

**A Training Plan for the
Department of Research
and Specialist Services,
Zimbabwe, 1985 to 1988**

Department of Research and Specialist Services,
Ministry of Agriculture, Harare, Zimbabwe

International Service for National Agricultural Research,
The Hague, Netherlands

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing and operations.

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

ISNAR also plays an active role in assisting these national programs to establish links with both the international agricultural research centers and donors.

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EXECUTIVE SUMMARY

Since Independence in 1980, there has been a radical transformation in the pattern of staffing in DR & SS with very large increases in the number of African scientists and administrative and technical support staffs. However, not surprisingly, most of these new recruits have very limited research experience - only a quarter of the research scientists have been engaged in professional research activities for more than five years. Moreover, nearly two-thirds of this cadre have yet to obtain a Master of Science degree which is now considered to be a minimum qualification for an agricultural research scientist. While the attendance of research personnel at short term scientific and management training events has increased in recent years, there are still considerable outstanding needs in these areas.

The provision of training for DR & SS personnel is one of the most critical factors which will determine the overall effectiveness of the agricultural research system in Zimbabwe during the next decade. It is very important therefore that the training effort is comprehensively and systematically planned. The main recommendation of this report is therefore, that DR & SS should implement a training plan for the period 1985-1988 which will ensure that the outstanding training requirements will be met. The report describes the major objectives of such a training plan and considers in some detail the precise training requirements of senior research personnel.

Research scientist trainees. It is recommended that a four year traineeship for university graduate recruits should be established. Trainees would be designated assistant research officers (ARO) and the experimental officer grade would be abolished. An individual training program for each ARO should be carefully determined. This should comprise of (i) an initial two year period of structured on-the-job training with senior research personnel being assigned specific responsibilities for the training of AROs. This on-the-job experience should be supplemented by an induction course of at least a week and trainees should also be given the opportunity to attend a one-two month training course or other activity at an international research centre or elsewhere. In view of the shortage of experienced, well qualified scientists at a number of research stations and institutes, it is recommended that foreign scientists in the following disciplines should be recruited in order to provide essential on-the-job training to inexperienced scientists: agronomy 1; crop breeding 1; horticulture 1; irrigation 1, range nutrition 1, range management 1 and entomology 1. (ii) ARO's who are academically qualified and who satisfactorily complete the first two years of on-the-job training, should register for a master of science degree. Three types of M.Sc./M.Phil. degrees are likely to be required in order to cater for the current range of postgraduate training needs whilst minimizing the disruption to on-going research programs: a two year M.Phil. research degree at the University of Zimbabwe with provision for up to 12 months attendance at taught courses overseas, and one and two year M.Sc. courses at overseas universities. Acceptance of

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the masters degree training recommendation implies that, given the experience and qualification profiles of university graduates currently employed by DR & SS, 31 officers will need to register for masters degrees between 1985-1988. (10 in the Crops Division, 10 in the Livestock and Pastures Division and 11 in Research Services). Taking into account the training requirements of additional scientist recruitment during this period (resignations plus vacancies in the 1984 establishment) increases this figure to 77.

Research technician trainees. While the training needs of research technicians do not require a formal traineeship, it is recommended that all research technicians who lack formal training should be strongly encouraged to obtain full technician qualifications as quickly as possible. In addition, greater opportunities should be provided for research technicians to attend short courses both locally and overseas.

In-career training for research scientists and managers. It is recommended that those scientists who have acquired their M.Sc./M.Phil. degrees and have clearly demonstrated their competence and commitment to agricultural research should be allowed to register for doctorate degrees. Normally they should be expected to register with the appropriate faculty at the University of Zimbabwe and undertake their thesis research while working on-the-job. Where local supervision is not available, provision should be made for the student to seek assistance from overseas institutions.

While it is primarily the responsibility of scientists themselves to keep up to date with advances in scientific knowledge, short courses, conferences and other kinds of contacts with experts in their specialized fields are essential. It is recommended, therefore, that, as a general rule, research scientists should be able to participate in such activities at least, on average, every three-four years.

Given the overall size of DR & SS and the increasing complexity in planning and management a national agricultural research system such as Zimbabwe's, it is very important that senior managers in DR & SS have the opportunity to upgrade regularly their management knowledge and skills.

Implementing the training plan. It is estimated that the total cost of the training plan for the period 1984-1988 is Z\$4.125 million, the main expenditure needs being: postgraduate courses Z\$1.24 million; short courses and contact visits Z\$0.64 million and training personnel Z\$2.24 million.

Finally, it is recommended that a training officer should be appointed as soon as possible to prepare and implement the training plan. This officer should be a senior administrator. The post should be graded at the Chief Research Officer level.

Conditions of Service. Although conditions of service issues are not specifically included in the terms of reference, a number of tentative recommendations are offered. These center on the need to modify the existing grading structures of both research scientists and technicians in order to ensure that these personnel are provided with sufficient incentives throughout their careers.

CHAPTER 1

INTRODUCTION

Origin of the study

In September 1983 two staff members from ISNAR were invited to participate in the first annual review meeting of Zimbabwe's National Agricultural Research and Extension Project 1983/84 - 1986/87. A loan of US\$31.3 million from the International Bank for Reconstruction and Development (IBRD) and the International Fund for Agricultural Development (IFAD) has been negotiated for the project.

The need for systematic in-service training for agricultural research personnel has been identified as playing an essential role in ensuring the success of the Project. Consequently, as part of the negotiations for the project loan, it was agreed that the Department of Research and Specialist Services (DR&SS) should appoint a training officer and that an analysis of the training requirements of the department should be undertaken.

On 6 October 1983 the Director of DR & SS, Dr. P.R.N. Chigaru, on behalf of the Secretary for Agriculture, formally requested the assistance of ISNAR in undertaking this training needs analysis and the preparation of a training plan for the department. The Director-General of ISNAR, Dr. W.K. Gamble, responded favorably to this request and it was agreed that an ISNAR team should visit Zimbabwe early in 1984.

Terms of reference

The following terms of reference were developed by DR & SS and ISNAR and approved by IBRD and IFAD:

- * Conduct a detailed training needs analysis of existing professional and technical staff.
- * Prepare an overall training plan for DR&SS.
- * Design a system which would enable staff selected for appointment to senior research and managerial positions to be trained.
- * Design training required to meet the operational objectives of DR&SS drawing upon existing resources in the Ministry of Agriculture, the University of Zimbabwe, and elsewhere in Zimbabwe.
- * Recommend the attributes required for the DR&SS training officer.

Composition of the team

The team comprised of two ISNAR staff, Dr. T. Ajibola Taylor, Senior Research Officer (Team Leader) and Dr. Paul Bennell, Research Fellow; and Mr. Addis Antenneh, Livestock Economist, International Livestock Centre for Africa. Dr. B.N. Ndimamde, Deputy Director DR&SS, worked closely with the team and participated in many of the interviews, visits, and discussions.

Program of the Team

Two members of the team were in Zimbabwe from 5 March to 23 March 1984; they were joined by the third member in the final week. Prior to the arrival of the team, two sets of human resource questionnaires were distributed to institute/station heads and all research officers and technicians. These questionnaires, nearly all of which were satisfactorily completed, provided a valuable data base for the analysis.

During their visit, the team had discussions with the Secretary for Agriculture, the Director and Assistant Directors of DR & SS, the Director of AGRITEX, heads of research institutes and stations, and individual research scientists and technicians. The team visited all the institutes and units at the Agricultural Research Centre in Harare, and five outlying research stations. In addition, the team discussed training issues with the Dean and Chairmen of the Departments of the Faculty of Agriculture, University of Zimbabwe and the Principals of the Harare Polytechnic, and the Gwebi College of Agriculture. A list of the people met appears in Appendix 1.

CHAPTER 2

THE DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES

2.1 Organization and Management

The Department of Research and Specialist Services (DR & SS) was formally established in 1948, though some of its units are more than 70 years old. It is one of four departments or units within the Ministry of Agriculture, the other three being the Department of Agricultural Technical and Extension Services (AGRITEX), the Department of Veterinary Services, and Tsetse and Trypanosomiasis Control. DR & SS is responsible for conducting research in agricultural science (crops, livestock) and for providing various services to the agricultural industry (excluding components concerned with tobacco, sugar cane, pigs and forestry). It also applies government regulations related to agriculture (e.g. plant inspection, phytosanitary control and meat grading).

The Department has three main divisions; crops, livestock and pastures and research services. Each is headed by an assistant director. Central administration at the Agricultural Research Center in Harare is the responsibility of a unit consisting of seven executive officers. An organization chart for the department is presented in Figure 1.

Since DR & SS is a public institution, administrative procedures are determined by government rules and regulations. The Public Service Commission and the Treasury therefore, have overall responsibility for matters relating to personnel and financial administration respectively. Similarly, all matters relating to manpower development are the responsibility of the Ministry of Labour, Manpower Development and Social Affairs (MLMDSA). Thus the Ministry deals with applications and approvals for work permits and administers government and donor supported scholarship schemes. Also, under Decree No. 2 of 1984 all civil servants attending meetings etc., overseas, must obtain prior approval from the Prime Minister's office.

The Role of Agricultural Research

Any training strategy proposed for DR & SS must be supportive of future research programs. Since independence, increasing attention has been focused on the need to increase agricultural production and farm incomes in the communal sub-sector, while at the same time maintaining production in the commercial sub-sector. The marked differences between these two sectors is revealed by an examination of Table 1. Meeting these twin objectives poses a formidable challenge to DR & SS.

While agricultural research undertaken at DR & SS prior to independence in 1980 was of a very high standard, it is generally accepted that much of it was orientated towards the commercial (as opposed to the predominantly smallholder communal) sector. However, there is now a growing recognition in DR & SS that the appropriate research programs for two such dramatically different farming systems

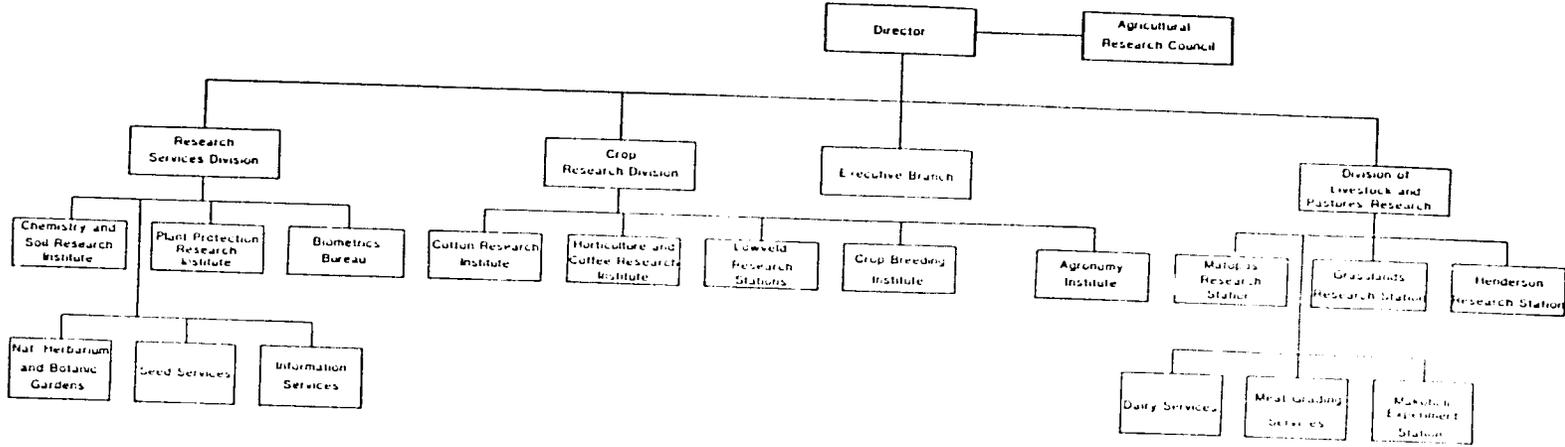


Figure 1: Organization Chart of DR & SS

diverge considerably. Thus, increasing efforts are being devoted towards developing research programs for communal area agriculture, in particular applied and farming systems research.

Table 1. Input/Output Accounts Commercial Farm and Communal Farm Sector 1974-1980 (Z\$ million).

Year	Total Outputs	Total Inputs	Total Value Added	Total Outputs	Total Inputs	Total Value Added
74	369	145	224	108	7	101
75	385	165	220	106	8	98
76	415	178	237	107	8	99
77	404	197	207	108	9	99
78	430	210	220	75	8	67
79	452	231	221	104	8	96
80	607	298	309	147	11	136
Mean	473	203	234	108	8	99

Source: IBRD, Zimbabwe Agricultural Sector Study 1983.

There is also a growing awareness among senior DR & SS management of the need to introduce more systematic department wide programming procedures which will provide the basis for the development of a detailed medium term plan for agricultural research in Zimbabwe. Until such a plan is produced, it is clearly not possible to derive very detailed estimates of future manpower and training requirements.* The primary objective of this report is therefore to delineate the main features of a desirable training strategy for DR & SS. However, whenever possible, the long and short term training needs of the individual research scientists and technicians currently employed by DR & SS are also outlined. It will be the task of the proposed training officer to elaborate in detail training requirements for existing and future staff in consultation with senior management and as part of on-going programming activities.

* The MLMDSA completed a comprehensive national manpower survey in 1983 but unfortunately an attempt was not made to derive estimates of future manpower requirements in each of the major sectors of the economy.

Table 2. Personnel costs and total expenditure of DR & RS
1978/79 - 1984/85 (Z\$'000)

	(i) Personnel Costs	(ii) Total Expenditure	(i) as % of (ii)
1978/79	3307	5065	65.3
1979/80	3390	5214	65.0
1981/82	5770	7731	74.6
1982/83	5970	8245	72.4
1983/84	6410	8978	71.4
1984/85 (requested)	7537	10914	69.0

2.2 Financial Resources

As a department of the Ministry of Agriculture, DR & SS receives the bulk of its recurrent and development budgets from the government of Zimbabwe. As can be seen from Table 2, there have been relatively large increases in the total annual expenditures of DR & SS in recent years (approximately between 6.0% - 9.0% per annum). However, while the DR & SS total appropriation increased by 72.1% between 1979/80-1983/84, the overall cost of living index increased by 81.5% so that there is unlikely to have been any significant increase in real terms during this period.

Government expenditure on agricultural research (excluding tobacco) amounted to 1.23% of agricultural growth domestic product (GDP) in 1982 which is lower than the World Bank's 1990 target of 2.0% but is well above the normally recommended level of 1.0%, and compares well with the situation in other developing countries.* It should be pointed out however that this figure was 1.62% in 1978/79 and 1.32% in 1979/80.

The government's financial commitment to agricultural research (excluding tobacco) amounted to 0.33% of total government expenditure in 1983/84 (see Table 1). Approximately 7.5% of the Ministry of Agriculture's budget was allocated to DR & SS in 1983/84, slightly over half the amount received by AGRITEX for the agricultural extension program.

*According to 1980 data the percentage equivalent of agricultural GDP committed to agricultural research in Zimbabwe was over twice the average figure for countries in Africa.

Table 3. The Relative Size of DR & SS Expenditure.

	DR & SS % Agric. GDP	DR & SS % Total Govt.	DR & SS % MOA	DR & SS % AGRITEX
1981/82	1.17	0.36	7.7	53.1
1982/83	1.23	0.28	5.3	51.4
1983/84	n.a.	0.33	7.5	53.1

External Assistance

DR & SS receives external assistance from a number of sources. The most important of these at present is the National Agricultural Extension and Research Project which is being co-funded by The International Fund for Agricultural Development (IFAD) and the International Bank for Reconstruction and Development (IBRD) under a loan agreement. The overall aim of the project, which is expected to be implemented during the period 1983/84-1986/87, is to build the agricultural extension and research capacity needed to substantially increase agricultural production and farm incomes in the communal areas, while enabling the commercial agricultural sub-sector to maintain and improve its performance. The aims of the research program within the project are:

- * strengthen the organizational administrative and accounting structures and practices within DR & SS in order to better meet present research priorities;
- * eliminate the backlog in housing, transport, equipment and materials needed to restore capacity in plant breeding, cotton, and agronomy research;
- * expand those research activities which directly benefit farmers in the communal areas particularly in the low rainfall areas of Natural Regions III, IV and V;
- * strengthen the in-service training capability of DR & SS by formalizing an on the job training program; and
- * provide technical assistance in key areas to support permanent staff while they undergo on the job training.

US\$10.9 million of the US\$31.1 million project loan has been allocated to DR & SS. A considerable part of this is intended for direct or indirect training activities; 334 man months of fellowships and study tours at a total cost of US\$669.26* (Z\$614.0); in-service training costs amounting to US\$194.0 (Z\$178.0) and 420 man months of technical assistance and consultancies costing US\$2.952 million (Z\$2.70 million).

* In March 1984, US\$1.0 = Z\$0.92.

The International Development and Research Centre (IDRC) of Canada is supporting 2 projects: a three year sorghum and millet breeding program based at Matopos Research Station costing Z\$322,251 and the animal production systems research project which has a total budget of Z\$327,000. An important objective of this latter project is to train DR & SS staff in on-farm research methods and this will entail frequent meetings between project scientists and personnel from the International Livestock Center for Africa (ILCA) based in Addis Ababa, Ethiopia.

The Overseas Development Administration (ODA) of the British Government has established a Special Fund for Agricultural Research in Zimbabwe which at present is supporting 3 projects: the Matopos Goat Research Unit; laboratory equipment for Henderson Research Station and Sabi Valley Research Station at a total cost of £498,000. In addition, 6 postgraduate degree scholarships have been awarded to DR & SS scientists during the last two years.

The United States Agency for International Development (USAID) has also assisted DR & SS to train agricultural research personnel under the African Manpower Development and Science and Technology Assistance Programs. The Zimbabwe Agricultural Sector Assistance (ZASA) Program totalling US\$45.0 million is the largest USAID grant aid program in support of agriculture in Zimbabwe. However, DR & SS has not yet made any detailed submissions to receive assistance from the ZASA program.

2.3 Conditions of Service

Ideally, an analysis of training requirements should be undertaken only as part of a comprehensive review of all conditions of service for personnel employed. Since such a review is not explicitly part of the terms of reference of this study, the team did not attempt to make a detailed analysis of other aspects of conditions of service, most notably grading and salary structures, promotion criteria and evaluation procedures. We understand however, that a study on remuneration in DR & SS and AGRITEM is being undertaken by a team drawn from these two departments, and is expected to submit its report in June 1984. It will be essential therefore for the remuneration study team to consider carefully the contents of this report in order to ensure that both sets of recommendations on training and remuneration are mutually consistent and indeed supportive of each other.

While, by developing country standards, the level of salaries paid to research scientists and technicians in DR & SS are relatively high (measured in real terms), considerable concern has been expressed in recent years about the declining value of these incomes as a result of rates of inflation far in excess of (infrequent) public sector salary increases. This in turn has resulted in the emergence of sizeable public-private income differentials for many occupational categories especially among professional personnel which, it is alleged, has encouraged many civil servants to take up more lucrative appointments in the private sector. Fortunately however, the situation is likely to have eased with the January 1984 pay award of 5.0% for all civil servants plus an addition of 15.0% for civil servants in designated highly skilled occupations of which agricultural research scientists and technicians are part. The point to stress of course is that the rate of return to high cost investments in training for agricultural research

personnel will be unacceptably low if a large proportion of these individuals, with their highly specific skills, are (i) induced away to other types of unrelated employment, or, (ii) even if they do remain at DR & SS, do not fully exploit these skills because they do not enjoy sufficiently attractive conditions of service to motivate them properly. In short, training is a necessary but not sufficient condition for ensuring productive agricultural research personnel.

In view of the importance of conditions of service issues in influencing the effectiveness of any training strategy, the team felt obliged to analyze briefly prevailing salary and grading structures for research officers and technicians in DR & SS. Our comments and tentative recommendations are presented in Appendix 2.

