



CESO

**Kenyan Netherlands Review
of the Project of Assistance to
the Department
of Agricultural Engineering
University of Nairobi**

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**Centre for the study
of education in
developing countries**

NAIROBI, NOVEMBER 1990

Report prepared by
the Centre for the Study of Education
in Developing Countries (CESO)
and submitted to the Minister for
Development Cooperation

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1. INTRODUCTION

In 1987 the Department of Agricultural Engineering approached the Netherlands Government to support the establishment of the M.Sc. programme in Agricultural Engineering and the M.Sc. programme in Land and Water as a follow-up after assistance to the development of a B.Sc. Agricultural Engineering programme. The proposal was approved and the project started that same year.

The objective of the project was:
to allow the Department of Agricultural Engineering to firmly establish the new M.Sc. programme. It was envisaged that towards the end of the five year period a full-fledged university department, with both undergraduate and post-graduate programmes would be operating on its own.

In the project document it was foreseen that a mid-term review should take place after about two and a half years from the beginning of the project. It would look at possible achievements, the relevance of the objectives at that moment and suggest adjustments, if any. The joint donor recipient mission also had to report on the necessity of any final evaluation. Details of the terms of reference can be found in Annex 1.

The mid-term review was carried out from 19-30 November 1990.
The team was composed of the following persons:

- Mr. G.W. Peter, education specialist, mission leader
- Prof. Dr. Ir. L. Speelman, agricultural engineering specialist
- Prof. G.C.M. Mutiso, sociologist, policy/management specialist
- Dr. F.J. Wang'ati, Consultant Agricultural Research Development

The evaluation report is based on documentation studies, discussions and interviews with staff of the Department of Agricultural Engineering, past and present students of the Department and with the relevant University authorities.

The review team would like to express its sincere appreciation to all persons that contributed to the review by giving their time and information. Special acknowledgement goes to Dr. D.K. arap Some and to Mr. K.J. Lenselink for their help in programming the review exercise.

The team also wants to thank Mr S. Mundati for his assistance in typing the report and Mr. J. Pit for his technical assistance.

We do hope that the efforts of the review team may contribute to the further development of the Department of Agricultural Engineering.

Nairobi, November 1990

2. BACKGROUND OF THE PROJECT

2.1 Project history

The Netherlands assistance to the Faculty of Agriculture of the University of Nairobi started in 1976. During this first phase focus was mainly upon developing the B.Sc. Agriculture curriculum for the Crop Science Department. To serve that purpose, temporary supernumerary teaching staff was provided as well as scholarships for staff development abroad and material inputs.

Support was also provided for building construction and the Postgraduate Diploma course in Irrigation and Soil Conservation.

A joint planning mission reviewed the project in June 1979 and made the following recommendations:

- extension of the existing project for a period of five years;
- in addition to teaching special attention should go to research, the latter to be considered as an integral part of the role of the University in the agricultural development of Kenya;
- within the framework of the existing link between the University of Nairobi and the Agricultural University in Wageningen the latter would be the recruiting agency on the Dutch side;
- project progress would be reviewed annually, dealing with progress reports, project staff, allocation of scholarships and funds, and future activities.

The Department of Agricultural Engineering belongs both to the Faculty of Agriculture and the Faculty of Engineering. It is located at the Faculty of Agriculture, Kabete Campus, and provides teaching to both B.Sc. and M.Sc. students in that Faculty. However, the B.Sc. and M.Sc. Agricultural Engineering are programmes of the Faculty of Engineering. Most administrative matters are dealt with in the Faculty of Agriculture and most academic matters in the Faculty of Engineering.

The mid-term review of phase II, which was carried out in 1982, a.o. recommended that a detailed review should be carried out in order to develop a new proposal for negotiation with the Dutch Government. The latter Joint Review of the Department of Agricultural Engineering was realized in August 1985 and took as its main aim the development of the Department as a whole. A subsidiary aim was to review the Animal Draught Power Development Project.

The mission found that earlier recommendations had been sufficiently implemented, although structured and operational linkages between the Department and practical activities in agricultural development in the country had not yet taken place.

The main conclusions and recommendations of the 1985 review mission can be summarized as follows:

- consolidation of the B.Sc. Agricultural Engineering programme did not require further extension of the support
- it was essential to establish a post-graduate programme at M.Sc. level in Agricultural Engineering in view of the direct relation this had to Kenya's development problems and priorities
- the animal draught power project had to become a research programme of the Department
- in a next phase of the project the dissemination of technology to implementing organizations had to become a central point. Dissemination should be treated as a research topic of the Department.
- priority areas for research of nationally accepted importance in the field of

agricultural engineering should be developed.

In short, the 1985 review mission focused on the need for a M.Sc. programme including the resulting manpower demand and material resources required and it also indicated the need for research and development programmes and their relation with the educational development of the Department.

The Department of Agricultural Engineering then proposed to establish a M.Sc. programme at the university comprising a two-year course of study, with lectures, practicals etc. in the first year and research and thesis work in the second.

The programmes that would be on offer were:

- M.Sc. Agricultural Engineering, with options in Agricultural Power and Machinery, Agricultural Processing and Structures, and Soil and Water Engineering for graduates in Agricultural Engineering;
- M.Sc. Land and Water Management for graduates in Agriculture.

In anticipation of the M.Sc. programme, which was foreseen to start in 1987, the post-graduate Diploma course in Soil Conservation/Irrigation was suspended.

After having proposed the new M.Sc. programme at the University of Nairobi, the Department of Agricultural Engineering prepared a project proposal of assistance for the new programme that was submitted to the Netherlands Government.

2.2 Project objectives

The objective of phase III of the Netherlands assistance is stated in the project document as follows:

To allow the Department of Agricultural Engineering to firmly establish the new M.Sc. programme, thereby creating university graduates of an advanced level of know-how and understanding, relevant to the pressing technical agricultural development priorities in the country.

It was also stated in the proposal that towards the end of the five-year period of this phase, further Netherlands support might no longer be required and a full-fledged University Department, with both undergraduate and post-graduate programmes would be operating on its own, with sufficiently trained staff, adequate teaching facilities, and a relevant integrated research programme underway.

2.3 Project components

Academic staff

The foreign fellowships programme for staff development would comprise three Ph.D. candidates and six M.Sc. candidates, coming to a total of 21 man-years of fellowships abroad. Sending future staff members for M.Sc. training was seen as a short-term measure to speed up staff training, as not all M.Sc. programmes would start simultaneously in 1987. Supernumery staff would be provided for four years to cater for the period when fellows were on training. An extra year would be needed to finalize project matters bringing the total to nine man-years.

Non-academic staff

Research work, in connection with thesis work of M.Sc. students would create the need for more non-academic staff, especially technicians and senior technicians. As technicians were difficult to recruit, they would be sent for short specialized courses. After training they would be deployed to assist in post-graduate training, demonstration and research.

Local scholarships

In order to secure a reasonable initial input of M.Sc. students in the various programmes an equivalent of six scholarships would be provided. Since the M.Sc. would start in alternate years a total of 15 man-years was programmed.

Buildings and furniture

The increasing number of students and staff would bring about the need for two lecture rooms, four staff offices, records and archives space, a computer/video room and some graduate study rooms. This was equivalent to adding an extra floor on top of the existing building.

Equipment

Teaching methods in the Department had to be updated and consequently more modern teaching aids like audio-visual material would be needed. Another aim was the production of lecture notes and hand-outs in case text books were not suitable. In that way students would have more time for self-study and lecturers would be able to devote more time to study, student supervision, research and the creation of inter-institutional links. The purchase of display and demonstration equipment for more intensive training was also conceived as an important investment as well as the development of some of the existing laboratories.

Research

For the development of a comprehensive medium- to long-term research programme funds were planned for instrumentation, temporary personnel, data processing equipment and general materials, and some assistance from other sources like transport and travel was expected.

Conferences

In order to enable the staff to attend occasional international and regional conferences for information reasons and to strengthen links with other scientists and institutions in the country and region, funds were set aside for this purpose. At the same time possibilities were created for staff to organize and fund workshops, seminars and possibly conferences. The exchange of information and ideas was considered as important for the Department in the process of establishing itself as a national and possibly regional centre in agricultural engineering.

Review

A mid-term review was to take place after about two and a half years.

3. EDUCATION PROGRAMME

3.1 Introduction

The M.Sc. programme is expected to contribute to the development of professional Agricultural Engineers in Kenya and in this way supporting the development of agriculture in this country (Kijne et al). After approval in 1986/1987, an M.Sc. programme started, consisting of a two-years course of studies with lectures, practicals etc, in the first year and research and thesis work in the second. The following M.Sc. programmes were foreseen and offered (Project proposal 1986).

- a) M.Sc. Agricultural Engineering with options in:
 - i) Agricultural Power and Machinery
 - ii) Agricultural Processing and Structures
 - iii) Soil and Water Engineering

Candidates for the M.Sc. programme in Agricultural Engineering should have a B.Sc. in Agricultural, Mechanical or Civil Engineering from the University of Nairobi or an equivalent degree from another recognized university. (University of Nairobi Calendar 1989-90).

- b) M.Sc. Land and Water Management.
Candidates should have a B.Sc. degree in Agriculture from the University of Nairobi or an equivalent degree from another recognized university, or from a University programme closely related to the M.Sc. programme with additional experience. Programme a is in the Faculty of Engineering, Programme b is in the Faculty of Agriculture.

The objective of the M.Sc. programmes is the creation of University graduates of an advanced level of know-how and understanding, relevant to the present (and future) technical agricultural development priorities in Kenya.

3.2 Programmes

3.2.1 Course combinations for various programmes

Programmes and course contents are given in the University calendar 1989-90. Courses are standardized on 45 contact hours.

Core courses which should be taken by all students are:

- AE401 Energy for Agriculture
- AE402 Project Planning and Management
- AE403 Statistics and Experimentation
- AE404 Social and Physical Ecology

Students in the M.Sc. Land and Water Management are required to take an additional course:

- AE405 Applied Fluid Mechanics

- (A) Students in the Agricultural Power and Machinery programme have to choose seven courses out of ten, each one having 45 contact hours.

- AE411* Agricultural Mechanization Development
- AE412 Agricultural Machine Design
- AE413 Soil Dynamics in Tillage and Traction
- AE414 Functional Analysis of Agricultural Machines
- AE415* Ergonomics
- AE416 Mechanical Vibrations
- AE417* Applied Mathematics

- AE431* Physical Properties of Biological Materials
- AE432 Agricultural Processing and Residue Management
- AE433* Drying Storage of Agricultural Products

(B) Students in the Agricultural Processing and Structures programme have to choose seven additional courses out of eleven:

- AE431* Physical Properties of Biological Materials
- AE432* Agricultural Processing and Residue Management
- AE433* Drying and Storage of Agricultural Products
- AE434 Functional Analysis of Agricultural Buildings
- AE435 Design of Agricultural Structures
- AE436 Building Materials
- AE437 Processing Plant Design
- AE438 Heat and Mass Transfer
- AE417* Applied Mathematics
- AE411* Agricultural Mechanisation Development
- AE415* Ergonomics

(C) Students in the Soil and Water Engineering programme have to choose seven additional courses out of eleven:

- AE452* Applied Hydrology and Agrometeorology
- AE453* Soil Erosion and Sedimentation
- AE454* Land Evaluation and Land Use Planning
- AE456* Soil and Water Conservation Management
- AE457* Soil and Water Conservation Structures
- AE458 Field Irrigation Engineering
- AE459 Land Drainage Engineering
- CE481 Water Resources Management and Administration
- CE485 Engineering Hydraulics
- CE491 Water Resources Engineering
- AE417 Applied Mathematics

(D) Students in the Land and Water Management programme have to choose six optional courses out of ten:

- AE451 Soil-Water-Plant Relations
- AE452* Applied Hydrology and Agrometeorology
- AE453* Soil Erosion and Sedimentation
- AE454* Land Evaluation and Land Use Planning
- AE455 Rural Water Resources Development
- AE456* Soil Water Conservation Management
- AE457* Soil and Water Conservation Structures
- AE460 Irrigation Water Management
- AE461 Drainage and Land Reclamation
- AE462 Irrigation Economics and Planning

(Common courses of both the programmes A and B resp. C and D are marked with *)

A scheme of the compulsory and elective courses is given in Table 1.

