, incomes and employment for a vast proportion of the population, and raw materials for the growth and development of manufacturing industries. Kenya's agricultural success had largely depended on the generation, adaptation and application of research findings, mainly in the highly productive farming in the high to medium potential areas. With increasing population pressure on land and increasing demand for food and raw materials, the emphasis is shifting to increasing the productivity of small-holder farming in the less-favored and marginal areas (semi-arid to arid) and to

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* For further details of Background and data refer to Kenya's National Agricultural Research System ISNAR R2 and A Manpower and Training Plan for the Agricultural Research System in Kenya 1983-1987.

further improving the efficiency of production in the high potential areas. But agricultural research has yet to produce the scale of suitable and economically viable technologies necessary to rapidly increase the productivity of some of these areas. The result is that Kenya, like many sub-Saharan African countries, is now experiencing a decline in per capita food production at a time when its population is increasing at about the rate of 4 per cent per annum. The Government believes that improved productivity and production can be achieved largely by strengthening the research system which is charged with the responsibility of improving agricultural production through scientific research and the application of relevant research results for the overall development of the country.

The Review Report on Kenya's Agricultural Research System, prepared by ISNAR, identified lack of adequate manpower and planned manpower development as major weaknesses in the system. Not only are the numbers of research scientists inadequate in relation to the priority and urgent problems of agricultural research and development, a large proportion are inadequately, or not, trained for research functions. It has been further documented that between 55 and 70% of the present research staff have neither the training nor the experience required for productive agricultural research.

The Government authorities have considered and approved the recommendations that the inadequacies in terms of numbers and quality of training be immediately corrected by embarking on a substantial research-oriented training program at various levels, following a detailed feasibility study of scientific manpower requirements and training needs. Such a detailed analysis of manpower and training needs was undertaken with ISNAR's assistance in 1982 and an acceptable Manpower and Training Plan which forms the basis of the present proposal was produced.

A summary of the current state and status of research scientists in the national agricultural research system and the requirements for nett additions for 5 years as presented in the Manpower Development and Training Plan is as follows:

Sector of Agricultural Research	No of current staff	No. of experienced* staff Ph.D	M.Sc	No. of inexperienced staff	Nett additions to 1987
1. Crop Commodities Research and Services	385	53	53	279	72
2. Livestock Research (including Animal Prod. Beef, Dairy, Sheep and Goats etc.)	65	12	13	40	55
3. Veterinary Research	98	26	27	45	20**
4. Forestry Research	18	4	4	10	50
Total	566	95	97	374	197
		192			

* (Experienced research officer is an individual with at least an MSc degree and five or more years of experience).

** (Nett additions increased in Veterinary research in order to provide for diversified and specialized training).

These data emphasize the need for urgent provision for training for over half of the current staff and for the nett additions envisaged in the immediate future. The details of the disciplines in which training will be undertaken within these four broad sectors of agricultural research will be worked out progressively and in accordance with the basic training of staff and the overall priority needs of the approved research programs and the research service. Special emphasis will be accorded to training of research program leaders and to training in research management.

The Government authorities of Kenya in approving the major recommendations of the Manpower study and in adopting the Training Plan recognize these as important steps in the positive strategy for dealing with the problem of acute shortage of research personnel to undertake urgently needed increased agricultural productivity and output. This emphasis on building the manpower base for the agricultural research system would ensure continuing improvement in the productivity and performance of the system in the long run.

The Government of Kenya believes that a major effort in manpower development is fully justified at this time in view of the country's critical and compelling needs for development-oriented research necessary to generate improved production technologies for food and export commodities and raw materials. The adoption and implementation of this effort, in concert with other recommendations on organization and management and the overall improvement of the

research environment and service, which are currently being deliberated upon, and which are likely to form the basis of further request for assistance, would go a long way in strengthening Kenya's national agricultural research system. This in turn would strengthen our economy and increase our chances of meeting our clearly defined national development objectives.

3. THE PROPOSAL

The present manpower development and training proposal is designed to enable Kenya train the necessary research personnel over a period of 10 years and to build a secure base for in-country manpower development and training. We propose that it should involve:

- assistance in the training of research scientists and support personnel through local and overseas fellowships and grants at different levels

- and the strengthening of relevant postgraduate programs at the University of Nairobi.