CHAPTER 3

THE STAFFING SITUATION

3.1 Inter-divisional Distribution of Research Personnel 1970-1984.

Before analyzing in detail the present staffing situation, it is useful to have an overall picture of the distribution of research personnel among the three divisions in DR & SS in recent years. Utilizing data from staff lists and the training requirement questionnaires, the numbers of scientists and technicians employed and the size of establishments for each group are presented in Tables 4 and 5 for the years 1970, 1974, 1977 and 1984.

It can be observed that between 1970 and 1984 there was an overall increase of 40% in the number of scientists employed, but a decrease of 19% in technician employment. Within the scientist cadre, the percentage increases were crops 24%, livestock and pastures 68%, and research services 30.2%. The corresponding figures for technicians were crops 3.9%, livestock and pastures -33.3%, and specialist services -27.8%. The percentage of scientists employed in the crops division fell from approximately 30% in 1970 to 27% in 1984 (although this decrease is considerably larger i.e. 35% if 1974 is taken as the base year). Livestock and pastures scientists, on the other hand, increased their percentage representation from 22-23% in the early 1970s to over 28% in 1984. There was a slight percentage decline in the number of scientists in the specialist services division. The corresponding percentage figures for technicians are 22.7% to 38.1% for crops, 37.8% to 30.9% for livestock and pastures, and 34.9% to 30.7% for specialist services.

3.2 Appointments and Resignations 1981-1983

There has been a radical transformation in the pattern of staffing in DR & SS since independence. By 1984 over 75% of the European scientists employed in the late 1970s had resigned to be replaced by mainly young African Zimbabweans. Whereas there were only two African research officers in 1974 (1.7% of the total) and four in 1977 (3.7% of the total), this increased dramatically after 1980, so that by March 1984 there were 86 African research and experimental officers comprising 65.1% of the research scientist cadre and only 28 (soon to be only 25) European Zimbabwean scientists (21.2% of the total) (See Table 6.). There were 18 foreign scientists working in DR & SS in early 1984 (13.6% of the total) only 8 of whom, however, can be considered to be experienced scientists. The breakdown of African and European technicians is presented in Table 7.

While there has been a steady decline in the annual rate of resignations since 1980 among research officers, there was a substantial increase in appointments in 1983 -- over 42 mainly young graduates were recruited by DR & SS (See Table 8.). It can be observed from Table 9 that half of this recruitment was concentrated in the livestock and pastures division.

Table 4. Employment and Vacancies of Experimental and Research Officers 1970-1984

	1970		1974		1977	March 1984	
	A	V	A	V	A	A	V
<u>Directorate</u>	4	0	4	0	4	5	0
<u>Crops</u>							
Agronomy I	5	1	10	0	7	6	2
Cotton RI	7	1	10	1	6	8	2
Crop Breeding I	6	4	8	2	10	9	0
Horticulture RC	-	-	2	0	2	2	1
Coffee RS	2	1	3	0	1	2	1
Rhodes-Inyanga ES	1	0	1	0	1	2	0
Lowveld RT	7	1	7	1	4	5	2
Sub-Total	28	8	41	4	31	34	8
<u>Livestock & Pastures</u>							
Grasslands RS	6	1	4	0	4	7	2
Henderson RS	8	0	11	0	12	12	0
Matopos RS	4	4	7	0	7	9	3
Makoholi ES	2	0	1	0	1	2	1
Dairy Service	2	4	4	1	3	7	0
Sub-Total	22	9	26	1	27	37	6
<u>Research Services</u>							
Plant Protection RI	13	3	14	1	14	14	3
Chemistry & Soils RI	19	6	20	3	16	24	4
Biometrics Bureau	4	2	4	2	4	7	0
Herbarium							
& Botanic Garden	4	1	5	0	6	4	1
Seed Services	3	0	2	0	3	6	3
Information			2	1	3	1	1
Sub-Total	43	12	47	6	46	56	12
FSR Team	-	-	-	-	-	4	1
TOTALS	97	29	118	12	108	136	27
(A + V)	127		130		n.a.	163	

A = actual; V = vacancy.

Table 5. Employment and Vacancies of Research Technicians, 1970-1984.

	1970		1974		1977	March 1984	
	A	V	A	V	A	A	V
<u>Crops</u>							
Crop Breeding I	7	1	9	0	8	4	2
Agronomy I	3	0	7	2	11	12	0
Cotton RI	6	2	10	1	9	8	4
Coffee RS	2	0	2	0	2	2	0
Horticulture RS	-	-	2	0	3	1	1
Rhodes-Inyanga RS	2	0	2	0	1	2	1
Lowveld RS	8	5	11	1	6	5	3
Sub-Total	28	8	43	4	40	34	11
<u>Livestock & Pastures</u>							
Grasslands RS	11	0	10	0	7	6	1
Henderson RS	8	1	7	0	9	7	0
Matapos RS	14	0	11	2	12	8	1
Makoholi ES	2	0	3	0	2	3	1
Dairy Services	4	2	6	0	6	2	0
Sub-Total	39	3	37	2	36	26	3
<u>Research Services</u>							
Plant Protection RI	11	3	14	4	14	13	1
Chemistry & Soils RI	12	1	15	0	14	8	3
Seed Services	7	2		1	1	2	0
Biometrics Bureau	2	0	3	0	3	1	2
Herbarium & Botanic Garden	2	0	3	0	2	2	0
Sub-Total	36	9	35	5	34	26	6
FSR Team	-	-	-	-	-	0	2
Totals	103	20	115	11	110	86	22
(A+V)	123		126		110	108	

Table 6. Employment of National and Foreign Research Scientists, March 1984.

Institution	Nationals		Foreigners	
	African	European	Experienced*	Inexperienced
<u>Crops</u>				
Agronomy I	7	0	0	0
Cotton RS	4	3	1	0
Crop Breeding	8	1	0	0
Horticulture & Coffee RI	2	2	1	1
Lowveld RS	4	0	1	0
Sub-total	25	6	3	1
<u>Livestock and Pastures</u>				
Grasslands RS	3	3	0	1
Henderson RS	4	8	0	0
Matopos RS	6	2	0	1
Makoholi ES	2	0	0	0
Daily Services	5	2	0	0
Sub-total	20	15	0	2
<u>Research Services</u>				
Plant Protection RI	13	0	0	1
Chemistry & Soils RI	17	1	1	5
Biometrics Bureau	5	0	1	1
Herbarium & Botanic Garden				
Seed Services	3	3	0	0
Information	1	0	0	0
Sub-total	39	7	3	7
FSR Team	2	0	2	0
Total	86	28	8	10
%	65.1	21.2	6.0	7.6

* i.e. more than 10 years of research experience

Table 7: Employment of African and European Research Technicians, March 1984.

	<u>African</u>	<u>European</u>
<u>Crops</u>		
Agronomy Institute	9	3
Cotton RI	5	1
Crop Breeding I	2	2
Horticulture & Coffee Ri	2	2
Lowveld RS	6	1
	<hr/>	
Sub-total	24	9
<u>Livestock & Pasture</u>		
Grasslands RS	3	3
Henderson RS	5	3
Matopos RS	5	3
Makoholi ES	3	0
Dairy Services	0	2
	<hr/>	
Sub-total	16	11
<u>Research Services</u>		
Plant Protection RI	10	1
Chemistry & Soils RI	6	1
Biometrics Bureau	1	0
Herbarium & Botanic Gdn.	2	1
Seed Services	0	1
Information Services	0	0
	<hr/>	
Sub-total	19	4
GRAND TOTAL	59	24
<hr/>		

Table 8. Appointments and Resignations of Senior Staff 1981-1983

	Appointments*			Resignations		
	RO/EO	RT	AA/TA	RO/EO	RT	AA/TA
1981	25(7)	21(6)	10(0)	30(28)	37(32)	13(8)
1982	13(4)	12(2)	11(0)	27(20)	9 (7)	3(0)
1983	42(6)	17(2)	10 n.a.	22(18)	16 (4)	n.a.

() = European officers

* includes expatriates.

3.3 Qualification, Experience and Vacancy Profiles

The qualification, experience and vacancy profiles of research scientists and technicians are the three most important indicators of the staffing situation at each of the research institutes and stations in DR & SS.

Crops Division

From Tables 10 and 11 it can be seen that of the 27 national scientists employed in the crops research division, 15 have two years of experience or less (55.5%) and 21 (77.7%) have five years experience or less. Fifteen have only a B.Sc. qualification (55.5%), ten are M.Sc./M.Phil. holders (37.0%) and two (7.4%) have Ph.D.s.

At the institution level, the experience profiles of research scientists are particularly weak at the Agronomy Institute (where none of the scientists employed have more than five years experience), the Horticulture and Coffee Research Institute, and the Lowveld Research Stations. Only the Cotton Research Institute and the Herbarium and Botanical Garden have enough sufficiently qualified researchers to provide the necessary on-the-job training for young scientists. In addition, the Crop Breeding and the Horticulture and Coffee Research Institute have particularly weak qualification profiles. Only two crops scientists are registered for postgraduate degrees at the University of Zimbabwe. None are undertaking postgraduate training overseas at present.

All but two of the 33 research technicians employed in the crops division are agricultural diploma holders, the great majority having been acquired in-country from the Chibero and Gwebi agricultural colleges. As can be seen from an examination of Table 12, crops research technicians are on average more experienced than their research scientist counterparts, with 50% of them having more than five years of research experience. Once again, however, there are significant inter- and intra-institution variations in these experience profiles.

Table 9. Recruitment and Resignations of Research Scientists and Technicians by Institution, 1983.

	Recruitment		Resignations	
	RO/EO	RT	RO/EO	RT
<u>Crops Division</u>				
Agronomy I	4	4	3	1
Cotton RS	1	2	0	3
Crop Breeding I	1	2	0	1
Horticulture & Coffee RI	3	2	1	2
Lowveld RS	1	1	1	1
Sub-total	10	11	5	8
<u>Livestock and Pastures Division</u>				
Grasslands RS	3	1	2	0
Henderson RS	7	2	2	2
Matopos RS	6	1	5	1
Makoholi ES	1	0	0	0
Dairy Services	4	0	2	0
Sub-total	21	4	11	3
<u>Research Services Division</u>				
Plant Protection RI	3	1	5	0
Chemistry & Soils RI	6	0	1	4
Biometrics Bureau	2	1	0	0
Herbarium & Botanic Garden	0	0	0	0
Seed Services	0	0	0	0
Information Services	0	0	0	0
Sub-total	11	2	6	4
GRAND TOTAL	42	17	22	15

Table 10. Qualification and Experience Profiles of Research Scientists by Institute/Station, July 1984.

Institution	Employment		Highest Qualification Attained			Undertaking Postgraduate Training				Research Experience (Years)				
	Actual*	Establishment	BSc	MSc	PhD	MPhil UZ	MSc O/S**	DPhil UZ	Phd O/S	0-2	3-5	6-10	11-15	16+
<u>Directorate</u>	5(0)	5	1	1	3	0	0	0	1	0	0	1	2	2
<u>Crops</u>														
Agronomy Institute	6(0)	16	3	2	1	0	0	0	0	5	1	0	0	0
Cotton RI	7(1)	9	2	4	1	0	0	1	0	1	2	2	0	2
Crop Breeding I	7(0)	14	5	2	0	0	0	0	0	3	0	1	2	1
Horticulture & Coffee RI	6(2)	6	4	1	1	0	0	0	0	3	1	0	0	2
Lowveld RS	5(1)	8	2	3	0	1	0	0	0	3	1	0	0	1
Sub-total	31(4)	53	16	12	3	1	0	1	0	15	5	3	2	6
<u>Livestock and Pastures</u>														
Grasslands RS	7(1)	6	4	2	1	2	0	2	0	2	2	0	1	2
Henderson RS	12(0)	9	8	3	1	3	1	0	1	6	2	2	1	1
Matopos RS	9(1)	10	6	3	0	0	0	0	0	5	1	1	0	2
Makoholi RS	2(0)	2	2	0	0	1	0	0	0	1	1	0	0	0
Dairy Services	6(0)	5	4	2	0	0	0	0	0	4	1	0	0	1
Sub-total	36(2)	32	24	10	2	6	1	2	1	18	7	3	2	6
<u>Research Services</u>														
Plant Protection RI	14(1)	16	8	5	1	0	3	1	0	4	7	3	0	0
Chemistry & Soils RI	24(6)	26	13	8	3	0	2	0	0	11	7	3	2	1
Biometrics Bureau	7(2)	7	5	2	0	0	1	0	1	4	2	0	0	1
Herbarium & Botanic Gdn.	4(1)	5	4	0	0	0	0	1	0	1	0	0	0	3
Seed Services	5(0)	6	4	0	1	0	0	0	0	3	1	1	0	0
Information Services	1(0)	2	1	0	0	0	0	0	0	0	1	0	0	0
Sub-Total	55(10)	62	35	15	5	0	6	2	1	23	18	7	2	5
<u>FSR Team</u>	4(2)	5	1	1	2	1		0		0	2	0	2	0
TOTALS	131(18)	152	77	39	15	8	7	5	3	56	32	14	10	19

* University graduates employed as experimental officers and above.

** O/S = overseas

() = foreign scientists

Table 11. Percentage Distributions of Qualifications and Years of Experience Among Scientists, July 1984.

Institution	Qualifications			Years Experience				
	B.Sc.	M.Sc.	Ph.D.	0-2	3-5	6-10	11-15	16+
<u>Crops</u>								
Agronomy Institute	50.0	33.3	16.7	83.3	16.6	0.0	0.0	0.0
Cotton RI	28.6	57.1	14.2	14.2	28.6	28.6	0.0	28.6
Crop Breeding I	71.4	28.6	0.0	42.8	0.0	14.3	28.6	14.2
Horticulture & Coffee RI	75.0	25.0	0.0	50.0	16.7	0.0	0.0	33.3
Lowveld RS	50.0	50.0	0.0	60.0	20.0	0.0	0.0	20.0
Overall Percentage:	51.6	38.7	9.7	48.4	26.1	9.7	6.4	19.5
<u>Livestock & Pastures</u>								
Grasslands RS	50.0	33.3	16.6	16.6	33.3	0.0	16.6	33.3
Henderson RS	66.6	25.0	8.3	50.0	16.6	16.6	8.3	8.3
Matopos RS	75.0	25.0	0.0	62.5	0.0	12.5	0.0	25.0
Makoholi ES	100.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0
Dairy Services	66.6	33.3	0.0	66.6	16.7	0.0	0.0	16.7
Overall Percentage	66.6	27.8	5.5	50.0	19.4	8.3	5.5	16.7
<u>Research Services</u>								
Plant Protection RI	61.5	30.8	7.7	30.8	53.8	23.0	0.0	0.0
Chemical and Soils RI	55.5	33.3	11.1	55.5	27.8	15.5	0.0	0.0
Biometrics Bureau	80.0	20.0	0.0	80.0	20.0	0.0	0.0	0.0
Herbarium & Botanic Garden	100.0	0.0	0.0	25.0	0.0	0.0	0.0	75.0
Seed Services	80.0	0.0	20.0	60.0	20.0	20.0	0.0	0.0
Information Services	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Overall Percentage	63.6	27.3	9.1	41.8	32.7	12.7	3.6	9.1

Table 12. Experience and Qualification, Profiles for Research Technicians, July 1984.

	Employment		Qualification					Research Experience (Years)				
	Actual	Establishment	Local Dip.	D/S Dip.	ZNTC	HND/C&GII	Cert or less	0-2	3-5	6-10	11-15	16+
<u>Crops</u>												
Agronomy I	12	17	9	3	0	0	0	5	1	2	1	3
Cotton RS	8	11	8	0	0	0	0	3	2	1	2	0
Crop Breeding I	4	10	2	0	0	0	2	1	0	0	1	2
Horticulture & Coffee RI	4	6	3	1	0	0	0	1	2	0	0	1
Lowveld RS	5	10	4	1	0	0	0	1	1	2	0	1
Sub-total	33	54	26	5	0	0	2	11	6	5	4	7
<u>Livestock & Pastures</u>												
Grasslands RS	6	9	3	1	1	0	1	0	1	1	0	3
Henderson RS	7	9	3	2	0	0	2	1	1	2	2	2
Matopos RS	8	11	3	4	0	0	1	1	0	3	0	4
Makoholi ES	3	4	3	0	0	0	0	0	2	1	0	0
Dairy Services	2(1)	6	0	2	0	0	0	1	0	1	0	0
Sub-total	26(1)	39	12	9	1	0	4	3	4	8	2	9
<u>Research Services</u>												
Plant Protection RI	13	16	3	2	1	2	5	4	1	1	2	4
Chemistry & Soils RI	7	20	0	0	2	2	3	0	1	0	1	5
Biometrics Bureau	1	3	0	0	0	0	1	0	0	0	1	0
Herbarium & Botanic Garden	3	3	0	1	0	0	2	0	0	0	0	3
Seed Services	1	4	0	0	1	0	0	1	0	0	0	1
Information Services	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	25(1)	46	3	3	4	4	11	5	2	4	1	13
TOTALS	84(1)	139	42	17	5	4	17	19	12	17	7	29

There is a research officer:research technician current employment ratio of at least 1:1 at all the crops research institutes and stations, with the noticeable exception of the Crop Breeding Institute where this ratio is less than 1.0:0.5. As will be discussed later, this shortage of research technicians has compounded the difficulties involved in training research officers at the Crop Breeding Institute, since there are insufficient research technicians to maintain breeding programs while young research scientists attend postgraduate training courses.

There were 22 vacancies* for research officers (41.5% of establishment) and 21 vacancies for research technicians (38.9%) in the crops division in July 1984. Although the incidence of vacancies was higher in the outlying stations than those situated in the Harare area, this does not appear to be a serious problem. Clearly, however, the overall vacancy situation for FOs and RTs is worrying.

Livestock and Pastures Division

Of the 34 national scientists employed in the livestock and pastures division of DR & SS, only 11 (32.3%) have obtained a higher degree. Whereas Grasslands Research Station is relatively well endowed with M.Sc. and Ph.D. scientists (3 out of 6 nationals), at Matopos Research Station, 6 of the 8 scientists are only B.Sc. holders. This lack of postgraduate training is further compounded by the very limited on-the-job research experience of the majority of livestock and pastures scientists -- for the division as a whole over half have been employed for two years or less and nearly 75% for five years or less. The recent recruitment of graduates to replace the exodus of experienced scientists from Matopos Research Station has resulted in 5 out of the 8 scientists there having less than two years of experience. The situation is even more serious at dairy services with a corresponding percentage of 71.4%. At the other extreme, the pasture sections at Grasslands and Henderson Research Stations have four experienced scientists who could provide on-the-job training for as many as four to five trainee scientists, and yet only one is employed. It is also interesting to note that there is only one scientist (recently recruited from forestry research) in range management and ecology (at Matopos Research Station). Applied research in this area is of critical importance in improving the productivity of the range in ecological area IV.

Up until now, only the assistant director of the livestock and pastures division and the director of Henderson Research Station have obtained postgraduate qualifications (D.Phils.) from the animal science department of the Faculty of Agriculture, University of Zimbabwe. However, another eight scientists are currently registered for M.Phil. and D.Phil. degrees at the university, and another 4-5 are likely to join them in 1984 and 1985. As will be discussed in greater detail in Chapter 5, these are part-time research degrees, jointly supervised by senior scientists in the division and at the university. One other scientist is registered for a Ph.D. (at a South African university). He is expected to submit his thesis in the near future. Only one scientist is attending a full-time M.Sc. program -- a two year course in dairy science in the U.S. No experienced foreign scientists are presently employed in the livestock and pastures division.

* A precise analysis of vacancy rates is difficult because of the practice of holding some university graduates and agricultural assistants against research technician posts.

There are 26 research technicians in the livestock and pastures division, nine of whom have more than 16 + years of experience and only three (11.5%) have two years or less of experience (However, a number of the longest serving research technicians will be retiring during the next three years which will have an important effect on the staffing situation for research technicians in the division). As a group they are also relatively well qualified - 80.7% have agricultural diplomas from local and overseas institutions and only 15.4% have a certificate or less.