3.2.2 Profiles of the programmes

It can be noticed that students can define their own profile.

However, under certain conditions the freedom for selection between the courses offered will only lead to marginal differences between the profiles A and B of Agricultural

Table 1. Schedule of Core courses and Elective courses

		I. <u>Agricultural Engineering</u>			II. <u>Land and Water</u>
<u>Course numbers</u>		A	B	C	D
AE - 401		X	X	X	X
402		X	X	X	X
403		X	X	X	X
404		X	X	X	X
405					X
AE - 411		X	X		
412		X			
413		X			
414		X			
415		X	X		
416		X			
417		X	X	X	
AE - 431		X	X		
432		X	X		
433		X	X		
434			X		
435			X		
436			X		
437			X		
438			X		
AE - 451				X	
452				X	X
453				X	X
454				X	X
455				X	X
456				X	X
457				X	X
458				X	
459				X	
AE - 460					X
461					X
462					X
CE - 401				X	
405				X	
491				X	

Engineering and C and D of respectively Agricultural Engineering and Land and Water Management. For reasons of teaching efficiency, and with respect to the demand for research capacity of the staff members, the question arises whether the intake number of students justifies the existence of four options.

On the other hand, if the relevance of the courses requires a clear academic profile fitted to the job expectations of the students and the need for trained specialists at the M.Sc. level, the degrees of freedom have to be reduced.

The review team interviewed a limited number of M.Sc. students, some having already graduated. From these interviews it appeared that most of the students interviewed have the intention to find jobs in industry, governmental services and institutions, or want to be self-employed e.g. as consultants or as private advisors.

From this point of view it seems that generalists are more required than specialists. The team recommends that the Department establishes a system which enables follow up of students after graduation. Such a data bank would help in quality control of the teaching programmes as well as in an eventual adaptation or updating of the courses and programmes, in response to changing requirements and progressing technology in Kenyan agriculture. The Department management could make such a data bank a responsibility of the permanent educational advisory committee proposed in chapter 6 of this report. Furthermore this information could be valuable in finding the balance between the demand for M.Sc. education in the future and the demands and requirements set by actual or potential sectors of employment.

At present there is no need for major changes of the running programmes on the short term, also because the number of graduated students is too small for drawing significant conclusions. Recommendations for minor changes and adaptations are however given in section 3.5. Nevertheless there is fair expectation that even within this decade Kenyan agricultural technology will progress in such a way - especially on large and medium size farm types - that agricultural engineers at M.Sc. level, need to have a thorough knowledge of either the management and operational research of engineering aspects in biosystems, or knowledge of production quality control and the engineering aspects of the output-input ratio.

For the first type of agricultural engineers it is clear that they will have to be familiar with modelling and simulation techniques with a special emphasis on software development and application of modern information systems. For the latter type it is again clear that they must have a good knowledge of instrumentation and electronic data acquisition and processing.

3.2.3 Number of students for the M.Sc. programmes

For the postgraduate programmes the number of students enrolled are listed below in Table 2, together with the future expectations of intake.

Table 2. M.Sc. student numbers

Year	SWE	APM	APS	LWM	Total
1987/88	8	-	-	8	16
1988/89	-	5	5	-	10
1989/90	9(8)	-	-	6	15(14)
1990/91	-	-	5	-	5
1991/92	7	-	-	7	14
1992/93*	-	7	7	-	14
1993/94*	8	-	-	8	16

* projections

For the 1989/90 intake scholarships were available from other sources than the Netherlands project, as there has been a good response from external donors e.g.

Ministry of Agriculture, Jomo Kenyatta University, SIDA, SAREC and DAAD and of the University of Nairobi towards the programme. For 1990/91 the situation is quite different and of the 5 M.Sc. students in APS 4 are sponsored by the project. It is not expected that this sponsorship will be a priority during phase out.

3.3 The teaching system

3.3.1 Lectures

At the moment there are 36 different courses for the M.Sc. programmes in Agricultural Engineering. The content of the courses is found in the University Calender, which lists the topics to be taught. The team gained the impression that the descriptions are very suitable for the information of both students and colleague lecturers and teachers. With respect to the needs of the students, it may serve as an aid for making a choice between the elective courses. The content of the courses gave the review team no reasons for further comments. The topics agree very well with similar M.Sc. programmes in Agricultural Engineering abroad.

However, it should be mentioned that a more extensive course description and study guidelines for the students are desirable. These descriptions can be used for internal purposes, being a means of informing the students in what way the transfer of knowledge will be done (e.g. by means of class-lectures and /or practical work, demonstrations, training questions, self study etc.) Moreover, such a course or study guide should make clear what are the final expectations, aims and objectives of a specific course. Secondly, this extensive information can be used by the teaching staff to avoid overlap and gaps. In this respect the review team fully supports the initiatives developed in the Soil and Water Engineering and Land and Water Management group. We believe these are good examples for the other sections in the Department.

Until now, transfer of knowledge is commonly done by means of class lectures. The review team found that only in a few cases there were lecture notes or syllabi available for the students. Lectures are prepared and given by the teaching staff using parts of particular hand-books, articles, internal papers etc. Although such a system cannot be disqualified especially in this particular stage of education where students are supposed to work and think on an academic level, the system has one great disadvantage as the individual lecturer being responsible for a particular course is the only well informed specialist. In case he should leave the University, the transfer of knowledge, experience and information is not guaranteed, which in some cases may lead to a successor having to start with the set-up of the courses from a low-level.

For this reason the team recommends that the tasks of the teaching staff should be divided in such a way, that adequate time is spent on the preparation of well developed lecture notes or internal text books, for the benefit of both the students and the staff colleagues. Since many topics of the M.Sc. programmes are also handled in other Universities e.g. in the Netherlands, co-operation between Kenyan and Dutch lecturers in the development of suitable lecture notes can be helpful in doing this more efficiently. This could be part of the content of the second half of phase III or of a phasing out period. Moreover it would tighten the scientific co-operation between the Departments of Agricultural Engineering in Nairobi and Wageningen. In this respect we would like to emphasize that the larger part of the Kenyan staff got their scientific training in Western countries which can be considered an advantage for this particular objective.

3.3.2 Practical work and field training

Since M.Sc. graduates should be able to transfer their know-how into the Kenyan agricultural society and, additionally, into a wider region of the African continent, their education should be based on theory as well as practical skills. For practical work and demonstrations which explain and explore theory, there are facilities available in the fields of:

- farm power and machinery
- soil and water engineering
- irrigation
- design and adaptation of farm equipment

A very strong point is the fact that computer facilities are available now, and that they will be extended. The same holds for the soft-ware packages. The team was pretty well surprised by the intensive use of these facilities in the M.Sc. training programmes. Although computers are intensively used for word-processing, some statistical work and modelling is also done. We consider this development as an important step forward towards the structural use of modern information technology in both teaching and research areas of the Department of Agricultural Engineering of Nairobi University. The review committee had the opportunity to read some examples of M.Sc. theses, prepared in 1989/90. We got the impression that in the field of irrigation, computer modelling was done at a remarkably high level. On the other hand it was noticed that for conducting field experiments in the rural areas, students are forced to improvise due to a lack of sufficient (basic) measuring equipment. It should be emphasized that, especially when the Department aims to have opportunities for starting a strong research programme, a better and more sophisticated instrumentation pool will be of great importance. Since even in the short term lack of proper instrumentation can give a delay in thesis preparation, the members of the Department should make their wishes clear to the Research Committee, the Chairman, and the Project Coordinator, enabling the Department to make priority decisions.

3.3.3 Examinations

The review committee had the opportunity to go through some twenty examinations of courses of the years 1989/1990. The standards are to a reasonable degree in agreement with norms to be set for M.Sc. graduates in Agricultural Engineering worldwide. The questions posed, fitted well with the course topics and moreover with the most important subjects. There proved to be a difference between some examinations with respect to:

- reproduction of gained knowledge only
- application and transfer of know-how to solve new problems including problem recognition
- the abstract and more fundamental approach versus the descriptive approach of the course contents

However the committee is satisfied about the examination level as a whole.

The results of the examination from 1987 until now are listed in Table 3 below.

Table 3. Numbers passed first time/total number

Course Year	L&WM	S&WE	AP&M	AP&S
1987 intake	2/8	7/8	-	-
1988 intake	-	-	3/5	1/5
1989 intake	4/6	5/8	-	-
1990 intake	(not examined yet)			

From the student interviews it appeared that in general coursework including the examination was not a problem. However, some students had problems with courses having a more fundamental content like applied mathematics and applied fluid mechanics. This is partly due to the fact that sometimes there are several years between their B.Sc. graduation and the enrolment in the M.Sc. programme. Some other students mentioned the fact that - at least for them - there was some overlap with former B.Sc. courses (e.g. Agricultural Machine Design, Functional Analysis of Agricultural Machines and Drying and Storage of Agricultural Products). This overlap should be watched in

future and has to be taken into consideration when changing or upgrading the course contents.

3.4 Course development

Up-dating of the course content belongs to the normal task of the teaching staff members. As stated before in the short-term there seems to be no need for major changes in the course content and the programmes. For the medium term, i.e. by the end of phase III, the following recommendations are given with respect to the programmes and courses. We strongly advice the Department to develop a course of about 135 hours dealing with problem oriented education. The content of such a course should deal with the theory of systems thinking and a practical implementation of the systems theory in a case study. The subjects of this case study should be of a multidisciplinary character. This means that engineering aspects have to be integrated with socio-economic, as well as with environmental aspects. The students should practice in problem analysis, problem solving and reporting within a team of 5-6 persons. The theoretical part (45 hrs) can be given to all the M.Sc. students in the Agric. Engineering programmes. The case study should be supervised by one staff member and the students should be able to contact 2 or 3 others to get information from different disciplines and subdisciplines.

The aims and objectives are:

- training the students in the methodology of the implementation of multidisciplinary research projects
- training the students in report writing
- to improve their social skills like communication, discussion and debating as well as co-operating as team members.

The review team believes that the time for incorporation of this course in the M.Sc. programme can be found by deleting some course components which are more or less overlapping with previous B.Sc. courses.

3.5 Quality control

Although evaluations by students are carried out at the end of the courses there exists no structural system of quality control of both the curriculum and the course level. We recommend the Department to organize an evaluation system for both. This can be done by a permanent education committee (see also section 6.6.2.3 organisational issues). It is not necessary to develop new techniques for the evaluation of the quality control of the education programme since many techniques are already available in other Universities all over the world. However, the introduction of such a system in the department should be managed very wisely since consumers and producers of education might have different opinions about relevance and quality of courses and about the performance of a lecturer.

Although the team observed no complaints about a too heavy study load, it noted that some students delay submission of their M.Sc. thesis. One problem is that it takes too much time for a student before he is able to define the research problem in a systematic way. We believe that especially during the starting period of the thesis work, a strict scheme of appointments for feed-back is needed. Students should keep themselves very strictly to those appointments with their supervisors. In such a way progress in thesis work can be influenced very positively. As a consequence faculty members have to adhere to the schedule in a similarly strict way.

With respect to quality control, last but not least, the team wants to make the following remark. The thesis should be considered as the key for the graduate with respect to his scientific capacities and hence one of the most important criteria for employment. Therefore, norms for the quality of thesis work should be strictly kept at a high level. If a student occasionally should fail at the end, this is a real bad thing, but even worse is the fact that an incapable student has graduated for the sake of pity after spending two, three or more years at the University.