The latter would require the University of Nairobi to strengthen and diversify its postgraduate training program in agriculture and veterinary medicine, and to initiate or strengthen appropriate undergraduate programs in a limited number of areas, e.g. in animal production, forestry and range management in order to meet complimentary needs for research and training.

In consciously focusing on agricultural research as a priority area, it is appreciated that this proposal represents only a proportion of Kenya's overall manpower development needs in scientific, industrial and technological research. It is therefore clear that we shall continue to mobilize internal as well as external sources for the additional training of manpower to ensure balanced development.

4. OBJECTIVES

The specific objectives of the proposal will be:

(a) To train, every year, about 40-48 research scientists who are currently in service, or will be recruited, but who lack research-oriented training to M.Sc. and Ph.D. levels.

(b) To expose annually about 30 serving research officers in the NARS to appropriate research or research support training at relevant IARCs.

(c) To train about 100 research support personnel in required techniques of research locally, overseas, and at IARCs.

(d) To encourage and assist the University of Nairobi in the strengthening of its postgraduate program in agriculture and veterinary medicine, and of appropriate undergraduate programs in animal production, range management and forestry.

(e) To support local field work on small-farmer/pastoralist oriented research that would contribute to manpower development.

These objectives have been determined as appropriate after full consultation with all sectors of the national agricultural research system. They represent Kenya's full commitment to building a self-sustaining base for manpower development and training for a very important sector of the country's economy.

5. SCOPE OF PROGRAM

In order to carry out an orderly manpower development and training program consistent with national objectives, it is considered appropriate that the Proposal in 3 above be translated into two specific but inter-related projects as follows:

(i) A Fellowships and Training Project.

(ii) A University of Nairobi Postgraduate Research Training Support Project.

It is estimated that these projects can be divided into an initial period of 5 years, followed by another period of 5 years, with 1984 or 1985 as the starting year. It is realized that some further support would be required in these and subsequent years in order to stabilize manpower and training inputs in the national agricultural research system and fully integrate agricultural research education and other agricultural research endeavours into a highly productive system. The projects therefore constitute an integral part of the overall efforts to strengthen the national agricultural research system.

(i) Fellowships and Training Project

Ideally, Kenyan research scientists who are currently in service and the nett additions, based on estimated requirements proposed in the Manpower and Training Plan, should be trained according to the following schedule:

	1984	1985	1986	1987	1988	Total
M.Sc. (Univ/Nairobi)	34	40	52	52	57	235
M.Sc.(Overseas)	37	33	30	30	29	159
Ph.D. (Univ/Nairobi)	2	4	5	6	7	24
Ph.D. (Overseas)	15	14	14	13	13	69
IARCs Research or other ad hoc/short terms training	26	32	34	28	28	148
Total	114	123	135	135	134	635

But in view of the need to consider the requirements for the continued execution of viable research programs while the Fellowships and Training Project is in progress, it has been proposed and agreed as realistic that the training envisaged be spread over a period of 10 years as shown below, the starting year being adjusted as appropriate:

	1984	'85	'86	'87	'88	'89	'90	'91	'92	'93	Total
M.Sc. Univ/Nairobi	15	15	18	21	24	25	25	30	32	30	235
M.Sc. (Overseas)	18	20	24	18	18	15	14	12	10	10	159
Ph.D. Univ/Nairobi	2	2	2	2	2	2	3	2	4	3	24
Ph.D. (Overseas)	10	8	8	8	7	7	7	6	4	4	69
IARCs Research + other ad hoc short-term training	15	18	20	24	20	18	15	8	5	5	148
Total	60	63	70	73	71	67	64	58	55	52	635

This also takes account of provisions for the release and recruitment of staff over a period of ten years.

On the basis of these projections a total of 394 M.Sc. and 93 Ph.D. fellowships will be required over a period of 10 years. Of these, 235 M.Sc. and 24 Ph.D. will be tenable at the University of Nairobi and 159 M.Sc. and 69 Ph.D. will be tenable at overseas institutions.