On the basis of the 1984/85 establishment figures for the livestock and pastures research division, there were 13 vacancies for research technicians (33.3% of establishment) in July 1984 but none for research officers.

Research Services Division

The research services division employs the largest number of scientists in DR & SS -- 45 nationals and 10 foreigners. Among national scientists, 13 (28.8%) have obtained a higher degree. At the research institute level, the Chemistry and Soils Research Institute has the relatively best qualified staff -- 44.4% with M.Sc. and/or Ph.D. degrees. However, of the three divisions, the research services division has the most inexperienced research scientists -- 74.5% have five years experience or less. With the exception of the Herbarium and Botanical Garden, there are no large variations in this percentage among the institutions. Of the ten foreigners employed, three have less than five years experience, and the remainder over 10 years. The largest concentration of expatriates is in the Chemistry and Soils Research Institute, where six are employed. In comparison with the other two divisions, the research services division has a relatively active postgraduate training program at present, particularly in the Plant Protection Research Institute and the Biometrics Bureau. There are five scientists undertaking M.Sc. degrees at overseas universities and another two are registered for D.Phil. degrees at the University of Zimbabwe.

A total of 25 research technicians work in the research services division. This yields a RO:RT ratio of 1:0.45 which appears unduly high. As a group, they are considerably more experienced than their research scientist counterparts -- 13 out of 25 (52.0%) have more than 16 years experience. As is to be expected, a relatively high percentage have formal laboratory technician qualifications, but 11 out of the 25 (44.0%) have only certificate level or less qualifications.

Vacancies existed for seven research officers (12.7% of establishment) and 21 for research technicians (45.6% of establishment) in the research services division. Eleven of the latter were in the Chemistry and Soils Research Institute.

CHAPTER 4

THE SUPPLY OF AGRICULTURAL RESEARCH PERSONNEL

4.1 Research Scientists

Among the 114 national research scientists employed by DR & SS, only 38 obtained their B.Sc. degree at the University of Zimbabwe (UZ). In part, this is a reflection of the low priority attached to the teaching of agriculture at the University prior to independence. Although the agricultural degree was first introduced over 20 years ago, it was not until 1979 that the Department of Agriculture was upgraded to full faculty status. Since independence however, the importance of developing a strong faculty of agriculture (FOA) at UZ has been clearly recognized both by the government and the university itself. It can be expected therefore that in future most graduate recruits into DR & SS will be UZ products.

The FOA comprises three departments, crop science, animal science, and land management and, at present, offers a three year B.Sc. agricultural degree in four major areas: animal science, crop science, soil science and agricultural economics. Within the options of animal science and crop science. Some production and research biases are introduced through the selection of courses at the Part II or Part III stages. Only a relatively small proportion of graduate recruits into DR & SS are products of the Department of Biological Sciences. Post graduate training is based on M.Phil. and D.Phil. research degrees which, with the exception of the M.Sc. degree in food science (which is offered jointly with the Department of Biochemistry), do not entail any formal coursework. (See Chapter 5).

The increase in the intake of students into FOA since 1981 can be seen from an examination of Table 13. Students choose their major options at the beginning of their first year. What is particularly noticeable is the rapid increase in the numbers opting for agricultural economics and, in 1984, animal science and the absolute decline in enrolments in the crop science department. It is unlikely that these trends in enrolments correspond with the pattern of demand for agricultural graduates and should therefore, be a matter of concern to DR & SS and other major employers.

Table 13. Undergraduate Intake into the Faculty of Agriculture, 1981-1984.

	1981	1982	1983	1984
Animal Science	16	10	16	27
Crop Science	15	21	18	14
Soil Science	0	3	7	8
Agricultural Economics	5	9	15	20
Total Intake	36	43	66	69

In 1982 agricultural students accounted for 4.2% of total enrolments at UZ. While this is a relatively small percentage, the FOA has still managed to attract students of a sufficiently high academic calibre; while the average number of advanced ('A') level examination points scored by the 1981 intake into FOA was only two, by 1984 this had increased to five. However, in common with most other universities in Africa, entry requirements for agriculture are relatively low compared with those for most of the other main professions, most notably, medicine, engineering and law.

The relevance of the FOA undergraduate course for agriculture research will be discussed in the next section. However, in terms of overall grades, six of the 36 graduates in 1983 obtained an upper second or above (one in animal science, two in crop science and three in agricultural economics). Although it is clearly wrong to make a fetish of degree and diploma grades, it is still the case that agriculture research organizations must seek to recruit graduates of the highest academic calibre. Thus, the relatively low output of first and upper second degrees from FOA, (particularly in animal and crop science) is worrying.

The recurrent 1984 budgets for the three FOA departments are: animal science Z\$225,000, crop science Z\$319,000 and land management Z\$257,000 which with the 1984 FOA enrolment of approximately 175 yields an annual average cost per student Z\$4600. Salaries absorb a sizeable proportion of these budgets.

The Faculty of Agriculture Development Project

The Faculty of Agriculture has recently embarked upon a major development program. It has been helped in this task by a specially appointed faculty review committee which is comprised of five experienced academics from overseas universities. The most important recommendations of the committee's report, which was submitted in December 1982, are;

- * To increase the undergraduate output to 100 per year
- * The establishment of a university farm
- * Introduction of a four year degree so as to include one year of practical field experience
- * Greater coursework flexibility
- * Encouragement of postgraduate training

During the next university triennium 1984-1987, the FOA plans to introduce a four year undergraduate degree, and student enrolments are projected to be 180 in 1985, 210 in 1986, and 230 in 1987. From a purely quantitative point of view, with these projected outputs from FOA, the recruitment requirements of DR & SS for graduate scientists between 1984-1988 should be attainable (see Chapter 9).

FOA staff establishments are expected to increase from 28 in 1984 to 42 in 1987. In order to cope with the increase in enrolments, the FOA is to receive considerable assistance from the United States Agency for International Development (USAID) between 1983-1987. A total of US\$6,332,000 is to be provided which will cover *inter alia* the costs of new infrastructure (new buildings, a farm, research and study facilities); six experienced academics from Penn State and Michigan State Universities; and 20 postgraduate fellowships to be undertaken at these universities.

A major objective of the FOA development program is to recruit and train nationals to become full faculty members. At present, only four of the staff are African Zimbabweans. It is planned, therefore, to appoint up to 30 nationals as staff development fellows during the next three years. They will register for M.Phil. degrees at the university but will be given the opportunity to do up to 12 months of course work at Penn State or Michigan State Universities. The exact type and amount of coursework is to be decided upon by a special committee comprising representatives from the FOA and the Ministry of Agriculture.

The Undergraduate Syllabus

The B.Sc. degree in agriculture at UE is intended to provide a broad training in agriculture which is considered appropriate for the execution of development programs, particularly in the communal areas. Thus there are limited options in crop science, animal science, soil science and agricultural economics. While some senior managers and scientists in DR & SS believe that these graduates have adequate formal training to be able to embark effectively on a career in research by subsequent on-the-job training and eventual registration for a M.Phil., it is the team's view that such a general undergraduate agricultural degree can not be considered as being sufficient training for most agricultural research scientists. This is particularly true of disciplines such as plant pathology, entomology, nematology and for many areas of crop science, animal science and soil science.

A close examination of the undergraduate curricula shows that there are not more than one-two specialized courses offered at the Parts II and III (out of a total 11-12 courses) for most of the major agricultural research disciplines. For example, animal science graduates take only one course in grassland science in Part II and only one course in livestock improvement in Part III and yet they may be deployed in pasture science or animal breeding; crop science graduates take two courses each in crop protection and genetics and plant breeding at Parts II or III. Furthermore, there is very limited teaching of research methodology, biometrics, and the special study is an elective in all the options. Under these circumstances, it is difficult to see how this training on its own can be considered adequate for research scientists covering a wide range of specialist disciplines. It is necessary but not sufficient.

4.2 Research Technicians

The supply of research technicians to DR & SS is mainly from the Colleges of Agriculture at Chibero and Gwebi. The Colleges which are administered by the Ministry of Agriculture through the Chief of Agricultural Education, offer a two year diploma course leading to the Zimbabwe National Diploma in Agriculture. Whereas, prior to independence, the colleges provided a three year training program in farm management for the commercial sub-sector, the course structure has been modified in recent years in order to cater for the manpower requirements of the communal area sub-sectors, particularly in the areas of extension and development. The current diploma course is two years in duration and consists of four compulsory subject areas: field husbandry, animal husbandry, agricultural engineering, and farm management and land use planning. No options are offered. Minimum entrance requirements are GCE ordinary level passes in English language, mathematics and a science subject, or equivalent, and at least one season's experience in practical commercial farming.

Approximately 80 students are currently enrolled at each of the colleges and student capacity at Chibero is shortly to be increased to 120. With the continuation of the low drop out rates, the annual output of diploma holders should be sufficient to meet all major recruitment demands during the next five years. Laboratory technicians are usually recruited with either GCE Ordinary or Advanced level qualifications and must then attend day and block release courses for at least four years at Harare Polytechnic in order to obtain the Zimbabwe National Technician Certificate (ZNTC) and the City and Guilds Laboratory Technicians Diploma Part II.

4.3 Agricultural and Technical Assistants

There were 29 laboratory based technical assistants and 59 agricultural assistants employed by DR & SS in March 1984. While these tiers of research personnel are considered to fall outside of the terms of reference of this study, they nonetheless perform important support functions.

Agricultural assistants are recruited from four agricultural institutes (at Mlezu, Esigodini, Rio Tinto and Kushinga-Pikelela). They had a combined student output of 41 in 1982/83 but this is expected to increase to approximately 350 by 1986/87. The certificate course lasts two years and is heavily oriented towards practical skill training. (A modular system of training is currently being introduced.) Minimum entry requirements are two years of post-primary education. While an increasing number of certificate holders have obtained 'O' level passes, very few manage to obtain the entry requirements for the agricultural colleges while working on the job.

Technical assistants, on the other hand, are in a better position to upgrade themselves to research technician status, since many of them have the required 'O' level passes to enrol for the ZNTC day release course at Harare Polytechnic. Approximately 5 technical assistants at DR & SS are undertaking this course at present.

CHAPTER 5

THE PROVISION OF IN-SERVICE TRAINING

5.1 Research Scientists

Information concerning past, present and expected masters and doctoral training of research scientists presently employed at DR & SS is summarized in Table 14. Of the 43 M.Sc./M.Phil. holders, only eight received their degree from the University of Zimbabwe. This is partly because many of these officers have only recently returned from usually long periods overseas in both developed and developing countries prior to independence, but, as was mentioned earlier, it is also a reflection of the weakness of the department/faculty of agriculture at the University, especially during the 1970s. Only two of the eight Ph.D. scientists in DR & SS were supervised by staff at UZ.

There has been an appreciable increase in the number of DR & SS scientists currently registered for postgraduate degrees at the University of Zimbabwe - three from crops, seven from livestock and pastures, and two from research services. This is probably due to some improvement in the relationship between DR & SS and the faculty of agriculture and a more positive attitude by the majority of senior DR & SS management to local postgraduate training opportunities. In the case of livestock and pastures scientists however, the recent decision by the Cattle Producers Association to award a relatively large number of postgraduate scholarships each worth US\$3,000 per annum has also provided an important incentive to researchers to register for these degrees. All seven will be supervised from the animal science department. Two of the three crop scientists are registered in the crop science department, while the two research services scientists have supervisors in the Department of Biological Sciences.

Seven of the eight scientists currently expected to go for M.Sc. training in 1984 will attend universities in the United Kingdom. An important reason for this concentration is the marked preference by DR & SS management for 9-12 month M.Sc. degree courses as opposed to 24 month courses, which are generally offered by US universities (see Chapter 6).

It is widely agreed that the postgraduate training capacities of the faculties of agriculture and science at the University of Zimbabwe must be developed both to provide the required skilled personnel but also to establish strong research programs within the university. The Faculty Review Committee concluded that 'greater benefit would accrue to both trainee and the university if more postgraduates were on campus'. However, the committee made no specific recommendations on the development of postgraduate courses.

Table 14. Past, Present and Expected Postgraduate Training By Country.*

	Attained		In-training 1984		Expected 1984	
	M.Sc./M.Phil.	Ph.D./D.Phil.	M.Sc./M.Phil.	Ph.D./D.Phil.	M.Sc./M.Phil.	Ph.D./D.Phil.
Zimbabwe	8	1	8	4	?	?
United Kingdom	15	3	2	0	7	0
United States	5	1	3	0	1	0
Other developed	0	2	0	1	0	0
USSR/East Europe	2	0	0	0	0	0
Developing countries	8	0	0	0	0	0
South Africa	4	1	0	1	0	0
Not known	1	0	0	0	0	0
Totals	43	8	13	6	8	0

* excluding Directorate.

While senior members of the faculty of agriculture are also in favour of postgraduate training, at this early stage in the development of the faculty, it is felt that the first priority is to establish strong undergraduate teaching programs. Thus, the three constituent departments will not be in a position to offer taught M.Sc. courses until 1987 or 1988. (The exception is the proposed M.Sc. in crop protection to be jointly run by the crop science and biological science departments, probably in 1986). As an interim strategy it is planned to develop a strong M.Phil. program which will allow students the option of undertaking up to one year of course work overseas.

The present capacity of the Department of Biological Sciences to offer taught masters courses is also very limited. Entomology and pathology M.Phil. degrees have not been offered by the department since 1977/78. The most recent M.Phil. ecology course was run in 1981 but was attended mainly by employees from the parks and wildlife service. While M.Phil. taught courses in entomology and pathology are advertised in the 1984 university syllabus, plans to mount them are still in their early stages. Furthermore there has been virtually no consultation between the department and DR & SS who is seen as the major client for these courses.

Short Courses

From Table 15 it can be observed that while a relatively large proportion of crop scientists have attended at least one short course (67.7%), the corresponding percentages for livestock and pastures and research services scientists are considerably lower (31.4% and 32.6% respectively). Moreover, specialist courses account for a much larger proportion of total short courses for crop scientists compared with scientists employed in the other two divisions. Over 14 of the 19 specialist crops courses were held at or sponsored by the international agricultural research centers (IARCs) and were attended by mainly younger scientists from the agronomy and crop breeding institutes for periods ranging from 1 to 6 months. Most of them considered these courses to be useful, particularly in the areas of applied research methodology, although a minority stated that they were probably more appropriate for research technicians. The remaining five specialist courses for crop scientists were also held at or sponsored by organizations overseas.

Five out of the seven farming system research (FSR) courses were run by the Faculty of Agriculture at the University of Zimbabwe under a contract from The International Maize and Wheat Improvement Center (CIMMYT). They were started in 1982 and a further three year contract has recently been signed. The courses are held twice yearly - the first in February for three weeks on FSR research methodologies and the second in September for two weeks on experimental analysis. They are attended by up to 30 agricultural scientists from eastern and central Africa.

Relatively very few livestock and pasture scientists have attended specialist short courses (6/35) although this is partly the result of the very high levels of recruitment in recent years. Only one of the six has visited an overseas institution (The International Livestock Center for Africa), the others being run locally by the Animal Breeders Cooperative and the Cattle Cooperative. Only the livestock and pastures member of the animal production systems research team has attended the FSR course at the University of Zimbabwe. Among research services scientists, two

Table 15. Attendance by Research Scientists at Short Courses

I. Specialist Courses

Crops	Number	Livestock & Pastures	Number	Research Services	Number
Agronomy	6	Artificial Insemination	2	Pathology	4
Breeding	3	Animal Management	1	Nematology	1
Entomology	1	Animal Nutrition	1	Soil Science	1
Horticulture	1	FSR	1	FSR	1
FSR	7	Miscellaneous	1	Agrometeorology	1
Conservation & Land Use	1			Instrumentation	3
Sub-total	19		6		11

II. General Courses

	Crops	Livestock & Pastures	Research Services
Management/administration	2	1	4
Biometrics	3	4	1
Computing	0	0	2
Public Speaking	1	2	0
Report Writing and Library	0	3	0
Sub-total	6	10	7

III. Study Tours/contact visits 3 5 1

Total Courses Attended	28	21	19
Total Number Individuals	31	35	46
Number Individuals Attending	24	14	15
% Attendance	77.4	40.0	32.6

pathologists attended (4) IARC courses and three others have also attended courses at overseas institutions. Other than isolated instrumentation courses very little short term training has been undertaken in the chemistry and soils research institute.

General courses have been attended mainly by older scientists in DR & SS. This is because (i) the biometrics and report writing courses offered by DR & SS in the 1970s have been discontinued and (ii) attendance by DR & SS personnel at the public speaking, conservation and land use and other courses run by the training unit of AGRITEX has tended to lapse in recent years. The DR & SS biometrics course was usually run over a six months period and required regular attendance at lectures at the biometrics bureau in addition to individual study programs.

The training in management/administration is mainly accounted for by a two week course run for approximately 15 senior DR & SS managers at the Public Service Training Center in May 1982. The curriculum focused almost exclusively on basic administrative procedures relating to finance and personnel in the Civil Service in Zimbabwe. The evaluations of most of those who attended this course were generally favourable although there was a feeling that too much time was spent on "bureaucratic procedures", and no specific material was developed that related directly to current managerial changes in DR & SS.

5.2 Research Technicians

Long-Term Training

There are two types of long term training opportunities available to officers employed in the research technician cadre; obtaining an ordinary or higher technician qualification or degree level training. At present however, relatively few technicians are undertaking either of these types of training; in the research services division, two technicians are attending Harare Polytechnic for Part II of the City and Guilds Laboratory Technician Diploma and one is studying for the ZNTC. None of the crops or livestock technicians are presently studying for formal technician qualifications.

In the past it has been very unusual for a research technician to be upgraded to a research scientist, mainly because of the stipulation that the technician must complete a full training in an appropriate university degree subject. In order to be eligible to attend the university, the technician must also have obtained a first class diploma from a recognised agricultural college, and if admitted, the officer must resign her/his job (thus receiving no salary during the three-four years of training). Should the individual choose to rejoin DR & SS after finishing the degree, the entry point is still at the bottom of the research officers scale. Another important reason is that with the prevailing conditions of service in DR & SS, there is little financial incentive for the research technician to go for degree training. This is discussed further in Appendix 2.

At present in DR & SS, only one research technician (in the Crop Breeding Institute) has been upgraded to research officer status and this is considered to be an exceptional case since he did not have an appropriate degree. It is clear however, that among research technicians recruited

since independence there is growing demand for degree training (see Chapter 6). Two out of the six technician level recruits admitted by the faculty of agriculture in 1984 were from DR & SS.

Short Courses

From Table 16 it can be observed that, in both absolute and relative terms (compared with research scientists), the numbers of research technicians attending short courses are considerably lower, especially in the research services division. Among research technicians employed in the crops division, five have attended specialist courses run or sponsored by IARCs. The irrigation and conservation and land use courses were held in-country by AGRITEX. In the livestock and pastures division, none of the 27 technicians have been to an IARC (most notably ILCA) or any other institution overseas. As with their scientist colleagues, a few have attended locally run artificial insemination, and animal management and health courses all of which lasted no more than 4 weeks. In the research services division, only 2 research technicians have attended specialist courses. Neither of these was overseas. Finally, all general courses have been run or sponsored by DR & SS itself (biometrics and management/administration) or the training section of AGRITEX (public speaking).