4. RESEARCH

4.1 Characterization of research in Agricultural Engineering

Research at university level has a dual purpose:

- i) to improve and increase the fundamental knowledge of (agricultural and engineering) sciences, and
- ii) improve the level of knowledge transfer and hence, the quality of the education system.

In agricultural sciences there is an additional aim, i.e. the results of strategic research should be transferred on an operational level to the agro-subsystems for improving sustainability of agricultural production systems. This means that impacts on environmental and socio-economic subsystems have also to be taken into consideration. The same holds for research in agricultural engineering. However, taking into consideration future developments and new technological problems to be solved, research in agricultural engineering can also be defined as engineering research of production and environmental systems or as biosystems engineering, the latter being more related to future strategic goals and objectives of the agricultural engineering (research) discipline.

A basic condition for a successful approach to these objectives is the formulation of a strategic research plan, based on a multi-disciplinary and functional participation of the staff. As a consequence research themes have to be stated and research teams have to be formed to avoid scattering of research power, i.e. having too many projects for all individual staff members.

The basis for a successful performance of these limited research teams is the possibility of founding a strong and well equipped basic infra-structure, including technical assistants, instrumentation and computer facilities.

In addition, the move towards common responsibility for a powerful research profile should be supported by the majority of the Departmental staff. The review team wants to make clear that in their opinion the set-up of such strategic objectives and internal structures are of high importance for the future profile of the Department, the cooperation between the sections, and the possibility to get a status of "centre of excellence" for the East African region. Since available manpower for research will be limited - even when the Department is fully staffed - priorities will have to be set on the basis of support of the common research groups and approved by the Research Committee, which has already been established.

4.2 Present status

4.2.1 Current research projects

At present, research projects are performed on many topics.

- a) In the field of agricultural engineering power and machinery, current research is done in the fields of:
 - Safety aspects in agriculture and industry (Njau*, Kaumbutho and Maende)
 - Animal traction and tractor drawn implements (Kaumbutho, Some and Oudman, Ndugo*, Gebresenbet)
 - Animal draught power (Oudman, Odiewuor, Musau and Keya)
 - A load car for animal and small tractor power studies (Kaumbutho, Sikunyi, Mac Millan)
 - Tool frame for sugarcane destruction (Owende*, Kaumbutho, Maende)
 - Maize cobs gasifier / hammer mill

- (Butuk, Mwaura)
 - Soil compaction by transport trailers (Kanali*, Kaumbutho, Maende).
 - Multipass solar air heaters (Korir*, Luti, Dept. of Mech. Engineering)
 - Minimum tillage (Zelege*, Oudman, Michieka)
- b) In the field of soil and water conservation research is done on:
- Conservation measures for steep slopes (Thomas)
 - Conservation (Thomas, Bekeke*)
 - Erosion and productivity (Gachene; PhD project, Thomas, Mukui*)
 - Grass strips (Thomas, Tefera)
 - Land degradation (Thomas, Gachimbi*)
 - Terrace stabilization (Thomas)
 - Rainfall runoff studies (Sharma, Okio, Muweya, Lenselink, Thomas)
 - Rainwater harvesting (Muni, Gichuki, Biamah)
 - Reservoir sedimentation and catchment land use (Thomas, Mwaya*)
 - Sand dams (Thomas, Mburu*)
 - Water way design (Thomas, Gichuki)
- c) In the field of irrigation current research projects are:
- Water management in flooded rice schemes (Lenselink, Ndiritu, Githae, Kariuki, Wairangu, Sifuma, Mutisya, Ndiritu*)
 - Sprinkler irrigation system evaluation (Muni, Mwangi*, Kamau*)
- d) In the field of processing and structures:
- a project on housing, environmental and socio-economic constraints to optimal production on small dairy units is ready to start and waiting for funding by UNDP/AGROTECH.

From the above mentioned projects, two started in 1982, one in 1983 and all others in 1988 or later. M.Sc. students who are participating in the running projects are marked with *.

The review team appreciates the creative and opportunistic approach of the Department staff with respect to the number of topics. However, at the same time the team believes that the projects are too widely scattered over too many fields of interest. The present situation is not fruitful with respect to an optimal scientific output of the potential research power. Additionally, the team believes that the participation of M.Sc. students in the research programme should be intensified. In this way the linkages between the education programme and research will increase.

4.2.2 The history and future of research at the Department.

As was mentioned in chapter 3, in addition to teaching special attention should be paid to research, the latter being an integral part of the task of the University and its Departments. With respect to this particular objective, the review team wants to make the following comments and remarks. At the end of the 1970's during the building up phase of the Department a firm scientific base for research did not exist. Research was

narrowly focused and based on the interest of the leading staff members in the Department. The present situation is quite different, due to changing insights of the first part of the past decade and the fact that the Department now can benefit from the results of the staff development programme. The Department has now to make a crucial decision:

- a) either to choose for applied topics of research with a direct transfer and / or approach to extension officers and farmers etc. or
- b) to develop programmes focused on strategic research topics, with knowledge transfer to colleague scientists from similar institutions and with an indirect impact on all aspects of agriculture.

Referring to the introductory part of this chapter and taking into consideration what the (future) power of the Department has to be, the team recommends the option b. This means that within the coming months the Departmental management including the Research Committee and the members of staff have to discuss thoroughly which current research projects will be selected to be part of the strategic programme. This process of evaluation of relevancy and quality in the sense of scientific output (e.g. on the basis of number of papers in refereed journals etc.) may indeed lead to a strong reduction of the number of topics, and even short term disappointments for a number of staff members. Nevertheless, we strongly believe that the evaluation process for the medium and long term period will highly contribute to the future position of the Department of Agricultural Engineering in the University of Nairobi. The funds for further staff developments and for equipment should be fitted to this long term objectives.

The review team wants to emphasize that the concrete research priority settings should be considered an internal affair of the whole Department. We only want to give some ideas which might be useful for a successful performance of the selection process. From the interviews, as well as from the research output until now, we got the impression that in the field of (animal) draught and mechanical power related to the design of implements, there are good opportunities especially when measuring techniques for calculating efficiency rates are included. We would like to point out that duplication with other institutes should be avoided (eventually by co-operation). The gained knowledge about dynamic measuring methods and techniques can at a later stage be transferred to other fields of interest of the Department e.g. in energy research projects.

4.3 Research capacity

According to the information gained by the team from interviews with all the staff members of the Department (excluding those who were on study leave) the number of staff year equivalents (s.y.e.) in which one s.y.e. equals a workload of approximately 1800 hrs/yr, there are 10.5 s.y.e.'s required for teaching the courses in both the B.Sc. and M.Sc. programmes.

Referring to the need for preparation of proper text books and /or lecture notes, these basic requirements for s.y.e.'s certainly in the next few years will have to be multiplied by a factor 1.2. Due to temporary short absences, the Department's structure and external activities - provided that the latter are fitting to the philosophy of the Department - another 20% has to be added to the number of s.y.e.'s. So in summary, approximately 14.7 s.y.e.'s for teaching and external activities like extension or consultancy have to be made available. Setting aside a research potential of about 30% as an average for each staff member; the total number of staff has to include 21 s.y.e.'s. Once firmly established and provided that the courses and programmes are well developed, the research capacity might increase to about 35 - 40%.

We think this a rather optimistic estimate and we again like to emphasize the need for the development of a coherent research programme including priorities and operational plans. For instance, assuming a fixed staff number of 15 s.y.e.'s for the Department and a teaching load at the same level, will lead to a capacity of 4.5 s.y.e.'s for the rest of the

tasks. If the Department's strategy is focused on the possibilities for the staff members to spend about 20% of their time in consultancy work, then as a consequence only 1.5 s.y.e.'s are available for course upgrading, writing of text books and research activities.

We would like to emphasize this crucial point of the strategy for the Department's future existence and we want to make clear that the need for binding talented scientist to the University by means of offering the possibility for performance of the activities mentioned above, is very important.

4.4 Facilities and technical assistance

The review team is well aware of the fact, that the establishment of a well equipped instrumentation pool is a conditionality for the performance of strategic research work, especially in the field of agricultural engineering. For that reason the team recommends to the Dutch Government to provide additional support in terms of funding and training during the remaining part of phase III of the project and during the first part of a phasing out period of 3½ years.

The team recommends to the Department of Agric. Engineering to list the measuring equipment needed (hard and software components) for the set up of an instrumentation pool for soil sampling and determination of physical and mechanical properties of soils, related (bio) materials, data loggers, sensors and monitoring equipment, signal recording, -analyzing and data processing equipment. Part of the measuring equipment should be suitable for real-time measurements in the field. The budget requirements should include spare parts and costs of repair and maintenance. It is expected that this proposal will be submitted to the Dutch Embassy before May 1st, 1991.

5. STAFF DEVELOPMENT

5.1 Teaching Staff

5.1.1 Policy and strategy

The foundation for an effective and sustainable Department in a university is a complement of teaching staff who are well trained and motivated. The University of Nairobi has therefore been revising the salaries of academic staff regularly and although the current salaries may not be competitive internationally they are higher than those of similarly trained personnel in government service. The University has also tried to maintain high quality of staff by insisting on Ph.D for appointment to the grade of lecturer. Although this requirement has been somewhat relaxed in a few professional Departments - including the Dept. of Agric. Engineering, staff with PhD have better prospects as they will be in demand to supervise postgraduate students and to lead research.

Direct recruitment of trained staff has been difficult due to competition with other institutions and the private sector. The University has therefore endeavoured to retain undergraduates whose performance is outstanding as tutorial fellows and to develop them through the award of training fellowships in well-known institutions overseas. A formula has also been evolved to help determine the level of staff establishment corresponding to the number of students enrolled in a Department. Teaching staff are also expected and encouraged to develop their capacity through research, attendance of conferences and participation in consultancy activities and they are entitled to sabbatical study leave every five years.

5.1.2 Current situation

The authorized teaching staff establishment has grown from 8 in 1987 to 15 in 1990. This establishment provides for 1 Professor, 1 Associate Professor, 4 Senior Lecturers and 9 Lecturers. 13 positions are filled at present and there are 2 tutorial fellows awaiting training. In addition, the Department has two supernumerary staff provided under the Netherlands project, and has benefited from several visiting and part-time lecturers for the M.Sc. programme.

In terms of qualification, there are 5 Ph.D's and 8 M.Sc's, three of whom are already on study leave for a Ph.D. overseas. One of the senior staff is due to retire at the end of 1990 but a third supernumerary staff is expected to join the Department in January 1991 under the SAREC project. With the existing staff, the Department has been able to cope reasonably well with enrolment of 25-30 undergraduate and 10-16 M.Sc. students each year. Supervision of M.Sc. students and staff research has however tended to suffer as the result of a heavy teaching load especially in 1990-91 when intake of undergraduate students was doubled.

5.1.3 Training

One of the major objectives of the Netherlands Project was to assist the University in staff development by providing 21 man-years of fellowships abroad. These fellowships have been utilised as follows:

- 1 Ph.D, Farm Mechanization, Michigan State University, USA - 6 man-months - training completed.
- 1 Ph.D., Irrigation Engineering, Utah State Univ., USA, 18 months - completed.
- 1 M.Sc., Farm, Power and Machinery, Michigan State Univ., USA, 36 man-months - to complete by July, 1991.
- 1 Ph.D., Farm Power and Machinery, University of Minnesota, USA, 36 man-months - to complete in Sept. 1992.
- 1 Ph.D., Farm Power and Machinery, New Castle-upon-Tyne, U.K. 36 man-months - to complete Nov. 1992.