A total of 148 short-term research training fellowships for research scientists and research support technicians will also be required to enable that number of persons to participate in research training at IARCs and other institutions that have strong, relevant programs in the crops, commodities or systems of importance and interest to Kenya. IARCs such as ILRAD, ILCA, IITA, CIMMYT, CIAT, CIP, and ICRISAT will be approached to assist in such research training. It is also proposed that some additional provision be made for on-the-job training of research support personnel and for support to research scientists in post or in training to participate in seminars, conferences and workshops that have educational and training values.

In the event of a severe shortfall during the mobilization of internal and external resources for the manpower development and training projects embodied in this proposal, the minimum requirement will be to provide training for existing serving research officers who have had no formal research training at the postgraduate level. Out of a total of 566 current staff in Crop Commodities Research and Services, Livestock, Veterinary, and Forestry Research, 374 are regarded as 'inexperienced' or inadequately trained for research. As a minimum, these 374 officers will have to be trained over the next 10 years to provide the minimum base of trained research personnel for the system to fully function and be productive. The minimum training requirements, without expansion, would therefore entail an average of 38 fellowships per year over a 10-year period and can be phased over this period as follows:

	1984	'85	'86	'87	'88	'89	'90	'91	'92	'93	Total
M.Sc. Univ/Nairobi	10	15	15	15	15	20	25	25	30	30	200
M.Sc. (Overseas)	5	10	10	10	15	15	15	10	10	10	110
Ph.D. Univ/Nairobi	1	1	2	2	2	2	2	2	3	3	20
Ph.D. (Overseas)	3	3	4	4	5	6	6	6	5	2	44
Total	19	29	31	31	37	43	48	43	48	45	374

In addition to these, about 80 short-term, in-service research training fellowships (average of 8 per year) at IARCs and other relevant training institutions will be required to strengthen the expertise of serving research officers and research support technicians. Government recognized that this represents a fall back position which should be avoided if possible.

Details of the disciplines and areas of research training are not given here but they will approximate the requirements envisaged in the Manpower Training Plan. Provisions will be made through the Ministry of Agriculture and Livestock Development, to review on an annual basis the areas in which candidates will be trained and the distribution of such trainees among the services constituting the national agricultural research system.

(ii) University of Nairobi Postgraduate Research Training Support Project (1984-1988)

The purpose of this Project will be to assist in the building of an in-country capacity for the training of agricultural research scientists in the priority areas of need in Kenya. The University of Nairobi already has postgraduate programs in agriculture and veterinary medicine but it is felt that these require strengthening and diversification to enable them to improve on the numbers of intake, supervisory capacity and the quality and orientation of the training programs. Some external assistance will therefore be required to strengthen the M.Sc. programs, initiate Ph.D. programs in some important areas, and strengthen relevant undergraduate programs at least until 1988 or 1989.

Requirements for strengthening as determined by a joint ISNAR/University of Nairobi study team will include*:

(a) Provision of senior academic staff to assist in postgraduate teaching, supervision and curriculum development for about 5 years.

(b) Training of potential staff members in specific areas of shortage of expertise and/or experience.

(c) Infrastructural support in terms of a multipurpose postgraduate building, a research library building, books, journals and periodicals.

(d) Teaching and Research Equipment.

(e) Provision of research funds to support research station and on-farm research (farming/pastoral systems) of postgraduate students and their academic or research staff directors and collaborators.

(f) Provision of some short-term fellowships for training of research support staff and technicians.

There also appears to be a need for initiating or increasing the assistance to specific undergraduate programs such as in forestry, animal production, agro-meteorology and range management. The need here will be mainly in terms of items (a), (b), (c) and (d) above, and would involve cooperation with other departments in the University.

It is believed that a possible appropriate mechanism for achieving the strengthening of the postgraduate programs and the identified undergraduate programs, in the faculties of Agriculture and Veterinary Medicine (now college of Agriculture and Veterinary

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* ISNAR/University of Nairobi Report on requirements for Strengthening Postgraduate Research Training in Agriculture and Veterinary Medicine.