Table 16. Attendance by Research Technicians at Short Courses

I. Specialist Courses

Crops	Number	Livestock & Pastures	Number	Research Services	Number
Agronomy	2	Artificial Insemination	2	Botany	1
Breeding	2	Animal Management	1	Crop Production	1
FSR	2	Animal Health	1		
Irrigation	1	Agrometeorology	1		
Conservation & Land Use	2	Irrigation	1		
		Miscellaneous	3		
Sub-total	9		9		2

II. General Courses

	Crops	Livestock & Pastures	Research Services
Management/administration	2	1	0
Biometrics	2	1	2
Public Speaking	3	2	0
Machinery Maintenance	0	2	0
Sub-total	7	6	2
Total Courses Attended	16	15	4
Total Number Individuals	35	27	26
Number Individuals Attending	13	10	4
% Attendance	37.1	37.0	15.3

CHAPTER 6

THE DEMAND FOR TRAINING

6.1 Scientist and Technician Perceptions

As a broad generalization, the level of demand for postgraduate training in DR & SS is relatively high among younger, less experienced scientists. There are two sets of underlying reasons for this. First, it is the result of a general awareness that postgraduate training has become the norm for agricultural research scientists, not just in the developed countries but in developing ones as well. Many have already had the opportunity to visit research institutions overseas and interact with other scientists who themselves have benefited from postgraduate training. In common with young researchers all over the world, they are anxious to acquire as quickly and painlessly as possible the skills and knowledge necessary to become full members of the research community; and secondly, these scientists also correctly perceive that the acquisition of postgraduate qualifications will directly improve their incomes and, in the context of the present extremely buoyant staffing situation in DR & SS, considerably enhance their promotion prospects. More generally, in the immediate post independence situation in Zimbabwe, as was the case in the other African countries, it is difficult for a young graduate to sit on the sidelines while attractive, often foreign scholarships are awarded to his/her peers. Many realize that such scholarships may not be the most appropriate training for their career but accept that they are nonetheless highly desirable and increasingly indispensable credentials for the most sought after job opportunities in what is a fiercely competitive labour market. While it is easy to condemn this "diploma disease" it is extremely difficult to avoid.

Tables 17 and 18 summarize the written responses of all scientists employed by DR & SS to an open-ended question concerning their requirements for long-term (i.e. more than 9 months) training requirements. Analysis of these data indicate that there are several important factors which influence individual attitudes to postgraduate training. Of perhaps greatest importance, is the perceived adequacy of on-the-job training provided by experienced colleagues. While this factor does not seem to exert an independent effect on the numbers of eligible scientists who explicitly stated that they wanted to do a masters degree (see Table 17) it does, however, influence both the proposed timing and form of such training. More specifically, at those research institutes and stations where effective on-the-job training can be provided, significantly more scientists state that they are happy to do pure research postgraduate degrees. Conversely, where there is a paucity of experienced scientists who can act as supervisors, young researchers at these institutions tend to opt for M.Sc. course work degrees which at present involves attending universities overseas. Moreover, since the former group are generally more contented with their on-the-job training, they see less urgency to go for postgraduate training than the latter group who feel that, in the absence of experienced supervision, their best option is to receive formal, coursework instruction as quickly as possible.

Table 17. Individual and Management Assessments of Demand for Postgraduate Degree Training.

	Individual Assessment				Management Assessment				To go overseas 1984	
	M.Phil.UZ	M.Sc. Course	M.Sc.N.S.	Ph.D.	M.Phil.UZ	M.Sc. Course	M.Sc. N.S.**	Ph.D.	M.Sc.	Ph.D.
<u>Crops</u>										
Agronomy I	0	3	1	1	0	0	0	0	1	0
Cotton RI	1	0	0	1	0	0	0	0	0	0
Crop Breeding	1	0	1	2	0	1	0	0	1	0
Horticulture & Coffee RI	0	2	0	0	0	0	0	0	0	0
Lowveld RS	1	0	0	2	0	2	0	0	0	0
Sub-total	3	5	2	6	?	3	0	0	2	0
<u>Livestock & Pastures</u>										
Grasslands RS	0	0	0	0	1	0	0	0	0	0
Herderson RS	1	0	0	2	1	0	0	0	0	0
Matopos RS	2	0	3	1	4	0	0	0	0	0
Makoholi ES	0	0	0	0	1	0	0	0	0	0
Dairy Services	0	1	0	0	0	0	0	0	0	0
Sub-total	3	1	3	3	7	0	0	0	0	0
<u>Research Services</u>										
Plant Protection RI	0	3	0	0	0	1	0	2	2	0
Chemistry & Soils RI	1	6	1	1	2	2	1	4	2	0
Biometrics Bureau	0	1	0	0	0	2	0	1	0	0
Herbarium	0	1	0	0	0	1	0	0	0	0
Seed Services	0	2	0	0	0	0	0	0	2	0
Information	0	0	0	0	0	0	0	0	0	0
Sub-total	1	13	1	1	2	6	1	7	6	0
GRAND TOTAL	7	19	6	10	n.a.	9	1	7	8	0

* No specific estimates were available.

** Not specified.

Table 18. Potential M.Sc./M.Phil. Training Requirements for Graduate Research Staff, March 1984.

	Crops*	Livestock	Services	Totals
B.Sc. holders only	20	25	35	86
In-training M.Sc./M.Phil. or expected 1984	4	7	12	23
B.Sc. experienced/ unsuitable**	4	6	6	16
Eligible M.Sc./M.Phil. training	12	12	17	41
Explicit individual desire to do M.Sc./M.Phil.***	10	7	9	26

* includes FSR team.

** i.e. foreign scientists; resignations pending.

*** as stated in questionnaire.

The second important factor is the discipline of the young scientist. New graduate recruits in entomology, pathology, nematology, and soil chemistry and soil physics strongly believe that they need to attend specialist postgraduate training courses in order to embark effectively on careers in these disciplines. The same is also true of a relatively large number of eligible masters candidates employed in the crop division who do not consider their undergraduate training as being sufficient preparation for them to be able to run viable research programs.

It can be seen from Table 19 that only 9 out of a total of 27 eligible candidates expressed an explicit interest in registering for a post-graduate degree at the Ph.D./D.Phil. level. This is mainly attributable to the fact that many of the scientists have only recently acquired their masters level qualifications, but lack of appropriate DR & SS and university supervisors is also regarded as being an important explanatory factor among both crops and research services scientists. All want to do their doctoral research on relevant problems for the agricultural sector in Zimbabwe and realize the need, therefore, to register for a D.Phil. at the University of Zimbabwe and continue to work on-the-job.

Among research technicians, there appears to be a growing demand for agricultural degree training; seven crops and two livestock technicians specifically stated that they wanted to study for a degree. However, the demand for formal technician qualifications is non-existent among research technicians in these two divisions and, in the research services division, only two laboratory technicians want to attend the City & Guilds Part II course and one the ZNTC course.

The pattern of demand for short courses (as stated in questionnaire returns) among research scientists and technicians is shown in Tables 20 and 21. Between 40-50% of scientists expressed an interest in attending short courses. Demand is highest for breeding, instrumentation, management/administration, biometrics and computing courses. Considerably higher proportions of technicians in the crops and livestock and pasture divisions want to attend short courses than their scientist colleagues - 60% and 55.5% respectively. Among research services technicians demand is absolutely and relatively low - only 26.9%.

6.2 Management Perceptions

Clear differences of opinion exist among senior managers in DR & SS concerning the appropriate policies and practices which are deemed necessary for the training of agricultural research scientists and technicians. Essentially, two schools of thought can be delineated on this issue. The first group tend to be strong adherents of the traditional system of training in the department. This has attached

Table 19. Potential Ph.D./D.Phil. Training Requirements for Graduate Research Staff, March 1984.

	Crops*	Livestock	Services	Totals
B.Sc. and M.Sc. holders	14	10	16	40
Registered Ph.D./D.Phil. or expected to be in 1984	1	3	4	8
M.Sc. experienced/unsuitable**	2	1	2	5
Eligible Ph.D./D.Phil.	11	6	10	27
Explicit individual desire to do Ph.D./D.Phil.***	5	3	1	9

* includes FSR team.

** i.e. foreign scientists: resignations pending; near retirement.

*** as stated in questionnaire.

primary importance to the acquisition of structured, on-the-job experience by the young researcher working in close conjunction with experienced scientists. Such an "apprenticeship" is seen as essential in order to instil proper attitudes towards research activities, i.e. the socialization function, while at the same time providing sufficient opportunities to learn basic practical and experimental skills. It is argued that typically it takes three to five years of such training before the young researcher can start to become productive.

This traditional training approach or philosophy does not believe that formal postgraduate training courses are generally necessary or desirable for young researchers working in the majority of disciplines. With only a few exceptions, the first degree is regarded as an adequate basis from which the trainee can, through his own individual study with the

assistance of an experienced and knowledgeable mentor, gradually acquire the specialist skills and knowledge required for his job. In other words, there is an insistence that formal full-time training can rarely be substituted in a satisfactory manner for on-the-job experience and training. Respondents who had long experience working in research organizations in other countries expressed their concerns about what they saw as the serious disadvantages of sending young scientists for postgraduate training overseas. Such training is seen to be expensive (although the direct costs are rarely borne by national governments) but, more seriously, it is criticized as being usually irrelevant to the agricultural research priorities of the country and can exacerbate the attrition problem. It also results in the trainee being away for long periods of time in the wrong environment early in his/her career, without ever having had the opportunity to undertake day to day research activities. The other major criticism voiced about longer-term taught courses, both at local and overseas institutions, is that most

Table 20. Demand for Short Courses by Graduate Staff, March 1984.

I. Specialist Courses

Crops	Number	Livestock & Pastures	Number	Specialist Services	Number
Agronomy	2	Artificial Insemination	1	Entomology	3
Breeding	6	Pasture Seed Production	1	Pathology	1
Pathology	1	Animal Management	1	Soil Science	2
Horticulture	3	Animal Nutrition	1	Chemistry	1
FSR	1	Legume Agronomy	1	Pedology/	1
		Laboratory Management	1	Land Eval	1
				Seed Path.	2
				Instrumentn.	6
Sub-total	13		6		16

II. General Courses

	Crops	Livestock & Pastures	Specialist Services
Management/administration	5	4	6
Biometrics	5	4	1
Computing	0	6	2
Public Speaking	0	2	1
Driver's Licence	0	2	0
Sub-total	10	18	10

III. Study tours/contact visits

	1	2	0
Total Number Courses Demanded	24	26	26
Number Scientist Requesting	15	14	18
Total Employment Scientists	31	35	46
% Requesting Courses	48.4	40.0	39.1

Table 21. Demand for Short Courses by Research Technicians, March 1984.

I. Specialist Courses

Crops	Number	Livestock & Pastures	Number	Specialist Services	Number
Agronomy	5	Animal Management	3	Botany	2
Breeding	1	Poultry	1	Pathology	2
Entomology	1	Ecology - Veld & Pasture	2	Nematology	1
Horticulture	2	Microbiology	1	Horticulture	1
Conservation & Land Use	1				
Irrigation	1				
Range Mgmt.	1				
Miscell.	2				
Sub-total	14		7		6

II. General Courses

	Crops	Livestock & Pastures	Specialist Services
Management/administration	3	2	0
Biometrics	7	4	0
Computing	0	3	1
Public speaking/extension techs.	3	1	1
Farm Management	3	4	0
Machinery/Instrument Maintenance	4	0	0
Sub-total	20	14	2

III. Study Tours	0	1	1
Total Number Courses Demanded	34	22	9
Number Technicians Requesting	21	15	7
Total Employment Technicians	35	27	26
% Requesting Course	60.0	55.5	26.9

scientists, however inexperienced, are heavily involved in undertaking important research programs, and cannot afford to be absent from the department, in many cases not even for a month (although it would seem that this is difficult to reconcile with the view concerning the low productivity of inexperienced researchers).

While the proponents of the traditional approach tend to discourage taught postgraduate training programs, registration for M.Phil. and D.Phil. postgraduate degrees at the University of Zimbabwe, based on supervised research projects undertaken while on-the-job, are generally encouraged, since they entail minimum time commitments by the students. The acquisition of these postgraduate qualifications is regarded as being beneficial for the output of the research programs, while at the same time improving the motivation and career and salary prospects of the scientists. In the past, however, registration for these degrees has mainly been the result of individual initiatives rather than from management acting on the basis of explicitly stated training policies. Most respondents stated that ideally a researcher should have worked for at least three to five years before being allowed to register for such a degree, so that they have a clear idea of the kind of research project they want to undertake.

With regard to short-term training, prior to independence DR & SS attached quite considerable importance to young researchers regularly attending in-service courses in such areas as biometrics, public speaking, and scientific report writing, plus more specific courses run by organizations such as AGRITEX, The Cattle Cooperative, etc. Concern was expressed that attendance at these courses has tended to lapse in recent years at a time when there is a particularly urgent need by recently recruited research personnel for them. Attendance at short courses overseas was not, however, seen to be of particularly high priority for most scientists. In part, this is because many of the courses on offer are not regarded as being relevant and/or are too disruptive -- a common complaint is that they are too simple, since they invariably have to cater for individuals with a wide range of abilities and divergent backgrounds. But it is also partly due to the legacy of the pre-independence UDI period, when opportunities to travel overseas, except to South Africa, were very limited. Under such autarchic conditions there was little point in keeping up-to-date with courses on offer in other countries and it is apparent that this limited knowledge of available opportunities has tended to carry over into the post-independence period. There is also a prevalent belief that such courses have to be "earned". However, the importance of regular study tours, at least every two to three years, and other kinds of contact visits to institutions overseas is regarded as essential, especially for more senior scientists. It was noted that while scientists at the university are able to undertake such tours and visits on a regular basis, scientists at DR & SS face considerable difficulties in obtaining approval for similar contact visits.

Finally, as with research scientists, the traditional training approach considers that research technicians can only acquire the bulk of their knowledge and skills as a result of prolonged on-the-job training under experienced supervision, either from other technicians, or the research scientists who they are intending to support. While the diploma training received at the Chibero and Gwebi agricultural colleges is considered adequate, technician recruits receive no specific training in

agricultural research. In terms of formal training other than general courses in biometry and public speaking there is little demand for attendance at more specialized technical courses.

The second distinct approach to training in DR & SS attaches much greater importance to the need to send B.Sc. recruits for specialist postgraduate training early on in their careers. Learning on-the-job is considered of paramount importance, but it is felt that after one to two years experience intensive M.Sc. course work is indispensable in order for the researcher to become fully productive. Thus, pure research degrees undertaken on-the-job are not considered to provide sufficient depth and breadth of knowledge. Indeed, some respondents believe that such degrees encourage undue specialization too early in the scientist's career. More important still, at many stations and institutes it is argued that there are insufficient numbers of experienced scientists to ensure that the traditional approach of relying on on-the-job experience will work. Thus the general response of this group to the argument that taught M.Sc. degrees are too disruptive of on-going research programs is that this is a short sighted policy.

Proponents of this approach generally have a definite preference for one, rather than two year M.Sc. programs, and are strongly in favour of the University of Zimbabwe running these courses where there is adequate local demand. However, for more specialized courses, it is recognized that trainees will have to go to universities overseas. They also have a more positive attitude towards Ph.D./D.Phil. degrees as long as research is undertaken locally.

In general, this group of managers are younger and have themselves completed M.Sc. and Ph.D. degrees at universities overseas. They are particularly concerned about the likely adverse consequence of frustrating the training aspirations of young researchers, in particular the danger that they will resign to take up jobs elsewhere which offer more attractive training opportunities.

While the two groups have similar attitudes concerning the need for regular contact visits with scientists overseas, the second group attach more importance to short training courses, most of which are offered by foreign institutions. The other important difference is in their respective approaches to the training of support staff with the second group arguing that research technicians should be given much greater opportunities to attend overseas courses and, where they are of appropriate calibre, to be allowed to upgrade themselves to the research officer level by going to study for an agriculture degree at the university.

As can be observed from an examination of the management assessments of training demand presented in Table 17, the differences between the two groups are manifested quite clearly among the three divisions in DR & SS. Most notably, the assessment of training requirements by managers in the Research Services Division are considerably higher than in the other two divisions, particularly for taught M.Sc. courses and correspond closely with the pattern of demands enumerated by their research scientists and technicians -- in fact, these manager's assessment of Ph.D. training requirements is much higher, probably because they take a long view perspective than the individuals themselves. In the Crops Division there are important differences in the two sets of assessments, particularly with regard to the estimates for M.Sc. coursework training. However, in the Livestock Division there is greater correspondence.

6.3 The Traditional Training Approach: Some Limitations.

The traditional training philosophy in DR & SS has emphasized the overriding importance of inculcating young research personnel with the attitudes and commitment required for productive careers in agricultural research. The Department's unwavering adherence to the primacy of this socialization function is in marked contrast to the situation in many other developing countries where, all too often, the importance of purposeful on-the-job training has been neglected, with young scientists being sent on protracted training courses, mainly overseas. While we agree strongly with the Department's concern about research attitudes, we have a number of reservations about the present training practices.

First, the traditional approach to training only works effectively where there are experienced scientists and managers to impart the necessary practical and theoretical knowledge, and ensure the development of the correct attitudes. Experience in other agricultural research systems has shown that putting the young, untrained graduate "in the deep end" without this support invariably results in low quality researchers and/or high rates of attrition. At present in DR & SS only one research institution, the Cotton Research Institute, and a number of isolated research sections at other stations and institutes, have sufficiently experienced scientists to make the traditional training strategy work. From our interviews with young scientists in DR & SS it is apparent that many are in urgent need of such support.

Secondly, the traditional training approach generally undervalues the importance of formal training courses, both long and short term, in enhancing the practical and theoretical knowledge of scientists and technicians. It is now widely recognized that further postgraduate training in general research methodologies and more specialist disciplinary courses is a minimum requirement for research scientists. Attempting to learn these techniques and knowledge whilst working exclusively on-the-job is not an efficient mode of training, and is particularly unrealistic in the present situation in Zimbabwe, given the large number of trainees and the shortage of experienced scientists. The M.Phil. and D.Phil. research degrees offered by the University of Zimbabwe do not have course work components and the level of supervision of students is minimal. They cannot, therefore, be considered adequate forms of postgraduate training.

Thirdly, because the traditional training approach regards formal training courses as unnecessary except for a small minority of "specialist" disciplines, training activities for most scientists and technicians tend to be sporadic and ad hoc, and this is further compounded by the considerable divisional autonomy that exists concerning staff training decisions in DR & SS. There is increasing evidence to suggest that such an unsystematic approach is generating considerable frustrations among young research scientists, who want to benefit from postgraduate training. There is an increasing likelihood that many of the most able will be enticed away from DR & SS to take up more attractive training opportunities with other employers, most probably the university. There seems to be a lack of awareness among many managers in DR & SS about the potential seriousness of this threat.

Fourthly, the lack of a clear and specific policy on postgraduate training has meant that links with the Faculties of Agriculture and Science at the University of Zimbabwe have remained generally weak, and

even non existent in some instances (the Animal Science Department seems to be the only notable exception). Most contacts have resulted from the initiatives of individual scientists to register for postgraduate degrees. Thus to date DR & SS has played little role in the development of the Faculty of Agriculture, and in particular in the area of curriculum development and the future of postgraduate degree training. Fortunately, the need to rectify this situation is now clearly recognized in DR & SS.

CHAPTER 7

A TRAINING PLAN FOR DR & SS

The aim of this chapter is to outline the main characteristics of a systematic but realistic training plan for research scientists and technicians employed by DR & SS.

7.1 On-the-job Training

While there is an urgent need to increase and systematize formal training for scientists, (at least during the next five to ten years, while DR & SS rebuilds an experienced cadre of research personnel), structured on-the-job working experience must continue as the predominant form of training. In order to ensure the maximum effectiveness of this on-the-job training process, DR & SS will need to consider seriously the following actions.

First, the importance of carefully vetting potential recruits. Generally, only individuals of the highest intellectual calibre with a strong grounding in agriculture are able to make significant contributions to the agricultural research effort. Consequently, DR & SS should continue to maintain its policy of recruiting mainly agricultural graduates, keeping the number of science graduates to the minimum required in order to undertake essential service functions and appropriate research activities. A second class degree, preferably an upper second, should normally be considered the minimum entry qualification for a research scientist. However, individuals with lower grades have also proved to be good researchers. This underlines the importance of being able to vet effectively as large a pool as possible of job applicants. DR & SS should therefore endeavour to regularize its contacts with students at the appropriate departments of the University of Zimbabwe, so that they are well informed about careers in agricultural research. This would be an important activity of the training officer. More important still is the need to develop a strong vacation placement scheme in DR & SS and encourage students and staff to collaborate more effectively with DR & SS scientists. Joint research projects, in particular, provide an ideal vehicle for students to find out more about agricultural research. Once selected, it is essential that the successful applicant is recruited as expeditiously as possible. At present, however, DR & SS is losing potential recruits as a result of bureaucratic delays in the Ministry of Agriculture and the Public Service Commission.