- 1 Ph.D., Soil Conservation Structures, McGill University, Canada - 24 man-months - to complete by Sept. 1992.

The training programme will therefore have utilized only 13 out of the 21 man years provided by the time Phase III of the project comes to an end in July 1992. The main reason for the apparent delay in utilization of this valuable facility is the need to maintain a reasonable number of staff in the Department to ensure that the undergraduate and M.Sc. programmes can continue at a reasonable level of efficiency.

The future strategy for staff development at the Department will be influenced by the following factors:

- a) The need to strengthen the three main thrusts in research and training in the Department i.e. Agricultural Power and Machinery, Agricultural Processing and Structures and Soil and Water Engineering.
- b) The strong pressures for trained staff to move to the newer department of agricultural engineering at Egerton University and Jomo Kenyatta University College of Agriculture and Technology (JKUCAT).
- c) The need to establish a strong research and design capability at the Department which can serve other local institutions on consultancy basis at the higher levels of technology. Such a facility will motivate the highly trained staff to remain in the Department. This issue is discussed in more detail in section 6.6.2.

In order to meet this need, the following additional skills will be needed at the teaching staff level:

- 1 PhD in Operations Research/Labour Organization
- 1 PhD in Simulation/Modelling
- 1 PhD in Design and Ergonomics
- 1 M.Sc. in Systems Maintenance and Computer Programming
- 1 M.Sc. in Interface Computer Systems.

5.1.4 Supernumerary staff

The Department has benefited from two visiting lecturers from the Netherlands. These staff have taken the same teaching load as the Kenyan staff and have also been involved in guiding M.Sc. research in the fields of soil and water and animal traction. A third TA staff attached to the Department of Crop Science has helped greatly in teaching the statistics course, installation of the computers and training the M.Sc. students in computer use.

This assistance is very much appreciated and has enabled the Department to release more of its staff for overseas training. One of the Netherlands TA staff has also acted as project coordinator greatly facilitating the flow of funds, allocation of fellowships and purchase of equipment from Netherlands funds. It is, however, felt that the need for this personnel will diminish as the Kenyan staff return from training in the next two years and considering that the Department will have a Senior Lecturer and a Research fellow (instrumentation) provided under the SAREC project, possibly until 1993. It will however be highly desirable to provide the services of a highly experienced researcher on a part-time basis to guide the development of specialized research, design and consultancy capacity as described in section 6.

5.2 Technical staff

5.2.1 Staff establishment

The Department has an authorized establishment of technical support staff as follows:

- Chief technician (1) filled.
- Senior technicians (4) filled.

Technicians (7) 3 vacancies
 Draughtsman (1) filled
 Junior technician (1) vacant
 Mechanic (1) filled
 Machinist (1) filled
 Welder (1) filled
 Carpenter (1) filled
 Laboratory Assistants (2) 1 vacancy
 Field Assistants (3) 1 vacancy

The current establishment is reasonably adequate and is ably supplemented by a TA instrumentation research fellow under the SAREC project.

5.2.2 Training.

In recognition of the difficulty experienced by the Department in recruiting trained technicians, the Netherlands Project provided support in upgrading of skills of technical staff through postgraduate training and short specialized courses. Good progress has been made in fulfilling this objective. The chief technician is undertaking M.Sc. training in USA and the four senior technicians have received short-term specialized training, three under Netherlands Project sponsorship and the fourth under FAO sponsorship. One technician has received short-term training under Israel sponsorship. A senior technician and the draughtsman have also been sponsored for further training under the Netherlands Project. This activity should therefore continue during the remaining part of phase III. In particular, there is need to train two technicians comparable to an M.Sc. level, one in system maintenance and computer programming and one in interface systems. This training will be necessary if, as the team suggests in section 4, the Department decides to upgrade its research focus towards higher levels of specialization and use of modern techniques.

As noted in section 5.2.1, the technical staff are benefitting from higher training overseas which will enable them to advance to the level of teaching staff. There is already good precedence on this type of staff development in the Department. There is however continuing need to upgrade the skills of some of the technicians who will be used more on research especially in the field of electronics, computer use, technical drawing and fabrication of structures. Most of this training is available locally but it would be highly desirable to expose senior technicians to some of the relevant advanced technologies through short-term visits overseas.

5.3 Conclusions and recommendations

Although utilization of fellowships provided under the project is behind schedule, the staff development programme is progressing satisfactorily considering the various unavoidable constraints. The University has provided the necessary establishment and provided all the positions that can be filled on a continuing basis by qualified personnel. It will be possible to sustain and even improve on the teaching and research capacity in the Department. The Department cannot however, escape the pressures and responsibility to help meet staffing needs of the sister Departments at Egerton College, JKUCAT and Moi University. It should therefore utilize whatever facilities are available to upgrade skills of both teaching and technical staff and to give high priority to the development of facilities and programmes of high level research, design and consultancy in order to motivate the staff to remain within the Department. Very substantial progress has been achieved in the direction through the Netherlands Project and lately with the support of the SAREC project. The Technical Assistance personnel provided under the Netherlands Project have been particularly helpful in the implementation of the staff development programme but it is felt that the need for full-time TA staff will diminish as Kenyan staff already in training return to the department in 1992. In spite of progress made, the staff development programme will not have advanced sufficiently to ensure stability by the time phase III of the Netherlands Project ends in July 1992. In particular, complete severance at the end of phase III would mean that no more staff can be sent for training during the remaining period.

The team therefore recommends:

- Not done*
- a) Facilities be provided for the utilisation of the unused external fellowship funds over the next five years as follows:
 - 3 PhD from June 1991 to June 1994
 - 2 M.Sc. from June 1991 to June 1993
 - 3 PhD from June 1992 to June 1995Proposed fields of study are outlined in section 5.1.3
 - b) Fellowships be provided within the period 1991 - 1995 to enable technical staff to upgrade their skills locally and where necessary in overseas institutions.
 - c) Full-time Technical Assistance personnel be replaced with periodic extended visits by highly experienced TA research staff after 1992. The major role of such personnel would be to help in establishing long term capacity at the Department, and to help develop continuing collaborative arrangements between the Department and relevant institutions in the Netherlands.
 - d) The support for local M.Sc. scholarships which has been fully utilized, should be retained on a reducing scale i.e. three in 1991/93, two in 1992/94 and one in 1993/95. This facility will enable the Department to pick out outstanding students in the B.Sc. programme and to develop them to eventually join the Department teaching staff or advanced research assistance cadre.

6. ORGANIZATION

6.1 Organizational inputs

Phase III of the Project, which officially started on 1/8/1987, is implemented through the Department of Agricultural Engineering which is under two faculties of the University of Nairobi. These are the Faculty of Agriculture and the Faculty of Engineering. In turn the Faculties belong to two distinct colleges. These are the College of Agriculture and Veterinary Sciences and the College of Engineering and Architecture.

The two Colleges are part and parcel of the University of Nairobi which formally is a public university funded through the Ministry of Education. Its superior body is the University Council. Its chief executive is the Vice Chancellor who participates in the Council and who administers the University through the Senate and the Deans Committee.

The organogram of the Department of Agricultural Engineering (University of Nairobi) and the organogram of Phase 111 of the Netherlands Project for Assistance to the Department of Agricultural Engineering (University of Nairobi) are to be found at page 24 and page 25.

In Nairobi University, formal administration (executive responsibilities) of a Department is the responsibility of the Chairman of the Department, who is appointed by the Vice Chancellor. The chairman reports to the Vice Chancellor through the Dean of the Faculty(ies) who in turn report to the Principal of College(s). The ultimate academic body in the University is the Senate which is chaired by the Vice Chancellor. The Chairman represents the Department in the Senate. She/he also participates in the Faculty Board and the College Board as the representative of the Department. All departmental activities are reported to the Faculty Board, the College Board, the Deans Committee and the Senate, through the Department Chairman.

The 1986 Project document states that the Chairman is team leader and is responsible for project progress reports, together with the two Netherlands staff. The Project Coordinator prepares the reports which are sent out under the signature of the Chairman. Thus there was no specific requirement for the other departmental staff to be involved. Of course the fact that the Project Coordinator was a visiting lecturer in the Department, who has recently been promoted to senior lecturer, gives him access to the Department at all levels. Daily management of the project is the responsibility of the Project Coordinator. The other visiting lecturer is also head of the Animal Draught Power Project. Since there are supplementary funds in animal draught, not channeled through the main project (see organigram), the 33% of his time, which the Visiting Lecturer estimates he spends on extending animal draught power countrywide, includes a component for these outside funds. The Department has accepted this as a contribution to the Departmental extension efforts.

ORGANIGRAM OF THE DEPARTMENT OF AGRICULTURAL ENGINEERING (UNIVERSITY OF NAIROBI)

Ministry of Education

University of Nairobi

College of Engineering
and Architecture

College of Agriculture and
Veterinary Sciences

Faculty of
Engineering

Faculty of
Agriculture

Department of
Agricultural
Engineering

Dept. of
Crop Science

Chairman

(Academic)

(Technical)

(Administrative)

Professors.
Lecturers,
Tutorial Fellows

Chief Technician - - - - -

Secretary
Office messengers
Draftsman
Drivers
Cleaners

Senior Technicians

M.Sc. students
(year 1, 2)

Storekeeper
Lab. technicians
Craftsmen

B.Sc. students
(year 1, 2, 3)

Casual labourers

ORGANIGRAM OF PHASE III OF THE NETHERLANDS PROJECT FOR ASSISTANCE TO THE
DEPARTMENT OF AGRICULTURAL ENGINEERING (UNIVERSITY OF NAIROBI)

31.10.90

DGIS/DAF/MF
THE HAGUE

UNIVERSITY
ADMINISTRATION

Netherlands
Embassy, Nairobi

<---->

Visiting Lecturer &
Project Co-ordinator
(Neth.)

<---->

Chairman
Dept. Agric.
Engineering

<--- Other
donors
(SAREC,
ANSTI,
...)

Visiting Lecturer
& Head Animal Draft
(Neth.)

Visiting Lecturer
Crop Science Dept.
(Neth.)

Animal Draft Research
Assistant (Vacant)

Driver

Sponsoring:

1 Ph.D. fellow (CAN)

1 Ph.D. fellows (USA)

1 M.Sc. fellow (USA)

1 Ph.D. fellow (UK)

4 M.Sc. fellows (Kenya)

1 Technician (Kenya)

Harness makers/
Casual labourers

Other donors --->

Regional Animal
Draft Centres

<---Trekkraacht
voor Kenya

Note : Underlined = paid from Netherlands project funds

organ1.011/ws

6.2 Linkages

There are two ways of looking at the issue of linkages. These are the activities of the individual staff members and the coordinated and planned linkages of the Department. On the individual linkages with other institutions, a lot of activity has taken place since 1987. Individual staff members have made contacts with public and private institutions and are offering services which range from individual consultancy to placing M.Sc. students. Among the more notable examples of this is the linkage to Mumias Sugar Company to solve drainage problems in the sugar belt. Others are the extensive contacts in consulting on soil conservation particularly for projects operating in the Arid and Semi Arid districts, storage etc.

Over and above the linkages with institutions like SSIDP (which has sponsored 5 M.Sc. students) and NIB mainly related to the production of staff for them by the Department, individuals have participated in their projects when called upon.

Formally the Department (including the project) has relations on Soil and Water Conservation with Kenya Agricultural Research Institute. There are formal links with Egerton University where the department has assisted the new university in developing curricula. There are formal links between the Department and Jomo Kenyatta University College of Agriculture where some of the staff teach and where assistance on curricula has been rendered. The Ministry of Agriculture's Soil Conservation Branch, Irrigation and Drainage Branch and Mechanisation Branch have relations with the Department where specific departmental staff assist in programmes and problem solving.