Medicine), University of Nairobi, as had been tried on a limited scale before, will be to link these faculties with some appropriate faculties in universities or a consortium of universities in some countries (e.g. Canada, the United States, United Kingdom, Australia, Germany, or Netherlands) where strong programs already exist.

The broad outlines of the requirements for this Project as assessed by a joint ISNAR/University of Nairobi study team, with an external consultant from the University of London, are presented in Appendix 4.

It must be emphasized that these requirements are critical for the proper evolution and development of strong and productive postgraduate and undergraduate programs in the relevant areas. The support envisaged here has been carefully worked out in consultation with the University of Nairobi and has been related to the University's capacity to contribute to Manpower Development and Training in the first project and to the requirement to strengthen its own capacity to support, on a self-sustaining basis, manpower, training and research inputs into Kenya's overall national agricultural research system. It is recognized that some essential benefits will also accrue from this project to other developments in the field of university agricultural education and research in Kenya. The Project may also be spread over a period of 10 years, instead of 5, if this is considered desirable as a result of institutional capacity or resources availability.

6. KENYA'S CONTRIBUTION

The proposal to develop manpower for Kenya's national agricultural research system through in-country training and overseas fellowships will involve substantial local costs contributions by Kenya. Out of the total of 571 candidates proposed for research training in the 10 year period 1984-1993 (Alternative I), 374 are currently in service, and Kenya will have to continue to make provisions for their salaries, allowances (housing, medical, insurance) and for pension. These contributions are computed in Appendix 3. In addition, provision will be made for the salaries and other entitlements of the 197 nett additional staff to be recruited and trained during the period, and the 148 intermediate level ad hoc training of research and research support staff in IARCs and other appropriate institutions. Assuming that 50 per cent of the current staff will be on Job Group L (Senior Research Officer) and the remainder on Job Group J (Research Officer), Kenya's contribution in respect of these current staff will total Ksh.105,246,440 over the 10-year period.

The nett additional staff provision is estimated to amount to Ksh.54,383,820 bringing the total to Ksh.159,630,240 (or $13,302,520 in 1984 dollars). In the alternative option (Appendix II) where only the 374 present staff that require research training are to be trained over the 10-year period Kenya's contribution will amount to $8,770,530 in 1984 dollars. To both alternatives must be added the provisions of US $1,983,348 for the intermediate level and ad hoc training of research support staff bringing Kenya's contributions to US $15,119,153 under Alternative I and US $10,587,218 under Alternative II. The bases of these cost estimates are shown in Appendix III and the conversions are to 1984 US dollars i.e. excluding cost increases which are likely to be of the order of 6% per year over the 10-year period.

The University of Nairobi has just completed some capital buildings for the expansion of the undergraduate teaching, research and study facilities, and for the accomodation of the relatively new departments of Range Management and Forestry. These were constructed with World Bank loan funds at a cost of Ksh.7 million (US $583,333) and should be regarded as part of Kenya's capital contribution to the growth of both Faculties. Contributions in terms of staff time for postgraduate training, infrastructural support and research facilities that will be directed to this manpower development and training program, estimated on the basis of 10% of the 1982 recurrent expenditure of both faculties devoted to postgraduate programs will amount to about Ksh.13,695,200 (US $1,141,266) over the five year period. The Faculties of Agriculture and Veterinary Medicine of the University of Nairobi will in addition require major inputs in physical facilities, staff development, visiting academic staff, equipment, library resources, and research support funds, in order to enable them make increased and significant contributions to manpower development for Kenya's national agricultural research system. The details of these requirements as determined by a joint study team (ISNAR/University of Nairobi) are presented in the team's report and the broad outlines are given in Appendix IV. It is essential that these requirements be provided during the first 5 years of the program so as to ensure a meaningful and consistent contribution of the University to the strengthening of the manpower situation in Kenya's national agricultural research system. The Government of Kenya considers this as a priority area of development which must parallel other requirements and actions envisaged in this program for strengthening Kenya's agricultural research system.