Second, the formalization of an explicit apprenticeship or traineeship scheme for research scientists. It must be recognized that attractive training opportunities are a critically important means of attracting, retaining, and motivating research personnel in Zimbabwe at the present time. This is especially because it is unlikely that DR & SS will be able to offer preferentially higher salaries, as for example has been suggested in the IFAD/IBRD National Agricultural Extension and

Research Project Staff Appraisal Report of June 1983. Consequently, within three to four months of joining DR & SS, new recruits must be given the opportunity to discuss their training needs with their institute/station heads and the training officer, on the basis of which an individual training program can be tentatively outlined, and the necessary procedures initiated to identify possible types and combinations of training activities. As will be outlined in greater detail below, for research scientists this will normally involve: a one week induction/familiarization course run by DR & SS after their first season of research; an opportunity to attend a more specialized short term training course (probably of no more than one to two months in duration) related to their specific area of work, followed after approximately two years of on-the-job experience by registration for a masters degree which will normally require some course work to be undertaken. While the traineeship for research scientists should not take the form of a legally binding agreement as is the case in more conventional apprenticeship schemes, it is essential that scientists are confident that they will receive well structured, carefully programmed and high quality training opportunities both on and off the job.

Another important feature of the traineeship scheme is that it should be of a standard period, and all trainees should be treated equitably. Thus, for research scientists, the traineeship should be programmed to last approximately four years -- the first two years of on-the-job training, followed by a further two more years completing course work and a thesis/dissertation for a masters degree. Clearly there will be some variation in this period, depending on the needs and competence of the individual, and the specific training requirements of his/her research program, but these should be kept to a minimum. Finally, there should be a strong financial incentive to complete the traineeship.

Third, maximum use must be made of existing experienced staff in DR & SS in training young scientists and technicians. Many of the former group realize the importance of their training role, and this is reflected in the positive comments of the young scientists with whom they work. However, there are others who could be encouraged to devote more of their time to this training function; and, at a number of institutes/stations there are experienced staff who do not have younger scientists or technicians to supervise and train. While this situation can be more easily tackled where vacancies exist, there are some officers who are due to retire during the next five years who are unable to train a replacement on-the-job because of a lack of establishment positions. For these individuals, a strong case should be made for the creation of a supernumerary position. This will be discussed in greater detail in Chapter 9.

Finally, there is an urgent need to increase the number of experienced scientists in DR & SS. As has already been discussed in Chapter 3, the experience and qualification profiles of scientists and technicians employed at a number of research institutes/stations are extremely weak, with the result that these personnel are unlikely to receive adequate on-the-job training; and, as will be discussed in Chapter 9, with possible annual recruitment of graduates averaging 18-20 for the period 1984-1988, this situation is likely to get worse during the next few years. While we have argued that there is a particularly strong case to be made for scientists at these research stations and institutes to go for formal postgraduate training, it is still imperative

that they work in conjunction with an experienced scientist. It is our firm belief, therefore, that DR & SS should recruit a small group of experienced scientists from overseas. We are well aware of the problems that can arise with the employment of expatriates, but as the government itself recognizes in its current Transitional Development Plan 1981/82 - 1984/85, expatriates will have to play important "gap filling" roles during the next five years or so. At present DR & SS only has eight experienced expatriate scientists out of a total of 136 graduates employed. It is clear that these scientists have played an invaluable role in helping to maintain research programs and provide in-service training. With the continuing loss of experienced national scientists, the need for more expatriates will increase.

The team recommends therefore that at least seven additional expatriate scientists are recruited*. Details of these are presented in Chapter 8. They should be scientists with considerable experience, working in ecological conditions similar to those in Zimbabwe and, they should have a knowledge and sensitivity to the general scientific and managerial situation of an organization such as DR & SS. Their contracts should be for a minimum of three years, and they will be required first and foremost to undertake explicitly prescribed training activities for local personnel. They should not occupy substantial management posts in DR & SS. Finally, these scientists should be selected by, and responsible to DR & SS management.

7.2 Masters and Doctoral Degrees

A central component of the training plan for scientists in DR & SS is the need to undertake masters degree training during the third and fourth years of the traineeship period. All trainee scientists who are considered of sufficient calibre to pursue a productive career in agricultural research should be allowed to go for this training and not just the "high flyers". The normal rule will be that the trainee will be expected to have worked satisfactorily on the job for 18-24 months, i.e. at least two growing seasons, before being allowed to start on a formal post-graduate degree.

Under the present circumstances, there is a need for three basic types of master's degree. All three will involve combinations of both course work and research for a dissertation, and will be one to two years in duration. With the Type 1 arrangement trainee scientists will continue to register for an M.Phil. degree at the Faculties of Agriculture or Science at the University of Zimbabwe. However, unlike the present M.Phil. degree, they will normally be expected to undertake 3-12 months of course work, usually during the first year of their program. This course work should be sufficient to provide an adequate grounding in the trainee's field of specialization, but should at all times be kept to an absolute minimum. In the second year, the trainee will be required to complete a dissertation with the assistance of two experienced supervisors - one from the university and one from DR & SS. It is recognized that, for some subjects, the field or laboratory work necessary for the dissertation cannot be completed in one year, but in

* The three expatriate pedologists to be recruited under the IBRD/IFAD project have been excluded.

the majority of cases it should be possible for experiments to be started sufficiently well in advance for them to be completed in time for the writing-up stage.

The amount of course work required for each trainee will be determined by a joint committee comprised of representatives from DR & SS, the Ministry of Agriculture, and the Faculties of Agriculture and Science. As was mentioned earlier, a similar committee has been established to determine course work requirements for M.Phil. students being sponsored for fellowships to the U.S. An important part of the training officer's duties will be to service this committee by providing detailed information on relevant training courses and making the necessary arrangements well in advance.

While it is very important to develop local postgraduate training capacity in the agricultural sciences as soon as possible, it is unrealistic to expect the Faculties of Agriculture and Science to be able to mount a wide range of taught M.Sc. courses for at least the next four to five years. Both faculties are presently undergoing rapid expansion of their undergraduate student enrolments and it is essential, therefore, that teaching capacity at this level is adequately developed before undertaking post-graduate training programs. Thus, for most of the period 1964-1968, DR & SS will have to rely on overseas universities in order to provide the required M.Sc. course work for their trainees. However, by stipulating that Type 1 trainees should register for postgraduate degrees at the university, and that they undertake the research for their dissertation at DR & SS under university supervision, this provides a firm basis from which to develop the postgraduate training capabilities of the faculties.

The proposed 3-12 months of course work under the Type 1 M.Sc./M.Phil. scheme will require careful planning. While some flexibility is highly desirable in ensuring that the trainee receives the necessary course work whilst minimizing the time away from on-going research programs, the ability to offer different course menus will involve the prior establishment of special arrangements with overseas universities and other relevant establishments. Such a special arrangement has already been made by the Faculty of Agriculture with the Penns State and Michigan State Universities and we recommend that DR & SS explores the possibility of extending this arrangement in order for the number of M.Sc./M.Phil. fellowships under the faculty staff development plan to be substantially increased to include DR & SS's own postgraduate training needs. In addition, however, in view of the numbers and range of disciplines of potential M.Sc. trainees at DR & SS, the department should try to reach agreement with 2-3 other universities. While it is likely that these will be North American institutions, (given the considerable flexibility of postgraduate training programs), consideration should also be given to developing relationships with universities in other parts of the English speaking world, especially the United Kingdom, Australia, India, and perhaps other Anglophone African countries.

Details of the number of DR & SS trainee scientists who should undertake the Type 1 masters program are presented in Chapter 8. The team firmly believes that such a program is the most appropriate for the majority of young scientists working in the crops and livestock and pasture research divisions at the present time. It must be stressed that

this should be regarded as a short term policy of no longer than five years duration, after which time the Faculties of Agriculture and Science will be in a position to begin to offer the bulk of the postgraduate course work in the major fields of agricultural science.

M.Sc./M.Phil. Type 2 and 3 programs are considered necessary for those trainee scientists who require specialized postgraduate training. Such training is not amenable to the flexible, eclectic shorter course work philosophy underlying the Type 1 program, but must instead be conducted on the basis of a comprehensive series of inter-related courses. The majority of trainees requiring this type of training can be adequately catered for by what we have termed the Type 2 program which requires full time attendance at intensive 9-12 months M.Sc. degree courses. A small minority, however, will need to go for 24 month degree courses -- the Type 3 program -- but where these involve dissertations, field work for these should ideally be undertaken in Zimbabwe. While a large proportion of Type 2 and 3 trainees are employed in disciplines covered by the research services division (entomology, pathology, nematology, soil sciences, biometrics) a relatively small number from the crops, and livestock and pasture divisions will also need to undertake such training. Again, details are presented in Chapter 8.

Doctoral Degrees

The team recommends that those scientists who have completed a masters degree and who have the commitment and competence should be allowed to register for Ph.D./D.Phil. degrees. However, all doctoral research at DR & SS should be undertaken on the job. To spend three years or more overseas is too long and disruptive of research programs and it is likely that the research will not be relevant. Thus all doctoral candidates should register with the appropriate faculty at the University of Zimbabwe and have one supervisor from the university and one from DR & SS. Where suitable academic supervisors are not available, then arrangements should be made for an overseas supervisor to be appointed and sufficient budgetary provision for the student to visit his/her supervisor at least once during the research formulation and writing-up stages. The research thesis/dissertation must be carefully selected in order to ensure that while academically acceptable it is directly relevant and supportive of on-going programs. It is for this reason that the scientist will need to spend some time on the job before he/she is in a position to have accumulated enough experience and knowledge to know how to approach Ph.D./D.Phil. research. The team recommends therefore, that most scientists should spend at least two years after having obtained their masters degree working on the job before registering for a Ph.D./D.Phil.

7.3 Short Courses

As is widely recognized, agricultural research scientists and their support staffs must continually keep abreast with advances in agricultural science during their careers. For the most part this updating process must be their own responsibility which requires them, therefore, to keep well informed by reading the appropriate literature and, where necessary, corresponding with other scientists overseas who are pursuing similar research activities. However, regular short-term

training courses and contact visits are also essential components of any well-designed training strategy for senior agricultural research personnel. Four main categories of short-term* training activity broadly defined can be delineated:

- * induction courses
- * in-country technical courses
- * overseas technical courses, conferences and contact visits, and
- * specialized agricultural research management courses.

- * For definitional purposes, all courses less than nine months are considered to be short-term.

Induction Courses

Being put in at "the deep end" has proved to be rather a challenging and, at times, lonely process for many young researchers at DR & SS. As part of the traineeship program, it is strongly recommended that DR & SS organize annual induction courses for new scientist and technician recruits, most of whom it must be remembered, will continue to be fresh graduates from university and agricultural college. Such a course, or courses, would have the following objectives. First and perhaps most important, to get young research staff together so as to develop group solidarity and esprit de corps. This, in turn, should help to encourage interdisciplinary team work research, which hopefully will become an increasingly important modus operandi in DR & SS.

Second, new recruits need to be given the opportunity to familiarize themselves with DR & SS and the roles of agricultural research and extension in Zimbabwe. This would entail discussions and lectures by DR & SS senior management and leading scientists in addition to social scientists from the university and elsewhere. The young scientist and technician must be made aware of the needs of their primary clientele, the farmer (and, in particular, the farmer in the communal areas), think about how agricultural research can help to meet these demands, and begin to grapple with the complexities of the development process in a newly independent country such as Zimbabwe. They must become knowledgeable about the organization and management of DR & SS, both internally and in relation to the other major public and private institutions with which the department interacts. Visits should be arranged to research stations and institutes in the Harare area which will allow young scientists to show each other around their places of work and meet their colleagues.

Third, some lectures on simple administrative management skills and procedures which are required for their new jobs should be given, i.e. project preparation including budgeting, developing good relations with their support staff, and basic report writing skills and techniques; It is recommended that with the high recruitment levels that are likely to prevail for the next five years, the induction course is held annually at the Agricultural Research Centre, Harare after the new recruits have had 4-5 months experience in the field during a growing season, i.e. probably in May-June and be at least one week in duration.

In-country Courses

Our discussions with DR & SS management, scientists, and support staff, coupled with the analysis of the training requirement questionnaires indicate that short courses covering a range of topics should be offered in-country, either by DR & SS itself, or, where possible, by other public and private organizations. These courses can be divided into two types: general courses which cater for research staff from a diversity of research institutions such as in the subject areas of biometrics, computing, public speaking, farm management; and more specialist courses for research staff working in particular disciplines or as a team in a common research project or program e.g. FSR/OFR research methodologies, crop protection courses, artificial insemination. Wherever possible, DR & SS should make maximum use of relevant training courses that are on offer outside the department. However, where such courses are not available and there are sufficient numbers of research staff in DR & SS and perhaps elsewhere who would benefit from a particular course, then the team recommends that the Department provides appropriate instruction as frequently as is necessary. Details of courses that DR & SS could organize for existing staff are presented in Chapter 3. For more specialized areas, where there is unlikely to be enough local demand to warrant the running of a full course, the necessary training will have to be undertaken overseas although consideration should be given to the possibility of inviting experts from overseas for short periods of time to give on-the-job training and advice.

Teaching personnel for DR & SS training courses can be drawn from three sources.

- * DR & SS personnel themselves and, in particular, expatriate scientists who the team recommends should have explicit training responsibilities. Senior national scientists should, of course, also be used but many of them have heavy managerial responsibilities which are likely to prevent them from becoming involved.
- * Other local expertise, in particular from the relevant faculties at the University of Zimbabwe and individuals from other appropriate public and private institutions. A potentially useful source of trainers is those experienced scientists who have left (or are about to leave) DR & SS but continue to work locally -- although their competence as teachers will have to be carefully considered.
- * Overseas expertise will also need to be used for some courses. Drawing upon the scientific and teaching abilities of carefully vetted overseas scientists has proved to be an extremely effective and cost effective way of providing in-country training. Most respondents the team spoke to who identified a need for a particular DR & SS organized course, were able to think of suitable individuals who could be contacted.

Overseas Courses, Conferences and Contact Visits

As pointed out earlier, most senior agricultural research personnel in Zimbabwe will need to undertake specialist short courses at overseas training and research establishments at various times in their careers.

If courses and course candidates are carefully selected, then this type of training can be very effective in imparting specific knowledge and skills and, equally important, help to sustain the motivation of research staff as a reward for work well done; and since most courses are usually 1-3 months in duration, there is the important advantage that they cause little disruption to on-going research programs and to the life of the individual, especially if he/she has a family. The team strongly recommends, therefore, that overseas courses, conferences, and contact visits are seen as integral components of the training strategy for DR & SS.

While it is difficult to generalize about the type and frequency of short courses to be attended (given their diversity and the specificity of individual training needs), experience in other countries suggests that short intensive courses for scientists and technicians in the very early stages of their careers are particularly valuable in moulding attitudes and learning the basics of research methodology. It is for this reason that we recommend that the majority of trainee scientists are given the opportunity to attend a 1-2 month course overseas some time during the first two years of their traineeship. Courses at the IARCs are particularly useful in developing skills appropriate for carrying out applied and adaptive research, although since they will not be able to cater for all individuals, DR & SS will need to send trainees to other research institutions which also have the knowledge and experience of generating and transferring agricultural technology to small farmers. An important task of the training officer will be to identify systematically these institutions and consider their potential training role for DR & SS.

Once the traineeship has been completed, scientists will still need to go for short courses overseas. However, as they become more experienced, the importance of such courses generally declines while the demand for less structured and informal visits and attendance at international scientific gatherings increases. While the benefits of these types of contact visits are often less tangible, they are indispensable in maintaining the productiveness of the researcher. The team recommends, therefore, that as a general rule, researchers should be able to attend a course or make a contact visit of up to two months, on average, every 3-4 years during his/her career.

Every staff member from DR & SS who attends a short course and/or conference should be expected to prepare a detailed report of his/her activities and, where appropriate, give a seminar to colleagues and interested outsiders. This should help to ensure that participants from DR & SS are seen to be benefiting to the greatest extent possible from such courses while at the same time providing important feedback information on the value of the training experience.

The costs of most short courses overseas are normally borne by the training institution, either directly or indirectly via sponsorship by bi- and/or multi-lateral donors. Thus, the greater expense of such courses is rarely a pertinent factor. However, it is essential that DR & SS have some funds specifically assigned for short courses and contact visits overseas in order to ensure sufficient flexibility of response to meet all planned short-term training requirements. The size of this fund will be discussed in Chapter 9.

Management Training

The effectiveness of national agricultural research depends on good management. Invariably, however, management training for agricultural research has been seriously neglected. The team urges DR & SS therefore to ensure that appropriate training courses are organized for senior and middle level managers on a regular basis.

As was discussed in Chapter 6, the provision of management and administration training was consistently identified as an important training need by institute and station heads in DR & SS as well as other outside respondents. The potential importance of such training is also reflected in the responses to the task analysis section of the questionnaire, the results of which are summarized in Tables 22 and 23. It can be observed that the median value for the amount of time spent by institute and station heads on management tasks is 60% with lower and upper quartile values of 40% and 75% respectively. The corresponding values for section heads (median 15%, lower quartile 10%, and upper quartile 25%) are considerably lower but still significant. From a financial perspective, the DR & SS directorate and institute and station heads, a group of approximately 20 managers, now control a total annual budget of over Z\$ 10 million.

A short study on the training requirements for agricultural research management in DR & SS was conducted by a team from ISNAR in March 1983. Three major objectives for managerial training activities were identified:

1. There is a wide variety of quite specific administrative skills which can be strengthened through training. Many of these relate directly to finance and personnel. The need for such training is well recognized in DR & SS.
2. There is a set of more general management skills, especially in such areas as decision-making and leadership of subordinates, which can also be improved through training. But there is considerably less awareness in the department of the potential role of courses and seminars in developing them.
3. Regardless of the type of administrative/management skills to be taught, training courses can play a key role in enhancing the commitment of research scientists to their general managerial responsibilities. It is clear that the variability observed in the managerial performance of officers in the department is due not only to differences in the acquisition of certain skills, but also the differences in their degree of commitment to their tasks as managers.

The team recommends, therefore, that an annual one- two week management workshop for all senior managers in DR & SS (probably from section heads upwards and including senior administrative support personnel within the Directorate) should be held at congenial locations in Zimbabwe. The workshop would have two main objectives. First, as with the induction course for new recruits, it would provide the opportunity for DR & SS managers to discuss planning and managerial problems which they have encountered, and possible ways of rectifying or improving these. Secondly, a combination of lectures, group discussions and case studies on administrative procedures and also more general

research management issues as these specifically relate to the Zimbabwean context. For the 1985 workshop it is recommended that the group pay particular attention to the formulation and evaluation of research programs since this is clearly an area of utmost importance as DR & SS begins the process of developing a national plan for agricultural research.

Table 22. Task Analysis of Assistant Directors and Institute/Station Heads (% working time).