6.3 Personnel and staff inputs

The planned external staff were supplied as planned and on the whole they have well done the work they were supposed to do. DGIS has just evaluated them recently and as far as the team is aware there were no problems. The fact that Mr. Lenselink has been promoted by the University may be taken as comment on the University's view of his utility.

The involvement of one of the external staff in extension work of animal draught power raises questions on whether this is the desirable use of manpower, particularly given that the scientific basis of the technology is not yet completely established. This is a relevant question for the remainder of the project time, because in the now emerging research-oriented philosophy of the Department the research focus envisaged in 1987 has not fully materialized. Possibly, research should from now on get priority over extension. The subject of animal draught in the context of farm power and mechanization is, however, still very relevant and a new approach is discussed in chapter 4.

6.4 Material inputs

6.4.1 Overseas fellowships

In the original project document it was envisaged that 21 man years of fellowships would be expended by the project. To date only 13 man years have been expended. Consequently the team is of the opinion that during the remainder of the project period and a phasing out period, these fellowships should be expended by giving fellowships for staff development, given the need to expand research and teaching both within the university and for other national institutions (See Staff Development Section).

6.4.2 Local fellowships

Fifteen man years of local fellowships were planned. To date 20 man years fellowships have been used, clearly showing that there was demand for this. Since the projected budget line for this item is about exhausted, it may be a good idea for the department to continue encouraging on other organisations DAAD, SAREC, FAO, GOK and private sector etc for provision of local fellowships. The team does envisage Netherlands support for local fellowships during Phase out at a reducing rate.

6.4.3 Building, furniture and equipment

The addition of one floor on the existing building was accomplished between 1988 and 1990. This space has been occupied as at the time of the review mission. After completion of the office space the offices were equipped with shelving, chairs and filing cabinets in 1990. Other furniture bought in 1989 were, among others, a vacuum cleaner, drawing cabinets, filing racks, library shelves and tv/video cupboard, tables etc.. In 1987 a stencil scanner was bought. In 1988 two typewriters were bought together with a binding machine and in 1990 a duplicating machine, furniture for classroom and secretarial office were bought.

6.4.4 Research equipment

Perhaps the most significant acquisition on this line has been the increase of the computing capacity from the 3 PCs which were there before 1987 to ten. This has enabled the Department to train the M.Sc. students in word and data processing as well as in scientific uses for example modelling. Other research equipment is detailed in the Annex 4.

6.4.5 Teaching equipment

An assortment of teaching equipment has been acquired as detailed in Annex 4.

6.4.6 Transport

The department's transport fleet, mainly used for fieldwork, has been augmented by the acquisition of the following vehicles.

- 1 Toyota Land Cruiser
- 1 Nissan Microbus E23
- 1 Toyota Hilux Pickup
- 1 Toyota Dyna 350 minibus.

6.5 Financial aspects

Each year a budget is drawn up for the project by the project coordinator in close co-operation with the Chairman of the Department. The budget is sent for approval to the Netherlands Embassy. The project has a current account in a bank in Nairobi and funds for it are deposited by the Netherlands Embassy. Receipts are sent to the Embassy on a monthly basis.

This system has worked smoothly as it speeded up the operations. Decisions on spending the funds are mainly made by the various departmental committees although there has been some influence by the project coordinator. Final approval is by the Chairman of the Department.

Although an operating budget was presented, the project document does not specify project targets and outputs as opposed to the three broad input components as they are presented in the introduction of this report. Details on how the donor contribution relates to the local contribution are also missing, but under the heading of possible constraints the project document mentions that the viability of the M.Sc. Agricultural Engineering programme will a.o. depend on support from the University of Nairobi in increased establishment and additional financing (project document).

A detailed overview of the project expenses is provided in Annex 5. When comparing the original budget with the expenses until mid-1990, also taking into account the budgets for the remaining part of 1990 until the end of the project, the following remarks can be made:

- there is a considerable over-expenditure for supernumery staff. This has been caused by making use of the services of the visiting lecturer for statistics and

computer sciences during a period of three and a half years.

- another over-expenditure concerns materials. Originally it was conceived that the materials would be part of the running costs of the University. This was never specified in any document and actually has not been the case. Moreover books and documentation fall under this category, while originally they appeared as a separate category in the budget.
- there is underspending for the academic fellowships. Before the start of the project it was foreseen that the University would increase staff at short notice. However this did not happen within the conceived period and consequently there was insufficient staff at the Department (eight members) to send the proposed number abroad. It would at that moment have caused a negative effect on the teaching programme. There has been a shortfall of eight man-years so far and it will be impossible to cover them in order to complete the total of 21 man-years planned for the project period.

6.5.1 Operational expenditures

Table 4. Comparison of Department's operational (running) costs in KShs

University of Nairobi sources				
Year:	87/88	88/89	89/99	90/91
KShs:	224,000	230,600	228,000	116,800
Netherlands project sources				
Year:	1987	1988	1989	1990
KShs:	485,210	1,089,560	1,211,670	760,000

Examination of the University and project sources shows that the bulk of the costs for operations has come from the Project. The other key issue is the fact that the university source has not even kept up with inflation between the financial year 1987/88 and financial year 1989/90. Given the current GOK budgetary constraints, the University contribution was cut by fifty percent for 1990/91. This is likely to be the pattern over the next three years.

Whereas there may be ways in which the Project contribution can be reduced, the Department still will require at least the average it has used in the past four years annually for operating costs. This is about K.Sh. 764,000. Running costs have become a significant line item as shown in Annex 5. Information given to the team, suggests that there was an operational decision by the RNE that the project cover running expenses which were not planned for in the original conception. It was expected then that the running expenses would come from the University budget. Very early it was recognized that this was not feasible, hence the RNE decision.

It is important to point out that the University has established significant number of posts so that the whole Department has more than 48 employees. Given the parallel expansion in numbers of students handled by the Department, running costs have grown tremendously. On average the Department gets about Ksh. 350,000 per annum for general operations. This clearly is not sufficient as the team was informed by the Chairman. The problem of running costs is not peculiar to the Department but is shared by the rest of the university community and is tied to national budgetary strictures. Consequently it should be considered to committ resources to it during Phase out. However the Department should use its already considerable consultancy capacity, which the team wants enhanced, to finance aspects of running expenses especially for the graduate students' field work for they are more than likely to be the key field workers for the research and consulting activities of the Department.

Other potential sources of funds which could be used for running costs are:

- a. Permanent consultancy to Kenya Bureau of Standard to establish testing for farm machinery and equipment for certification.
- b. Permanent consultancy to the MOA Machinery Testing Centre at Nakuru
- c. Short courses to specialized units
- d. General consultancies to industry.

Although there is an operating budget, Project documents do not show concretely project targets and outputs, as opposed to the three broad objectives, and how the donor contribution relates to local contribution for each target and output. This would have allowed the review mission to detail the issue of running costs. However below we cull some outputs out of the text of the 1986 Project Document but since there is no correlation of these with budget lines in the document, detailed analysis of the relationships, to establish possible future running costs, is not possible within the time limits of the review team.

This inadequacy of the original document presents grave problems for discussion of sustainability and institutional capacity building. The preparation of the Phase out document must address this issue.

6.6 Activities

The Project Document states:

"The aims of the Proposed programme of Assistance (Phase III) are to allow the Department of Agricultural Engineering to firmly establish the new M.Sc. Programme..." This was to be done through the project components as described in 2.3.

a) Supernumerary staff

The two supernumerary staff were provided and have been in position since the beginning. The team recommends their retention until their original contract dates. After that the Department should administer the Phase out.

b) Non-Academic staff

One technician has been trained overseas and two have been trained locally. The problem in training is related to randomly hired personnel in the past who are not able to get into the formal technician training level required. With increase in technical establishment this problem ought to be overcome during phase out.

c) Local scholarships

These scholarships have been provided with 20 man years of training completed.

d) Buildings and furniture

Another floor on top of existing building has been constructed and the space is in use.

e) Equipment

The office, reprographic, audio-visual, display and demonstration equipment have been provided as shown in the Equipment Annex.

f) Research

A comprehensive and medium to long term research programme has definitely not been realized. The expectation that the Animal Draught Power would become the focus has not materialized. The activity as executed to date is too narrow to be the unifying theme for research. It can be absorbed into wider research activities

planned in the Department. However such a future project needs to be incorporated into a strategic research and consulting plan.

The team was presented with proposals which were worked on just before the team arrived. The Department or the project did not form a strategic research plan which would focus the department and the graduate students.

g) **Documentation**

On the whole a good reference centre has been built up at a cost of about Df1. 75,000 and is of use to the teaching faculty. Its utilization which is controlled by faculty borrowing may be problematic. The team was told that students can only borrow through a faculty member. If one accepts that graduate students are potential colleagues, this mode of operation seems to be counter productive.

h) **Transport**

The fleet augmentation has been done with adequate vehicles.

i) **Conferences**

From documents and presentations the following are the staff and places of conferences where the project paid in full or partially.

90: Korir	UK	88: Biamah	Thailand
Gumbe	USA	Kaumbutho	Zimbabwe
Some	Israel	Kaumbutho	Tanzania
		Gumbe	Tanzani
		Ogweno	Senegal
		Biamah	USA
		Gumbe	Nigeria
		Some	Nigeria
89: Lenselink	Israel	87: Biamah	Uk
Kaumbutho	Canada		

Seven of the 14 full and partial sponsorships were to the developed world. Six were to African countries and one was to Asia. This spread is conventional and it does not show emphasis on building regional contacts.

It is clear though that the persons sent to conferences out of the facility are few. Planning more spread access to conference resources is something the Department ought to focus on in its strategic planning. The structure and process of selection has become problematic as the staff has expanded and not every one has got the chance. Access to this limited resource should be managed more equitably.

6.7 **Organizational issues in the future**

6.7.1 **Departmental**

At the start of the project in 1987, the Department had eight staff. In November 1990 the Department has 19 staff including two Netherlands staff. It is projected that by 1992/93 the Department will have 16 staff. This will reflect the departure of the two Dutch TA and the retirement of Prof. Thomas.

The numbers alone do not tell the story. Of the projected staff in 1992/93 a significant number will have acquired Ph.D. level training. More important though is the fact that even those without this ultimate academic qualification will have extensive teaching and research experience. Other than two, all staff in 1992/93 will be Kenyan. This Department will then be supervising about 42 graduate students of which 5 would be

Ph.D and 37 Masters. This output is based on generally accepted normal loading of graduate students.

If the recommendations of the team on staff and research development during a phase out period is adopted, this Department will at the end of the phase out period be a mature Department comparable to other Nairobi University departments. To enable it to conduct relevant graduate training, research and contract consultancy needed by the national and regional public and private sectors, there is need to begin evolving a permanent Departmental process to:

1. Execute agreed Departmental plans without seeing them as only derived from either the section heads, the senior scholars or the chairman personally.
2. Plan long term training, research, and contract consultancy strategy
3. Manage conflicts arising out of competition for resources within the Department, particularly inter-sectional competition between the three sections, namely, Agricultural Power and Machinery, Agricultural Processing and Structures and Soil and Water Engineering.

6.7.2 Intra-departmental consensus building

The Department currently has 15 line committees and a recently established Research and Publications Committee. The team is of the opinion that it is crucial that the Department creates two additional staff committees. These are the executive and education committees.

Moreover the Research and Publications Committee should be strengthened.

The team is aware of the structured line committees of the University of Nairobi. The team is desirous of setting up a process by which the Department will be able to manage its long term concerns more efficiently by organizing the departmental process of competition of resources. Similarly, the Department ought to be confident of its internal processes. This is crucial as more shared resources are acquired, for conflicts over their allocation will exacerbate the centrifugal forces of the three sections leading to inefficient use of scarce research equipment capacity.