7. COST ESTIMATES

It is not possible to estimate the costs of the two projects in greater details at this stage. Estimates for the Fellowship Training Project and the University of Nairobi Postgraduate Research Training Support Project at what are considered the desired levels are indicated in Appendix I at a figure of US$ 25,176,300 and at a lower alternative level in Appendix II. These estimates have provided for increased costs at the rate of 6% per year over the projects' period but may need to be reviewed on an annual basis over the period. It appears that if the project is to be carried out there is not much chance to reduce the cost. The benefits we believe will justify the cost. Kenya's estimated contribution which is also quite high is a positive indication of the country's commitment to manpower and training as a means of improving the efficiency of the national research system.

The estimates for the University of Nairobi Postgraduate Support Project are based on the study of the requirements for postgraduate support by a joint ISNAR/University of Nairobi team (Appendix IV). Two different levels of support for this second project are also given in Appendices I and II, the preferred level being the one shown in Appendix I. They would need to be reviewed during the project period to determine the current appropriateness of the items and ensure the most effective and productive use of the resources available. It might also be necessary to assess possible need for extension beyond the 5 years envisaged.

It is hoped that the cost estimates provided here will serve as guidelines for more detailed project preparation and cost estimation by donors and other assistance agencies committed to assisting Kenya in strengthening its agricultural research system.

8. IMPLEMENTATION

It has been agreed through inter-Ministerial Consultations and meetings that the implementation of the projects will be undertaken at the levels of the relevant Ministries and Institutions, notably:

- The Ministry of Agriculture and Livestock Development;
- The University of Nairobi;
- The Research Institutes;

with the Ministry of Agriculture and Livestock Development playing the leading role. The National Council for Science and Technology will as hitherto continue to coordinate all planning, programming and policy issues with the international centers and agencies that will be involved. In doing so, it will continue to involve the relevant Ministries and Institutions, and seek the approval of the Treasury and the Directorate of Personnel Management. The major assistance that will be required from donors will be channeled through the established authorities of the External Aid Division of the Ministry of Finance.

As the program is now agreed by all concerned and the detailed costings of the projects established as far as practicable, the Government of Kenya with the support and assistance of ISNAR, wishes to approach a group of donors for consideration of support to initiate and carry out the program.

Table 1

Provisional Cost Estimates
(All costs in 1984 $

Project I - Fellowships and Training Project

	Costs per fellowship year $	Nos.	Cost Projections per year (1984-93) in $ '000										
			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
1. M.Sc. Fellowships (Univ. of Nairobi)	8,000	235	120	240	264	312	360	392	400	440	496	496	3,520
2. M.Sc. Fellowships (Overseas)	20,000	159	360	760	880	840	720	660	580	520	440	400	6,160
3. Ph.D. Fellowships (Univ. of Nairobi)	8,000	24	16	32	48	48	48	48	56	56	72	72	496
4.Ph.D. Fellowships (Overseas)	20,000	69	200	360	520	480	460	440	420	400	340	280	3,900
5. IARCs Research Training Fellowships	7,000	148	52.5	63	70	84	70	63	52.5	28	17.5	17.5	518
6. Seminars, Conferences, Workshops	-	-	10	10	10	10	10	10	10	10	10	10	100
Sub-total		635	758.5	1465	1,792	1,774	1,668	1,613	1518.5	1,454	1375.5	1275.5	14,694
Provision for increased costs per year			-	87.9	107.5	106.4	100.1	96.8	91.1	87.2	82.5	76.5	836
Total			758.5	1552.9	1899.5	1880.4	1768.1	1709.8	1609.6	1541.2	1458	1352	15,530

Project II - University of Nairobi Postgraduate Research Training Support Project

7. Multipurpose Postgrad. Building	-	-	462	462	-	-	-						924
8. Visiting Senior Academic Staff	-	50*	600	600	600	600	600						3,000
9. Staff Development Fellowships	-	52	572	572	456	332	228						2,160
10.Teaching and Research Equipment	-	-	325	325	325	325	325						1,625
11.Postgraduate Research Library	-	-	85	85	-	-							170
12.Library equipment, books etc.	-	-	-	100	100	-	-						200
13.Research Support Funds	-	-	170	170	170	170	170						850
14.Short-term special fellowships in research techniques	-	50	60	60	60	60	60						300
Sub-total	-		2274	2374	1711	1487	1383						9,229
Provision for increased costs at 6% per year			-	142.4	102.7	89.2	83						417.3
Total			2274	2516.4	1813.7	1576.2	1466						9,646.3
Grand Total (Projects I and II)													25,176.3

* Person years.