	Individual	Research	Manag./ Admin.	Formal Training	Extension Develop.
<u>Assistant Director</u>	1	5	80	10	5
	2	15	80	0	5
	3	5	75	10	10
<u>Institute/Station Head:</u>					
<u>Crops</u>	1	45	55	0	0
	2	40	60	0	0
	3	80	15	0	5
	4	80	5	10	5
	5	40	40	0	20
	6	10	75	5	10
	7	30	60	0	10
<u>Station/Unit Head:</u>					
<u>Livestock</u>	1	2	95	1	2
	2	40	40	10	10
	3	40	45	5	10
	4	0	80	10	10
<u>Institute/Unit Head:</u>					
<u>Specialist Services</u>	1	15	80	5	0
	2	55	35	10	0
	3	20	75	0	5
	4	33	65	0	2

Table 23. Task Analysis of Section Heads (% working time)

	Individual	Research	Manag./ Admin.	Formal Training	Extension Develop.
<u>Crops</u>	1	50	30	10	10
	2	80	5	0	15
	3	70	10	5	10
<u>Livestock</u>	1	80	13	6	2.5
	2	70	15	2	13
	3	50	30	10	10
	4	90	10	0	0
	5	75	15	0	10
<u>Specialist Services</u>	1	60	25	0	0
	2	60	30	5	5
	3	0	20	5	75
	4	10	25	5	60
	5	50	5	5	40
	6	80	20	0	0

Two (or possibly three) resource persons would be needed for such a course; an expert trainer on administrative practices in the public sector and a senior agricultural research manager preferably with a background in training and with particular expertise in the area of research programming.

Finally, it is also essential that all executive and senior clerical support staff in DR & SS are given the opportunity to attend appropriate in-service courses offered by the Public Service Training Sector in Harare.

7.4 Technician Training

While much of the philosophy underlining the training plan for research scientists applies also to research technicians, as a distinct cadre in the agricultural research organization there are specific training requirements for research technicians.

Long-term courses

Unlike the research scientist, there is not the same need for formal long-term training for research technicians. While the agriculture diploma course has been reduced to two years, it still provides the basic practical and theoretical skills for the kind of tasks undertaken by the field technician. Given the severely practical nature of the research technician's job, on-the-job experience over a long period must therefore continue as the basis of the training process for this cadre. It is for these reasons that the team does not believe that a formal traineeship with a specific trainee grade is necessary for the research technicians. However, for the majority of laboratory technicians who join DR & SS without full technician qualifications, it is important that adequate provision and encouragement is given for these individuals to attend the necessary training courses early in their careers.

As was noted earlier, there is a growing demand among research technicians to undertake degree courses. With the increasingly high quality of the intake into the agricultural colleges, there are likely to be a growing number of diploma holders who have the intellectual attributes to become research officers. The team recommends therefore that, if after at least two-three years on the job there is strong evidence to suggest that DR & SS would benefit significantly from a research technician going for degree training, then the officer should be allowed to do so. While such upgrading is only likely to be appropriate for a relatively small proportion of research technicians, it is nonetheless important that DR & SS adopt a systematic approach to the training of these individuals. To this end, the team recommend that (i) research technicians who are admitted to the university are allowed to keep their job in DR & SS and are subject to the same regulations and arrangements concerning payment of salaries while attending fulltime training institutions as apply to research scientists. In return, research technicians will be expected to be bonded to work for DR & SS for the appropriate period after completing their degrees. (ii) Urgent attention be given to determine what part of the agricultural degree course diploma holders can be exempted from. Certainly there seems no need for research technicians to do the proposed one year of practical work. By at least reducing the degree to three years, research technicians can be upgraded to research officer status with only one additional year of formal instruction than the direct entry university intake.

Short courses

It is the team's view that research technicians would benefit from more short-term training courses than has been the case in the past. It is recommended therefore that during the first two-three years at DR & SS research technicians attend a similar induction course to the one already described for research scientists, and also be given the opportunity to undertake a one-two months course directly relevant to their responsibilities in the research program. For field technicians in the crop division, the production courses at IARCS are particularly relevant. These and other possible courses are considered in more detail in Chapter 8. Finally, it is equally important that research technicians continually update their practical and theoretical knowledge and, while this is unlikely to be as significant an activity as it is with research scientists, nonetheless carefully selected courses should play an important role. As a very general rule, the team recommends that research technicians attend such courses at least every four-five years on average.

CHAPTER 8

TRAINING REQUIREMENTS

The training requirements for the present stock of senior agricultural research personnel in DR & SS have been assessed using the data and information derived from the questionnaires, and interviews with scientists, technicians and managers. The team's analysis has also taken into account the need for research program stability and development during the next 4-5 years. This has resulted in specific, rather than general recommendations, which if implemented will considerably improve the quality and performance of research staff.

In a limited number of cases it has been necessary to recommend the recruitment of additional expatriates whose functions will be to provide or strengthen expertise in specific priority areas of need, to assist with on-the-job training of newly recruited research scientists and technicians, and to carry research program responsibilities during the absence of nationals attending training courses. Requirements for short courses overseas in connection with masters degree training at UZ and for the acquisition of necessary techniques or exposure to specific research methodologies are discussed, and suggestions made for in-country on-the-job training which can be organized and delivered successfully within the department with or without assistance from local and overseas institutions and persons.

The training requirements are presented separately for each institute/station and unit. To these must be added the additional requirements which are likely to arise as a result of future attrition and expansion; these are presented in Chapter 9. It should be pointed out that scientists who are expected to start postgraduate degrees in 1984 have been excluded from this analysis.

8.1 The Crops Division

The training requirements for the Agronomy, Cotton, Crop Breeding, Horticulture and Coffee Research Institutes and for the Lowveld Research Stations are discussed below and summarised in Table 24.

Agronomy Institute

Two of the research scientists in this Institute require postgraduate training. It is recommended that one should go for a one year M.Sc. course in weed science at an appropriate institution overseas in 1985, and the second should register for the M.Phil. degree at UZ in agronomy or crops science also in 1985. The second candidate should be allowed to take appropriate overseas postgraduate courses in order to strengthen his field research work and academic background in research methodology and modern systems agronomic research. The team considers this training essential in view of the innovative and challenging approaches that will be involved in the Institute's research thrust in the communal areas.

In considering the particular strengths and weaknesses of the Institute in relation to its current research priorities, it is

Table 21. Outstanding Masters Degree Training Requirements for Crops Scientists, July 1984.

	M.Phil/UZ		1 year M.Sc.O/S		2 year M.Sc.O/S		Additional Foreign Scientists
	1985	1986	1985	1986	1985	1986	
Agronomy I							
Crop Production	1	0	0	0	0	0	1
Crop Physiology	0	0	0	0	0	0	0
Weed Science	0	0	1	0	0	0	0
Sub-total	1	0	1	0	0	0	1
Cotton RI							
Breeding	0	0	0	0	0	0	0
Pathology	0	0	0	1	0	0	0
Agronomy	0	1	0	0	0	0	0
Sub-total	0	1	0	1	0	0	0
Crop Breeding I							
Maize	0	0	0	0	0	0	0
Small Grain	0	0	0	0	0	0	0
Winter Cereals	0	0	0	0	1	0	0
Oilseeds	0	1	1	0	0	0	1
Sub-total	0	1	1	0	1	0	1
Horticulture & Coffee RI							
Horticulture RC	0	1	0	0	0	0	1
Rhodes-Inyanga ES	0	1	0	0	0	0	0
Coffee RS	0	0	0	0	0	0	0
Sub-total	0	2	0	0	0	0	1
Lowveld RS							
Agronomy	1	0	0	0	0	0	1*
Horticulture	0	0	0	0	0	0	0
Sub-total	1	0	0	0	0	0	1
GRAND TOTAL	2	4	2	1	1	0	4

* irrigation expert

recommended that an expatriate agronomist experienced in the area of on-farm research be recruited. This officer should have both training and research responsibilities, Communal Area Research Trials (CART), to collaborate with the farming systems team, and serve as the departmental supervisor for the M.Phil. candidate.

The Crop Breeding Institute

The training needs of the Crop Breeding Institute are substantial for a variety of reasons. These include the fact that most of the research officers are inexperienced scientists with first degrees in agriculture; the only senior scientist who could supervise the work of these young scientists has a full research program in addition to his duties as head of the institute; and there are a variety of crops (winter cereals, sorghum and millet, soybean, groundnut, sunflower, etc.) whose breeding programs will need to be further developed and strengthened. It is also apparent that, in view of the limited formal instruction in plant breeding at the first degree level at UZ, it is necessary to provide higher level courses for trainee crop breeders as part of their postgraduate training.

Plant breeding as a science-based discipline has evolved rapidly in many industrialized countries (most notably the U.S.A., Canada, U.K., and Netherlands), where some of the greatest advances have been made in the crops for which the Institute has a mandate. Thus the team firmly believes that it would be highly advantageous for the Institute to associate itself with and benefit from these advances through training links and the two-way flow of ideas and concepts. This will encourage a greater diversity of crop breeding concepts, approaches and practices in the Institute. It is therefore recommended that the following officers should undertake masters degree training; one should be sent for a two year M.Sc. course in cereals breeding (winter cereals) during 1985 and 1986 (preferably in the U.S. or Canada); one should go for a one year M.Sc. degree in plant breeding (groundnuts) in 1985; and the experimental officer working on soybean should register for an M.Phil. degree at UZ in 1986, and be given the opportunity to attend a postgraduate course overseas of six months' duration or less as part of the requirements for his M.Phil. The other more experienced soybean breeder would benefit from a short research attachment course at a suitable IARC such as IITA where he would be able to interact with scientists in the Grain Legume Improvement Program.

In view of the substantial requirements for training in this Institute and, in particular, the need for some of the scientists to be away for periods of six months to two years, it is recommended that the individual crop breeding programs that do not have research technicians at present be provided with at least one each as early as possible, and furthermore that in 1985 a senior expatriate oil seed breeder be recruited on contract for a period of three years to strengthen the programs and assist in the training and supervision of the locally registered scientists.

The Cotton Research Institute

Two of the research scientists at the Cotton Research Institute need postgraduate training. In order for the breeder-pathologist, who has spent most of his time to date working as a breeder, to make the desired impact as a cotton pathologist, it is essential he receives some formal training in plant pathology. It is recommended, therefore, that he undertakes a one year M.Sc. degree in plant pathology in 1986, preferably in an institution with a strong tradition of research work in disease resistance breeding or with the possibility of taking some graduate courses in this area. The second person should register for an M.Phil. in agronomy or crop science at UZ in 1986 but should also be able to benefit from short term overseas postgraduate courses specially selected with his academic needs, circumstances and crop emphasis in mind during the period of his registration.

The Horticulture and Coffee Research Institute

Most of the Zimbabwean scientists at the institute are young and inexperienced. Of the two eligible candidates for masters degree training, one already has a B.Sc. from a U.S. university and the other was trained in crop science at UZ. There is an urgent need to strengthen horticultural research in the department in view of the significance of horticultural crops in Zimbabwean agriculture. Excellent facilities are available for productive research work. It is recommended therefore that these two trainees should register for M.Phil. degrees at UZ in 1986, but that a senior expatriate horticulturist be recruited on contract for three years to assist in the development of this important research area and in the supervision of the trainee scientists. The faculty of agriculture will also have an expatriate horticulturist on its staff as part of the USAID assistance. This combination should ensure the effective supervision of the two M.Phil. candidates, establish and consolidate interactive research work between the university and the Department, and generally create a solid basis for future training and research in horticulture.

The Lowveld Research Station

The one candidate eligible for masters training at this research station is an agronomist. It is recommended that he should register for an M.Phil. degree at UZ in 1985. This should involve some short-term courses in soil/water management and agronomy. The team also recommends that in view of the importance of irrigation agronomic research at this station and in many of the resettlement and other types of schemes sponsored by government, an experienced expatriate scientist be recruited in the area of irrigation and water management. This officer should have major training and research functions and at least two young Zimbabwean research/experimental officers should work with him during his three year contract. The Department, in concert with the university should, as a matter of priority, make a determined attempt to develop the area of irrigation and water management from this nucleus.

8.2 The Livestock and Pastures Division

The Livestock and Pastures Division has so far been able to organize on-the-job training effectively because of a fairly good balance between the numbers of experienced and inexperienced scientists, the existence of

good research facilities at the major stations, and a reasonably good working relationship with the university. With the exception of Matopos Research Station where there is now a critical shortage of senior scientists, it would seem appropriate to continue and strengthen the program of on-the-job postgraduate training and emphasize the training role of the more senior scientists whose valuable experience should be tapped for this purpose. Such training would, however, need to be reinforced with study visits and short technical courses overseas as considered appropriate.

The masters degree training program for eligible scientists in the livestock and pastures division, which is detailed below and summarized in Table 25, is considered to be the minimum necessary to maintain viable research programs at the main research stations. Some additional training will also be required for the supernumerary staff that are being recommended in order to strengthen specific programs. (See Chapter 9.)

The Grasslands and Henderson Research Stations

Most of the research officers at these two stations have received suitable training, or are already registered for M.Phil. degrees at UZ and are being effectively supervised by DR & SS and university staff. There is however an urgent need to fill vacancies for pasture science scientists and for the creation of some supernumerary posts in critical areas where continuity of research and services must be ensured for the future.

Three candidates are assessed as eligible for masters training (one at Grasslands and two at Henderson). It is recommended that these three candidates be trained on the job by registering for the M.Phil. degrees at UZ in 1985, (one in the area of reproductive physiology and two in animal nutrition). Supervision arrangements for these candidates are at present satisfactory.

The Matopos Research Station

The Matopos Research Station presents a special case where the training requirements have become greatly accentuated by the loss of four experienced scientists during 1983. There are now only two senior scientists (animal breeding and plant ecology), one of whom also heads the station, and six young scientists in urgent need of training. The distant location of Matopos in relation to the university and other stations, the lack of expertise in some priority areas of research, and the need to avoid overloading the existing senior research and management staff with supervisory duties calls for immediate and specific investments in both overseas and local training, and in research support. It is recommended therefore that the following arrangements be made for these trainee scientists:

- * one to be sent for a two-year M.Sc. degree in range management (preferably in the United States) in 1985.
- * one to be sent for a one-year M.Sc. course in animal breeding (Edinburgh or elsewhere) in 1986.

Table 25. Outstanding Masters Degree Training Requirements for Livestock and Pasture Scientists, July 1984.

	M.Phil/UZ		1 year M.Sc.O/S		2 year M.Sc.O/S		Additional Foreign Scientists
	1985	1986	1985	1986	1985	1986	
Henderson R.S.							
Livestock	2	0	0	0	0	0	0
Pastures	0	0	0	0	0	0	0
Sub-total	2	0	0	0	0	0	0
Grassland RS							
Livestock	1	0	0	0	0	0	0
Pastures	0	0	0	0	0	0	0
Sub-total	1	0	0	0	0	0	0
Matopos RS							
Range Livestock Nutrition	1	1	0	1	0	0	1
Livestock Brdg. Range Management & Ecology	0	0	1	0	0	0	0
	0	0	0	0	1	0	1
Sub-total	1	1	1	1	1	0	2
Makoholi ES	0	1	0	0	0	0	0
Dairy Services	1	0	0	0	0	0	0
GRAND TOTAL	5	2	1	1	1	0	2

- * one to register for the an overseas M.Sc. degree in range/animal nutrition in 1986.
- * one to register for the M.Phil. degree in biochemistry at UZ in 1986.
- * one to register for the M.Phil. degree in nutrition (with an analytical chemistry bias) in 1985.

In the last two cases opportunities should be sought for short-term courses that would enable the candidates to strengthen their academic background in their major subject areas during the period of registration.

In addition to these training requirements, there is an urgent need to strengthen immediately range nutrition and range management research. The team recommends therefore that two experienced expatriates be recruited on three year contracts to provide expertise in these two areas of research. These scientists are essential in order to provide a balanced research program. Apart from their direct research inputs in the programs, they should also have explicit training responsibilities for trainee scientists.

Makoholi Experiment Station

One livestock scientist at the station is eligible for masters training and it is recommended that he should register for an M.Phil. in animal science at UZ in 1986. Adequate arrangements will have to be made for the planning of his program and the supervision of his work both in the department and the university. He should also be required to take a suitable short course during the period of registration for the M.Phil.

Dairy Services

The existing staff in dairy services are relatively well trained in relation to their functions in services and some research. The major training need here is for short courses in the more technical areas of dairy services. This can be achieved through short-term attachments and study visits to major dairy installations and establishments overseas. The team recommends that one of the dairy officers who has had five years experience register for the M.Phil. degree at UZ in 1985.

8.3 The Research Services Division

Training requirements for the present stock of scientists in the Plant Protection Research Institute, the Chemistry and Soils Research Institute and the other units and services in this division are presented below and summarized in Table 26.

The Plant Protection Research Institute

Two scientists are deemed eligible for postgraduate training. The nematologist should register for an M.Phil. degree at UZ in 1985, and the entomologist should be sent for a one year overseas M.Sc. course in 1985. The only experienced entomologist is also head of the institute.

Table 26. Outstanding Masters Degree Training Requirements for Research Services Scientists, July 1984.

	M.Phil/UZ		1 year M.Sc.O/S		2 year M.Sc.O/S		Additional Foreign Scientists
	1985	1986	1985	1986	1985	1986	
Plant Protection RI							
Entomology	0	0	1	0	0	0	1
Pathology	0	0	0	0	0	0	0
Nematology	1	0	0	0	0	0	0
Sub-total	1	0	1	0	0	0	0
Chemistry & Soils RI							
General Analyt. lab.	0	1	1	0	0	0	0
Special Analyt. lab.	0	1	0	0	0	0	0
Crop Nutrition	0	0	0	0	0	0	0
Pedology & Soil Survey	0	0	1	0	0	0	0
Soil Prod. Lab.	0	0	1	0	0	0	0
Sub-total	0	2	3	0	0	0	0
Biometrics Bur.	0	0	1	1	0	0	0
Herbarium & Bot. Garden	0	0	1	0	0	0	0
Seed Services	0	0	0	1	0	0	0
Information Svcs.	0	0	0	0	0	0	0
GRAND TOTAL	1	2	6	2	0	0	1

The trainee entomologists will need considerable guidance and there are also sizeable in-service training needs in pest control methods and general plant protection technology. It is recommended therefore that a senior expatriate entomologist is recruited for a period of three years. This officer should also assist in the establishment of the regional plant protection stations.

The Chemistry and Soils Research Institute

The training requirements of the Chemistry and Soils Research Institute involve both local and overseas courses in areas ranging from analytical chemistry to soil microbiology. Five of the existing staff eligible for training are recommended for the following postgraduate degrees:

- * one to be sent overseas for a one year M.Sc. course in analytical chemistry (with emphasis on methods) in 1985.
- * one to be sent overseas for a one year M.Sc. course in pedology and land evaluation in 1985.
- * two to register for M.Phil. degrees at UZ in analytical chemistry in 1986. It is also recommended that both candidates be given opportunities for short courses overseas to study special analytical techniques and instrumentation as integral parts of their postgraduate training programs.
- * one to be sent overseas for a one year M.Sc. degree in soil microbiology in 1985.

The team recommends that, in view of the progressive introduction of new analytical methods and equipment, provision should be made for two short-term consultants to visit the institute to offer advice and generally assist national research personnel in these areas. These visits are necessary because of the increasing pressure for faster and more comprehensive services, especially with the expansion of services to the communal and resettlement areas.

Information Services

It is essential that DR & SS has effective library and public relations services. It is recommended therefore that the officer in charge of this unit be sent overseas for a one year masters degree in library science or information science in 1986. During his absence it will be necessary to have a short-term library/information science consultant. We suggest that attempts be made to secure such a consultant through technical assistance and that a research technician level person should also be appointed to act as an assistant to the Information Officer.

The Biometrics Bureau

With two officers currently undertaking postgraduate degrees in the U.S. and Canada, the Bureau should be reasonably well staffed to fulfil its service and training functions when they return.

In respect of the two other trainees eligible for postgraduate training, it is recommended that both candidates be sent overseas for one year M.Sc. degrees (one in 1986 and the other in 1987), since there is no suitable training in agricultural statistics currently available in Zimbabwe. The team suggests that one of these candidates should specialize in the use of statistical methods for livestock research.

The Herbarium and Botanical Garden

The main outstanding training requirement in the Herbarium and Botanical Garden is the need to upgrade the expertise of the officer in plant taxonomy. It is recommended therefore that this officer be sent overseas for a one year M.Sc. degree in plant taxonomy in 1985.