6.7.2.1 Executive committee

This committee in a way informally exists. The various section heads informally assist the Chairman in administration of the Department, solicitation of funds for research and evaluation of the graduate programme. However, it is the opinion of the team that this should be formalized so as to manage the centrifugal forces of competition more effectively.

Size:

Four staff members

Composition:

The Chairman of the Department

The heads of the three sections of the Department, namely, APM, APS and SWE.

Tasks:

1. To act as the executive arm of the Department in respect to intra Departmental planning, and supervision of the research, educational and consultancy matters.
2. To plan and coordinate the consultancy role of the Department over and above the occasional consultancies done by individuals. It is crucial that the technical/equipment resources of the Department be used to generate funds for the department and not just personal consultancies.

6.7.2.2 Research committee

When the M.Sc. programme was started the philosophy of the Department leadership then was to concentrate on low level technology exclusively in terms of both research and extension. This key policy decision, was made without Departmental staff consultation.

Now a Research and Publications Committee has been established, but it needs strengthening.

The team's evaluation of the current philosophy in the Department is that the focus of research ought to be appropriate for the needs of the country and thus cannot be low level technology only. This in a way explains the marginalization of the animal draught component of the project within the thinking of the Department.

The second point is that the Department's research does not have a firm basis for long term research particularly with respect to efficient acquisition and use of basic research equipment for both graduate students and staff.

The team is therefore convinced that the Department should strengthen its committee on research structured as follows:

Size:

Three staff members and one graduate student

Composition:

One representative from each of the three sections and one graduate student selected by the other graduate students.

Tasks:

1. To develop a strategic research plan for the Department and to evaluate all proposals from staff and students with the criteria agreed.
2. To set staff and graduate students research priorities in keeping with the agreed strategic plan.
3. To plan the utilisation of departmental technical human and material resources.
4. To plan the expansion of measurement and computing capacity and its utilization for graduate students and staff research, contract consultancy and publication.

6.7.2.3 Education committee

There is a tendency for the different sections to act as rivals in the quest for M.Sc. students and in the support the Department gives to each of the section's students. The existence of projects which were not adjusted to changing departmental philosophy and needs fuels this rivalry. In the long term this can become unproductive in the sense of producing graduates who are not uniformly trained.

The team is of the opinion that strengthening and restructuring the staff committee would be useful in evaluating all graduate students and ensuring that known and transparent criteria are used in matters relating to selection, quality and timeliness of submission of work.

Size:

Three staff members and one graduate student

Composition:

One staff member from each of the three sections and a graduate student selected by his peers.

Tasks:

1. Set criteria for and supervise M.Sc. quality control including quality of supervision.
2. Set criteria for and supervise selection of PhD candidates relating them to staff development needs of the Department and other universities.
3. Set criteria for and supervise staff development including supervision on the selection for and award of fellowships.
4. Set up and supervise a Management Information System for tracing M.Sc. and Ph.D. leavers so as to use their needs and experience as input into the revision of graduate and undergraduate curricula.

5. Set up and supervise continuous course rationalization procedures.
6. Set up criteria and supervise for staff student relations on academic (particularly supervision) and publication of student derived research and consultancy data.

6.7.3 Purpose of committees

These committees would be set up by the Departmental Staff Meeting. They would report, through the Chairman to the Departmental Staff Meeting.

The team would like to emphasize that the recommendations on these committees are not intended to interfere with the line authority of the Chairman. They are strictly intended for rationalizing the intra departmental process.

6.8 Organization during phasing out

The teams recommendation in staff development shows that there will be no supernumary staff during the Phase out period after the termination of the current project.

The team is of the opinion that the creation of a staff committee system be a conditionality for the financing of the project during Phase Out.

Similarly before the start of Phase Out, there should be an agreed Departmental Strategic Research and Educational Plan developed by the staff committees identified above and discussed by the whole Department and all other relevant University authorities.

The departmental strategic plan should clearly quantify all inputs by donors and the University into the Department. It should further set short term and long term research and educational objectives of the Department so as to facilitate end of project evaluation.

It is recommended that these planning activities be done during the next six months so that the target of Phase out can be met.

7. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

7.1 Education

- 1) The four running M.Sc. programmes all have a compulsory and an elective part. Since the degrees of freedom for election by the students are rather high, they are able to specialize themselves fairly well, e.g. on the basis of their experiences already gained or on their job expectations. However the degree of freedom for course selection may lead to only small differences between the programmes AMP and APS on one hand and SWE and LWM on the other. On a mid-term base we recommend to the Department to watch carefully the basis for the existence of four programmes instead of two.
- 2) The course contents give a good insight into the scope of the study programmes. The education topics agree well with those of similar M.Sc. programmes in Agricultural Engineering in which soil and water components are included. In the near future there seems to be no need for major changes of the courses. Nevertheless the team recommends that the Department develops a system which enables it to follow the graduates during their careers. In this way there would be a feed-back, which can be used for updating the courses and/or programmes to the actual needs and requirements.
- 3) We noticed that teaching is done mostly by class lectures based on handbooks, articles etc. We recommend the preparation of lecture notes or syllabi for the students as well as for the staff members' benefit. In such way overlapping and missing items can be avoided. Moreover, if a staff member should leave the university, his successor does not have to start from the zero-level.
- 4) Examinations are of a good standard and agree very well with the scientific level which M.Sc. graduates in Agricultural Engineering are supposed to have. The team prefers to some extent examinations which require the transfer and application of gained theoretical knowledge to familiar problems including the recognition of the key of the problem to be solved, rather than a more simple reproduction of knowledge.
- 5) The team recommends the development of a course dealing with problem orientated education of about 135 contact hours. One third of the content should deal with systems theory and handle subjects like systems thinking, problem-analyzing and solving. The remaining part should be used for a case study performed by a group of students. The case should include engineering as well as socio-economic and environmental aspects.

The objectives of the course are multipurpose:

- i. Students should be trained in the methodology of problem solving on an academic level by learning how to describe a system and how to divide it into relevant sub-systems.
 - ii. Students should be trained in report writing not only as individuals but also as a team.
 - iii. Students should be trained in communication and in discussion techniques and last but not least in co-operation.
- 6) The system for quality control of the courses and programmes should be improved. We recommend the development of an established structure and the introduction of procedures for quality control of the course contents and the performance of lectures. The Department can use evaluation techniques which are already in use at universities all over the world.

7.2 Research

- 1) The current research programmes deal with many topics and are covering a wide field of interests due to the specific knowledge of staff members. The number of research topics is high. When considering the research capacity of the staff this number will have to be reduced in order to optimize the output/input ratio.
- 2) Until now there is no common theme in research in which the greater part of the staff participates. The formulation of a strategic research plan which clearly describes the way in which the Department sees its own future task is necessary:
 - a) Research can be focused on applied topics with a more direct output to the agricultural sector (i.e. farmers and /or extension officers).
 - b) Research can be focused on strategic topics of a high scientific level with indirect output to the agricultural sector. The Department's aim is to be recognized as a centre of excellence in the East African Region.

The review team recommends the development of the second option.

- 3) Until now not many M.Sc. students are dealing with the research projects of the Department. It is recommended to link their thesis work with the current research programmes as was partly done with the B.Sc. students. In order to enable the Department to select outstanding students in the B.Sc. programme and develop them to join the Department staff, the support for local M.Sc. scholarships should be retained on a reducing scale.
- 4) The Department has very good research facilities in the field of computers. So, modelling and simulation in the fields of e.g.
 - farm and production systems engineering
 - operations research/labour organization
 can be performed.

Our findings are that on the other hand there is no basic instrumentation pool for more sophisticated research on e.g draught and power transfer and energy efficiency studies. The team recommends to the Department to investigate the needs and requirements for such instrumentation within 3 to 6 months from now, based on the strategic plan for research. The team recommends to the Dutch authorities to support the establishment of an instrumentation pool.

- 5) The priority setting of research is an internal affair of the Department based on the strong and weak points in the scientific level. The team believes that research on animal draught and mechanical power related to the design and adaptation of soil tillage equipment can be a successful item. The gained knowledge about the measuring techniques used can be applied in a later stage in a second project on energy studies. The team wants to make clear that it is well aware of the problems related to the process of priority setting for some individual staff members, once having chosen a common research theme the funding and input in manpower should be protected as well as the training of the technical research assistance.
- 6) A coherent research programme will highly contribute to the sustainability of the Department since the existing three sections will be more or less forced to work on subjects of common interests and in a multidisciplinary way.

7.3 Staff Development

- a) **Teaching staff**
The programme of staff development has progressed well and one third of the teaching staff have acquired PhD degrees. It will however not be possible to utilize all the scholarships during the remaining part of phase III. The Team

recommends that an additional 3½ years phase out period be provided giving a total of 5 years from December 1990. During this period the following training should be completed:

6 PhD including one in Operational Research/Labour Organization, one in Simulation/Modelling, and one in Design and Ergonomics.

The Department should also establish strong and coordinated high level research and consultancy facilities which would help to retain the highly trained staff.

b) **Technical staff**

Upgrading of skills of technical staff through short courses has gone very well and one of the senior staff in the cadre is undertaking training at M.Sc. level, with the possibility of advancing to teaching staff cadre.

The team commends this effort and recommends that the Netherlands assistance be continued to enable more technical staff to upgrade their skills. In particular, it is recommended that two technical staff be trained to M.Sc. level, one in computer systems maintenance and programming, the other in computer systems interfacing. These skills will be highly valuable in uplifting the level of research and consultancy in the Department.

c) **Technical assistance**

The TA staff have played a major role in the development of the Department, especially the M.Sc. programme and research in the last three years. Their role is however expected to diminish as Kenyan staff return from training during the next two years. The team therefore recommends that full-time TA personnel be replaced with periodic extended visits by highly experienced research personnel after 1992. The major role of such personnel could be to help the Department to establish capacity for high level research and to develop continuing collaborative arrangements between the Department and relevant institutions in the Netherlands.

7.4 **Organizational issues**

The review team concluded that the Project Team was effectively integrated into the teaching and research activities of the Department.

Further, the review team was impressed by the extensive consultation process between the project and the Department.

The project was instrumental in supporting the Department in establishing the M.Sc. programme.

During the remaining part of Phase III, the Department will be expected to:

- a) develop a strategic research plan
- b) set up an internal planning and quality control process based on a formal Staff Committee System.

Recommendations

The review team recommends that:

- a) the Project continues for a Phase Out period
- b) the Department seeks to expand sources of "running costs"
- c) the Department establishes linkages with a University in the Netherlands for the purposes of backstopping especially on research and procurement.
- d) during Phase Out in 1994 a mission should be mounted to discuss eventual difficulties during this phase.

ANNEX 1

TERMS OF REFERENCE

Terms of reference for the Review Mission of the "Assistance to the Department of Agricultural Engineering, University of Nairobi (Phase III)", November 1990.

A. Background

Phase III of the Netherlands bilateral aid project "Assistance to the Department of Agricultural Engineering, University of Nairobi" started in 1987. The aim of the assistance programme (phase III) is to allow the Department of Agricultural Engineering to firmly establish a M.Sc. programme, thereby creating University graduates of an advanced level of know-how and understanding, relevant to the pressing technical agricultural development priorities in the country.

The main objectives of the project as agreed upon by the Kenya and the Netherlands Government and described in the relevant project documents (project proposal 1986, progress report Aug. '87 - July '88, Progress report Aug. '88 - July '89) can be summarized as follows:

- academic staff training and development in the form of fellowships for specialized training abroad plus local fellowships and technical staff training;
- provide senior supernumerary staff from the Netherlands for syllabus development, teaching, research and project administration.
- technical implementation, including buildings, equipment, transport, research, documentation, conferences.

It was foreseen that a mid-term review should take place after about 2, 5 years.