Table 2

Provisional Cost Estimates (Alternative) - All costs in 1984 $
(Minimum requirements to provide training for currently serving Research officers and minimum postgraduate support)

Project I - Fellowships and Training Project

	Costs per fellowship year	Nos.	Cost Projections per year (1984-93) in $ '000										
	$		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
1. M.Sc. Fellowships (Univ. of Nairobi)	8,000	200	80	200	240	240	240	280	360	400	440	480	2,960
2. M.Sc. Fellowships (Overseas)	20,000	110	100	300	400	400	500	600	600	500	400	400	4,200
3. Ph.D. Fellowships (Univ. of Nairobi)	8,000	20	8	16	32	40	48	48	48	48	56	64	408
4.Ph.D. Fellowships (Overseas)	20,000	44	60	120	200	220	260	300	340	360	340	260	2,460
5. IARCs Research Training Fellowships	7,000	80	21	28	35	56	49	35	21	14	10.5	10.5	280
6. Seminars, Conferences, Workshops	-	-	10	10	10	10	10	10	10	10	10	10	100
Sub-total		454	279	674	917	966	1107	1273	1379	1332	1256.5	1224.5	10,408
Provision for increased costs per year			-	40.4	55	58	66.4	76.4	82.7	79.9	75.4	73.5	607.7
Total			279	714.4	972	1024	1173.4	1349.4	1461.7	1411.9	1331.9	1298	11,015.7

Project II - University of Nairobi Postgraduate Research Training Support Project

7. Multipurpose Postgrad. Building	-	-	462	462	-	-	-						924
8. Visiting Senior Academic Staff	-	30*	360	360	360	360	360						1,800
9. Staff Development Fellowships	-	32	344	344	240	208	180						1,316
10.Teaching and Research Equipment	-	-	195	195	195	195	195						975
11.Postgraduate Research Library	-	-	85	85	-	-	-						170
12.Library equipment, books etc.	-	-	-	100	100	-	-						200
13.Research Support Funds	-	-	102	102	102	102	102						510
14.Short-term special fellowships in research techniques	-	50	60	60	60	60	60						300
Sub-total	-		1608	1708	1057	925	897						6,195
Provision for increased costs at 6% per year			-	102.5	63.4	55.5	53.8						275.2
Total			1608	1810.5	1120.4	980.5	950.8						6,470.2
Grand Total (Projects I and II)													17,485.9

* Person years.

Table 3

Estimated Kenya's Contribution to Manpower Development and Training

Alternative I

Groups		Proportion/Numbers	US $
(a)	Research Officers Job Group 'J' (Salaries, allowances etc. including Pension for 3 years each)	50% of research trainees	5,483,884
(b)	Senior Research Officers Job Group 'L' (Salaries, allowances etc. including Pension for 3 years each)	50% of research trainees	7,651,971
(c)	Intermediate level and ad hoc training at IARCs and other Institutions	148	1,983,348
		Total	15,119,153

Alternative II

(a)	Research Officers Job Group 'J' (Salaries, allowances etc. including Pension for 3 years each)	187	3,591,896
(b)	Senior Research Officers Job Group 'L' (Salaries, allowances etc. including Pension for 3 years each)	187	5,011,974
(c)	Intermediate level and ad hoc training at IARCs and other Institutions	148	1,983,348
		Total	10,587,218

Data Bases

Research Officer Job Group 'J'

Salary	£2154 p.a.
Housing Allowance	£1350 p.a.
Leave Allowance	£32.5 p.a.
Medical Allowance	£150 p.a.
Pension	$\frac{1}{500}$ x Salary x No. of yrs

Senior Research Officer Job Group 'L'

Salary	£3144 p.a.
Housing Allowance	£1800 p.a.
Leave Allowance	£40 p.a.
Medical Allowance	£150 p.a.
Pension	$\frac{1}{500}$ x Salary x No. of yrs

Note:
K£ = 20 shillings; 12 Ksh = 1 US $. All figures in 1984 US dollars

Cost of intermediate level research support training estimated at 50% cost of Senior Research Officer.