Seed Services

The Seed Services Unit is currently undergoing important staff changes and the total picture of training requirements may not be clear until all vacancies are filled and replacements designated for all retiring staff. Furthermore, it is recognized that most of the training for seeds services will have to be done locally on-the-job by utilizing expertise, both in-country and from overseas. The team recommends therefore that priority be given to the training of research officers and technicians in accordance with the strategy of in-country technical courses outlined in Chapter 7 and developed in more detail later in this chapter. However, one trainee scientist should undertake a one year M.Sc. course in seed technology in 1986.

The Animal Production Systems Project

The team was impressed by the proposed arrangements for the training of research officers and technicians working with this project. The decision to recruit an agricultural economist is of particular interest. However, if agricultural research in Zimbabwe is to focus successfully on technology generation and adaptation for resource-poor communal farmers, it is essential that more social scientists are employed by DR & SS. There is a relatively large group of agricultural economists in the Ministry of Agriculture from which the Department could recruit this expertise. Once appointed, these officers will require short training courses which deals with on-farm and farming systems research methodologies.

8.4 Research Technicians

In accordance with the training strategy for DR & SS discussed in Chapter 7 and, on the basis of a careful assessment of the current staffing situation and training requirements in the Department, it is recommended that the following in-service courses be organized for research technicians:

- * A short course of about two weeks duration in statistics and field experimentation for field research technicians. This would be an introductory course on the concepts and applications of statistics in field experimentation, and should be given at least yearly on a regular schedule.

- * A short course of about two weeks duration in experimental design and analysis. This should be a more advanced course for experienced research technicians and even for some scientists. This course should also be scheduled and given at least once a year.
- * A course of about 4-6 weeks duration in crop protection technology. This should be for field and laboratory technicians in PPRI and some field stations. The course should emphasize concepts of pest and disease control, use and application of crop protection equipment and chemicals and precautions in the application of plant protection methods on small farms. There should be a strong practical component.
- * A specialised short-term course in soil and plant analytical techniques (2-3 weeks). This course will be for research technicians in the Chemistry and Soils Research Institute and should be given with special orientation to the services requirements of Zimbabwean agriculture and the facilities available or planned for DR&SS.
- * A specialized two week course on scientific instrumentation mainly for technicians for the laboratory based institutes e.g. CSRI, PPRI. This course should also focus on existing instruments in the Department and emphasize application and maintenance.
- * A short 2-3 week course on seed inspection and certification. This course should aim at the training of technicians in both field and laboratory aspects of seed inspection and certification. It may be given once every other year until all the technicians are fully trained.

Courses (iii), (iv), and (v) are required as soon as possible; they should be repeated, if and when necessary. In addition to these, other in-country technical courses as identified by heads of institutes and stations may need to be mounted to upgrade the expertise of technicians in specific areas of research training.

For the courses indicated above DR&SS will need to seek the assistance of other institutions such as the University, the Polytechnic, AGRITEX; other persons with expertise from the private sector; and in some cases, external agencies. Research technicians should be encouraged to participate in relevant courses mounted by AGRITEX such as public-speaking, farm management, etc. Finally, more field technicians should be given the opportunity to attend the UZ/CIMMYT on-farm and farming systems research training courses.

The team has not attempted to make specific recommendations concerning the attendance of research technicians at short courses held at overseas institutions. This will need to be done by the training officer working in close collaboration with the DR & SS Directorate and institute/station needs. However, institutions and countries offering potentially useful courses are listed in Appendix 4.

8.5 Training Requirements for Additional Staff 1984-1988

Having discussed at some length the training requirements of existing senior research staff employed by DR & SS, it is now necessary to consider briefly the training requirements for the additional scientists and technicians who are likely to be recruited between 1984-1988. This will allow estimates of total training requirements during this period to be derived.

There are two possible sources of demand for additional scientist and technician recruits in the future: (1) replacements for staff who leave DR & SS and (2) net additions to the present stock of personnel either as a result of the filling of vacancies or, thereafter, increases in the overall staff establishment permitted by the Public Service Commission. Each of these sources of demand will be dealt with in turn.

The Rate of Attrition

The number of staff who will have to be replaced will depend on the wastage or attrition from DR & SS. The rate of attrition, for say, research scientists is the average number who die, retire or resign to take up employment elsewhere, expressed as a percentage of the initial stock of scientists.*

In 1983 the rate of attrition of research and experimental offices was 23.9% and for research technicians 19.2%. However, it is necessary to disaggregate the resignation data further in order to take into account differences in the rates of attrition of African and European staff members. Thus, for African and European research scientists the rates of attrition in 1983 were 7.4% and 45.0% respectively. The corresponding figures for research technicians were 20.6% and 16.0%. Analyzing the destinations of research staff also provides important additional information on the attrition issue. As can be seen from Table 27, nine of the 18 European scientists went overseas and, of those who have stayed in Zimbabwe, at least five are known to be working for private sector employers. Of the four African scientists who left, two went to other public sector organizations and two joined the private sector. The situation with regard to technician attrition (see Table 28), is potentially more worrying for DR & SS given the relatively large numbers involved, in particular among those who left for private sector employers.

The likely rates of attrition among African and European scientists and technicians employed by DR & SS between 1984-1988 will depend on many factors. One set relates to the underlying functioning of DR & SS, which

* In practice however, deriving this figure is considerably more difficult. With regard to the DR & SS questionnaire data, the rate of attrition has been calculated as: $1983 \text{ resignations} / (\text{December } 1983 \text{ stock} + 1983 \text{ resignations} - 1983 \text{ appointments})$.

Table 27. Destination of European & African Research Scientists, 1983.

Division		Civil Service	Educ. Instit.	Other Parastatal	Private Sector	Overseas	Not Known	Totals
<u>Crops</u>	E	0	0	0	2	0	1	3
	A	1	1	0	0	0	0	2
Sub-total		1	1	0	2	0	1	5
<u>Livestock and Pastures</u>	E	0	1	0	3	5	1	10
	A	0	3	0	1	0	0	4
Sub-total		0	4	0	4	5	1	14
<u>Specialist Services</u>	E	0	0	0	0	4	1	5
	A	0	0	0	1	0	0	1
Sub-total		0	0	0	1	4	1	6
	E	0	1	0	5	9	3	18
	A	1	1	0	2	0	0	4
GRAND TOTAL		1	2	0	7	9	3	22

E = European; A = African.

Table 28. Destination of European and African Research Technicians, 1983

Division		Civil Service	Educ. Instit.	Other Parastatal	Private Sector	Overseas	Not Known	Totals
<u>Crops</u>	E	0	0	0	2	0	1	3
	A	2	2	0	1	0	0	5
Sub-total		2	2	0	3	0	1	8
<u>Livestock and Pastures</u>	E	0	0	0	0	1	0	1
	A	0	0	1	0	0	0	1
Sub-total		0	0	1	0	1	0	2
<u>Specialist Services</u>	E	0	0	0	0	0	0	0
	A	0	2	1	3	0	0	6
Sub-total		0	2	1	3	0	0	6
	E	0	0	0	2	1	1	4
	A	2	4	2	4	0	0	12
GRAND TOTAL		2	4	2	6	1	1	16

E = European; A = African.

in turn is influenced by the nature of the organizational structure, quality of research management, terms and conditions of service for research personnel, and patterns of promotion. A second set of factors concern developments at the national level in the labour markets for agricultural research personnel and, more generally, agricultural and science graduates.

Table 29. Target Recruitment for Scientists, 1984-1988.

	1984	1985	1986	1987	1988
Replacements for African Officers	7	7	8	8	8
Replacements for European Officers	7	5	4	3	2
Recruitment for Vacancies	5	5	5	3	3
	19	17	17	14	13

It is clearly very difficult to say with any degree of certainty how all these multifarious factors will influence the staffing situation in DR & SS but, after careful consideration, the team believes that the rates of attrition for African and European research scientists will be 8.0% and 25.0% respectively for the period in question, and 15.0% and 20.0% for African and European research technicians. In order to maintain current staffing levels with these rates of attrition, annual recruitment levels between 1984-1988 for scientists and technicians will have to be maintained at the level shown in Tables 29 and 30. While these levels of recruitment for attrition may be difficult to attain during the early part of this period, they should be easier to maintain thereafter, given the higher levels of projected output from the university and colleges of agriculture.

Table 30. Target Recruitment for Research Technicians, 1984-1988.

	1984	1985	1986	1987	1988
Replacements for African Officers	9	8	7	5	5
Replacements for European Officers	5	4	3	2	2
Recruitment for Vacancies	11	11	11	11	11
	25	23	21	18	18

Vacancy and Establishment Levels

Since a comprehensive plan for agricultural research for the next 5-10 years has not yet been developed, no detailed estimates are available on proposed net additions to the stocks of research scientists and other support staff. Interview and questionnaire responses indicate however, that senior DR & SS management are more concerned to consolidate the present numbers of staff, given the large scale of recruitment in recent years and the general inexperience of research personnel. This was also the view taken in the IFAD/IBRD National Agricultural Extension and Research Project report which recommended no net increases in senior staff establishments of DR & SS. Furthermore, although it has been suggested that DR & SS research budgets should be increased in order to allow a greater commitment of resources to communal area research (equivalent to 2% of the agricultural GDP of this sector), levels of funding are already relatively high (1.2% of agricultural GDP in 1982) and, with the present financial stringency in the government sector, just maintaining the present level of expenditure in real terms will be a major objective. Thus, it is recommended that DR & SS should only plan to fill the existing vacancies in its current establishments for research scientists and technicians during 1984-1988. These amount to 25 and 21 posts respectively which, given the high levels of recruitment required just to compensate for resignations, can probably only be filled gradually during the period. Tentative schedules are presented in Tables 29 and 30.

Supernumeraries

While the team does not believe that there should be any net additions to DR & SS's establishment during the period 1984-1988, there is a need for a number of supernumerary posts to be created. These are required where there are experienced scientists and technicians who are nearly at the end of their careers but do not have young officers training on the job under their supervision. Clearly, if appropriate vacancies exist in the institutes/stations where these individuals are working then this problem can be relatively easily solved. This is not the case, however, where a vacancy does not exist. The other justification for the appointment of supernumeraries is where there are insufficient numbers of research technicians to carry out programs, especially when research scientists have to attend coursework overseas.

After careful examination of the staff situation in DR & SS, the team recommends that supernumeraries in the following research programs should be appointed:

- * One pasture research scientist
- * One scientist for the Herbarium and Botanical Garden
- * One research technician for the potato team, CBI
- * Two research technicians for Matopos Research Station
- * One research technician for the Legume Inoculant factory at Grasslands Research Station
- * One research technician for the Herbarium and Botanical Garden
- * One research technician for the Information Services

Quantitative Estimates of Future Training Requirements

Until research programs for the next 5-10 years are developed, it is not possible to specify the precise training requirements of the scientists and technicians who will be recruited during 1984-1988. However, on the basis of the proposed training plan, approximate estimates of the overall numbers of senior research personnel needing to undertake long and short term training courses can be derived.

First, recruitment levels for scientists and technicians will justify an annual induction course for each group. Second, with two years of on-the-job training required before scientist trainees are allowed to register for M.Phil. and M.Sc. degrees and, assuming that during this period, 75.0% of each annual intake of recruits will actually start post graduate training (taking into account attrition and unsuitable candidates), then a total of 40 trainees will need to be trained at the masters level between 1986-1988 (14 in 1986, 13 each in 1987 and 1988). Third, with the proposed recruitment of scientist and technician trainees, total short course training requirements will remain at unchanged, requiring therefore that the short training funds (both for in-country and overseas courses) are, in real terms, maintained at their 1984 levels.

CHAPTER 9
IMPLEMENTATION

9.1 The Cost of the Training Plan

Estimates of the number of DR & SS scientists who will need to go for M.Sc./M.Phil. degrees during the period 1984 - 1988 are presented in Table 31. It has been assumed these trainees will undertake the three types of masters program in the same proportions as has been recommended for 1985 and 1986. The costs of these masters programs cannot be ascertained precisely, particularly given the flexible nature of the M.Phil. coursework at the University of Zimbabwe. However, it has been assumed that (i) the average cost of the Type 1 course will be approximately Z\$15,000 per trainee (ii) most Type 2 - one year M.Sc. courses will be undertaken at British universities. The cost of a one year M.Sc. course in the United Kingdom in 1984 is approximately £9,000 (Z\$12,000). (iii) The approximate cost of a two year M.Sc. in the United States is Z\$40,000.

Table 31. Total M.Sc./M.Phil. Training Requirements, 1985-1988.

	Existing Staff			Newly Recruited Staff			1984-1986	
	1985	1986	Totals	1986	1987	1988	Totals	
M.Phil./UZ	8	14	22	6	7	7	20	
1 yr. M.Sc.	10	3	13	7	5	5	17	
2 yr. M.Sc.	2	0	3	1	1	1	3	
Totals	20	17	37	14	13	13	40	

The total costs for each of these M.Sc./M.Phil. programs are presented in Table 32. In addition, another Z\$70,000 has been budgeted to allow D.Phil. students to visit universities overseas while undertaking the research for their thesis.

With regard to short courses for scientists and technicians, it can be seen from Table 32 that the costs of DR & SS short-courses have been estimated at between Z\$40-50,000 per annum. Overseas short courses and contact visits will require funds of Z\$70,000 per annum. The two annual induction courses, one each for scientists and technician trainees, will cost approximately Z\$20,000 and the annual management course Z\$25,000.

Finally, the costs of personnel with major training responsibilities have also been included under a separate heading in Table 32. The technical assistance estimates have been based on those presented in the IFAD/IBRD Staff Appraisal Report (i.e. Z\$7,400 per month), although these should be treated as maximum estimates since the team believes that the experienced scientists required should be able to be recruited at much lower cost.

Table 32. Estimated Cost of the Training Plan (Z\$ '000)*

	1985	1986	1987	1988	Totals
1. <u>Postgraduate Courses</u>					
M.Phil./UZ	120	300	105	105	630
M.Sc. 1 year	120	120	60	60	360
M.Sc. 2 year	40	60	40	40	180
D.Phil.	15	15	20	20	70
Sub-total	295	495	225	225	1,240
2. <u>Short Courses and Contact Visits</u>					
DR & SS In-Service	40	45	50	50	190
Overseas	70	70	70	70	280
Induction	20	20	20	20	80
Management	25	25	25	25	100
Sub-total	155	160	165	165	645
3. <u>Training Personnel</u>					
Supernumeraries	64	68	72	76	280
Full-time Technical Assistance	620	620	620	-	1,860
Training Officer	25	25	25	25	100
Sub-total	709	713	717	101	2,240
GRAND TOTAL	1159	1368	1107	491	4,125

* in 1984 prices.

9.2 The Training Officer

The detailed preparation and implementation of the proposed training plan for DR&SS should be the responsibility of a training officer. The team recommends therefore that a training officer be appointed as soon as possible. In view of the critical importance of the training function in DR & SS it is also recommended that the training officer be directly attached to the office of the director in order to avoid any possible complications that might arise if he/she was formally a member of one of the three divisions, and so that this person can work closely with members of the Directorate and other senior managers in DR&SS. Furthermore, it is apparent that the size and complexity of the training requirements in DR & SS are such that the training officer will need to work full time and exclusively for DR & SS.

Functions and Responsibilities

The functions and responsibilities of the training officer should be as follows:

- * To develop and review annual and periodic training plans for the department in consultation with the various heads of divisions, institutes, and stations.
- * To liaise with the university, polytechnic, agricultural colleges and other institutions in the development of suitable training programs/courses for scientific and technical staff of the department.
- * To compile and maintain detailed information on relevant training programs in-country and overseas and to periodically circulate this information in an appropriate form to senior manager in DR&SS.
- * To plan and organize suitable in-service training courses for DR&SS staff in consultation with heads of institutes, units, or services.
- * To liaise with AGRITEX and other relevant governmental departments concerning matters of training.
- * To arrange periodic reviews of training courses offered to DR & SS staff.
- * To liaise with IARCs on matters of training. This will probably require visits by the training officer to IITA, CIAT, ICRISAT, and ILCA soon after his/her appointment.
- * To compile and maintain relevant documentation on trainees in the department.
- * To compile annually a report on the training facilities in the department.
- * To assist and facilitate the preparation of training materials for in-service training and other presentations on training in the department.
- * Establish evaluation and record systems for training and followup activities.

Attributes

The minimum requirements for the post of training officer in DR&SS are that the individual must have a proven record as a competent administrator at a senior level in large, preferably public service, organizations and capable of interacting effectively with a diverse range of personnel. It is also highly desirable, but not essential, that the training officer has (i) an agricultural research or agricultural education background and (ii) previous experience in managing training programs.

An individual with the above qualities and experience is only likely to be attracted to DR&SS if he/she is appointed at a senior level. The team recommends therefore, that the training officer should receive the same conditions of service as a chief research officer in DR & SS.

APPENDIX 1

People we met

Ministry of Agriculture, Harare

Mr. P. Mupawose	Secretary of Agriculture
Dr. S. Muchena	Deputy Secretary of Agriculture

Department of Research and Specialist Services, Harare

Directorate

Dr. P. R. N. Chigaru	Director
Dr. B. N. Ndimande	Deputy Director

Crops Research Division

Mr. R. Fenner	Assistant Director
	Agronomy Institute
Dr. E. E. Whingwiri	Head of Institute
Mr. C. Ndebele	Technician, Crop Production Unit Matopos

Crop Breeding Institute

Mr. J. N. Mushonga	Senior Research Officer, Small Grain Team
Mr. V. Gwarazimba	Experimental Officer, Millet Breeding
Mr. A. N. Mashiringwani	Research Officer, Winter Cereals Team
Mr. A. Z. Chiteka	Research Officer, Groundnut Breeding
Ms. K. Mtindi	Research Officer, Sunflower Breeding
Mr. M. J. Joyce	Principal Research Technician, Potato Breeding

Cotton Research Institute

Mr. G. G. Rabey	Principal Research Officer, Head of Station
Mr. G. B. Jones	Technical Cooperation Officer (ODA), Cotton Research Team Leader
Mr. T. Mashavira	Experimental Officer, Cotton Agronomy
Mr. P. Marerwa	Research Technician, Agronomy
Mr. M. Chuchu	Research Technician, Agronomy
Dr. J. H. Brettel	Chief Research Officer, Team Leader, Pest Research

Horticulture Research Centre

Mr. M. L. Vogel	Acting Officer-in-Charge
Mr. L. R. Msika	Experimental Officer
Mr. N. Madzogo	Farm Manager

APPENDIX 2

Grading and Salary Structures in DR & SS

Research Scientists

The main grades and annual salary increments for research scientists are presented in Table 33. The team has the following general observations to make concerning the appointment and advancement of research scientists in DR & SS.

1. The overall percentage distribution of research scientists in DR & SS in March 1984 was: experimental officers 38.5%, research officers 34.2%; senior research officers 14.9%; principal research officers 8.8%; and chief research officers 3.5% (see Table 34).
2. While there are nine annual increments to the research officer scale barrier at Z\$10,896, in practice this is normally reduced to four years if (i) the officer has an M.Sc. on joining DR & SS or acquires such a qualification during his/her first four years (as the team recommends) and (ii) has been assessed as progressing in a satisfactory way.
3. An M.Sc. scientist with satisfactory performance evaluations enjoys relatively rapid salary increases during his/her first four years of employment at DR & SS (i.e. 44.0% during this period).
4. There are very few annual increments within the principal research officer and chief research officer grades. Thus, "the high flyer" progressing through the scale barriers as quickly as possible would have reached the maximum salary of Z\$16,872 in 15 years, with another 15-20 years of his/her career remaining, and earning only slightly double the starting salary.