B. Tasks

The review mission should cover the following areas: organizational inputs, personnel/staff inputs, material inputs, activities, education programme, students, research, financial situation, institutional development and future assistance. The mission is requested to look into the following questions:

- a. Organizational inputs
 - which organizational arrangements exist for the implementation of the project (responsible authorities, co-operation agencies, daily management, guiding boards, reporting etc.)?
 - are these organizational arrangements conducive to the objectives of the project? how do they work in practice? what problems are met? how can they be solved?
 - how is the co-operation with other institutions, Universities, ongoing projects (SSIDP, NIB), research institutes?
- b. Personnel/staff inputs
 - are the staff inputs in line with the aims and tasks set for the project?
 - how does the staff execute its task?
 - how is the co-operation and task division between all concerned in the project?
- c. Material inputs
 - are the (planned) inputs of material, equipment, travel costs, fellowships etc. in line with the aim and tasks set for the project?
 - are the inputs supplied according to the plans at the right time?
- d. Activities
 - have the activities been executed according to the project document?
 - have the collaborating parties performed activities which were not described in the project documents?
- e. Educational programme

With respect to the course contents, research topics and field training, the following aspects need to be assessed:

- concurrence with project objectives;
- quality and quantity;
- concurrence with latest knowledge/ideas;
- to which extent are students apart from necessary technical subjects-exposed to such non-technical subjects as farmer involvement and attention to socio-economic issues prior to project implementation?
- to which extent is the education programme in agreement with the actual work the students are expected to do after finalization of the study?
- is there a need for developing short (follow-up) courses for graduates working in the field as part of the departments programmes?
- which adjustments of the education programme are necessary for the second part of phase III?

f. Students

- how many have been/will be trained?
- which type of jobs do students get after graduation and which conclusions can be drawn in relation to the present teaching programme?

g. Research

- evaluate existing programme in the Department;
- possibly suggest further research topics/areas.

h. Development of financial situation

i. Institutional development and future assistance

- to which extent will the project contribute to institution building?
- what has been done to institutionalize the project?
- what are the indications that the M.Sc. courses can and will develop positively after the project period?
- which assistance from Netherlands expertise will be required in the future?
- which further Netherlands assistance will be required in the future?

j. Conclusions

- to which extent has the project achieved its objectives in the first half of phase III?
- which adjustments are necessary for the last part of phase III?

C. Personnel requirements

The mission will be composed of four persons.

Netherlands members:

- Mr. G.W. Peter, educational specialist
mission leader
- Prof. Dr.L. Speelman, agricultural engineering specialist.

Kenyan Members:

- Dr. F.J. Wang'ati, soil physicist
- Prof. G.C.M. Mutiso, consultant

D. Duration of mission and reporting

The mission will be in the field in Kenya from November 19th to November 30th, 1990. The mission will produce a draught report, which will be discussed with the parties concerned before the Netherlands members leave Kenya.

The mission will submit a joint evaluation report in the English language to the Netherlands Directorate-General International Co-operation within four weeks of completion of the mission, i.e not later than December 28th, 1990.

WORK SCHEDULE

Saturday, 17 November,

Arrival of the Dutch evaluation team members in Nairobi.

Sunday, 18 November,

Meeting of the full evaluation team with Mr. M. Koper, Secretary of the Netherlands Embassy.

Monday, 19 November,

Meeting of the team with Mr. M.Koper at the Netherlands Embassy for briefing on the evaluation;

Meeting of the team with Dr. D.K. arap Some, Chairman of the Department of Agricultural Engineering and Mr. K.J. Lenselink, project co-ordinator, for programming the evaluation.

Tuesday, 20 November,

Plenary session with the entire staff of the Department of Agricultural Engineering;
Meeting with Prof. D.M. Mukunya, Dean of the Faculty of Agriculture.

Wednesday, 21 November

Interviews with:

Mr. L. Oudman, visiting lecturer;

Mr. C.M. Maende, lecturer and Mr. P.M. Owende, tutorial fellow

Dr. F.N. Gichuki, lecturer

Dr. D.K. arap Some, Chairman of the Department of Agricultural Engineering,

Meeting with Prof. S.O. Wandiga, Deputy Vice-Chancellor Administration and Finance
and Prof. G.K. King'oriah, Deputy Principal College of Architecture and Engineering.

Thursday, 22 November

Interviews with M.Sc. students;

Interview with Mr. K.J. Lenselink, visiting lecturer and project co-ordinator

Friday, 23 November

Interviews with:

Dr. L.O. Gumbe, senior lecturer

Dr. T.C. Sharma, senior lecturer

Mr. J. Pit, visiting lecturer

Discussion with Dr. D.K. arap Some on the organization of the Department.

Saturday, 24 November

Report writing

Sunday, 25 November

Report writing

Monday, 26 November

Interviews with:

Mr. J.K. Korir, tutorial fellow

Mr. R.K. Muni, lecturer
Meeting with Dr. D.K. arap Some, Prof. D.B. Thomas and
Mr. K.J. Lenselink, lecturer on the progress of the evaluation.
Mr K.J. Lenselink, visiting lecturer

Tuesday, 27 November

Interviews with M.Sc. graduates

Wednesday, 28 November

Interview with Mr. G. Muchiri, Chief, Agricultural Engineering Division, Ministry of Agriculture

Thursday, 29 November

Interview with Dr. E.N. Mwaura, Senior Lecturer.

Meeting with Departmental staff to discuss conclusions.

Friday 30 November

Meeting with the Principal College of Agriculture and Veterinary Sciences, Prof. Oduor-Okello.

Debriefing of the review team at the Netherlands Embassy.

Debriefing visit to Mr. Mule, Principal Finance and Establishment Officer, Ministry of Education.

Departure of Dutch evaluation team members.

DOCUMENTATION

ANNEX 3

- A review of the Department of Agricultural Engineering, University of Nairobi, October 1982
- Alan F Fowler, Dr. Kabiru Kinyanjui
- Joint Review of the Department of Agricultural Engineering, University of Nairobi, August 1985
- Dr. J.W. Kijne, Mr. D.B. Thomas, Mr. J. de Meyere, Dr. E.N. Mwaura, Mr. A.F. Fowler
- Project Proposal, Assistance to the Department of Agricultural Engineering, University of Nairobi (Phase III). Nairobi, October 1986
- Thirteenth Progress Report, May 1987
- Fourteenth Progress Report, July 1988
- Fifteenth Progress Report, July 1989
- Sixteenth Progress Report, July 1990
- Workplan and budget second half 1987
- Beoordelingmemorandum DGIS
- Workplan and budget for 1988
- Workplan and budget for 1989
- Workplan and budget for 1990
- Workplan and budget for 1991
- Five Year Development Plan (1989-1993), Department of Agricultural Engineering
- Review of SAREC/UON Project, Draft Report 16-11-90
- Current Research Projects, Department of Agricultural Engineering, First Draft.
- (a large number of additional proposals was received during the review)
- M.Sc. Thesis
- Examinations of the courses 1989/1990
- University of Nairobi Calender, 1989-1990.

ANNEX 4

UNIVERSITY OF NAIROBI - DEPARTMENT OF AGRICULTURAL ENGINEERING

List of major purchases under the Netherlands project

Period: 1.8.1987 till 30.6.1990

A) CATEGORY: BUILDINGS, FURNITURE, OFFICE EQUIPMENT

#	DATE	ITEM	SUPPLIER	PRICE	CO
<u>BUILDING/CONSTRUCTION</u>					

1989					
1	89.04.13	1 Building certificate no. 1	Kimaara	KSh 205000	
2	89.05.30	1 Building certificate no.2	Kimaara	KSh 296000	
3	89.06.05	1 Consultant certificate no. 1	Mbaya	KSh 54670	
4	89.07.10	1 Professional fee note no. 1	IRCU/Nyonges	KSh 6503	
5	89.07.28	1 Building certificate no. 3	Kimaara	KSh 219000	
6	89.09.12	1 Building certificate no. 4	Kimaara	KSh 476000	
7	89.09.15	1 Professional fee note	Boga	KSh 59383	
8	89.09.20	1 Professional fee note no. 2	IRCU/Nyonges	KSh 5523	
9	89.12.05	1 Professional fee note	Mbaya	KSh 6643	
10	89.12.19	1 Building certificate no. 5	Kimaara	KSh 330000	
1990					
11	90.03.15	1 Consultants fees	IRCU/Nyonges	KSh 5661	
12	90.05.09	4 Fluorescent fittings	Gathenge	KSh 11200	
<u>FURNITURE</u>					

1988					
13	88.07.18	Dexion steel shelving store	Datini	KSh 23969	
14	88.12.20	8 Office chairs	MIBM	KSh 10262	
15	88.12.20	4 Filing cabinets	MIBM	KSh 20454	
16	88.12.20	4 Office desks	MIBM	KSh 28014	
17	88.12.20	4 Cupboards	MIBM	KSh 16842	
1989					
18	89.01.17	1 Vacuum cleaner	Overtoom	DFI 465	
19	89.01.17	1 Flat-laying drawing cabinet	Overtoom	DFI 2400	
20	89.01.17	1 Set combilux filing racks	Overtoom	DFI 2075	
21	89.01.17	1 Drawing board + chair	Overtoom	DFI 1799	
22	89.01.17	1 TV/video cupboard	Overtoom	DFI 1540	
23	89.01.17	1 Set combitheek library shelves	Overtoom	DFI 4508	

#	DATE	ITEM	SUPPLIER	PRICE	COUNTRY
24	89.01.17	4 PC/printer tables	Overtoom	DF1	1996 NL
25	89.04.17	1 Secretarial desk	Mecol	KSh	6985 K
26	89.04.17	20 Stacking chairs	Mecol	KSh	8004 K
27	89.04.17	1 Executive chair	Mecol	KSh	4395 K
28	89.04.17	1 Secretarial desk	Mecol	KSh	6985 K
29	89.04.17	1 Typist chair	Mecol	KSh	1783 K
30	89.04.17	1 Steel cupboard	Mecol	KSh	5140 K
31	89.04.17	3 Filing cabinets	Mecol	KSh	13141 K
32	89.10.13	10 Black office tables	Mecol	KSh	41350 K
33	89.12.01	45 Office chairs, etcetera	Mecol	KSh	141182 K

1990

34	90.02.22	30 Small class tables & 10 chairs	Mecol	KSh	60724 K
35	90.05.31	2 Secretarial chairs	MIBM	KSh	4591 K

OFFICE EQUIPMENT

1987

36	87.10.26	1 Rex Rotary stencil scanner 2150	Kulk&Kramer	DF1	3420 NL
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1988

37	88.12.20	1 Typewriter IBM 6747/2	MIBM	KSh	27000 K
38	89.04.07	1 Spiral binding machine	Govt. Suppl.	DF1	600 NL
39	89.04.07	1 IBM III typewriter M 6747-2	Govt. Suppl.	DF1	1877 NL

1990

40	90.03.19	1 Duplicating machine	Gestetner	KSh	48600 K
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B: CATEGORY: TEACHING, LABORATORY AND RESEARCH EQUIPMENT

RESEARCH EQUIPMENT

1987

41	87.10.26	1 Ott small current meter C2	Ahrin	Df1	7621 NL
42	87.10.26	1 WTW pH meter pH 90 (+ electr.)	Retsch	DF1	716 NL
43	87.10.26	1 WTW conductivity meter LF91	Retsch	DF1	980 NL
44	87.10.26	1 Ott water level recorder R16	Ahrin	Df1	8375 NL