Table 4

Estimated Costs of Requirements for the University of Nairobi Postgraduate Research Training Support

Requirements	Faculty of Agric. (as a whole)	Faculty of Veterinary Medicine	Special Assistance to Animal Prod. and Range Management	Special Assistance to Forestry	Total in Nos. and/or 1984$
1.Senior Acad. Staff Assistance (Nos.)	20	10	12	8	50 ($3,000,000)
2. Staff Development Fellowships (Nos.)	24	10	10	8	52 ($1,482,000)
3. Infrastructural support-postgraduate Building (laboratories, tutorial and seminar rooms, etc.) (US$'000)		(Both Faculties $924,000)			$924,000
4. Teaching and research equipment (US$'000)		(Both Faculties $1,625,000)			$1,625,000
5. Research-support funds (US$'000)		(Both Faculties $850,000)			$850,000
6. Library building, equipment and books (US$'000)		(Both Faculties $370,000)			$370,000
7. Short-term special training fellowships (Nos.)	20	20	5	5	50 ($300,000)
					$8,551,000

ANNEX XIII

ITINERARY OF THE TEAM 14 - 15 AUGUST, 1983

Schedule of Visits

14.8.83		Arrival in Nairobi, Kenya.	
15.8.83	a.m.	Secretary, NCST	- Dr. Wang'ati.
		P.S. MRDST	- Prof. Gacii.
	p.m.	Dean of Agriculture	- Prof. D. Ngugi.
		Dean of Vet. Med.	- Prof. G.M.O. Mugera.
		Discussion:	Terms of Reference Plan of Study Documentation required Plan of Report Preparation
16.8.83	a.m.	Acting Vice-Chancellor	- Prof. P.M. Mbithi.
	p.m.	Dean of Agriculture Kabete Dean of Veterinary Medicine	
17.8.83	a.m.	Chairmen of Departments, Faculty of Agriculture.	
	p.m.	cont. Chairmen of Departments, Faculty of Agriculture. Deans of Agriculture and Veterinary Medicine.	
18.8.83	a.m.	Chairmen of Departments, Veterinary Medicine. Librarian Kabete.	
	p.m.	Dean of Agriculture.	
19.8.83	a.m.	Director of Research Ministry of Agriculture. Director of Research Ministry of Livestock Development.	
	p.m.	Director-General of ILRAD. Training Officer ILRAD.	
20.8.83	a.m.	Preliminary Drafting of Report.	
	p.m.	Preliminary Drafting of Report.	
21.8.83		cont. of Preliminary Drafting of Report.	
22.8.83	a.m.	USAID - Mr. David Lumberg, Chief of Agriculture.	
	p.m.	Director Veterinary Research Laboratories Kabete. Deans of Agriculture and Veterinary Medicine.	
23.8.83	a.m.	Executive Secretary, NCST. CIDA Regional Representative, Ms. Helen Janssen.	
	p.m.	P.S. Ministry of Regional Development, Science and Technology. Hon. Minister, MRDST. Visit to KARI, Muguga.	
24.8.83	a.m.	Deans of Agriculture and Veterinary Medicine. Discussion of Conclusions and Recommendations.	
25.8.83		Departure for the Hague, Netherlands.	