The team has the following recommendations to make concerning the grading structure of research scientists in DR & SS:

1. The creation of an assistant research officer (ARO) grade to cover the four year traineeship period.
2. The restructuring of the main research scientists grades, in particular the principal and chief research officer grades so as to create more attractive career prospects for experienced staff. This will encourage them to remain at DR & SS long enough to become productive researchers, thereby ensuring a sufficiently high rate of return on training investments. Thus, the team recommends that the starting point for the main grades should be as follows:

* research officer at the beginning of year five

Table 33. Existing and Proposed Grading and Salary Structures for Research Scientists.

Years Service	Basic Salary*	Index 7536=100	Existing Grades	Recommended Grades
0	7536	100	RO	ARO
1	7920	105		
2	9072	120		
3	9528	126		
4	10896	144		
5	12264	163	SRO	RO
6	12720	169		
7	13176	175		
8	13632	181		
9	14088	187		
10	14544	193		
11	15000	199	PRO	SRO
12	15456	205		
13	15912	211	CRO	
14	16386	217		
15	16872	224	END	SB
16				PRO
17				
18				
19				
20				SB
21				CRO
22				
23				
24				
25				
26				
27				
28				
29				
30				END

* From 1/1/84 research officers and technicians have received a critical area shortage allowance which is approximately 15.0% of the basic salary.

- * senior research officer at the beginning of year 11
 - * principal research officer at the beginning of year 16
 - * chief research officer at the beginning of the year 21.
3. The extension of the CRO salary scale with annual salary increments of approximately 4.0%.

Table 34. Percentage Distribution of Research Scientists and Technicians by Main Grades.

	Research Scientists					Research Technicians		
	EO	RO	SRO	PRO	CRO	RT	SRT	PRT
Crops	26.5	41.2	20.6	8.8	2.9	82.8	5.7	11.4
Livestock & Pastures	40.0	31.4	14.3	5.7	8.6	85.2	11.1	3.7
Research Services	46.7	31.1	14.3	14.3	0.0	90.0	10.0	0.0
Overall	38.5	34.2	14.9	8.8	3.5	85.4	8.5	6.1

Research Technicians

The conditions of service for research technicians are more complicated to analyze as a result of multiple entry points and the generally more heterogeneous composition of this cadre. The following observations will be confined to the core group of research technicians with formal agricultural diploma qualifications who comprise 95.0% of research technicians in the crops division, 80.7% in livestock and pastures but only 24.0% in research services.

1. The overall percentage distribution of research technicians in DR & SS in March 1984 was: research technician 85.4%; senior research technician 8.5%; and principal research technician 6.1%.
2. Comparing Tables 33 and 35 it can be seen that there is considerable overlap between the salaries paid to research technicians and research scientists. Indeed, if it is assumed that the research technician is awarded the additional increments after two years service and progresses without any delay through the two SB barriers to the final research technician SB barrier (at year 14), then the technician is earning Z\$12,720 which is 77.6% of the salary of the scientist at the same stage in her/his career. (This percentage increases still further if the technician is awarded two additional increments for "above average ability" at the Z\$9,072 scale barrier).
3. Two-thirds of all research technicians employed cannot advance beyond the Z\$12,720 scale barrier at year 14 of their career and thereby achieve promotion to senior research technician (SRT) and principal research technician (PRT) grades. With a stable staffing situation, this creates considerable frustrations as research technicians have

to wait many years for vacancies to arise in SRT and PRT establishments. Even with the high levels of recruitment in DR & SS in recent years, the percentages of research technicians with 16+ years of experience in crops, livestock and pastures and research services divisions were 20.6%, 34.4% and 50.0% respectively in March 1984.

4. No research technician can advance beyond the end of the very short PRT grade with a maximum salary of Z\$15,000. In theory, this barrier can be reached after 19 years of a technician's career, with at least another 20 years of productive work ahead of the officer.
5. The level of attrition for research technicians is at present twice as high than that of scientists because of their high market value as farm managers in the private sector and the considerably more attractive conditions of service and, in particular promotion prospects in other government departments, notably AGRITEX.

The team proposes the following recommendations concerning conditions of service for research technicians.

1. A single suitability board (SB) bar for research technicians at the present salary of Z\$10,890 (10 years of service) and the abolition of the additional qualification requirement at this SB barrier.
2. Removal of the Z\$12,720 SB barrier (year 14) and the repeal of the regulation that only two-thirds of technicians can advance beyond this point.
3. A terminal point in the SRT grade at the present salary of Z\$13,176 (year 15).
4. A terminal point for the PRT grade at year 20 and the creation of a new chief research technician (CRT) grade until year 30 with an extension of the salary scale with annual increments of 4.0% of initial salary.
5. With the present high rates of attrition of research technicians, the RS:RT income differentials should be maintained.

Table 35. Existing and Proposed Grading Structures for Research Technicians.

Years Employed	Basic Salary (Z\$)	Index 6024=100	Existing Grades	Recommended Grades
0	6024	100	RT	RT
1	6384	106		
2	7536	125		
3	7920	131		
4	8304	138		
5	8688	144		
6	9072	151		
7	9528	158		SB
8	9984	166	RT	
10	10896	181		SB
11	11352	189	RT	SRT
12	11808	196		
13	12264	204		
14	12720	211		SB
15	13176	218	SRT	SB
16	13632	226		PRT
17	14088	234		PC
18	14544	241	PRT	
19	15000	249	END	
20				SB
21				CRT
22				
23				
24				
25				
26				
27				
28				
29				
30				

END

Table 36. Crops Scientists, July 1984.

Institution	Employment	Highest Qualification Attained			Undertaking Postgraduate Training				Research Experience (Years)				
		BSc	MSc	PhD	MPhil UZ	MSc O/S	DPhil UZ	Phd O/S	0-2	3-5	6-10	11-15	16+
<u>Agronomy Institute</u>													
Crop Production	2	1	1	0	0	0	0	0	2	0	0	0	0
Crop Physiology	2	1	0	1	0	0	0	0	1	1	0	0	0
Weed Research	2	1	1	0	0	0	0	0	2	0	0	0	0
Sub-total	6	3	2	1	0	0	0	0	5	1	0	0	0
<u>Cotton R.I.</u>													
Breeding	2(1)	1	1	0	0	0	0	0	0	0	1	0	1
Agronomy/Physiology	2	1	1	0	0	0	0	0	1	0	0	1	0
Pest Research	3	0	2	1	0	0	1	0	0	2	0	0	1
Sub-total	7(1)	2	4	1	0	0	0	0	1	2	1	1	2
<u>Crop Breeding I</u>													
Maize Team	1	1	0	0	0	0	0	0	0	0	0	1	0
Small Grain Team	1	0	1	0	0	0	0	0	0	0	0	0	0
Winter Cereals Team	1	1	0	0	0	0	0	0	0	1	0	0	0
Oilseeds Team	4	3	1	0	0	0	0	0	2	0	0	1	1
Sub-total	7	5	2	0	0	0	0	0	2	1	1	2	1
<u>Horticulture and Coffee R.I.</u>													
Horticulture R.C.	2(1)	2	0	0	0	0	0	0	2	0	0	0	0
Rhodes Inyanga E.S.	2	2	0	0	0	0	0	0	1	0	0	0	1
Coffee R.S.	2(1)	0	1	1	0	0	0	0	1	0	0	0	1
Sub-total	6(2)	4	1	1	0	0	0	0	4	0	0	0	2
<u>Lowveld R.S.</u>													
Agronomy	4(1)	2	2	0	1	0	0	0	2	1	0	0	1
Horticulture	1	0	1	0	0	0	0	0	1	0	0	0	0
Sub-total	5(1)	2	3	0	0	0	0	0	3	1	0	0	1
TOTALS	31(4)	16	12	3	1	0	1	0	15	5	2	3	6
<u>Farming Systems Team</u>	4(2)	1	1	2	1	0	1	0	0	2	0	2	0

Table 37. Crop Technicians, July 1984.

Institution	Employment	Highest Qualification Attained			Research Experience (Years)				
		Local Dip.	O/S Dip.	Cert. or less	0-2	3-5	6-10	11-15	16+
<u>Agronomy I</u>									
Crop Production	6	6	0	0	3	1	2	0	0
Crop Physiology	2	2	0	0	1	0	0	0	0
CART	1	1	0	0	1	0	0	0	1
Weed Research	3	0	3	0	0	0	0	1	2
Sub-total	12	9	3	0	5	1	2	1	3
<u>Cotton R.I.</u>									
Breeding	2	2	0	0	2	0	0	0	0
Agronomy/Physiology	2	2	0	0	1	1	0	0	0
Pest Research	3	3	0	0	0	1	0	2	0
Field Management	1	1	0	0	0	0	1	0	0
Sub-total	8	8	0	0	3	2	1	2	0
<u>Crop Breeding</u>									
Maize Team	1	1	0	0	0	0	0	1	0
Oilseeds Team	1	1	0	0	1	0	0	0	0
Potatoes	1	0	0	1	0	0	0	0	1
Field Management	1	0	0	1	0	0	0	0	1
Small Grains	0	0	0	0	0	0	0	0	0
Sub-total	4	2	0	2	1	0	0	1	2
<u>Horticulture & Coffee RI</u>									
Horticulture R.C.	1	1	0	0	0	1	0	0	0
Rhoyes Inyanga E.S.	2	1	1	0	1	0	1	0	0
Coffee R.S.	2	2	0	0	0	1	0	0	1
Sub-total	5	4	1	0	1	2	1	0	1
<u>Lowveld R.S.</u>									
Agronomy	3	3	0	0	1	0	2	0	0
Horticulture	1	1	0	0	0	1	0	0	0
Field Management	1	0	1	0	0	0	0	0	1
Sub-total	5	4	1	1	1	2	0	1	
TOTALS	34	27	5	2	11	6	6	4	7

Table 38. Livestock Scientists, July 1984.

Institution	Employment	Highest Qualification Attained			Undertaking Postgraduate Training				Research Experience (Years)				
		BSc	MSc	PhD	MPhil UZ	MSc O/S	DPhil UZ	Phd O/S	0-2	3-5	6-10	11-15	16+
<u>Grasslands R.S.</u>													
Livestock Unit	3(1)	2	1	0	1	0	1	0	1	2	0	0	0
Pasture	3	1	1	1	0	0	1	0	1	0	0	0	2
Sub-total	7	4	2	1	2	0	2	0	2	2	0	1	2
<u>Henderson R.S.</u>													
Livestock	8	5	2	0	2	1	0	1	4	1	2	0	0
Pasture	3	3	0	0	1	0	0	0	1	1	0	0	1
Poultry Unit	1	0	1	0	0	0	0	0	1	0	0	0	0
Sub-total	12	8	3	1	3	1	0	1	6	2	2	1	1
<u>Matopos R.S.</u>													
Range Livestock Nutrition	4	3	1	0	0	0	0	0	3	0	1	0	0
Livestock Breeding	3(1)	2	0	0	0	0	0	0	2	0	0	0	0
Veld Management & Ecology	1	1	0	0	0	0	0	0	0	0	0	0	1
Sub-total	8	6	2	0	0	0	0	0	5	0	1	0	2
<u>Makgohli E.S.</u>	2	2	0	0	1	0	0	0	1	1	0	0	0
<u>Dairy Services</u>	6	4	2	0	0	0	0	0	4	1	0	0	1
TOTALS	35(2)	24	9	2	6	1	2	1	18	6	.	2	6

(-) = foreign scientists

Table 39. Livestock Technicians, July 1984.

Institution	Employment	Highest Qualification Attained				Research Experience (Years)				
		Local Dip.	O/S Dip.	ZNTC	Cert. or less	0-2	3-5	6-10	11-15	16+
<u>Grasslands R.S.</u>										
Livestock Unit	1	1	0	0	0	1	0	0	0	0
Pasture	2	1	0	0	0	0	1	0	0	1
Legume Inoculants	1	0	1	0	0	0	0	1	0	0
Analytical Lab.	1	0	0	1	0	0	0	0	0	1
Estate	1	0	0	0	1	0	0	0	0	1
Sub-total	6	1	1	1	0	1	1	0	3	
<u>Herderson R.S.</u>										
Livestock	1(1)	0	0	0	1	0	1	0	1	0
Pasture	2	2	0	0	0	1	0	1	0	0
Estate	2	0	1	0	1	0	0	0	0	2
Poultry	2	1	1	0	0	0	0	1	1	0
Sub-total	7	3	2	0	2	1	1	2	2	2
<u>Matopos R.S.</u>										
Range Nutrition	1	0	0	0	1	0	0	0	0	1
Livestock Breeding	4	1	3	0	0	1	0	1	0	2
Veld Man. & Ecology	2	2	0	0	0	0	0	2	0	0
Estate	1	0	1	0	0	0	0	0	0	1
Sub-total	8	3	4	0	1	1	0	3	0	4
<u>Makeholi E.S.</u>	3	3	0	0	0	0	2	1	0	0
<u>Dairy Services</u>	2(1)	0	2	0	0	1	0	1	0	0
TOTALS	26(2)	12	9	1	4	3	4	8	2	9

Table 40. Research Services Scientists, July 1984.

Institution	Employment	Highest Qualification Attained			Undertaking Postgraduate Training				Research Experience (Years)				
		BSc	MSc	PhD	MPhil UZ	MSc O/S	DPhil UZ	Phd O/S	0-2	3-5	6-10	11-15	16+
<u>Plant Protection R.I.</u>													
Entomology	6	5	0	1	0	1	0	0	4	1	1	0	0
Pathology	3	0	3	0	0	0	1	1	0	2	1	0	0
Nematology	5(1)	3	2	0	0	2	0	0	0	4	1	0	0
Sub-total	14(1)	8	5	1	0	3	1	1	4	7	3	0	0
<u>Chemistry & Soils R.I.</u>													
General Analytical Lab.	3	2	0	1	0	0	0	0	1	2	0	0	0
Special Analysis Lab.	4	2	2	0	0	0	0	0	3	1	0	0	0
Crop Nutrition	3(1)	1	1	1	0	0	0	0	2	0	1	0	0
Pedology & Soil Survey	6(3)	4	2	0	0	0	0	0	2	2	1	0	1
Soil Productivity R.L.	7(2)	4	2	1	0	1	0	0	2	2	1	1	0
Sub-total	24(6)	13	8	3	0	1	0	0	11	7	3	2	1
<u>Biometrics Bureau</u>	7(2)	5	2	0	0	1	0	1	4	2	0	0	1
<u>National Herbarium</u>	4(1)	4	0	0	0	0	1	0	1	0	0	0	3
<u>Seed Services</u>	6	4	1	1	0	0	0	0	3	1	1	0	1
<u>Information Services</u>	1	1	0	0	0	0	0	0	0	1	0	0	0
TOTALS	56(10)	35	16	5	0	5	2	0	23	18	7	2	6

Table 41. Services Technicians, July 1984.

Institution	Employment	Highest Qualification Attained					Research Experience (Years)				
		Local Dip.	O/S Dip.	ZNTC	HND/C&GII	Cert. or less	0-2	3-5	6-10	11-15	16+
<u>Plant Protection R.I.</u>											
Entomology	2	0	0	0	0	2	0	0	0	1	1
Pathology	3	1	0	1	1	0	2	0	0	1	0
Nematology	1	0	0	0	0	1	0	0	0	0	1
Pesticide Registration	1	0	0	0	1	0	0	1	0	0	0
Plant Inspection	6	2	2	0	0	1	1	0	1	0	2
Sub-total	13	3	2	1	2	5	4	1	1	2	4
<u>Chemical and Soil R.I.</u>											
General Analytical Lab.	1	0	0	1	0	0	0	0	0	0	1
Special Analysis Lab.	0	0	0	0	0	0	0	0	0	0	0
Crop Nutrition	2	0	0	0	1	1	0	0	0	1	1
Pedology and Soil Survey	2	0	0	0	1	1	0	1	0	0	1
Soil Productivity R.L.	2	0	0	1	0	1	0	0	0	0	2
Sub-total	7	0	0	2	2	3	0	1	0	1	5
<u>Biometrics Bureau</u>	1	0	0	0	0	1	0	0	0	1	0
<u>National Herbarium</u>	3	0	1	0	0	2	0	0	0	0	3
<u>Seed Services</u>	1	0	0	1	0	0	1	0	0	0	1
<u>Information</u>	0	0	0	0	0	0	0	0	0	0	0
TOTALS	25	3	3	4	4	11	5	2	1	4	13

APPENDIX 4

Institutions and Countries Offering Potentially Useful Short Courses.

Crops

Farming Systems Research	- IITA, CIMMYT, ICRISAT
Crop Research/Production	- IITA, ICRISAT, IRRI, CIMMYT
Soil Fertility	- ICRISAT, IITA, Australia
Soil Microbiology	- INTSOY, IITA, Netherlands
Soil Water Management	- IITA, ICRISAT, IIMI (Sri Lanka), Netherlands
Crop Genetic Resources	- IBPGR, IRRI, CIAT, ICRISAT
Dryland Agriculture	- Australia, ICRISAT, ICARDA
General Agronomy	- U.K., ICRISAT, IITA
Horticultural Research	- AVRDC, U.K., Kenya
Fruit and Vegetable Research and Production	- AVRDC, Netherlands, F.A.O.
Coffee Research	- Kenya, Brazil
Sorghum and Millet	- ICRISAT, Nigeria
Oilseeds Research	- INTSOY, Brazil, IITA, ICRISAT, F.A.O.
Potato Research	- CIP, Netherlands
Plant Breeding	- Netherlands, U.K., U.S.A.
Soil Productivity	- CIAT, Netherlands, U.K.
Rhizobium Studies	- Hawaii, IITA
Seed Technology	- ISTA

Livestock and Pastures

Mixed Farming Systems	- ILCA
Animal Nutrition	- U.S.A., ILCA, U.K.
Dairy Research	- U.K., Denmark
Pasture Science	- Australia, ILCA, CIAT, Hurley (U.K.)
Pasture Seed Production	- Australia, CIAT
Range Management	- U.S.A., Australia
Tropical Legumes	- CIAT, Australia
Animal Breeding	- U.K., ILCA
Animal Production Systems	- ILCA, Kenya, Mali
Dairy Services	- U.K., U.S.A., Denmark

Research Services

Agricultural Chemistry	- U.K., IITA, U.S.A.
Crop Nutrition	- ICRISAT, IITA
Pedology and Soil Survey	- Netherlands, U.S.A.
Soil Microbiology	- IITA, U.S.A., U.K.
Analytical Techniques	- U.K., IITA
Soil Classification	- Netherlands, U.K.
Plant Quarantine and Plant Inspection	- CPPTI (India), Kenya, Australia

Pest Control Technology	- U.K., ICIPE, IITA, ICRISAT
Pest and Disease Management	- U.K., IITA, ICIPE, Nigeria
Nematology	- U.K., U.S.A., Nigeria, Netherlands
Plant Pathology	- U.K., U.S.A., Nigeria, IRRI, Denmark
Entomology	- U.K., U.S.A., IRRI, IITA, etc.
Pesticide Analysis	- U.K., U.S.A., Tanzania
Seed Technology and Seed Services	- U.K., U.S.A., AVRDC
Phytovirology	- IITA, Netherlands, U.S.A.

APPENDIX 5

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APPENDIX 6

List of Acronyms

AGRITEX	Department of Agricultural Technical Services and Extension
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacionale de Mejoramiento de Maiz y Trigo
DR & SS	Department of Research and Specialist Services
FOA	Faculty of Agriculture
FSR	Farming Systems Research
GCE	General Certificate of Education
GDP	Gross Domestic Product
IARC	International Agricultural Research Center
IBRD	International Bank for Reconstruction and Development
ICRISAT	International Center for Research in the Semi-Arid Tropics
IDRC	International Development Research Center
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture
ILCA	International Livestock Center for Africa
ISNAR	International Service for National Agricultural Research
MOA	Ministry of Agriculture
MLMDSA	Ministry of Labour, Manpower Development and Social Affairs
ODA	Overseas Development Administration
PSC	Public Service Commission
USAID	United States Agency for International Development
UZ	University of Zimbabwe
ZNTC	Zimbabwe National Technician's Certificate