#	DATE	ITEM	SUPPLIER	PRICE	COUN
1988					
45	88.01.13	11 Pressure plate accessories ELE	Intertest	DFI	3433 N
46	88.01.13	30 Tensiometers + insertion tool	Intertest	DFI	5074 N
47	88.01.13	20 Core cutters + driver 100 mm ELE	Intertest	DFI	1379 N
48	88.01.13	20 Core cutters + driver 150 mm ELE	Intertest	DFI	3917 N
49	88.01.31	1 Solar pump	Chintu	KSh	6750 K
50	88.03.31	2 Solar modules	Animatics	KSh	12600 K
51	88.05.20	2 Multitech 710 + 910 computers	Micropower	KSh	138568 U
52	88.09.30	1 Windvane	Sciex	KSh	6283 K
53	88.10.31	6 Metal Parshall flumes	Harritz&Bell	KSh	10998 K
54	88.11.10	1 Stop watch	N. Sports Hs	KSh	1100 K
55	88.11.17	999 Plastic collection bottles	OldMarkSoap	KSh	15000 K
56	88.11.30	2 Aerofoil fans	CMC Engin.	KSh	17700 K
1989					
57	89.01.09	1 Recording rain gauge	Intertest	DFI	3735 N
58	89.01.09	1 Raingauge logging system	Intertest	DFI	4490 N
59	89.01.09	1 Aerodynamic raingauge	Intertest	DFI	1080 N
60	89.01.17	48 Soil cores 50 mm, caps, in case	Eijkelkamp	DFI	1517 N
61	89.01.17	1 Fuel consumption monitor	Euromac	DFI	3100 N
62	89.01.17	1 Flatbed recorder BD40/04/05	Kipp	DFI	2210 N
63	89.01.17	1 Auger set heterogeneous soils	Eijkelkamp	DFI	1351 N
64	89.01.17	1 Solar integrator CC 12	Kipp	DFI	5040 N
65	89.01.17	2 Groundwater potential probes	Eijkelkamp	DFI	2663 N
66	89.01.17	1 Sand box pF apparatus complete	Eijkelkamp	DFI	3165 N
67	89.01.17	3 Soil permeability kits	Eijkelkamp	DFI	2731 N
68	89.01.17	1 Hydraulic tester	Euromac	Dfl	3550 N
69	89.01.17	2 Solarimeters CM 11	Kipp	DFI	3880 N
70	89.01.17	6 Gouge augers complete	Eijkelkamp	DFI	840 N
71	89.01.17	2 Double ring infiltrometers	Eijkelkamp	DFI	2383 N
72	89.01.17	1 Froment electronic dynamometer	Euromac	DFI	28750 N
73	89.01.17	1 Dynamometer computer system	Euromac	DFI	6530 N
74	89.01.17	5 Edelman augers + extensions	Eijkelkamp	DFI	1078 N
75	89.01.31	2 Water storage tanks 500 gallon	Rafiki	KSh	3200 K
76	89.03.15	9 Pressure gauges, various ranges	Armfield	UKP	1808 L
77	89.03.15	7 Parshall flumes	Armfield	UKP	1592 L
78	89.03.15	5 WSC flumes	Armfield	UKP	745 L
79	89.03.15	2 Small current meters	Armfield	UKP	4062 L
80	89.04.07	1 Electronic balance Sartorius	Eijkelkamp	DFI	4805 N
81	89.04.07	1 Rainfall simulator Kamphorst	Eijkelkamp	DFI	3723 N
82	89.04.07	2 Open channel measuring sticks	Eijkelkamp	DFI	3870 N
83	89.04.07	1 Kaolin pF box complete	Eijkelkamp	DFI	4025 N
84	89.04.07	2 Ott water level recorders R16	Ahrin	DFI	16802 N
85	89.05.15	6 Animal draught ploughs	Rumptstad	DFI	0 N
86	89.05.15	6 Seed drills	Rumptstad	Dfl	0 N
87	89.05.15	6 Multicultivators	Rumptstad	DFI	0 N
88	89.05.23	1 Automatic weather station	Vicon	DFI	6528 N
89	89.11.22	2 Rainfall recorders + spares	Casella	UKP	2016 L
90	89.11.24	1 Electrothermal heater	Intertest	DFI	1720 N
91	89.11.24	1 Automatic porometer + spares	Intertest	DFI	12555 N
92	89.11.24	1 Proving ring penetrometer	Intertest	DFI	1535 N

#	DATE	ITEM	SUPPLIER	PRICE	COUNTRY
93	89.11.24	1 Electronic balance Sartorius	Intertest	DFI	3960 NL
94	89.11.24	2 Thermohygrographs + spares	Intertest	DFI	3685 NL
95	89.11.24	1 Field vane tester + accesories	Intertest	DFI	1817 NL
96	89.11.24	1 Humidity/temperature meter	Intertest	DFI	1575 NL
97	89.11.24	1 Pocket shear meter	Intertest	DFI	623 NL
98	89.11.24	1 Research microscope + accessor.	Intertest	DFI	14746 NL
99	89.11.24	1 Soxhlet apparatus + thimbles	Intertest	DFI	3335 NL
100	89.23.05	10 Pyrex 1-litre measuring cylinder	Howse&McGeor	KSh	7125 K

TEACHING EQUIPMENT

1987

101	87.09.25	2 Bukura ploughs	Ekima Engin.	KSh	3900 K
102	87.10.15	1 Mouldboard plough Kverneland	Lagum	KSh	44776 K
103	87.10.19	1 Crop sprayer	KGGCU	KSh	2209 K
104	87.10.26	1 Portable welding machine 240V	Eyle&Ruygers	DFI	1000 NL
105	87.10.26	1 Oil-cooled welding machine 415V	Eyle&Ruygers	DFI	1500 NL
106	87.11.03	1 Colour television 27CS-6896/98	Philips	DFI	3140 NL
107	87.11.03	1 Video cassette recorder VR6641/	Philips	DFI	2005 NL
108	87.11.12	1 Band saw machine	Rafiki	KSh	44870 K
109	87.11.19	2 Stereoscopes	Sciencescope	KSh	57600 K
110	87.12.07	1 Powered hacksaw, electric	UnAuto Tools	KSh	60000 K

1988

111	88.01.14	1 Slide/filmstrip projector Telex	Pioneer	USD	1500 USA
112	88.01.14	1 Overhead projector	Pioneer	USD	1200 USA
113	88.02.29	8 Educational videos	London TServ	UKP	811 UK
114	88.06.22	1 Bukura plough	Ekima	KSh	1000 K
115	88.07.26	1 Machine vice	A. Shariff	KSh	12000 K
116	88.07.26	2 Vices 5"	UnAuto Tools	KSh	5200 K
117	88.07.26	1 Knuging tool	Aquva	KSh	1137 K
118	88.07.26	5 Hacksaw frames	A. Shraiff	KSh	1500 K
119	88.07.26	3 Anvils	UnAuto Tools	KSh	5400 K
120	88.07.26	1 Jacobs chuck	Comhard	KSh	3350 K
121	88.07.26	2 Anvils 25 kg	A. Shariff	KSh	6800 K
122	88.08.31	1 Hydraulic pipe bender	Aquva	KSh	29000 K
123	88.09.01	1 Multi-purpose plough	Ekima	KSh	1250 K
124	88.09.26	4 Engineering squares 6"	A. Shariff	KSh	2000 K
125	88.09.26	1 Vernier height gage	A. Shariff	KSh	7250 K
126	88.09.29	1 Plane no. 5	A. Shariff	KSh	1260 K
127	88.09.29	3 No. 4 planes	A. Shariff	KSh	2640 K
128	88.09.29	5 Claw hammers	A. Shariff	KSh	1250 K
129	88.09.29	5 Hand brace	A. Shariff	KSh	4300 K
130	88.09.29	2 Rebate planes	A. Shariff	KSh	1980 K
131	88.09.29	12 Plane cutters	A. Shariff	KSh	1200 K
132	88.09.29	2 Plough planes	A. Shariff	KSh	2080 K
133	88.10.31	2 Tapes of 50 m	Sciex	KSh	5600 K

#	DATE	ITEM	SUPPLIER	PRICE	COUN
1989					
134	89.01.05	5 Forceps	K. Railways	KSh	4550 K
135	89.01.17	1 Vertical drill type 13	Overtoom	DFI	905 M
136	89.01.31	1 Bench vice	UnAuto Tools	KSh	4218 K
137	89.02.28	1 Stanley plane no. 5	A. Shariff	KSh	960 K
138	89.02.28	1 T-bar clamp	A. Shariff	KSh	2100 K
139	89.02.28	1 Bench vice No. 5	A. Shariff	KSh	3900 K
140	89.02.28	Teaching books, transparencies	John Deere	KSh	41898 F
141	89.04.07	1 Overhead projector Demolux	Govt. Suppl.	DFI	649 M
142	89.05.25	1 Multicultivator	Rumptstad	DFI	0 M
143	89.05.25	1 Seed drill RZM-150	Rumptstad	DFI	3560 M
144	89.06.30	1 Fertilizer spreader	Amiran	KSh	32850 K
145	89.06.30	5 Acer 500 microcomputers	Micropower	KSh	187508 L
146	89.07.18	1 Compact welding set	EA Oxygen	KSh	11900 K
147	89.07.27	1 Measuring table plate	UnAuto Tools	KSh	22000 K
148	89.11.03	1 Vernier caliper	Hardw&Tools	KSh	1500 K
149	89.11.16	1 Bukura plough	Ekima	KSh	2500 K
1990					
150	90.03.19	10 Slide changers	Pioneer	KSh	11780 K
151	90.06.20	14 Welding goggles	Oriental	KSh	2520 K

C: CATEGORY TRANSPORT

VEHICLES

152	87.09.25	1 Toyota Landcruiser	Toyota	Yen2739000	J
153	87.10.02	1 Nissan Micro-bus E23	DT Dobie	KSh 284775	K
154	88.03.30	1 Toyota Hi-lux pick-up	Toyota	KSh 285297	K
155	90.11.14	1 Toyota Dyna 350 minibus	Toyota	KSh 661620	K

Comparison of Netherlands project expenditure with original budget

	Budget of May 77	Exp. 1987 half	Exp. 1988	Exp. 1989	Budget 1990 v.2	Budget 1991	Budget 1992	*Total expend.	Balance
9100 MISSIONS									
9130 Project missions	50000				50000			50000	0
9200 PERSONNEL									
9210 Netherlands experts	1710000	231209	513745	541347	540000	315000	135000	2276301	-566301
9230 Local personnel	102000	6979	21658	18728	19000	15000	9000	90365	11635
9400 ACQUISITIONS									
9410 Buildings	170000	7733	6231	169451	60000	15000		258415	-88415
9421 Furniture	150000	15000	44699	21388	14000	10000		105087	44913
9422 Teaching/Lab. equipment	252000	32000	43208	40319	40000	30000	10000	195527	56473
9423 Research equipment	300000	40276	84542	79734	60000	40000	10000	314552	-14552
9430 Vehicles	100000	68194	32725	30623	70000			170919	-70919
9480 Freight & insurance	50000	7994	17902		20000	15000	5000	96519	-46519
9500 OPERATIONAL COSTS									
9520 R&M equipment	31000	5181	10118	4801	15000	10000	5000	50100	-19100
9530 R&M vehicles	47000	5396	19626	29313	35000	35000	15000	139335	-92335
9540 Office costs	41000	4026	10853	17925	10000	10000	5000	57804	-16804
9550 Materials	51000	28555	50441	54619	50000	40000	20000	243615	-192615
9571 Local travel & subsistence	51000	5363	9084	6413	10000	10000	5000	45860	5140
9572 Conferences	80000		8834	8096	10000	10000		36930	43070
9600 TRAINING									
9621 Msc fellowships	200000	22185	29994	60395	30000	35000	16000	193574	6426
9622 Special courses	91000		17192	353	5000	5000		27545	63455
9631 Academic fellowships	1425000	111015	100197	131677	160000	190000	120000	812889	612111
9632 Technical staff training	150000		52939	17858				70797	79203
	5051000	591106	1073988	1233040	1198000	785000	355000	5236134	-185134