ANNEX XIV

LIST OF PERSONS MET

1.	Dr. F. J. Wang'ati	National Council for Science and Technology.
2.	Prof. P. Gacii	Permanent Secretary, Ministry of Regional Development Science and Technology.
3.	Prof. P. M. Mbithi	Acting Vice-Chancellor.
4.	Dr. D. B. Thomas	Chairman Department of Agricultural Engineering.
5.	Prof. C. M. Jacob	Professor of Agricultural Engineering.
6.	Mr. W. Schulthess	Chairman, Department of Food Science Technology.
7.	Dr. S. O. Keya	Chairman, Department of Soil Science.
8.	Prof. C. N. Karue	Chairman, Department of Range Management and former Dean of Agriculture.
9.	Dr. A. N. Said	Chairman, Department of Animal Production.
10.	Dr. J. C. Kiptoon	Chairman, Department of Clinical Studies.
11.	Dr. M. M. Kagiko	Department of Public Health, Pharmacology and Toxicology.
12.	Dr. R. M. Eley	Department of Veterinary Physiology.
13.	Dr. Oduor	Department of Veterinary Anatomy.
14.	Mr. S. Durrani	Librarian, Kabete Library.
15.	Mr. J. K. Gitau	Director of Research, Ministry of Agriculture.
16.	Mr. Amiani	Training Officer, Ministry of Livestock Development.
17.	Mr. Kiragu	Ministry of Livestock Development.
18.	Dr. Gray	Director-General, ILRAD.
19.	Dr. J. K. Lenahan	Training Officer, ILRAD.
20.	Dr. L. Abe	Training Officer, ICIPE.
21.	Mr. A. D. Lundberg	Chief of Agriculture, USAID.
22.	Dr. S. Chema	Deputy Director of Veterinary, Ministry of Livestock Development.
23.	Ms. Helen Janssen	CIDA Representative, Canadian High Commission.
24.	Hon. K. N. K. Biwott	Minister for Regional Development, Science and Technology.

ANNEX XV

Brief biographics of ISNAR/University of Nairobi team members

Dr. T. Ajibola Taylor
ISNAR Staff

is an agricultural entomologist and agricultural research administrator; now Senior Research Officer at the International Service for National Agricultural Research (ISNAR) at the Hague. He studied agriculture at the University College, Ibadan (1953-58) and obtained the Ph.D. degree from King's College, University of Durham, UK in 1961. He was 13 years at the University of Ibadan, Nigeria, as Lecturer, Professor and Head of the Department of Agricultural Biology, and Dean of the Faculty of Agriculture; 4 years as Professor of Plant Science and Director, Institute of Agricultural Research and Training, University of Ife, Nigeria; 4 years as member of the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR); 14 years as President of the Council of the International African Migratory Locust Organization (OICMA) and 1 year as Senior Research Fellow at ISNAR. He is Fellow of the Institute of Biology, London, and of the Nigerian Academy of Science. He has served on councils, boards and committees of several international organizations and held a number of consultancies in many countries of Africa and in Western Europe.

Prof. J.A. Laing
ISNAR Consultant

is Professor Animal Husbandry and Hygiene at the Royal Veterinary College, University of London. He studied animal production and veterinary science at the Universities of Edingburgh and Cambridge and obtained the Ph.D. Degree from Cambridge in the late 40s. He was lecturer, senior lecturer and reader in veterinary medicine at the University of Bristol 1949-1959. He was appointed to and has since held the Courtauld Chair of Animal Husbandry and Hygiene, University of London. He is Fellow of the Institute of Biology, London and editor of the British Veterinary Journal. He has served on several committees and commissions in the UK and Europe and has been consultant to FAO, WHO, EEC and other international organizations.

Dr. D.N. Ngugi
Univ. of Nairobi

is a crop scientist and currently the Dean of the Faculty of Agriculture, University of Nairobi. He took an agriculture degree from Makerere University in 1966 and the Ph.D. from University of Reading in 1972. He has since 1972 been on the staff of the University of Nairobi as senior lecturer and professor in crop science. He has been Chairman of the Department of Crop Science since 1976 and has been closely associated with postgraduate development in the Faculty of Agriculture. He is a member of the Kenya National Academy. He serves on several national committees and has held a number of consultancies in Kenya and abroad.

Dr. G.M. Mugera
Univ. of Nairobi

is a veterinary scientist and currently the Dean of the Faculty of Veterinary Medicine, University of Nairobi. He obtained his first veterinary diploma from Makerere University College in 1960 and later the M.Sc. and Ph.D. Degrees in microbiology and pathology from Michigan State University in 1962 and 1965. He has since 1965 been on the staff of the University of Nairobi as lecturer, senior lecturer and professor. He has been chairman of the Department of Veterniary Pathology and Microbiology since 1970 and has served twice as dean of the faculty. He has supervised and examined many postgraduate students in Kenya and abroad. He serves on several national committees and has been a consultant to FAO, WHO and other international organizations.

isnar

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